

Energy & Sustainability Statement

For

26 Netherhall Gardens

London Borough of Camden London NW3 5TL

Prepared for

Atlas Property Lettings & Services Ltd

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FXFCUTIVE SUMMARY

Mecserve Ltd has been appointed by Atlas Property Lettings & Service Ltd to prepare an Energy and Sustainability Statement to support the planning application for the proposed scheme at 26 Netherhall Gardens in the London Borough of Camden. Building works on the site include a 4-storey extension to the existing building to provide four new residential units.

This Energy and Sustainability Statement, prepared in line with the Energy Assessment Guidance (October 2018) published by the Greater London Authority, outlines the key features and strategies adopted by the development team to enhance the energy performance of the proposed development at 26 Netherhall Gardens. The scheme complies with all relevant policies with regards to energy and carbon emissions, set by the Camden Local Plan (2017). Sections 2 and 3 review these policies and demonstrate how the proposed design meets the planning targets and requirements to minimise its environmental impact.

The strategy for reducing energy use and associated carbon emissions through the design of the scheme follows the London Plan energy hierarchy, namely:

- Be Lean Reduce energy demand through passive design strategies and best practice design of building services, lighting and controls;
- Be Clean Reduce energy consumption further by connecting to an existing district heating system and exploit provision of Combined Heat and Power (CHP) systems;
- Be Green Generate power on site through Renewable Energy Technologies.

The following passive and active energy efficiency features have been considered in the proposed strategy for 26 Netherhall Gardens:

- High performance building fabric of low U-values that exceed Part L minimum standards;
- Double-glazed windows of low U-values will help reduce the heating demand further;
- All junctions will conform to Accredited Construction Details thus eliminating thermal bridging;
- Individual gas-fired condensing boilers of high efficiency will provide heating and domestic hot water to the newly built apartments;
- All apartments will feature Mechanical Ventilation with Heat Recovery (MVHR) to make use
 of wasted heat of the exhaust air by preheating the incoming air;
- Light fittings will be of low energy types;
- Photovoltaic (PV) panels will be installed to generate renewable energy on site.

Following the proposed energy strategy, the new flats achieve significant carbon savings and comply with the Target Emission Rate (TER) set by Part L of current Building Regulations and Council carbon target i.e. a 19% reduction over 2013 TER. The following sections present the CO₂ savings for the new extension at 26 Netherhall Gardens. As recommended by the GLA Energy Guidance Assessment, the updated SAP 10 emission factors have been used to reflect the fact that grid



electricity has significantly decarbonised since the last update of Part L in April 2014. Appendix 6 of the report presents the carbon savings achieved using the SAP 2012 emission factors for comparison, calculated using the GLA carbon emission reporting spreadsheet.

Table 1 demonstrates the overall reduction in the regulated carbon emission of the development after each stage of the London Plan Energy Hierarchy.

Table 1 Total CO₂ emissions reduction for the development

		Carbon dioxide emissions (Tonnes CO ₂ per annum)
Baseline Emis	ssions	6
Be Lean After energy demand reduction		5
Be Clean	After CHP	5
Be Green	After renewable energy	5

Table 2 demonstrates the total regulated CO_2 savings from each stage of the Energy Hierarchy. As demonstrated below, an overall 19% reduction in carbon emissions can be achieved over Part L 2013 TER when applying the proposed strategy, which exceeds the 19% reduction set in the Camden Local Plan.

Table 2 Total regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated carbo	n dioxide savings
	(Tonnes CO2 per annum)	(%)
Savings from energy demand reduction	1	11%
Savings from CHP	0	0%
Savings from renewable energy	0	8%
Total Cumulative Savings	1	19%



Figure 1 below illustrates the total carbon savings achieved at each stage of the London Plan Energy Hierarchy for 26 Netherhall Gardens. Overall, the scheme exceeds the 19% carbon reduction required by the Camden Council.

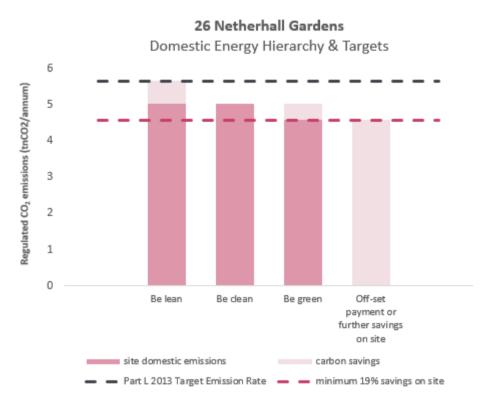


Figure 1 Total carbon savings achieved over Baseline Emissions



1. INTRODUCTION

Over recent years, global public opinion has been increasingly concerned with the state of the environment and the impact of climate change. Buildings are responsible for a significant proportion of the world's energy consumption. In the United Kingdom, domestic, commercial buildings and industry contribute 43%¹ of the total CO2 emissions. These figures highlight the need for building owners, developers and designers to design environmentally sustainable buildings.

This report provides a review of the sustainability and efficiency benchmarks for the scheme and sets out targets for the development in terms of both sustainability and energy. An overview of different sustainability and energy-efficiency technologies that are likely to be appropriate for the development are also included in this statement.

As the design progresses, the strategies outlined in this report will be further developed and subjected to detailed financial feasibility studies. The environmental strategies and options outlined in this report are based on the current information available and are likely to evolve with the design.

The energy calculations presented in this report will need to be continually updated through the detailed design stages to reflect any changes. The energy analysis presented here should be treated as preliminary information based on the currently available data.

1.1 PROPOSED DEVELOPMENT

The proposed development is located at 26 Netherhall Gardens in London Borough of Camden, within the Fitzjohns / Netherhall conservation area. Building works on the site include a 4-storey extension to the existing building to provide four new residential units (2×1 -Bed apartments, 1×2 -Bed apartment and 1×2 -Bed duplex).

For a detailed description of the proposed design, please refer to the Design and Access Statement prepared by Squire & Partners Architects.

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¹ Department for Environment, Food and Rural Affairs, http://www.defra.gov.uk/, 2008





Figure 2 Bird's eye view of existing Building



Figure 3 Proposed scheme – 26 Netherhall Gardens Road view



2. OVERVIEW OF ENVIRONMENTAL STANDARDS, TARGETS AND POLICIES

2.1 NATIONAL POLICIES

ENERGY WHITE PAPER

The Energy White Paper: Our Energy Future – Creating a Low Carbon Economy² is an energy policy in response to the increasing challenges faced by the UK, including climate change, decreasing domestic supplies of fossil fuel and escalating energy prices. The Energy White Paper sets four priorities:

- Cutting the UK's carbon dioxide emissions the main contributor to global warming by some 60% by about 2050, with real progress by 2020;
- Security of supply;
- A competitive market for the benefit of businesses, industries and households;
- Affordable energy for the poor.

CLIMATE CHANGE ACT 2008

Published in 2008 by the UK Government, Climate Change Act³ is the world's first long-term legally binding framework to mitigate against climate change. The Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target to 80% by 2050.

In addition to the standards, targets and policies discussed above, the relevant British Standards and CIBSE Guidelines were used to assist in determining the most appropriate Ecologically Sustainable Design (ESD) initiatives for the development.

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² Dti, (2003); Energy White Paper Our Energy Future - Creating a Low Carbon Economy. TSO.

³ OPSI, (2008); Climate Change Act. HMSO.



NATIONAL PLANNING POLICY FRAMEWORK (NPPF) (FEBRUARY 2019)

The Government has developed the National Planning Policy Framework (NPPF) which plays a key role in delivering the Government's objectives on sustainable development. The framework encourages ownership at the local level and provides guidance to promote effective environmental protection, economic growth and ensuring a better quality of life for all, both now and in future generations. Some of the main objectives of the Governments planning framework in relation to sustainability are:

- Build prosperous communities with opportunities for employment and economic growth across all areas of society;
- Reduce the need for car dependency and provide easy access to public transport;
- Maintain, and enhance or restore biodiversity and geological interests;
- Protect the condition of land, its use, and its development from potential hazards;
- Ensure that all new developments contribute to the Governments targets of carbon emission reductions.

2.2 REGIONAL POLICY

THE LONDON PLAN (MARCH 2016)

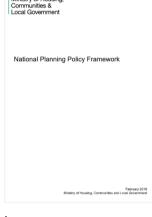
The London Plan, prepared by the Mayor of London's office, deals with matters that are of strategic importance to Greater London. The London Plan is the overall strategic plan setting out an integrated social, economic and environmental framework for the future development of London, looking forward until 2036.

Chapter 5 of the London Plan deals with matters related to climate change.





Supplementary Planning Guidance, Sustainable Design and Construction (April 2014) provides framework for implementing the London policies.





2.3 LOCAL POLICIES

CAMDEN LOCAL PLAN (2017)

The Camden Local Plan sets out the Council's planning policies and replaces the Core Strategy and Development Policies planning documents (adopted in 2010). This sets out the key elements of the Council's planning vision and strategy of the borough.

Through its Camden Planning Guidance (CPG) on Energy efficiency and adaptation (Draft November 2018) the council provides additional information on key energy and resource issues within the borough.



The following is the review of the London Plan and Camden Planning Policies for Climate Change mitigation and Climate Change Adaptation followed by measures implemented in the proposed development to meet the applicable policy requirements.



3. CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGY

Climate Change is the rise in average global temperature due to increasing levels of greenhouse gases in the earth's atmosphere (primarily CO2) that prevent the radiation of heat into space.

Buildings and spaces built today should respond to climate change issues and adapt to mitigation and adaptation measures. The London Plan through its policies addresses these issues and will require London Boroughs to consider how their developments will function in the future in the context of changing climate.

Through various policies, Camden Council encourages developments to meet the highest feasible environmental standards, where feasible and possible, in order to minimise the effects of and adapt to climate change. The climate change risks for the London Borough of Camden are summarised below:

- Hotter, drier summers;
- Milder, wetter winters;
- More frequent extreme high temperatures;
- More frequent heavy downpours of rain;
- Significant decreases in soil moisture content in summer;
- Sea level rise and increases in storm surge height;
- Possible higher wind speeds.



3.1 CLIMATE CHANGE MITIGATION

As per the definition of United Nations Environment Programme (UNEP), Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour.

The following policies from the London Plan and London Borough of Camden local policies relate to Climate Change Mitigation, in the context of this proposed development.

LONDON PLAN 2016 CLIMATE CHANGE MITIGATION POLICIES

- Policy 5.1 Climate change mitigation;
- Policy 5.2 Minimising carbon dioxide emissions;
- Policy 5.3 Sustainable design and construction;
- Policy 5.5 Decentralised Energy Networks;
- Policy 5.6 Decentralised energy in development proposals;
- Policy 5.7 Renewable energy;

CAMDEN LOCAL PLAN (2017) CLIMATE CHANGE MITIGATION POLICIES

Policy CC1 Climate change mitigation;

The policies above are explained and reviewed in detail below providing a response on measures implemented for this proposed development.



3.2 CLIMATE CHANGE MITIGATION – REVIEW AND MEASURES IMPLEMENTED

Policy 5.2 Minimising Carbon Dioxide Emissions

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

Be lean: use less energy;

Be clean: supply energy efficiently; Be green: use renewable energy.

Measures being considered in the project to meet the above policy requirements

The proposed scheme, comprising an extension with 4 No. new dwellings, is not classified as a major development according to London Plan. Therefore, Policy 5.2 is not applicable to the proposed development. The energy strategy proposed, however, follows London Plan Energy Hierarchy and this report is written in line with GLA Energy Assessment Guidance.

In order to design an energy efficient, low carbon development, the design team has followed the London Plan Energy Hierarchy i.e.

- The development is designed to have highly efficient envelope and passive strategies, e.g. building fabric of high thermal performance and applying Accredited Construction Details to minimise thermal bridging, have been incorporated in the design where possible. Efficient building services including MVHR and low energy lighting are proposed to reduce energy consumption;
- The design team has carried out a feasibility study to assess the potential of connecting the scheme to a district heating network or provide a Combined Heat and Power to meet heating demand;
- A feasibility study to identify the most suitable renewable energy technologies has been carried out and presented in this report.

As a result of the proposed strategy, the scheme achieves an overall reduction of 19% over the 2013 TER, exceeding the reduction target set by the Camden Council.

Policy 5.3 Sustainable Design and Construction

A. The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.



B. Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

Measures being considered in the project to meet the above policy requirements

The strategy for minimising carbon dioxide emissions is outlined in the following sections of the Energy and Sustainability Statement, prepared in accordance with GLA Energy Assessment Guidance. Due to Sustainable design features integrated in the design of the proposed units, the development exceeds the carbon dioxide target reduction set by the council thus achieving a reduction of more than 19% over 2013 TER.

Passive design measures such as enhanced thermal performance of well insulated thermal elements and use of Accredited Construction Details as well as condensing boilers of high efficiency and Mechanical Ventilation with Heat Recovery (MVHR) will help reduce heating demand first and then energy consumption. During summer, windows can be fully opened to allow for fresh air to remove excessive heat gains and reduce the risk of overheating. Low water use fittings will be installed to minimise water consumption on site targeting a daily consumption less than 105 litres/person. Materials of low environmental impact, which will be responsibly resourced, will be also specified for the scheme. More information can be found on the Design and Access Statement prepared by Squire & Partners Architects.

Policy 5.5 Decentralised Energy Networks

A. The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

B. Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

A. The Mayor expects 25 per cent of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025. In order to achieve this target, the Mayor prioritises the development of decentralised heating and cooling networks at the development and area wide levels, including larger scale heat transmission networks.

B. Within LDFs boroughs should develop policies and proposals to identify and establish decentralised energy network opportunities. Boroughs may choose to develop this as a supplementary planning document and work jointly with neighbouring boroughs to realise wider decentralised energy network opportunities. As a minimum, boroughs should:



- a. identify and safeguard existing heating and cooling networks
- b. identify opportunities for expanding existing networks and establishing new networks. Boroughs should use the London Heat Map tool and consider any new developments, planned major infrastructure works and energy supply opportunities which may arise
- c. develop energy master plans for specific decentralised energy opportunities which identify:

major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)

major heat supply plant

possible opportunities to utilise energy from waste

possible heating and cooling network routes

implementation options for delivering feasible projects, considering issues of procurement, funding and risk and the role of the public sector

d. require developers to prioritise connection to existing or planned decentralised energy networks where feasible.

Measures being considered in the project to meet the above policy requirements

The scheme, comprising of 4 new residential units, will have constant heating demand, mainly due to hot water usage, throughout the year. However, due to high performance building fabric performance proposed, BFRC-rated double-glazed windows and low water use fittings to be specified, this is expected to be low. According to the London Heat Map (Figure 4), the site is not within a district heating opportunity area and there is no existing network in close proximity or one to become available in the future.

Therefore, given the small scale of the scheme and currently no availability in close proximity, it is not feasible or viable to connect to a district heat network.



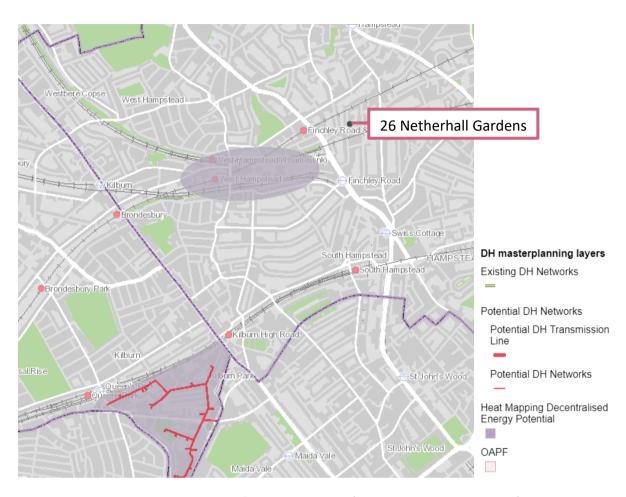


Figure 4 Image of London Heat Map (www.londonheatmap.org.uk)

Policy 5.6 Decentralised Energy in Development Proposals

- A. Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.
- B. Major development proposals should select energy systems in accordance with the following hierarchy:

Connection to existing heating or cooling networks;

Site wide CHP network;

Communal heating and cooling.

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



Measures being considered in the project to meet the above policy requirements

According to the London Heat Map, there is no available district heating in close proximity currently or in the future. Given the scale of the proposed scheme, consisting of 4 new flats, installation of Combined Heat and Power (CHP) is not considered to be feasible, as there is not high heating and hot water demand throughout the year to enable the CHP unit to run continuously for long period thus ensuring maximum carbon and cost savings. As per GLA guidance on energy assessments, a higher number of residential units is required to justify installation of a CHP unit.

Policy 5.7 Renewable Energy

A. The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

- B. Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.
- C. Within LDFs boroughs should, and other agencies may wish to, develop more detailed policies and proposals to support the development of renewable energy in London in particular, to identify broad areas where specific renewable energy technologies, including large scale systems and the large-scale deployment of small scale systems, are appropriate. The identification of areas should be consistent with any guidelines and criteria outlined by the Mayor.
- D. All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.

Measures being considered in the project to meet the above policy requirements

A feasibility study has been carried out to assess renewable energy technologies that could be appropriate for the proposed development (please refer to Section 8).

Policy CC1 Climate change mitigation

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

We will:



- a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
- b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
- c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
- d. support and encourage sensitive energy efficiency improvements to existing buildings;
- e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
- f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

- g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
- h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
- i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

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

Measures being considered in the project to meet the above policy requirements

The development makes efficient use of land within the borough by providing additional residential units within the existing site. The site is well served by public transportation links thus reducing car usage. More information can be found in the Design and Access Statement prepared by Squire & Partners Architects.

The development is designed to reduce carbon emission by more than 19% overall in line with the Camden Local Plan. The energy section of this report outlines the proposed energy strategy developed for the scheme including enhanced building fabric performance, energy efficiency building services systems and photovoltaic panels thus reducing carbon emissions by 19%.

The scheme has been designed to have mechanical ventilation and the façade has been carefully developed to balance between adequate daylighting, passive solar heat gains and risk of overheating in summer. The development incorporates water-efficient sanitary ware to reduce the use of potable water.





3.3 CLIMATE CHANGE ADAPTATION

For a long time, the main focus of climate change has been on mitigation, making sure we minimise our impact on the environment. Adaptation strategies are those that take into account climate change and ensure that the building is capable of dealing with future change in climate. Given the time lag associated with climate change, even if we change the way we live, there is likely to be noticeable change in the climate during the life of the building.

To ensure that buildings maintain their relevance, it is essential that adaptation strategies are addressed during the design phase. Adoption of these strategies will mean that, even as we undergo climate change, the buildings can still function as required.

The following policies from the London Plan and London Borough of Camden local policies relate to Climate Change Adaptation, in the context of this proposed development.

LONDON PLAN 2016 CLIMATE CHANGE ADAPTATION POLICIES

Policy 5.9 Overheating and cooling;

Policy 5.10 Urban greening;

Policy 5.11 Green roofs and development site environs;

Policy 5.12 Flood risk management;

Policy 5.15 Water use and supplies;

CAMDEN LOCAL PLAN (2017) CLIMATE CHANGE MITIGATION POLICIES

Policy CC2 Adapting to climate change;

Policy CC3 Water and flooding;

Policy CC4 Air quality;

Policy CC5 Waste;

Above policies are described and reviewed in detail below providing a response on measures implemented for this proposed development.



3.4 CLIMATE CHANGE ADAPTATION – POLICY REVIEW AND MEASURES IMPLEMENTED

Policy 5.9 Overheating and Cooling

A. The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.

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

minimise internal heat generation through energy efficient design;

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

manage the heat within the building through exposed internal thermal mass and high ceilings; passive ventilation;

mechanical ventilation;

active cooling systems (ensuring they are the lowest carbon options).

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

Measures being considered in the project to meet the above policy requirements:

Even though the scheme is not classified as a major development, measures to eliminate the risk of overheating have been considered and integrated in the design of the new flats. The following will be applied to ensure comfort during summer within the main living areas of the units:

- well insulated fabric elements and high airtightness to prevent heat transfer from the external environment.
- Openable windows to allow for natural cross ventilation. Windows will be of low g-value to avoid heat transmittance during summer but allow for passive heating in the winter.
- When required, additional flow rates can be provided through whole house mechanical ventilation, bypassing heat recovery.



 Tenants will be advised to purchase A-rated appliances of low energy consumption to reduce internal heat gains. Energy efficiency light fittings that emit less heat than standard types thus reducing overheating will be also specified.

Policy 5.10 Urban Greening

- A. The Mayor will promote and support urban greening, such as new planting in the public realm (including streets, squares and plazas) and multifunctional green infrastructure, to contribute to the adaptation to, and reduction of, the effects of climate change.
- B. The Mayor seeks to increase the amount of surface area greened in the Central Activities Zone by at least five per cent by 2030, and a further five per cent by 2050,
- C. Development proposals should integrate green infrastructure from the beginning of the design process to contribute to urban greening, including the public realm. Elements that can contribute to this include tree planting, green roofs and walls, and soft landscaping. Major development proposals within the Central Activities Zone should demonstrate how green infrastructure has been incorporated.

Measures being considered in the project to meet the above policy requirements:

The use of appropriate vegetation in the communal and private gardens and balconies aspires to enhance the ecological value of the site thus reducing urban island heat effect.

Further information can be found in the Design and Access Statement prepared by Squire & Partners Architects.

Policy 5.12 Flood Risk Management

- A. The Mayor will work with all relevant agencies including the Environment Agency to address current and future flood issues and minimise risks in a sustainable and cost effective way.
- B. Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated technical Guidance on flood risk [1] over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 (TE2100 see paragraph 5.55) and Catchment Flood Management Plans.
- C. Developments which are required to pass the Exceptions Test set out in the NPPF and the Technical Guidance will need to address flood resilient design and emergency planning by demonstrating that:



the development will remain safe and operational under flood conditions;

strategy of either safe evacuation and/or safely remaining in the building is followed under flood conditions;

key services including electricity, water etc. will continue to be provided under flood conditions; buildings are designed for quick recovery following a flood.

D. Development adjacent to flood defences will be required to protect the integrity of existing flood defences and wherever possible should aim to be set back from the banks of watercourses and those defences to allow their management, maintenance and upgrading to be undertaken in a sustainable and cost effective way.

E. In line with the NPPF and the Technical Guidance, boroughs should, when preparing LDFs, utilise Strategic Flood Risk Assessments to identify areas where particular flood risk issues exist and develop actions and policy approaches aimed at reducing these risks, particularly through redevelopment of sites at risk of flooding and identifying specific opportunities for flood risk management measures.

Measures being considered in the project to meet the above policy requirements

The site is in a low flood risk zone according to the Environmental Agency Flood Map (Figure 6). Based on Map 6: Historic flooding and Local Flood Risk Zones of the Local Plan, the site is close to those parts that have experienced significant sewer or surface water flooding and therefore considered to have the potential to be at risk of surface water flooding. As explained previously, however, the proposed development does not increase the impermeable area of the building.



Figure 5 Environment Agency Flood Map



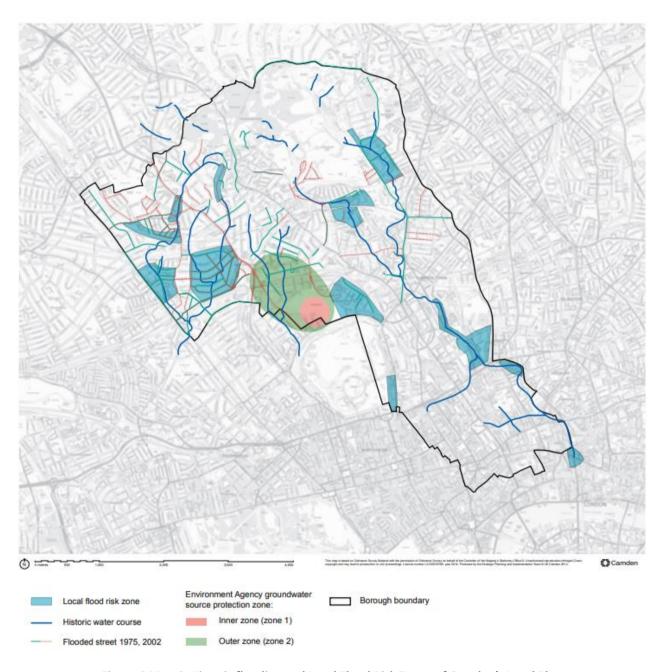


Figure 6 Map 6: Historic flooding and Local Flood Risk Zones of Camden's Local Plan



Policy 5.15 Water Use Supplies

A. The Mayor will work in partnership with appropriate agencies within London and adjoining regional and local planning authorities to protect and conserve water supplies and resources in order to secure London's needs in a sustainable manner by:

minimising use of mains water;

reaching cost-effective minimum leakage levels;

in conjunction with demand side measures, promoting the provision of additional sustainable water resources in a timely and efficient manner, reducing the water supply deficit and achieving security of supply in London;

minimising the amount of energy consumed in water supply;

promoting the use of rainwater harvesting and using dual potable and grey water recycling systems, where they are energy and cost-effective;

maintaining and upgrading water supply infrastructure;

ensuring the water supplied will not give rise to likely significant adverse effects to the environment particularly designated sites of European importance for nature conservation.

B. Development should minimise the use of mains water by:

incorporating water saving measures and equipment; designing residential development so that mains water consumption would meet a target of 105 litres or less per head per day.

C. New development for sustainable water supply infrastructure, which has been selected within water companies' Water Resource Management Plans, will be supported.

Measures being considered in the project to meet the above policy requirements

All new apartments will have low water use fittings to reduce the water consumption and the energy consumption on site. Installation of low flow rate showers, taps and dual flush toilets, together with smaller baths (where applicable) will mean that all apartments will achieve a maximum internal water use of 105 litres per person/day, with an additional 5 litres person/day for external water use.



Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

- a. the protection of existing green spaces and promoting new appropriate green infrastructure:
- b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
- d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

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

- e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
- f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
- g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and
- h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

Measures being considered in the project to meet the above policy requirements

As the proposed extension consists of 4 new residential units only, Policy CC2 does not apply. However, wherever practical and feasible for a development of this type and scale, good practice sustainable development principles will be incorporated in the design to minimise the environmental impact of the scheme.



Policy CC3 Water and flooding

The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible.

We will require development to:

- a. incorporate water efficiency measures;
- b. avoid harm to the water environment and improve water quality;
- c. consider the impact of development in areas at risk of flooding (including drainage);
- d. incorporate flood resilient measures in areas prone to flooding;
- e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and
- f. not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable.

The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.

Measures being considered in the project to meet the above policy requirements

The site is in a low flood risk zone according to the Environmental Agency Flood Map (Figure 6). Based on Map 6: Historic flooding and Local Flood Risk Zones of the Local Plan, the site is close to those parts that have experienced significant sewer or surface water flooding and therefore considered to have the potential to be at risk of surface water flooding.

Policy CC4 Air quality

The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate



the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

Measures being considered in the project to meet the above policy requirements

The proposed scheme will provide 4 additional dwellings in the existing site surrounded mainly by residential buildings. Low NOx individual gas-fired boilers are proposed to provide heating to the new apartments, therefore, any impact on the air quality will be minimal.

Policy CC5 Waste

The Council will seek to make Camden a low waste borough.

We will:

- a. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;
- deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;
- safeguard Camden's existing waste site at Regis Road unless a suitable compensatory
 waste site is provided that replaces the maximum throughput achievable at the existing
 site; and
- d. make sure that developments include facilities for the storage and collection of waste and recycling.

Measures being considered in the project to meet the above policy requirements

Recycling and composting will be promoted by e.g. providing relevant facilities and information to the future tenants through a Home User Guide.



4. BUILDING REGULATION COMPLIANCE

The Building Regulations Part L (Conservation of Fuel and Power) applies to all components of the development. The most recent version of the regulations came into effect on the 6th April 2014. In order to meet the performance requirements of Part L, the design of the building must comply with the prescriptive provisions laid out in the Compliance Checklist. The development falls under the Building Regulations Part L category of L1A. The criteria of Part L are outlined in the table below.

Table 3: Part L1A 2013 Criteria

Part L Requirements				
Α	 Limiting heat gains and losses i. through thermal elements and other parts of the building fabric; and ii. from pipes, ducts and vessels used for space heating, space cooling and hot water services 			
В	Providing fixed building services which i. are energy efficient; ii. have effective controls; and iii. are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances			
С	Providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a way as to use no more fuel than is reasonable in the circumstances.			

The development will comply with all the design limits on building fabric, heating, cooling, hot water and lighting efficiencies where feasible and practicable. Detailed energy calculations have been completed to assess the energy impact of this development.

4.1 BUILDING ENERGY MODEL

STROMA FSAP 2012 software (version 1.0.4.16), approved by BRE for full implementation of the Standard Assessment Procedure (SAP 2012) has been used to assess the energy performance and annual carbon emissions of the scheme after energy efficient measures have been applied. The energy assessment has been completed by Mecserve's energy modelling team who are accredited On Construction Dwelling Energy Assessors. As recommended by the GLA Energy Guidance Assessment, the updated SAP 10 emission factors have been used to reflect the fact that grid electricity has significantly decarbonised since the last update of Part L in April 2014. Appendix 6 of the report presents the carbon savings achieved using the SAP 2012 emission factors for comparison, calculated using the GLA carbon emission reporting spreadsheet.



4.2 BASELINE CARBON EMISSION RATE

The building comprises four new dwellings. According to the GLA Energy Assessment Guidance (October 2018) and the Camden Local Plan (2017), the new build elements will be assessed against Part L1A standards. Therefore, the L1A Target Emission Rate (TER) will be used to determine the baseline CO2 emissions.

The following table (Table 4) presents the baseline CO2 emissions for the proposed scheme.

From 6 April 2014, Approved Document L1A has introduced a fabric energy efficiency standard (FEES). This is the maximum space heating and cooling energy demand for a new home. It is measured as the amount of energy which would normally be needed to maintain comfortable internal temperatures in a home and is measured in kWh per m² per annum. Table 4 also presents the Target Fabric Energy Efficiency (TFEE) calculated by FSAP 2012 software.

Table 4 Baseline Carbon Dioxide emissions

Regulated Carbon dioxide emissions	26 Netherhall Gardens
Baseline Carbon Emission Rate (Part L1A 2013 TER)	5 tnCO₂/annum
Part L1A 2013 Target Fabric Energy Efficiency Rate (TFEE)	72.60 kWh/sqm/annum



5. LONDON PLAN ENERGY HIERARCHY

To meet the requirements of Policy 5.2 Minimising Carbon Dioxide Emissions development proposals should minimise carbon dioxide emissions in accordance with the following energy hierarchy:

Be lean: use less energy;

Be clean: supply energy efficiently; Be green: use renewable energy.

The hierarchy provides the mechanism through which the carbon dioxide (CO₂) emission reduction targets in Policy 5.2 of the London Plan are achieved. It also contributes to the implementation of strategic energy policies relating to decentralised networks and ensures opportunities for building occupants to receive efficient, secure and affordable energy.

GLA Energy Assessment Guidance (October 2018) states that the energy assessment must clearly identify the carbon footprint of the development after each stage of the energy hierarchy. Regulated emissions must be provided and, separately, those emissions associated with uses not covered by Building Regulations i.e. unregulated energy uses.

Considering that the proposed development is a minor scheme, the following sections describe the proposed energy strategy developed for the scheme to meet the carbon savings target set by the Camden Council i.e. 19% over Part L1A 2013 TER. New residential dwellings are required to demonstrate how this has been met by following the London Plan Energy Hierarchy described above.



6. BE LEAN – DEMAND REDUCTION

Be Lean measures is the first stage of the Energy Hierarchy where energy demand of the building is reduced through architectural and building fabric measures (passive design) and energy efficient services (active design). Be lean Measures should demonstrate the extent to which the energy demand meets or exceeds Building Regulations. The following sections demonstrates how the prosed development will achieve energy and CO₂ emissions reduction over the baseline emissions.

6.1 PASSIVE DESIGN

Passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading.

This will be achieved through:

- Building Orientation: The orientation of the new extension is largely dictated by the shape
 of the existing site. The main façade is facing West. The internal layout of the dwelling has
 been set out to maximise the number of habitable rooms that can take advantage of solar
 gain and natural light;
- Passive Solar Design and Daylight: The make-up of the proposed façade has balanced proportion of solid wall to glazing, thus providing optimum amount of daylight and winter solar heating, without excessive solar gains during the summer;
- Thermal performance of the fabric: the proposed building fabric exceeds the requirements set in the Part L regulations;
- Thermal bridges: Accredited Construction Details will be used to minimise the impact of thermal bridges thus reducing heat losses;
- Air-tightness: Using enhanced construction skills and rigorous detailing to reduce the air permeability of the building and therefore eliminate heat losses through infiltration.

Table 5 below shows initial assumptions on building fabric specifications including air permeability. These will be thoroughly reviewed by the design team at later stage.

Table 5 Proposed building fabric specifications

Building Fabric	U-value	Wall	0.18
	[W/m ² K]	Floor	0.15
		Roof	0.15
		Window	1.40 – Double-glazed (g-value: 0.63)
	Air perme	ability	5 m³/m²hr @50Pa
	Thermal B	ridging	All junctions need to conform with Accredited Construction Details

Achieving the above values will reduce the energy demand of the development in advance of adding any active energy efficiency measures or renewable energy systems to the development.



6.2 ACTIVE DESIGN

After reducing the energy demand of the development, the next stage would be to use energy efficient building services, lighting and controls throughout the scheme to reduce fuel consumption. Our proposed energy strategy includes the following:

- Heating: Individual gas-fired condensing combi boilers with automatic ignition of high efficiency are proposed for each flat to provide heating;
- Ventilation: Fresh air will be provided to the occupants via Mechanical Ventilation with Heat Recovery;
- Domestic Hot Water: A well-insulated hot water cylinder will be provided to every apartment with minimum storage losses fed by individual gas-fired boilers;
- Lighting: All light fittings will be dedicated low energy types i.e. either LED or fluorescent.

Table 6 Proposed building services systems

HVAC Systems	Primary Heating	Individual gas-fired condensing combi boilers with automatic ignition of		
	System	89.7% efficiency		
	Heating Controls	Programmer, thermostat and TRVs		
		Boiler interlock		
		Delayed start thermostat	at	
	Ventilation	Whole house balanced mechanical ventilation with heat recovery as per		
		below table (Approved installation scheme)		
		Number of wet rooms	SFP (W/I/s)	Heat exchanger efficiency (%)
		1 + kitchen	0.40	94
		2 + kitchen	0.43	94
	Comfort Cooling	Not provided		
Lighting	Installed Light	All light fittings are dedicated low energy types i.e. either LED or fluorescent.		
	fittings	5 5 7		

6.3 SAVINGS FROM BE LEAN MEASURES

After implementing all the passive and active energy efficiency measures listed in sections 6.1 and 6.2, the carbon dioxide emissions of the proposed scheme are reduced from 6 tnCO2 to 5 tnCO2 per year. Therefore, the reduction in Carbon Emission of the building at this stage is 11%, as the following table demonstrates.

Table 7 Carbon Dioxide emissions reduction for the development

Regulated Carbon dioxide emissions (Tonnes CO ₂ per annum)		26 Netherhall Gardens	
Baseline Emissions		6	
Be Lean After energy demand reduction		5	
Carbon Savings over Baseline		1	
Carbon Reduction over Baseline		11%	



Subsequently, the reduction in Fabric Energy Efficiency of the building is 15%, as the following table demonstrates.

Table 8 Fabric Energy Efficiency Rate reduction for the development

Fabric Energy Efficiency (kWh per m² per annum)	26 Netherhall Gardens	
Part L1A Target Fabric Energy Efficiency (TFEE) Rate	72.60	
Dwelling Fabric Energy Efficiency (DFEE) Rate	61.52	
Reduction over 2013 TFEE	15%	

6.4 NON-REGULATED ENERGY USE

The Camden Planning Guidance on Energy efficiency and adaptation (November 2018) requires that the energy demand and carbon dioxide emissions of the nonregulated end uses should also be calculated and reported in the energy assessments. In accordance with BRE SAP calculation procedures for estimating the non-regulated carbon emissions, the carbon emission from appliances in the development will be circa 2 tnCO₂ per year and total emissions from cooking in all dwellings are approximately 0.7 tnCO₂ per year. The total carbon emissions of the residential units from non-regulated energy use is therefore 2.7 tnCO₂ per year.

The following strategies are proposed to reduce the non-regulated energy demand of the development:

- A rated appliance: The kitchens will be fitted out with highly efficient A-rated appliances or alternatively information about high efficiency units will be provided to future owners.
- Installation of energy meters with display monitors for each flat. This will encourage the
 occupants to become more interested and involved in how energy is being used in their flat.
- Information will be provided to occupants which will explain the operations of the installed systems and PV panels and how energy efficient behaviour can reduce the cost/carbon emissions of the development

It is estimated that proposed strategies may reduce the unregulated carbon emission by at least 10% down to 2.4 tnCO₂ per year. However, at this stage, this can only be an assumption as small power consumption depends mainly on occupant's behaviour.



7. BE CLEAN – SUPPLYING LOW CARBON ENERGY

In accordance with the Energy Hierarchy of London Plan 2016, connection to existing district heat networks, site wide Combined Heat and Power (CHP) and incorporation of CHP in the buildings has been considered for the scheme.

7.1 DISTRICT ENERGY NETWORK

In response to the second tier of the Energy Hierarchy and the GLA's requirement that developments seek to connect to optimise energy supply, a preliminary investigation into the adjacent heat loads and infrastructure has been undertaken. According to the London Heat Map, there is no district heating network in close proximity available currently or in the future. Therefore, given also the size and scale of the proposed scheme, connection to a district energy network is not considered feasible.

7.2 COMBINED HEAT AND POWER (CHP)

As there is not a viable source of heat that the development could connect to, the appropriateness of installing a Combined Heat and Power (CHP) engine within a communal heating system for the proposed development has been considered.

As CHP usually has significantly higher capital cost compared to conventional gas fired boilers, to maximise its efficiency it is it is important that the CHP plant operates for as many hours as possible and matches closely the base heat so that the generated heat is not wasted. Due to the number of apartments been added to the existing site, the annual demand for space heating and domestic hot water for the scheme is expected to be low throughout the year.

There are Micro CHP units available in the market that can serve development of this scale but their numbers are very limited. Also, the on-site performance of such Micro CHP units is not considered as reliable as that of larger CHP units and they are generally less efficient. According to GLA guidance, a higher number of flats is required to justify installation of a CHP unit in a residential building. For these reasons, a CHP led heating and hot water system is not recommended for the development. Instead, individual gas-fired condensing combi boilers of high efficiency are proposed for the residential units.



8. BE GREEN- RENEWABLE ENERGY TECHNOLOGIES

In order to further reduce emissions from the development in accordance with the local authority policies and London Plan Energy Hierarchy, it is necessary to consider the introduction of renewable energy systems on site.

A high-level assessment of the following renewable technologies was carried out as part of the feasibility study.

- Biomass Boilers;
- Wind Turbines;
- Heat Pumps (Ground/Water/Air);
- Solar Hot Water Heating (SHWH);
- Photovoltaics;
- Solar thermal panels.

8.1 PHOTOVOLTAIC (PV) PANELS SOLAR HOT WATER HEATING

The design team has reviewed the building roof space for the development. Photovoltaic panels work efficiently on flat or south facing unobstructed roof areas. A photovoltaic panel (PV) array with the following characteristics is proposed for the new extension to generate renewable energy on site thus reducing the electricity demand of the dwellings. Figure 7 shows the indicative position of the panels on the roof of the new extension. These should be installed at 10 degrees to allow for self-cleaning from rainwater and make sure these are not visible from the street level.

Table 9 Proposed building fabric specifications

Photovoltaic	No.	10
(PV) panels	Power output	2.5 kWp (250Wp each)
	Efficiency	≥ 15.5%
	Area	circa 1.63 sqm per panel (16.3 sqm in total)
	Orientation	South
	Inclination	10 degrees to allow for self-cleaning from rainwater



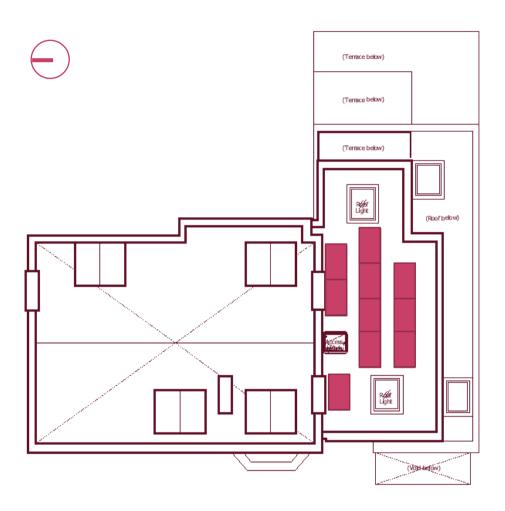


Figure 7 Indicative position of the PV array on the roof



9. CONCLUSION

This Energy Statement outlines the key features and strategies adopted by the development team to reduce energy use and carbon emissions for the scheme and demonstrate compliance with London Plan 2016 and London Borough of Camden Climate Change Mitigation and Adaptation Policies.

The strategy for reducing energy use and associated carbon emissions through the design of the scheme follows a three-step approach in line with the London Plan Energy Hierarchy.

- Reducing the energy demand through passive design strategies and provision of high quality building envelope;
- Reducing the energy consumption through best practice design of building services, lighting and control; and,
- Installation of on-site Low and Zero carbon technologies.

Passive and active energy efficiency features include:

- Building fabric of high thermal performance, in terms of U-values and air tightness, and use
 of Accredited Construction Details;
- Building services systems of high efficiency, including condensing boilers and MVHR units, and light fitting of low energy types;
- Photovoltaic (PV) panels will be installed to generate renewable energy on site.

This energy performance statement has demonstrated that the new development has achieved a carbon emission reduction in excess of 19% over the Part L1A Target Emission Rate, as required by the Camden Council. The following table (Table 10) provides a summary of the carbon savings achieved at each stage of the London Plan Energy Hierarchy as a result of the proposed energy strategy described in the report. As recommended by the GLA Energy Guidance Assessment, the updated SAP 10 emission factors have been used to reflect the fact that grid electricity has significantly decarbonised since the last update of Part L in April 2014. Appendix 6 of the report presents the carbon savings achieved using the SAP 2012 emission factors for comparison.

Table 10 Carbon Dioxide emissions reduction for the development

•	ted Carbon dioxide emissions Fonnes CO ₂ per annum)	26 Netherhall Gardens
Baseline Emi	ssions	6
Be Lean	After energy demand reduction	5
Be Clean	After CHP	5
Be Green	After renewable energy	5
Carbon Savin	gs over Baseline Emissions	1
Carbon Redu	ction over Baseline Emissions	19%



Table 11 demonstrates the total regulated CO₂ savings from each stage of the Energy Hierarchy. As demonstrated below overall 19% reduction in carbon emission can be achieved applying the proposed strategies.

Table 11 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated carbo	n dioxide savings
	(Tonnes CO2 per	(%)
	annum)	(70)
Savings from energy demand reduction	1	11%
Savings from CHP	0	0%
Savings from renewable energy	1	8%
Total Cumulative Savings	1	19%

Figure 8 below illustrate the total carbon savings and the total reduction achieved at each stage of the proposed Energy Hierarchy respectively.

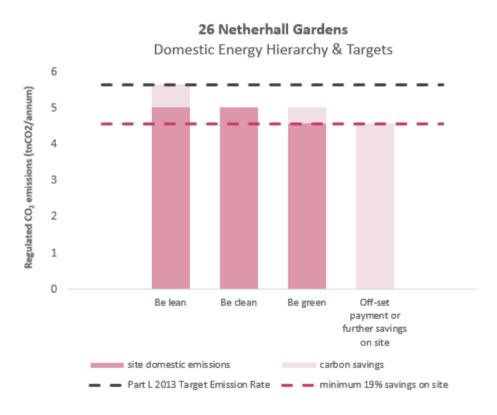


Figure 8 Total carbon savings achieved at each stage over Baseline Emissions



APPENDIX 1. LOW/ZERO CARBON TECHNOLOGIES

BIOMASS BOILER

A biomass boiler works effectively against a consistent heating load, however, adequate space dedicated for storing the fuel is required. Within inner London areas, there are concerns about the effect of small scale biomass systems on air-quality particularly with respect to particulates released through the boiler flue. For this reason, we would not recommend a biomass boiler for this development.

WIND TURBINES

Wind turbines' performance in urban areas is normally not very good and unpredictable due to turbulences on air movement caused by the surrounding built environment. Wind turbines may also raise issues due to noise disturbance and their visual impact. Therefore, this technology is not suitable for this site.

GROUND SOURCE HEAT PUMP

Ground source heat pumps have been considered for the development. With a closed loop borehole system, it would be possible to drop loops beneath the proposed extension. However, given that the heating demand for this development is low, the cost of installing a ground source heat pump would not make this system financially viable. Therefore, given that a ground source system would be complex, technically risky, costly and deliver limited carbon emissions savings, we would therefore not recommend this approach for the development.

AIR SOURCE HEAT PUMP

Air-source or aerothermal heat-pumps work on the same principals as a ground-source heating system but extract heat or coolth from the air. ASHPs perform better when connected to an underfloor heating system that requires lower water temperature. ASHPs have low maintenance costs and they are simple to install compared to a GSHP. ASHPs, however, tend to drop their efficiencies when ambient air temperature is low during wintertime as there is no heat to absorb. Even though they are considered as Low carbon Technologies they run on electricity which is a carbon intensive fuel. For this reason, we would not recommend ASHPs for this development.

SOLAR HOT WATER HEATING

Solar thermal hot water systems can work well on residential developments. However, compared to PV panels, they require higher maintenance and more space inside the apartments for risers and hot water storage. Therefore, we would recommend that the available roof space is utilised for the installation of a PV array.



APPENDIX 2. TER WORKSHEET OF TYPICAL APARTMENT



(22)m =

TER WorkSheet: New dwelling design stage

panos.dalapas@mecserve.com

User Details: Assessor Name: Panagiotis Dalapas Stroma Number: STRO030082 **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.4.16 Property Address: Apartment 3-Be Lean Address: Apartment 3, 26, Netherhall Gardens, LONDON, NW3 5TL 1. Overall dwelling dimensions: Volume(m³) Area(m²) Av. Height(m) Ground floor (1a) x (2a) =(3a) 86.86 2.8 243.21 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4) 86.86 (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =Dwelling volume 243.21 (5) 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.12 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration (15)0 Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =(16)0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)(18)0.37 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.26 Infiltration rate modified for monthly wind speed Jan Feb Mar Jun Sep Oct Nov Dec Apr May Jul Aug Monthly average wind speed from Table 7

Wind Factor $(22a)m = (22)m \div 4$ (22a)m= 1.27 1.25 1.23 1.08 0.95 0.95 0.92 1.08

4.3

3.8

3.8

1.12

1.18



TER WorkSheet: New dwelling design stage

panos.dalapas@mecserve.com

Adjusted infiltration	rate (allowing	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.33 0.3		0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
Calculate effective If mechanical ver	_	rate for t	he appli	cable ca	se		-		-	-		(220)
If exhaust air heat pu		endix N (2	3h) = (23a	a) × Fmv (e	equation (N	N5)) other	rwise (23h) = (23a)			0	
If balanced with heat) = (20 0)			0	
a) If balanced me	-	-	_					2h)m + (23h) 🗴 [1 – (23c)	0 ÷ 1001	(23c)
(24a)m= 0 0		0	0	0	0	0	0	0	0	0]	(24a)
b) If balanced me	chanical ve	ntilation	without	heat rec	coverv (N	и ЛV) (24b)m = (22	2b)m + (1 23b)	ļ	J	
(24b)m= 0 0		0	0	0	0	0	0	0	0	0		(24b)
c) If whole house	extract ven	tilation c	r positiv	re input v	ventilatio	n from c	outside				ı	
if (22b)m < 0	.5 × (23b), tl	hen (24d	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	.5 × (23b	o)		_	
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural venti if (22b)m = 1								0.5]				
(24d)m= 0.56 0.5	5 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effective air char	ge rate - en	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.56 0.5	5 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3. Heat losses and	d heat loss p	paramete	er:									
ELEMENT	Gross rea (m²)	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
	, ,											
Doors				1.92	X	1	=	1.92				(26)
Doors Windows Type 1				1.92	〓 ,	1 /[1/(1.4)+		1.92 2.15				(26) (27)
					x1,		0.04] =					, ,
Windows Type 1				1.62	x1/	/[1/(1.4)+	0.04] =	2.15				(27)
Windows Type 1 Windows Type 2				1.62	x1, x1, x1,	/[1/(1.4)+ /[1/(1.4)+	[0.04] = [0.04] = [0.04] = [0.04]	2.15				(27) (27)
Windows Type 1 Windows Type 2 Windows Type 3				1.62 1.59 4.39	x10 x10 x10 x10	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array}$	2.15 2.11 5.82				(27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4				1.62 1.59 4.39	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	2.15 2.11 5.82 1.59				(27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5				1.62 1.59 4.39 1.2	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59				(27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6				1.62 1.59 4.39 1.2 1.2	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59				(27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7				1.62 1.59 4.39 1.2 1.2 1.2	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59				(27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8				1.62 1.59 4.39 1.2 1.2 1.2 1.2	x1.	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 1.59 3.98				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	96.43	19.79	Ð	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39	x1.	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor	96.43 27.89	19.79	=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 4.39 4.39 8.57	x1.	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1			=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 4.39 4.39 8.57 76.64	x1,	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 Walls Type2	27.89	1.92	=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39 8.57 76.64 25.97	x1.	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 Walls Type2 Roof	27.89 38.42 nts, m² vindows, use e	1.92	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1,	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	0.04] = [0.04]	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99		n paragraph] [] [] [(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 Walls Type1 Walls Type2 Roof Total area of elements	27.89 38.42 nts, m² vindows, use e poth sides of in	1.92 0 ffective winternal wall	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1.	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99		ı paragraph	7 3.2 52.7	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 Walls Type1 Total area of elements of the windows and roof windows and windows and roof windows and roof windows and roof win	27.89 38.42 Ints, m² vindows, use e poth sides of in /K = S (A x	1.92 0 ffective winternal wall	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1.	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	$\begin{array}{c} 0.04 = \begin{bmatrix} 0.04 = \begin{bmatrix} 0.04 = \end{bmatrix} \\ 0.04 = \begin{bmatrix} 0$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99	as given in			(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type 1 Walls Type 1 Walls Type 2 Roof Total area of elements of the windows and roof the include the areas on the Fabric heat loss, Windows Type 9	27.89 38.42 Ints, m² vindows, use e poth sides of in /K = S (A x x)	1.92 0 ffective winternal wall	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39 8.57 76.64 25.97 38.42 171.3 alue calculatitions	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18 0.13	0.04] = [0.04]	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99	as given in (2) + (32a).		52.7	(27) (27) (27) (27) (27) (27) (27) (27)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f



(52)

(53)

Mecserve Ltd Panagiotis Dalapas 020 3141 5800

TER WorkSheet: New dwelling design stage

Volume factor from Table 2a

Temperature factor from Table 2b

	ad of a dat	امام ممام	dation										
nermal bridge	ad of a det es : S (L			usina Ap	pendix l	<						36.23	(3
details of therma	,	,		•	•							00.20	(
otal fabric he			, ,	·	,			(33) +	(36) =			88.96	(3
entilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)	•		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 44.58	44.41	44.24	43.45	43.3	42.6	42.6	42.47	42.87	43.3	43.6	43.91		(3
at transfer o	coefficier	nt, W/K	-			-		(39)m	= (37) + (3	38)m			
)m= 133.55	133.37	133.2	132.41	132.26	131.56	131.56	131.44	131.83	132.26	132.56	132.88		
at loss para	meter (H	 ILP), W/	m²K						Average = = (39)m ÷	` '	12 /12=	132.41	(3
)m= 1.54	1.54	1.53	1.52	1.52	1.51	1.51	1.51	1.52	1.52	1.53	1.53		
						l		,	Average =	Sum(40) ₁ .	12 /12=	1.52	(4
mber of day	s in mor	nth (Tabl	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
f TFA > 13.9 f TFA £ 13.9 nual averag	9, N = 1 je hot wa	+ 1.76 x ater usag	ge in litre	s per da	ıy Vd,av	erage =	(25 x N)	+ 36		9)	.48		
f TFA > 13.9 f TFA £ 13.9 nual averag duce the annua	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre	es per da 5% if the d	ny Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)			
f TFA > 13.9 f TFA £ 13.9 nual averag duce the annua	9, N = 1 9, N = 1 ge hot wa al average	+ 1.76 x ater usag	ge in litre	es per da 5% if the d	ny Vd,av Iwelling is	erage = designed	(25 x N)	+ 36		9)			
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan	9, N = 1 9, N = 1 ge hot wa al average litres per p	+ 1.76 x ater usag hot water person per Mar	ge in litre usage by t day (all w	es per da 5% if the d rater use, h	ny Vd,av welling is not and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 95	.48		
f TFA > 13.9 f TFA £ 13.9 nual averageduce the annual more that 125 Jan t water usage in	9, N = 1 9, N = 1 ge hot wa al average litres per p	+ 1.76 x ater usag hot water person per Mar	ge in litre usage by t day (all w	es per da 5% if the d rater use, h	ny Vd,av welling is not and co	erage = designed i ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	9) 95	.48		
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan water usage in	9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, r May Vd,m = fac 89.75	y Vd,av welling is not and co Jun ctor from 1	erage = designed id) Jul Table 1c x 85.93	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57	Oct 97.39 Fotal = Su	9) Nov 101.21 m(44) ₁₁₂ =	.48 Dec 105.03	1145.77	(4
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan water usage in 105.03 ergy content of	9, N = 1 9, N = 1 le hot was al average litres per p Feb n litres per 1 101.21	+ 1.76 x Inter usage hot water person per Mar day for ear 97.39	ge in litre usage by s day (all w Apr ach month 93.57	es per da 5% if the d vater use, f May Vd,m = fac 89.75	y Vd,av welling is not and co Jun ctor from 7 85.93	erage = designed and designed a	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57	Oct 97.39 Total = Sunth (see Ta	9) Nov 101.21 m(44) ₁₁₂ = ables 1b, 1	.48 Dec 105.03 c, 1d)	1145.77	(4
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan t water usage in)m= 105.03 ergy content of	9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, r May Vd,m = fac 89.75	y Vd,av welling is not and co Jun ctor from 1	erage = designed id) Jul Table 1c x 85.93	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 0 kWh/mon 109.19	Oct 97.39 Total = Sunth (see Tail 127.25	9) Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	.48 Dec 105.03 c, 1d) 150.84		(4
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan t water usage in 105.03 ergy content of 155.76	9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per 101.21 hot water 136.22	+ 1.76 x ater usag hot water person per Mar day for ea 97.39 used - calc 140.57	ge in litre usage by s day (all w Apr ach month 93.57 culated mo	es per da 5% if the d sater use, f May Vd,m = fact 89.75 onthly = 4.	y Vd,av lwelling is not and co. Jun ctor from 7 85.93	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75 DTm / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mon 109.19	Oct 97.39 Total = Sunth (see Ta	9) Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	.48 Dec 105.03 c, 1d) 150.84	1145.77	(4
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual amore that 125 Jan t water usage in)m= 105.03 ergy content of)m= 155.76 estantaneous w)m= 23.36	9, N = 1 9, N = 1 ge hot wa al average litres per p Feb n litres per 101.21 shot water 136.22 vater heatin 20.43	+ 1.76 x ater usag hot water person per Mar day for ea 97.39 used - calc 140.57	ge in litre usage by s day (all w Apr ach month 93.57 culated mo	es per da 5% if the d sater use, f May Vd,m = fact 89.75 onthly = 4.	y Vd,av lwelling is not and co. Jun ctor from 7 85.93	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75 DTm / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mon 109.19	Oct 97.39 Total = Sunth (see Tail 127.25	9) Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	.48 Dec 105.03 c, 1d) 150.84		(4
if TFA > 13.9 if TFA £ 13.9 if TFA £ 13.9 inual average duce the annual average that 125 Jan it water usage in 105.03 ergy content of 155.76 instantaneous with 123.36 ater storage	9, N = 1 9, N = 1 le hot was all average litres per p 101.21 16 hot water 136.22 vater heatin 20.43 IOSS:	+ 1.76 x Inter usage hot water person per horsel day for early 140.57 Inter usage hot water wa	ge in litre usage by 8 day (all w Apr ach month 93.57 culated mo 122.55 of use (no	es per da 5% if the d rater use, h May Vd,m = fact 89.75 onthly = 4. 117.59 o hot water 17.64	y Vd,av lwelling is not and co Jun ctor from 7 85.93 190 x Vd,r 101.47 r storage),	erage = designed in designed i	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19	+ 36 a water us Sep 93.57 0 kWh/mon 109.19 16.38	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) 112 = ables 1b, 1 138.9 m(45) 112 =	.48 Dec 105.03 c, 1d) 150.84 22.63		(4
f TFA > 13.9 f TFA £ 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan t water usage in 105.03 ergy content of 155.76 estantaneous was 10 m = 23.36 ater storage orage volume	9, N = 1 9, N = 1 ge hot was all average litres per p Feb n litres per 1 101.21 shot water 136.22 vater heatin 20.43 loss: lie (litres)	+ 1.76 x Inter usage hot water person per Mar day for ear 97.39 used - calcondition 140.57 Ing at point 21.09 including the second the seco	ge in litre usage by s day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	y Vd,av lwelling is not and co. Jun ctor from 7 85.93 190 x Vd,r 101.47 storage),	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa	+ 36 a water us Sep 93.57 0 kWh/mon 109.19 16.38	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) 112 = ables 1b, 1 138.9 m(45) 112 =	.48 Dec 105.03 c, 1d) 150.84		(4
f TFA > 13.9 f TFA £ 13.9 nual average duce the annual more that 125 Jan t water usage in 105.03 ergy content of 155.76 estantaneous was 100 m = 100	9, N = 1 9, N = 1 le hot was all average litres per properties per	ter usaghot water berson per Mar day for ea 97.39 used - calc 140.57 ag at point 21.09 includin nd no ta	ge in litre usage by 8 day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	y Vd,av welling is not and co Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/more 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) 112 = sbles 1b, 1 138.9 m(45) 112 = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63		(4
f TFA > 13.9 f TFA £ 13.9 f TFA £ 13.9 nual average duce the annual average duce the annual at more that 125 Jan t water usage in 105.03 ergy content of 155.76 estantaneous we have storage orage volume community have herwise if not the storage where the storage was a storage was	9, N = 1 9, N = 1 ge hot was all average litres per p Feb n litres per 1 101.21 f hot water 136.22 vater heatin 20.43 loss: line (litres) heating as o stored	ter usage hot water person per Mar day for ear 97.39 used - calc 140.57 ag at point 21.09 includin nd no ta	ge in litre usage by 8 day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	y Vd,av welling is not and co Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/more 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) 112 = sbles 1b, 1 138.9 m(45) 112 = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63		(4
if TFA > 13.9 if TFA £ 13.9 inual average duce the annual average that 125 Jan t water usage in)m= 105.03 ergy content of)m= 155.76 instantaneous w)m= 23.36	9, N = 1 9, N = 1 ge hot was all average litres per properties per	+ 1.76 x Inter usage hot water person per day for early grand	ge in litre usage by s day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ink in dw er (this in	es per da 5% if the d rater use, f May Vd,m = fac 89.75 onthly = 4. 117.59 o hot water 17.64 colar or W relling, e- acludes in	y Vd,av lwelling is not and co. Jun ctor from 5 85.93 190 x Vd,r 101.47 r storage), 15.22 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/more 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) 112 = 1bles 1b, 1 138.9 m(45) 112 = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63		(4)
f TFA > 13.9 f TFA £ 13.9 f TFA	9, N = 1 9, N = 1 19 hot was all average litres per properties per	ter usaghot water berson per Mar day for ea 97.39 used - calc 140.57 ag at point 21.09 includin and no talc hot water eclared lo	ge in litre usage by s day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in	es per da 5% if the d rater use, f May Vd,m = fac 89.75 onthly = 4. 117.59 o hot water 17.64 colar or W relling, e- acludes in	y Vd,av lwelling is not and co. Jun ctor from 5 85.93 190 x Vd,r 101.47 r storage), 15.22 /WHRS nter 110	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/more 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44)12 = 1bles 1b, 1 138.9 m(45)112 = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63		(4)
if TFA > 13.9 if TFA £ 13.9 if TFA £ 13.9 inual average duce the annual average duce the annual average in the average in the average in the average average volumes are storage orage volumes are storage in the average in the averag	9, N = 1 9, N = 1 19 hot was all average litres per properties per	ter usaghot water berson per Mar day for ear 97.39 used - calc 140.57 ag at point 21.09 includin nd no tachot water eclared lost mable storage	ge in litre usage by s day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d ater use, f May Vd,m = fac 89.75 onthly = 4. 117.59 o hot water 17.64 colar or W relling, eacludes in cor is knowear	y Vd,av lwelling is not and co. Jun etor from 7 85.93 190 x Vd,r 101.47 r storage), 15.22 /WHRS nter 110 nstantar	erage = designed of Id) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mort 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63		(4
f TFA > 13.9 f TFA £ 13.9 f TFA £ 13.9 nual average duce the annual average duce the annual at more that 125 Jan t water usage in 105.03 ergy content of 10m= 155.76 estantaneous we have storage volume community have been at extensive if no atter storage. If manufact imperature for ergy lost frought in the manufact in the ergy lost frought in the manufact in the ergy lost frought in the ergy l	9, N = 1 9, N = 1 19 hot was all average litres per properties per	ter usaghot water berson per Mar day for ea 97.39 used - calc 140.57 ag at point 21.09 includin and no talc hot water eclared lost Table storage eclared control of the storage eclared	ge in litre usage by s day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder l	es per da 5% if the d ater use, f May Vd,m = fac 89.75 20.0000000000000000000000000000000000	y Vd,av lwelling is not and co. Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage 0 litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boild	+ 36 a water us Sep 93.57 0 kWh/mort 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63 0		(4 (4 (4 (4 (4 (5
if TFA > 13.9 if TFA £ 13.9 if TFA £ 13.9 inual average duce the annual average duce the annual average in the average in the average in the average content of the average in the average volume community in the average in the avera	9, N = 1 9, N = 1 19, N = 1 19 hot was all average litres per properties per prop	ter usaghot water overson per Mar day for ea 97.39 used - calce 140.57 ag at point 21.09 includin nd no ta hot water eclared long at point gelared of factor fr	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	es per da 5% if the d ater use, f May Vd,m = fac 89.75 20.0000000000000000000000000000000000	y Vd,av lwelling is not and co. Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage 0 litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boild	+ 36 a water us Sep 93.57 0 kWh/mort 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25 Total = Sunth 19.09	9) Nov 101.21 m(44)12 = 138.9 m(45)12 = 20.84	.48 Dec 105.03 c, 1d) 150.84 22.63 0		(4)



TER WorkSheet: New dwelling design stage

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Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 0 $ Enter (50) or (54) in (55)	(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0 0	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 0 0 0 0 0 0 0 0 0 0 0	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m	
(61)m= 50.96 46.03 49.63 46.14 45.74 42.38 43.79 45.74 46.14 49.63 49.32 50.96	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m + (61)m$	m
(62)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8	
Output from water heater (annual) ₁₁₂ 2068.74	(64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 $\times (46)$ m + (57) m + (59) m	
(65)m= 64.53 56.8 59.15 52.29 50.53 44.33 42.21 47.31 47.84 54.72 58.51 62.89	(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):	
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	
Metabolic gains (Table 5), Watts	(66)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(66) (67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.



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Orientatio	entation: Access Factor Table 6d		r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c	Gains (W)			
East (0.9x	1	x	3	x	19.64	x	0.63	x	0.7	=	18.01	(76)	
East (0.9x	1	х	4.39	x	19.64	x	0.63	х	0.7	=	26.35	(76)	
East (0.9x	1	х	3	x	38.42	x	0.63	х	0.7	=	35.23	(76)	
East (0.9x	1	x	4.39	x	38.42	x	0.63	х	0.7	=	51.55	(76)	
East (0.9x	1	x	3	x	63.27	x	0.63	х	0.7	=	58.01	(76)	
East (0.9x	1	x	4.39	x	63.27	x	0.63	х	0.7	=	84.89	(76)	
East (0.9x	1	x	3	x	92.28	x	0.63	х	0.7	=	84.61	(76)	
East (0.9x	1	x	4.39	x	92.28	x	0.63	x	0.7	=	123.81	(76)	
East (0.9x	1	x	3	x	113.09	x	0.63	x	0.7	=	103.69	(76)	
East (0.9x	1	x	4.39	x	113.09	x	0.63	x	0.7	=	151.73	(76)	
East (0.9x	1	x	3	x	115.77	x	0.63	x	0.7	=	106.14	(76)	
East (0.9x	1	x	4.39	x	115.77	x	0.63	x	0.7	=	155.32	(76)	
East (0.9x	1	x	3	x	110.22	x	0.63	x	0.7	=	101.05	(76)	
East (0.9x	1	x	4.39	x	110.22	x	0.63	x	0.7	=	147.87	(76)	
East (0.9x	1	x	3	x	94.68	x	0.63	x	0.7	=	86.8	(76)	
East (0.9x	1	x	4.39	x	94.68	x	0.63	x	0.7	=	127.02	(76)	
East (0.9x	1	x	3	x	73.59	x	0.63	x	0.7	=	67.47	(76)	
East (0.9x	1	x	4.39	x	73.59	x	0.63	x	0.7	=	98.73	(76)	
East (0.9x	1	x	3	x	45.59	x	0.63	x	0.7	=	41.8	(76)	
East (0.9x	1	x	4.39	x	45.59	x	0.63	x	0.7	=	61.16	(76)	
East (0.9x	1	x	3	x	24.49	x	0.63	x	0.7	=	22.45	(76)	
East (0.9x	1	x	4.39	x	24.49	x	0.63	x	0.7	=	32.86	(76)	
East (0.9x	1	x	3	x	16.15	X	0.63	X	0.7	=	14.81	(76)	
East (0.9x	1	x	4.39	X	16.15	x	0.63	x	0.7	=	21.67	(76)	
South (0.9x	0.77	x	1.2	x	46.75	x	0.63	x	0.7	=	17.15	(78)	
South (0.9x	0.77	x	1.2	x	46.75	X	0.63	X	0.7	=	17.15	(78)	
South (0.9x	0.77	x	1.2	X	46.75	x	0.63	x	0.7	=	17.15	(78)	
South (0.9x	0.77	x	1.2	x	46.75	x	0.63	х	0.7	=	17.15	(78)	
South (0.9x	0.77	x	1.2	x	76.57	X	0.63	X	0.7	=	28.08	(78)	
South (0.9x	0.77	x	1.2	x	76.57	x	0.63	X	0.7	=	28.08	(78)	
South (0.9x	0.77	x	1.2	x	76.57	x	0.63	х	0.7	=	28.08	(78)	
South (0.9x	0.77	x	1.2	x	76.57	X	0.63	X	0.7	=	28.08	(78)	
South (0.9x	0.77	x	1.2	x	97.53	x	0.63	x	0.7	=	35.77	(78)	
South (0.9x	0.77	x	1.2	X	97.53	x	0.63	х	0.7	=	35.77	(78)	
South (0.9x	0.77	x	1.2	x	97.53	x	0.63	x	0.7	=	35.77	(78)	
South	0.9x	0.77	x	1.2	x	97.53	x	0.63	x	0.7	=	35.77	(78)	
South (0.9x	0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)	
South (0.9x	0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)	
South	0.9x	0.77	X	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)	



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	-												
South	0.9x	0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	х	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	х	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	х	0.7	=	40.54	(78)
South	0.9x	0.77	X	1.2	x	108.01	X	0.63	х	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.2	x	108.01	x	0.63	х	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.2	x	108.01	X	0.63	х	0.7	=	39.61	(78)
South	0.9x	0.77	X	1.2	x	108.01	X	0.63	х	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.2	x	104.89	x	0.63	х	0.7	=	38.47	(78)
South	0.9x	0.77	x	1.2	x	104.89	X	0.63	х	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	x	104.89	X	0.63	х	0.7	=	38.47	(78)
South	0.9x	0.77	x	1.2	x	104.89	x	0.63	х	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	X	101.89	X	0.63	х	0.7	=	37.37	(78)
South	0.9x	0.77	x	1.2	x	101.89	X	0.63	х	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	101.89	X	0.63	х	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	101.89	X	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	82.59	x	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	x	1.2	x	82.59	x	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	X	82.59	X	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	x	82.59	X	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	X	55.42	X	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	X	55.42	X	0.63	X	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	X	55.42	X	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	x	55.42	X	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	х	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
West	0.9x	0.77	X	1.62	X	19.64	X	0.63	X	0.7	=	9.72	(80)
West	0.9x	0.77	X	1.59	X	19.64	X	0.63	х	0.7	=	9.54	(80)
West	0.9x	0.77	X	4.39	X	19.64	X	0.63	X	0.7	=	26.35	(80)
West	0.9x	0.77	X	1.62	x	38.42	x	0.63	x	0.7	=	19.02	(80)
West	0.9x	0.77	x	1.59	x	38.42	x	0.63	x	0.7	=	18.67	(80)
West	0.9x	0.77	X	4.39	x	38.42	X	0.63	x	0.7	=	51.55	(80)
West	0.9x	0.77	X	1.62	x	63.27	x	0.63	x	0.7	=	31.33	(80)
West	0.9x	0.77	x	1.59	x	63.27	x	0.63	x	0.7	=	30.75	(80)



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West	0.9x	0.77		x	4.3	9	x	6	3.27	x	0.63	x [0.7	=	84.89	(80)
West	0.9x	0.77		x	1.6	2	x	9:	2.28	x [0.63	x	0.7	=	45.69	(80)
Vest	0.9x	0.77		x	1.5	9	x	9:	2.28	_ x [0.63	x	0.7	=	44.84	(80)
Nest	0.9x	0.77		x	4.3	9	x	9:	2.28	x [0.63	x	0.7	=	123.81	(80)
Vest	0.9x	0.77		x	1.6	2	x	11	3.09	×	0.63	x	0.7	=	55.99	(80)
Vest	0.9x	0.77		x	1.5	9	X	11	3.09	×	0.63	x	0.7	=	54.95	(80)
Nest	0.9x	0.77		x	4.3	9	X	11	3.09	×	0.63	x	0.7	=	151.73	(80)
Vest	0.9x	0.77		x	1.6	2	x	11	5.77	×	0.63	x	0.7	=	57.32	(80)
Vest	0.9x	0.77		x	1.5	9	X	11	5.77	×	0.63	x	0.7	=	56.26	(80)
Vest	0.9x	0.77		x	4.3	9	x	11	5.77	x [0.63	x	0.7	=	155.32	(80)
Vest	0.9x	0.77		x	1.6	2	x	11	0.22	×	0.63	x	0.7	=	54.57	(80)
Vest	0.9x	0.77		x	1.5	9	X	11	0.22	×	0.63	x	0.7	=	53.56	(80)
Vest	0.9x	0.77		x	4.3	9	X	11	0.22	x	0.63	x	0.7	=	147.87	(80)
Vest	0.9x	0.77		x	1.6	2	x	9	4.68	×	0.63	x	0.7	=	46.87	(80)
Vest	0.9x	0.77		x	1.5	9	X	9.	4.68	×	0.63	x	0.7	=	46.01	(80)
Vest	0.9x	0.77		x	4.3	9	X	9.	4.68	×	0.63	x	0.7	=	127.02	(80)
Vest	0.9x	0.77		x	1.6	2	x	7:	3.59	×	0.63	x	0.7		36.43	(80)
Vest	0.9x	0.77		x	1.5	9	x	7:	3.59	×	0.63	x	0.7		35.76	(80)
Vest	0.9x	0.77		x	4.3	9	x	7:	3.59	x	0.63	x	0.7	=	98.73	(80)
Vest	0.9x	0.77		x	1.6	2	x	4	5.59	×	0.63	x	0.7	_ =	22.57	(80)
Vest	0.9x	0.77		x	1.5	9	x	4:	5.59	×	0.63	x	0.7	_ =	22.15	(80)
Vest	0.9x	0.77		x	4.3	9	x	4:	5.59	×	0.63	x	0.7	=	61.16	(80)
Vest	0.9x	0.77		x	1.6	2	x	2.	4.49	×	0.63	x	0.7	_ =	12.12	(80)
Vest	0.9x	0.77		x	1.5	9	x	2.	4.49	×	0.63	x	0.7		11.9	(80)
Vest	0.9x	0.77		x	4.3	9	x	2.	4.49	×	0.63	x	0.7		32.86	(80)
Vest	0.9x	0.77		x	1.6	2	x	1	6.15	x	0.63	×	0.7		8	(80)
Vest	0.9x	0.77		x	1.5	9	x	10	6.15	×	0.63	x	0.7		7.85	(80)
Vest	0.9x	0.77		x	4.3	9	x	1	6.15	×	0.63	x	0.7	=	21.67	(80)
										_						
Solar <u>g</u> a	ains in y	watts, ca	alcula	ted	for each	n mont	:h_			(83)m	= Sum(74)m .	(82)m	_		_	
· L	158.56	288.33	432.9		584.46	686.6		92.53	663.37	587.	6 486.58	330	193.48	133.25	5	(83)
Ĭ-		nternal a			` 	` '	<u> </u>								7	
84)m=	563.96	691.62	821.6	66	949.67	1027.8	6 10	010.72	967.01	898	809.38	676.53	566.99	526.75	<u> </u>	(84)
7. Mea	ın interi	nal temp	eratu	ıre (heating	seaso	n)									
-		•		•			_			ole 9,	Th1 (°C)				21	(85)
Utilisat	- 1	tor for ga		-			Ť			1					7	
	Jan	Feb	Ma	-	Apr	May	+	Jun	Jul	Au		Oct	Nov	Dec		
-		0.00	0.98	a I	0.95	0.87		0.72	0.57	0.62	0.85	0.97	0.99	1	1	(86)
86)m=	1	0.99	0.50	<u> </u>						<u> </u>				•	_	
		temper				ea T1 ((follo	ow ster	os 3 to 7	in Ta	able 9c)				_	

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.67

19.68

19.68

19.68

19.67

19.67

19.67

19.67

(88)

19.67

=m(88)

19.66

19.66

19.66



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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.97 0.93 0.81 0.61 0.41 0.47 0.76 0.95 0.99 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 17.46 17.76 18.25 18.86 19.34 19.61 19.67 19.66 19.5 18.85 18.03 17.4	(90)
fLA = Living area ÷ (4) =	0.43 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.25 18.51 18.94 19.47 19.91 20.15 20.22 20.21 20.04 19.46 18.75 18.2	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	ı
(93)m= 18.25 18.51 18.94 19.47 19.91 20.15 20.22 20.21 20.04 19.46 18.75 18.2	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calc	ulate
the utilisation factor for gains using Table 9a	1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	(-0.0)
(94)m= 0.99 0.99 0.97 0.92 0.82 0.66 0.48 0.53 0.79 0.95 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	(05)
(95)m= 560.7 682.67 796.2 875.33 845.67 663.28 462.53 479.28 638.38 643.35 560.64 524.4	(95)
Monthly average external temperature from Table 8	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1863.1 1815.87 1657.13 1399.52 1085.2 730.6 476.63 501.18 783.45 1171.45 1543.98 1860.34	(97)
(97)m= 1863.1 1815.87 1657.13 1399.52 1085.2 730.6 476.63 501.18 783.45 1171.45 1543.98 1860.34 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	(07)
(98)m= 968.99 761.51 640.54 377.42 178.21 0 0 0 0 392.91 708.01 993.94	
Total per year (kWh/year) = Sum(98) _{15,912} =	5021.52 (98)
Space heating requirement in kWh/m²/year	57.81 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	(004)
Fraction of space heat from secondary/supplementary system	0 (201)
Fraction of space heat from main system(s) (202) = 1 - (201) =	1 (202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1 (204)
Efficiency of main space heating system 1	93.4 (206)
Efficiency of secondary/supplementary heating system, %	0 (208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/year
Space heating requirement (calculated above)	-
968.99 761.51 640.54 377.42 178.21 0 0 0 0 392.91 708.01 993.94	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
1037.46 815.32 685.8 404.09 190.81 0 0 0 420.67 758.04 1064.18	
Total (kWh/year) =Sum(211) _{15,1012} =	5376.36 (211)
Space heating fuel (secondary), kWh/month	
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,1012} =	0 (215)



(231)

(232)

75

367.13

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Total electricity for the above, kWh/year

Electricity for lighting

water	heating	l												
Output	from wa	ater hea	ter (calc	ulated a	bove)									
	206.71	182.25	190.2	168.7	163.33	143.85	137.82	153.64	155.33	176.88	188.22	201.8		
Efficier	ncy of w	ater hea	ter										80.3	(216)
(217)m=	88.44	88.26	87.87	87.02	85.27	80.3	80.3	80.3	80.3	87	88.07	88.52		(217)
Fuel fo	r water	heating,	kWh/mo	onth										
(219)m	1 = (64)	m x 100) ÷ (217)	m										
(219)m=	233.72	206.5	216.46	193.86	191.54	179.14	171.63	191.33	193.44	203.3	213.71	227.97	l	
								Tota	I = Sum(2	102) -			0.400.00	(040)
								Tota	ii = Ourii(2	13a) ₁₁₂ –			2422.62	(219)
Annua	ıl totals							Tota	ii		Wh/year	, ,	kWh/year	(219)
		fuel use	ed, main	system	1			Tota	ii		Wh/year	, ,](219)
Space	heating	fuel use		system	1			Tota	ii – Guiii(2		Wh/year		kWh/year	[(219)
Space Water	heating heating	fuel use		·		t		rota	- Guin(2		Wh/year		kWh/year 5376.36](219)
Space Water Electric	heating heating city for p	fuel use	d ans and	·		t		Tota	i – Guine		Wh/year	30	kWh/year 5376.36	(230c)
Space Water Electric	heating heating city for p al heatin	fuel use	d ans and	·		t		Tota	i – Guine		Wh/year		kWh/year 5376.36]

sum of (230a)...(230g) =

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1161.29 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	523.29 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1684.58 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	190.54 (268)
Total CO2, kg/year	sum	of (265)(271) =	1914.04 (272)
TER =			22.04 (273)



APPENDIX 3. TFEE WORKSHEET OF TYPICAL APARTMENT



TFEE WorkSheet: New dwelling design stage

panos.dalapas@mecserve.com User Details: **Assessor Name:** Panagiotis Dalapas Stroma Number: STRO030082 **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.4.16 Property Address: Apartment 3-Be Lean Address: Apartment 3, 26, Netherhall Gardens, LONDON, NW3 5TL 1. Overall dwelling dimensions: Volume(m³) Area(m²) Av. Height(m) Ground floor (1a) x (2a) =(3a) 86.86 2.8 243.21 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4) 86.86 (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =Dwelling volume 243.21 (5) 2. Ventilation rate: main secondary other total m³ per hour heating heating x 40 =Number of chimneys (6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 Number of passive vents x 10 =(7b) 0 0 Number of flueless gas fires x 40 =(7c)0 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.12 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9) 0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration (15)0 Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =(16)0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)(18)0.37 Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.7 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.26 Infiltration rate modified for monthly wind speed Jan Feb Mar Jun Sep Oct Nov Dec Apr May Jul Aug Monthly average wind speed from Table 7 (22)m =4.3 3.8 3.8

(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

Wind Factor $(22a)m = (22)m \div 4$



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Adjusted infiltration ra	te (allowir	na for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.33 0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
Calculate effective air	•	ate for t	he appli	cable ca	se	<u> </u>	!	<u> </u>	<u> </u>			
If mechanical ventils			al.) (aa	/		.=	. (22)	\			0	(23a)
If exhaust air heat pump	•		, ,	,	•		,) = (23a)			0	(23b)
If balanced with heat rec	-	-	_					.	001) .	4 (22.)	0	(23c)
a) If balanced mech					<u> </u>	- ` ` - 	ŕ	 		- ` ` `	÷ 100]	(0.4=)
(24a)m= 0 0	0	0	0	0	0 (1	0	0	0	0	0		(24a)
b) If balanced mech	т т			1	, 	r ´`	í `	r ´ `			1	(24b)
(24b)m= 0 0	0	0	0	0	0	0	0	0	0	0		(240)
c) If whole house ex if (22b)m < 0.5			-	-				5 × (23h))			
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ventilati	on or who	ole hous	e positiv	/e input	ventilatio	on from I	loft	l	l			
if (22b)m = 1, th				•				0.5]				
(24d)m= 0.56 0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effective air change	rate - en	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.56 0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3. Heat losses and h	eat loss p	aramete	er:									
ELEMENT Gro		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
Doors												
				1.92	X	1	=	1.92				(26)
Windows Type 1				1.92		1 /[1/(1.4)+		1.92 2.15				(26) (27)
					x1/	L	0.04] =					
Windows Type 1				1.62	x1/	/[1/(1.4)+	0.04] =	2.15				(27)
Windows Type 1 Windows Type 2				1.62	x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+	[0.04] = [0.04] = [0.04] = [0.04]	2.15				(27) (27)
Windows Type 1 Windows Type 2 Windows Type 3				1.62 1.59 4.39	x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array} = \begin{bmatrix} 0.04 \\ 0.04 \\ \end{array}$	2.15 2.11 5.82				(27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4				1.62 1.59 4.39	x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 $	2.15 2.11 5.82 1.59				(27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5				1.62 1.59 4.39 1.2 1.2	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59				(27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6				1.62 1.59 4.39 1.2	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59				(27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8				1.62 1.59 4.39 1.2 1.2 1.2 1.2	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 1.59 3.98				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9				1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor	43	19.70	a	1.62 1.59 4.39 1.2 1.2 1.2 1.2 4.39 8.57	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type 1 96.		19.79	=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 7.6.64	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 8 Windows Type 9 Floor Walls Type1 96. Walls Type2 27.	89	1.92	=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39 8.57 76.64 25.97	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 96. Walls Type2 27. Roof 38.	89 42		=	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39 8.57 76.64 25.97 38.42	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 96. Walls Type2 27. Roof 38. Total area of elements * for windows and roof windows	89 42 5, m ² dows, use ei	1.92	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	0.04] = [0.04]	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99		paragraph	3.2	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 96. Walls Type1 96. Total area of elements * for windows and roof windows	42 5, m ² dows, use et	1.92 0 ffective with ternal walk	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	$\begin{array}{c} 0.04 \\ 0.$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99		paragraph		(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type 1 Walls Type 2 Roof Total area of elements * for windows and roof windows include the areas on both fabric heat loss, W/K	89 42 5, m ² dows, use el a sides of in: = S (A x	1.92 0 ffective with ternal walk	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 1.2 1.2 2.1 3 4.39 8.57 76.64 25.97 38.42 171.3	x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.13	$\begin{array}{c} 0.04 = \begin{bmatrix} 0.04 = \begin{bmatrix} 0.04 = \end{bmatrix} \\ 0.04 = \begin{bmatrix} 0$	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99	as given in		52.74	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Floor Walls Type1 96. Walls Type1 96. Total area of elements * for windows and roof windows	89 42 s, m² dows, use en sides of in: = S (A x (A x k)	1.92 0 ffective winternal walk	ndow U-va	1.62 1.59 4.39 1.2 1.2 1.2 1.2 3 4.39 8.57 76.64 25.97 38.42 171.3 alue calculatitions	x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2 x1/2	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	0.04] = [0.04]	2.15 2.11 5.82 1.59 1.59 1.59 3.98 5.82 1.1141 13.8 4.67 4.99	as given in 2) + (32a).			(27) (27) (27) (27) (27) (27) (27) (27)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f



(52)

(53)

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Volume factor from Table 2a

Temperature factor from Table 2b

hermal bridge	es : S (L	x Y) cale	culated i	using Ap	pendix ł	K						36.23	(36
details of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
otal fabric he	at loss							(33) +	(36) =			88.96	(37
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 44.58	44.41	44.24	43.45	43.3	42.6	42.6	42.47	42.87	43.3	43.6	43.91		(3
eat transfer o	coefficier	nt, W/K	-		-		-	(39)m	= (37) + (3	38)m			
9)m= 133.55	133.37	133.2	132.41	132.26	131.56	131.56	131.44	131.83	132.26	132.56	132.88		
									Average =	Sum(39) _{1.}	12 /12=	132.41	(3
eat loss para	<u> </u>	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m= 1.54	1.54	1.53	1.52	1.52	1.51	1.51	1.51	1.52	1.52	1.53	1.53		— .
umber of day	s in mor	nth (Tahl	le 1a)					1	Average =	Sum(40) _{1.}	12 /12=	1.52	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
´	<u> </u>	<u> </u>				<u> </u>							
	9, N = 1							0013 x (⁻ + 36	IFA -13.		.48		(4
nnual averageduce the annua	9, N = 1 je hot wa al average	ater usag hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		95	.48		(4
nnual averageduce the annua	9, N = 1 je hot wa al average	ater usag hot water	ge in litre usage by	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		95	.48		(4
nnual averageduce the annual t more that 125	9, N = 1 ge hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,avelling is the hot and col	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		95	.48 Dec		(4
nnual averageduce the annual transfer that 125 Jan transfer usage in the street that the str	9, N = 1 ge hot wa al average litres per p Feb n litres per	ater usag hot water person per Mar	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,avelling is a frot and conduction Tun	erage = designed to ld) Jul Table 1c x	(25 x N) to achieve	+ 36 a water us Sep	Ge target of	95 Nov	Dec		(4
nnual averageduce the annual transfer that 125 Jan transfer usage in the street transfer that the street transfer tran	9, N = 1 ge hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by a day (all w	es per da 5% if the d rater use, I	ay Vd,avelling is the hot and col	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 93.57	Oct	95 Nov 101.21	Dec 105.03		`
Jan the water usage is the same in the sa	9, N = 1 ge hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month 93.57	es per da 5% if the d rater use, I May Vd,m = fa 89.75	ay Vd,ave lwelling is not and con Jun ctor from 7	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57	Oct 97.39 Fotal = Sur	Nov 101.21 m(44) ₁₁₂ =	Dec 105.03	1145.77	`
Jan of water usage is ergy content of	9, N = 1 Je hot wa Je hot water	hot water person per Mar day for ea 97.39	ge in litre usage by s day (all w Apr ach month 93.57	es per da 5% if the d rater use, I May Vd,m = fa 89.75	ay Vd,ave lwelling is not and con Jun ctor from 7 85.93	erage = designed to ld) Jul Table 1c x 85.93	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 b kWh/mor	Oct 97.39 Fotal = Suith (see Ta	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1	Dec 105.03 c, 1d)	1145.77	`
Jan t water usage i	9, N = 1 ge hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	ge in litre usage by s day (all w Apr ach month 93.57	es per da 5% if the d rater use, I May Vd,m = fa 89.75	ay Vd,ave lwelling is not and con Jun ctor from 7	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun th (see Ta	Nov 101.21 m(44)12 = 1bbles 1b, 1 138.9	Dec 105.03 c, 1d) 150.84		(4
Jan t water usage is tergy content of 5)m= 155.76	9, N = 1 ye hot wa al average litres per y Feb n litres per 101.21	Mar 97.39 used - calc	ge in litre usage by a day (all w Apr ach month 93.57 culated mo	es per da 5% if the da 5% if th	Ay Vd,avi Iwelling is that and co. Jun ctor from 7 85.93	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Fotal = Suith (see Ta	Nov 101.21 m(44)12 = 1bbles 1b, 1 138.9	Dec 105.03 c, 1d) 150.84	1145.77	(4
Jan the water usage is some some some some some some some som	9, N = 1 Je hot wa al average litres per p Feb n litres per 101.21 Thot water 136.22 vater heatin	Mar 97.39 used - calc	ge in litre usage by a day (all w Apr ach month 93.57 culated mo	es per da 5% if the da 5% if th	Ay Vd,avi Iwelling is that and co. Jun ctor from 7 85.93	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun th (see Ta	Nov 101.21 m(44)12 = 1bbles 1b, 1 138.9	Dec 105.03 c, 1d) 150.84		(4
Jan of water usage is the more that 125 Jan of water usage is the more that 125 Jan of water usage is the more that 125 are regy content of of more that 125 instantaneous was of atter storage	P, N = 1 Je hot wa Je hot wa Je hot wa Je litres per Je Je hot water	Mar 97.39 used - calc 140.57 ng at point	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no	es per da 5% if the d rater use, I May Vd,m = fa 89.75 onthly = 4. 117.59 o hot water	ay Vd,ave lwelling is that and con Stor from 1 85.93 190 x Vd,r 101.47	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in	(25 x N) to achieve Aug (43) 89.75 0Tm / 3600 107.9 boxes (46) 0	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 0	Nov 101.21 m(44) ₁₁₂ = 10bles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84		(4)
Jan the water usage is the water usage is the more that 125 Jan to water usage is the more that 125 Jan 105.03 the regy content of the more than taneous water usage is the more that 125 the more than taneous water storage orage volume	9, N = 1 Je hot wa Je litres per Je Je hot water Je hot water Je hot water Je hot water Je loss: Je (litres)	Mar Mar 97.39 used - calc 140.57 ng at point 0 including	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no	es per da 5% if the of rater use, I May Vd,m = far 89.75 onthly = 4. 117.59 o hot water 0	ay Vd,ave livelling is that and control of the storage lively with the storage	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 0	Nov 101.21 m(44) ₁₁₂ = bles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84		(4)
Jan Jan t water usage is it more that 125 Jan 105.03 it water usage is it more that 125 Jan 105.03 it water usage is it may content of it more that 125 it more t	P, N = 1 Je hot wa Je hot wa Je hot wa Je litres per Je Je hot water Je hot water Je hot water Je hot water Je litres per Je	Mar Mar 97.39 used - calc 140.57 ng at point 0 includin	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no	es per da 5% if the of the factor use, I May Vd,m = factor 89.75 onthly = 4. 117.59 o hot water 0 other or Water velling, e	ay Vd,ave levelling is that and construction from 1 85.93 190 x Vd,r 101.47 storage), 0 /WHRS	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 0 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0 ame ves	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 0		(4)
Jan of water usage is the more that 125 Jan of water usage is the more that 125 Jan 105.03 for the more that 125 for the more than 125 for the more th	P, N = 1 Ie hot wa al average litres per litres per 101.21 Thot water 136.22 Vater heatin 0 Toss: ie (litres) ineating a co stored	Mar Mar 97.39 used - calc 140.57 ng at point 0 includin	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no	es per da 5% if the of the factor use, I May Vd,m = factor 89.75 onthly = 4. 117.59 o hot water 0 other or Water velling, e	ay Vd,ave levelling is that and constructor from 1 85.93 190 x Vd,r 101.47 of storage), 0 /WHRS	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 0 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0 ame ves	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 0		(4)
Jan Jan t water usage is it)m= 105.03 ergy content of nstantaneous w so)m= 0 ater storage orage volum community heherwise if no	9, N = 1 Je hot wa Je hot wa Je hot wa Je hot wa Je litres per Je Je hot water 101.21 Je hot water 136.22 Je litres Je (litres) Je ating a Je stored Joss:	Mar Mar 97.39 used - calc 140.57 ng at point 0 including the talk of the talk of the talk of the talk of talk o	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no o ng any so ank in dw er (this in	es per da 5% if the of the of the the of the of the the of the	ay Vd,ave levelling is that and control of the second seco	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 0 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0 ame ves	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = bbles 1b, 1 138.9 m(45) ₁₁₂ = 0	Dec 105.03 = c, 1d) 150.84 = 0		(4)
Jan the water usage is the more that 125 Jan the water usage is the more that 125 Jan 105.03 the regy content of the stantaneous was an	9, N = 1 ye hot wa al average litres per ye 101.21 Thot water 136.22 vater heatin 0 loss: he (litres) heating a co stored loss: turer's de	Mar Mar 97.39 used - calc 140.57 ng at point 0 includin and no tal hot water	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no 0 and any so ank in dw er (this in	es per da 5% if the of the of the the of the of the the of the	ay Vd,ave levelling is that and control of the second seco	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 0 storage 0 litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 0 ame ves	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 0	Dec 105.03 = c, 1d) 150.84 = 0		(4)
Jan of water usage if 4)m= 105.03 dergy content of instantaneous water storage community hater storage if the water storage if the water usage if instantaneous water storage instantaneous water	P, N = 1 Je hot water litres per	ater usage hot water person per Mar day for ea 97.39 used - calce 140.57 ng at point 0 including and no talce hot water eclared lem Table	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no and any so ank in dw er (this in oss facto 2b	es per da 5% if the of the factor use, I May Vd,m = factor 89.75 onthly = 4. 117.59 o hot water 0 olar or Water velling, eacludes in or is known	ay Vd,ave levelling is that and control of the second seco	erage = designed to ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 0 storage 0 litres in neous con/day):	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47)	+ 36 a water us Sep 93.57 109.19 0 to (61) 0 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 0	Dec 105.03 c, 1d) 150.84 0		(4 (4 (4 (4 (4 (5
ot water usage in the state of	P, N = 1 Je hot wa Je hot wa Je hot wa Je hot wa Je litres per l Je hot water 101.21 Je hot water 136.22 Je litres Je (litres) Je actor for Je water for Je w	Mar Mar 97.39 used - calc 140.57 ng at point o including and no talch water eclared left marger to the colored c	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no ng any so ank in dw er (this in oss facto 2b cylinder l	es per da 5% if the of ater use, I May Vd,m = far 89.75 onthly = 4. 117.59 o hot water 0 olar or W velling, e acludes i or is kno ear oss factor	ay Vd,ave fivelling is that and construction from Total 85.93 190 x Vd,ro 101.47 of storage), 0 /WHRS nter 110 nstantar wn (kWh	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47) mbi boil	+ 36 a water us Sep 93.57 109.19 0 to (61) 0 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 0	Dec 105.03 c, 1d) 150.84 0 0		(4)
Jan of water usage is 4)m= 105.03 hergy content of 5)m= 155.76 instantaneous water storage torage volume community here therwise if no dater storage (atter storage)	P, N = 1 Je hot wa Je hot wa Je hot wa Je litres per l Je hot water 101.21 Je hot water 136.22 Je (litres) Je (litres) Je actor fro Je water seating a Je stored J	Mar day for ear of at point and no tall hot water of a storage eclared of factor fr	ge in litre usage by a day (all w Apr ach month 93.57 culated mo 122.55 of use (no one and in dw er (this in oss facto 2b c, kWh/ye cylinder I com Table	es per da 5% if the of ater use, I May Vd,m = far 89.75 onthly = 4. 117.59 o hot water 0 olar or W velling, e acludes i or is kno ear oss factor	ay Vd,ave fivelling is that and construction from Total 85.93 190 x Vd,ro 101.47 of storage), 0 /WHRS nter 110 nstantar wn (kWh	erage = designed to designed t	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 0 within sa (47) mbi boil	+ 36 a water us Sep 93.57 109.19 0 to (61) 0 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth (see Sunth (see Tail 127.25)	Nov 101.21 m(44) ₁₁₂ = bbles 1b, 1 138.9 m(45) ₁₁₂ = 0	Dec 105.03 c, 1d) 150.84 0 0		(4)



TFEE WorkSheet: New dwelling design stage

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parrooraarapas Crisos	serve.com	11										
Energy lost from wate	_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (54) in (•									0		(55)
Water storage loss ca	lculated f	or each	month			((56)m = (55) × (41)	m 				
(56)m = 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicate	ed solar sto	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= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss (a	nnual) fro	m Table	3							0		(58)
Primary circuit loss ca			,	,	` '	` '						
(modified by factor f	1				i						1	
(59)m= 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated	for each	month (61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 132.39 115.79	119.49	104.17	99.95	86.25	79.93	91.72	92.81	108.16	118.07	128.21		(62)
Solar DHW input calculated	l using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additional lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (€)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water hea	ater										•	
(64)m= 132.39 115.79	119.49	104.17	99.95	86.25	79.93	91.72	92.81	108.16	118.07	128.21		
1						Outp	out from w	ater heate	r (annual)₁	12	1276.95	(64)
Heat gains from water	heating	k\/\/h/ma	onth 0 2	= ′ [O OE	(45)	(04)	1 . 0 0	F(4 0)	()	(=0)		
	nicating,	KAAII/III	JIIIII U.Z	ാ പ്ര.രാ	× (45)III	+ (61)m	1] + U.8 X	([(46)m	+ (5/)m	+ (59)m]	
(65)m= 33.1 28.95	29.87	26.04	24.99	21.56	19.98	+ (61)m 22.93	23.2	27.04	+ (57)m 29.52	+ (59)m 32.05]	(65)
	29.87	26.04	24.99	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
(65)m= 33.1 28.95	29.87 culation (26.04 of (65)m	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
(65)m= 33.1 28.95 include (57)m in cal	29.87 culation of	26.04 of (65)m and 5a)	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
include (57)m in cal 5. Internal gains (se	29.87 culation of	26.04 of (65)m and 5a)	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
include (57)m in cal 5. Internal gains (see	29.87 culation of Table 5 e 5), Wat	26.04 of (65)m and 5a)	24.99 only if c	21.56 ylinder is	19.98 s in the o	22.93 dwelling	23.2 or hot w	27.04 rater is fr	29.52 om com	32.05 munity h		(65)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb	29.87 culation of the Table 5 e 5), Wat Mar 129.01	26.04 of (65)m and 5a) ts Apr 129.01	24.99 only if c : May 129.01	21.56 ylinder is Jun 129.01	19.98 s in the o	22.93 dwelling Aug 129.01	23.2 or hot w Sep 129.01	27.04 rater is fr	29.52 om com	32.05 munity h		
(65)m= 33.1 28.95 include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01	29.87 culation of the Table 5 e 5), Wat Mar 129.01	26.04 of (65)m and 5a) ts Apr 129.01	24.99 only if c : May 129.01	21.56 ylinder is Jun 129.01	19.98 s in the o	22.93 dwelling Aug 129.01	23.2 or hot w Sep 129.01	27.04 rater is fr	29.52 om com	32.05 munity h		
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculated)	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37	24.99 only if c : May 129.01 L, equati 8.5	21.56 ylinder is Jun 129.01 ion L9 or 7.17	Jul 129.01 r L9a), a	22.93 dwelling Aug 129.01 lso see	23.2 or hot w Sep 129.01 Table 5 13.52	27.04 rater is fr Oct 129.01	29.52 om com Nov 129.01	32.05 munity h		(66)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculated) (67)m= 20.79 18.46	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37	24.99 only if c : May 129.01 L, equati 8.5	21.56 ylinder is Jun 129.01 ion L9 or 7.17	Jul 129.01 r L9a), a	22.93 dwelling Aug 129.01 lso see	23.2 or hot w Sep 129.01 Table 5 13.52	27.04 rater is fr Oct 129.01	29.52 om com Nov 129.01	32.05 munity h		(66)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate) (68)m= 233.18 235.6	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52	24.99 only if c May 129.01 L, equati 8.5 dix L, eq 200.14	21.56 ylinder is Jun 129.01 fon L9 of 7.17 uation L 184.74	Jul 129.01 r L9a), a 7.75 13 or L1 174.45	22.93 dwelling Aug 129.01 lso see 10.08 3a), also	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 om com Nov 129.01	32.05 munity h Dec 129.01		(66) (67)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate)	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52	24.99 only if c May 129.01 L, equati 8.5 dix L, eq 200.14	21.56 ylinder is Jun 129.01 fon L9 of 7.17 uation L 184.74	Jul 129.01 r L9a), a 7.75 13 or L1 174.45	22.93 dwelling Aug 129.01 lso see 10.08 3a), also	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 om com Nov 129.01	32.05 munity h Dec 129.01		(66) (67)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate) (68)m= 233.18 235.6 Cooking gains (calculate) (69)m= 35.9 35.9	29.87 culation (e Table 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5 ated in A 35.9	26.04 of (65)m of and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52 opendix 35.9	24.99 only if c): May 129.01 L, equati 8.5 dix L, eq 200.14 L, equat	Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a)	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 om com Nov 129.01 20.04	32.05 munity h Dec 129.01 21.37		(66) (67) (68)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate) (68)m= 233.18 235.6 Cooking gains (calculate)	29.87 culation (e Table 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5 ated in A 35.9	26.04 of (65)m of and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52 opendix 35.9	24.99 only if c): May 129.01 L, equati 8.5 dix L, eq 200.14 L, equat	Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a)	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 om com Nov 129.01 20.04	32.05 munity h Dec 129.01 21.37		(66) (67) (68)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate) (68)m= 233.18 235.6 Cooking gains (calculate) (69)m= 35.9 35.9 Pumps and fans gains (70)m= 0 0	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5 ated in Ap 35.9 a (Table 5	26.04 of (65)m of and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52 opendix 35.9 oa 0	24.99 only if c May 129.01 L, equati 8.5 dix L, equ 200.14 L, equat 35.9	21.56 ylinder is Jun 129.01 fon L9 or 7.17 uation L15 184.74 ion L15 35.9	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 om com Nov 129.01 20.04 207.49	32.05 munity h Dec 129.01 21.37 222.89		(66) (67) (68) (69)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calcula (67)m= 20.79 18.46 Appliances gains (calcula (68)m= 233.18 235.6 Cooking gains (calcula (69)m= 35.9 35.9 Pumps and fans gains	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in 229.5 ated in Ap 35.9 a (Table 5	26.04 of (65)m of and 5a) ts Apr 129.01 opendix I 11.37 Append 216.52 opendix 35.9 oa 0	24.99 only if c May 129.01 L, equati 8.5 dix L, equ 200.14 L, equat 35.9	21.56 ylinder is Jun 129.01 fon L9 or 7.17 uation L15 184.74 ion L15 35.9	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 om com Nov 129.01 20.04 207.49	32.05 munity h Dec 129.01 21.37 222.89		(66) (67) (68) (69)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calcula (67)m= 20.79 18.46 Appliances gains (calcula (68)m= 233.18 235.6 Cooking gains (calcula (69)m= 35.9 35.9 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporatio (71)m= -103.21 -103.21	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in Ap 229.5 ated in A 35.9 c (Table 5 0 on (negating of the color) culated in Ap 15.02 culated in Ap 15.02	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37 Appendix 216.52 opendix 35.9 o tive value	24.99 only if c May 129.01 L, equati 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15 35.9 0 le 5)	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 om com Nov 129.01 20.04 207.49 35.9	32.05 munity h Dec 129.01 21.37 222.89 0		(66) (67) (68) (69) (70)
include (57)m in cal 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 Lighting gains (calculate) (67)m= 20.79 18.46 Appliances gains (calculate) (68)m= 233.18 235.6 Cooking gains (calculate) (69)m= 35.9 35.9 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporation	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in Ap 229.5 ated in A 35.9 c (Table 5 0 on (negating of the color) culated in Ap 15.02 culated in Ap 15.02	26.04 of (65)m and 5a) ts Apr 129.01 opendix I 11.37 Appendix 216.52 opendix 35.9 o tive value	24.99 only if c May 129.01 L, equati 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15 35.9 0 le 5)	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 om com Nov 129.01 20.04 207.49 35.9	32.05 munity h Dec 129.01 21.37 222.89 0		(66) (67) (68) (69) (70)
include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129.01 129.01 Lighting gains (calcula (67)m= 20.79 18.46 Appliances gains (calcula (68)m= 233.18 235.6 Cooking gains (calcula (69)m= 35.9 35.9 Pumps and fans gains (70)m= 0 0 Losses e.g. evaporatic (71)m= -103.21 -103.21 Water heating gains (29.87 culation of a Table 5 e 5), Wat Mar 129.01 atted in Ap 15.02 culated in 229.5 atted in Ap 35.9 s (Table 5 0 on (negating attention of the color) Table 5) 40.15	26.04 of (65)m of and 5a) ots Apr 129.01 opendix I 11.37 of Appendix 216.52 opendix 35.9 of of and 5a) of an and 5a) of an and 5a) of an and 5a) of an another another and 5a) of an another a	24.99 only if c): May 129.01 L, equati 8.5 dix L, eqi 200.14 L, equati 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15 35.9 0 le 5) -103.21	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9 0	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9 0 -103.21	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9 0 -103.21	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9 0	29.52 om com Nov 129.01 20.04 207.49 35.9 0 -103.21	32.05 munity h Dec 129.01 21.37 222.89 0 -103.21		(66) (67) (68) (69) (70) (71)
include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129	29.87 culation of a Table 5 e 5), Wat Mar 129.01 atted in Ap 15.02 culated in 229.5 atted in Ap 35.9 s (Table 5 0 on (negating attention of the color) Table 5) 40.15	26.04 of (65)m of and 5a) ots Apr 129.01 opendix I 11.37 of Appendix 216.52 opendix 35.9 of of and 5a) of an and 5a) of an and 5a) of an and 5a) of an another another and 5a) of an another a	24.99 only if c): May 129.01 L, equati 8.5 dix L, eqi 200.14 L, equati 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 or 7.17 uation L 184.74 ion L15 35.9 0 le 5) -103.21	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9 0	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9 0 -103.21	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9 0 -103.21	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9 0 -103.21	29.52 om com Nov 129.01 20.04 207.49 35.9 0 -103.21	32.05 munity h Dec 129.01 21.37 222.89 0 -103.21		(66) (67) (68) (69) (70) (71)
include (57)m in call 5. Internal gains (see Metabolic gains (Table Jan Feb (66)m= 129.01 129	29.87 culation of a Table 5 e 5), Wat Mar 129.01 ated in Ap 15.02 culated in Ap 229.5 ated in A 35.9 s (Table 5 0 on (negation of the color) ated 5 40.15	26.04 of (65)m and 5a) ts Apr 129.01 ppendix I 11.37 Appendix 216.52 opendix 35.9 o tive value -103.21	24.99 only if c): May 129.01 L, equati 8.5 dix L, eqi 200.14 L, equati 35.9 0 es) (Tab -103.21	21.56 ylinder is Jun 129.01 fon L9 or 7.17 uation L15 35.9 0 le 5) -103.21 29.95 (66)	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9 0	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 , also se 35.9 0 -103.21 30.82	23.2 or hot w Sep 129.01 Table 5 13.52 see Ta 178.12 ee Table 35.9 0 -103.21 32.23 - (69)m +	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9 0 -103.21 36.35 (70)m + (7	29.52 om com Nov 129.01 20.04 207.49 35.9 0 -103.21 41 1)m + (72)	32.05 munity h Dec 129.01 21.37 222.89 0 -103.21 43.08		(66) (67) (68) (69) (70) (71) (72)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.



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Orientati	ion:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	X	3	x	19.64	x	0.63	x	0.7	=	18.01	(76)
East	0.9x	1	X	4.39	x	19.64	x	0.63	x	0.7	=	26.35	(76)
East	0.9x	1	x	3	x	38.42	x	0.63	x	0.7	=	35.23	(76)
East	0.9x	1	X	4.39	x	38.42	x	0.63	x	0.7	=	51.55	(76)
East	0.9x	1	x	3	x	63.27	x	0.63	x	0.7	=	58.01	(76)
East	0.9x	1	x	4.39	x	63.27	x	0.63	x	0.7	=	84.89	(76)
East	0.9x	1	x	3	x	92.28	х	0.63	x	0.7	=	84.61	(76)
East	0.9x	1	X	4.39	x	92.28	x	0.63	x	0.7	=	123.81	(76)
East	0.9x	1	X	3	x	113.09	X	0.63	x	0.7	=	103.69	(76)
East	0.9x	1	X	4.39	x	113.09	X	0.63	x	0.7	=	151.73	(76)
East	0.9x	1	x	3	x	115.77	x	0.63	x	0.7	=	106.14	(76)
East	0.9x	1	x	4.39	x	115.77	x	0.63	x	0.7	=	155.32	(76)
East	0.9x	1	x	3	x	110.22	x	0.63	x	0.7	=	101.05	(76)
East	0.9x	1	x	4.39	x	110.22	x	0.63	x	0.7	=	147.87	(76)
East	0.9x	1	x	3	x	94.68	x	0.63	x	0.7	=	86.8	(76)
East	0.9x	1	x	4.39	x	94.68	x	0.63	x	0.7	=	127.02	(76)
East	0.9x	1	x	3	x	73.59	x	0.63	x	0.7	=	67.47	(76)
East	0.9x	1	x	4.39	x	73.59	x	0.63	x	0.7	=	98.73	(76)
East	0.9x	1	x	3	x	45.59	x	0.63	x	0.7	=	41.8	(76)
East	0.9x	1	x	4.39	x	45.59	x	0.63	x	0.7	=	61.16	(76)
East	0.9x	1	X	3	x	24.49	x	0.63	X	0.7	=	22.45	(76)
East	0.9x	1	X	4.39	x	24.49	x	0.63	x	0.7	=	32.86	(76)
East	0.9x	1	X	3	X	16.15	X	0.63	X	0.7	=	14.81	(76)
East	0.9x	1	X	4.39	x	16.15	X	0.63	x	0.7	=	21.67	(76)
South	0.9x	0.77	X	1.2	x	46.75	X	0.63	x	0.7	=	17.15	(78)
South	0.9x	0.77	X	1.2	x	46.75	X	0.63	X	0.7	=	17.15	(78)
South	0.9x	0.77	X	1.2	X	46.75	X	0.63	X	0.7	=	17.15	(78)
South	0.9x	0.77	X	1.2	X	46.75	X	0.63	X	0.7	=	17.15	(78)
South	0.9x	0.77	X	1.2	X	76.57	X	0.63	X	0.7	=	28.08	(78)
South	0.9x	0.77	X	1.2	X	76.57	X	0.63	X	0.7	=	28.08	(78)
South	0.9x	0.77	X	1.2	X	76.57	X	0.63	X	0.7	=	28.08	(78)
South	0.9x	0.77	X	1.2	X	76.57	X	0.63	x	0.7	=	28.08	(78)
South	0.9x	0.77	X	1.2	x	97.53	X	0.63	x	0.7	=	35.77	(78)
South	0.9x	0.77	X	1.2	X	97.53	X	0.63	X	0.7	=	35.77	(78)
South	0.9x	0.77	X	1.2	X	97.53	X	0.63	x	0.7	=	35.77	(78)
South	0.9x	0.77	X	1.2	x	97.53	X	0.63	x	0.7	=	35.77	(78)
South	0.9x	0.77	X	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x		X	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x	0.77	X	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)



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South	0.9x	0.77	x	1.2	x	110.23	x	0.63	x	0.7	=	40.43	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	х	0.7	=	42.13	(78)
South	0.9x	0.77	X	1.2	x	114.87	x	0.63	х	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	114.87	x	0.63	x	0.7	=	42.13	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	х	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	x	1.2	x	110.55	x	0.63	x	0.7	=	40.54	(78)
South	0.9x	0.77	X	1.2	x	108.01	x	0.63	X	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.2	x	108.01	x	0.63	x	0.7	=	39.61	(78)
South	0.9x	0.77	x	1.2	x	108.01	x	0.63	x	0.7	=	39.61	(78)
South	0.9x	0.77	X	1.2	x	108.01	x	0.63	X	0.7	=	39.61	(78)
South	0.9x	0.77	X	1.2	x	104.89	x	0.63	X	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	x	104.89	X	0.63	X	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	x	104.89	x	0.63	x	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	x	104.89	x	0.63	x	0.7	=	38.47	(78)
South	0.9x	0.77	X	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	101.89	x	0.63	x	0.7	=	37.37	(78)
South	0.9x	0.77	X	1.2	x	82.59	X	0.63	X	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	x	82.59	x	0.63	x	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	x	82.59	X	0.63	X	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	x	82.59	X	0.63	X	0.7	=	30.29	(78)
South	0.9x	0.77	X	1.2	x	55.42	x	0.63	X	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	x	55.42	X	0.63	X	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	x	55.42	x	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	X	55.42	x	0.63	x	0.7	=	20.32	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
South	0.9x	0.77	X	1.2	X	40.4	X	0.63	X	0.7	=	14.82	(78)
West	0.9x	0.77	X	1.62	X	19.64	X	0.63	X	0.7	=	9.72	(80)
West	0.9x	0.77	X	1.59	X	19.64	X	0.63	X	0.7	=	9.54	(80)
West	0.9x	0.77	X	4.39	X	19.64	X	0.63	X	0.7	=	26.35	(80)
West	0.9x	0.77	X	1.62	X	38.42	X	0.63	X	0.7	=	19.02	(80)
West	0.9x	0.77	X	1.59	x	38.42	x	0.63	x	0.7	=	18.67	(80)
West	0.9x	0.77	X	4.39	x	38.42	X	0.63	X	0.7	=	51.55	(80)
West	0.9x	0.77	X	1.62	x	63.27	X	0.63	X	0.7	=	31.33	(80)
West	0.9x	0.77	X	1.59	x	63.27	X	0.63	x	0.7	=	30.75	(80)



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West	0.9x	0.77		x	4.39	x	6	3.27	x	0.63	x [0.7	=	84.89	(80)
West	0.9x	0.77		x	1.62	X	9	2.28	x	0.63	x [0.7	=	45.69	(80)
West	0.9x	0.77		x	1.59	x	9	92.28	x	0.63	x	0.7	=	44.84	(80)
West	0.9x	0.77		x	4.39	x	9	92.28	x	0.63	x	0.7	=	123.81	(80)
West	0.9x	0.77		x	1.62	x	1	13.09	X	0.63	x	0.7	=	55.99	(80)
West	0.9x	0.77		x	1.59	x	1	13.09	x	0.63	x	0.7	=	54.95	(80)
West	0.9x	0.77		x	4.39	x	1	13.09	X	0.63	x [0.7	=	151.73	(80)
West	0.9x	0.77		x	1.62	X	1	15.77	x	0.63	x	0.7	=	57.32	(80)
West	0.9x	0.77		x	1.59	x	1	15.77	X	0.63	x	0.7	=	56.26	(80)
West	0.9x	0.77		x	4.39	x	1	15.77	X	0.63	x	0.7	=	155.32	(80)
West	0.9x	0.77		x	1.62	x	1	10.22	X	0.63	x	0.7	=	54.57	(80)
West	0.9x	0.77		x	1.59	x	1	10.22	X	0.63	x	0.7	=	53.56	(80)
West	0.9x	0.77		x	4.39	x	1	10.22	X	0.63	x	0.7	=	147.87	(80)
West	0.9x	0.77		x	1.62	x	(94.68	X	0.63	x	0.7	=	46.87	(80)
West	0.9x	0.77		X	1.59	X	é	94.68	X	0.63	x	0.7	=	46.01	(80)
West	0.9x	0.77		x	4.39	x	9	94.68	X	0.63	x	0.7	=	127.02	(80)
West	0.9x	0.77		x	1.62	x	7	73.59	X	0.63	x	0.7	=	36.43	(80)
West	0.9x	0.77		x	1.59	X	7	73.59	X	0.63	x	0.7	=	35.76	(80)
West	0.9x	0.77		x	4.39	X	1	73.59	X	0.63	x	0.7	=	98.73	(80)
West	0.9x	0.77		x	1.62	x	4	15.59	X	0.63	x	0.7	=	22.57	(80)
West	0.9x	0.77		x	1.59	x	4	15.59	X	0.63	х	0.7	=	22.15	(80)
West	0.9x	0.77		x	4.39	x	4	15.59	X	0.63	x	0.7	=	61.16	(80)
West	0.9x	0.77		x	1.62	x	2	24.49	X	0.63	x	0.7	=	12.12	(80)
West	0.9x	0.77		x	1.59	x	2	24.49	X	0.63	x	0.7	=	11.9	(80)
West	0.9x	0.77		x	4.39	x	2	24.49	X	0.63	x	0.7	=	32.86	(80)
West	0.9x	0.77		x	1.62	x	1	6.15	X	0.63	x	0.7	=	8	(80)
West	0.9x	0.77		x	1.59	x		6.15	X	0.63	x	0.7	=	7.85	(80)
West	0.9x	0.77		x	4.39	X	1	6.15	X	0.63	x	0.7	=	21.67	(80)
Ť		T I		$\overline{}$	for each mon	$\overline{}$				= Sum(74)m .				٦	(0.0)
(83)m=	158.56		432.9	_	584.46 686.6		692.53	663.37	587	.6 486.58	330	193.48	133.25		(83)
_	518.72			_	$\frac{(84)m = (73)r}{910.22 990.5}$		` '	934.13	000	00 770 40	000.00	T 500 70	400.0	7	(84)
(84)m=		!	779.3	_			976.09	934.13	862.	22 772.16	636.33	523.72	482.3		(04)
					heating seaso										7
-		•		•	eriods in the li	_			ole 9,	Th1 (°C)				21	(85)
Utilisa Г		Ť		\neg	ving area, h1	Ť						1	_	7	
(0.0)	Jan	Feb	Ma	_	Apr Ma	`	Jun	Jul	Αι		Oct	Nov	Dec	_	(00)
(86)m=	1	0.99	0.98		0.95 0.88		0.74	0.58	0.6	4 0.86	0.98	1	1		(86)
г				_	ving area T1	`		i 				, ,		٦	
(87)m=	19.27	19.48	19.82	2	20.26 20.63	3	20.88	20.96	20.9	95 20.75	20.24	19.66	19.23		(87)
Temp	erature	during h	eating	ре	eriods in rest	of d	welling	from Ta	ble 9	, Th2 (°C)				-	
(88)m=	19.66	19.66	19.66	3	19.67 19.67	7	19.68	19.68	19.6	8 19.67	19.67	19.67	19.67		(88)



TFEE WorkSheet: New dwelling design stage

Utilisa	ation fac		ains for	rest of d		h2,m (se	ee Table	9a)						
(89)m=	1	0.99	0.98	0.93	0.83	0.63	0.42	0.48	0.78	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.11	18.32	18.66	19.09	19.43	19.62	19.67	19.66	19.54	19.08	18.51	18.07		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.43	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2			·		
(92)m=	18.61	18.82	19.16	19.59	19.95	20.16	20.22	20.21	20.06	19.57	19	18.57		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m=	18.61	18.82	19.16	19.59	19.95	20.16	20.22	20.21	20.06	19.57	19	18.57		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation		or gains	using Ta							ı			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	i										(0.4)
(94)m=	1	0.99	0.98	0.93	0.84	0.67	0.49	0.55	0.81	0.96	0.99	1		(94)
			W = (94)	r ·	r	057.04	400.00	470.00	004.50	C44 45	540.64	400.00		(95)
(95)m=	516.69	641.01	760.06	848.88	830.25	657.31	460.86	476.38	624.56	611.45	519.61	480.88		(93)
(96)m=	4.3	age exte	ernal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				l	l	l	=[(39)m :				/.1	4.2		(30)
(97)m=	1910.53		1686.07	1415	1090.59	i	476.62	501.16	785.58	1186.59	1577.74	1909.12		(97)
				l	<u> </u>	<u> </u>	<u> </u>		700.00	1100.00	1077.7	1000.12		(- /
Opao.			ement to	ir each n	nonth k\	Nh/mont	th = 0.02	4 x [(97)	m - (95)	ml x (4)	1)m			
(98)m=	1037.02	<u> </u>	688.95	407.61	193.69	Wh/mont	th = 0.02	24 x [(97))m – (95 0)m] x (4 ⁻ 427.9	1)m 761.86	1062.61		
(98)m=		<u> </u>	ı	r	r	T		0	0	427.9	761.86		5396.18	(98)
	1037.02	816.54	688.95	407.61	193.69	T		0	0	427.9	r			=
Space	1037.02 e heatin	816.54 g require	688.95 ement in	407.61 kWh/m ²	193.69	T		0	0	427.9	761.86		5396.18 62.13	(98)
Space 8c. Sp	e heating	816.54 g require	688.95 ement in quiremer	407.61 kWh/m ²	193.69 ² /year	0		0	0	427.9	761.86			=
Space 8c. Sp	e heating	816.54 g require	688.95 ement in quirement July and	407.61 kWh/m² nt August.	193.69 ² /year See Tal	0 ole 10b	0	0 Tota	0 I per year	427.9 (kWh/year	761.86) = Sum(9	8)15,912 =		=
Space 8c. Sp Calcu	e heating pace coulated fo Jan	g require	ement in quirement July and Mar	kWh/m² nt August. Apr	193.69 2/year See Tal May	ole 10b Jun	Jul	0 Tota	0 I per year	427.9 (kWh/year	761.86 r) = Sum(90	8) _{15,912} =		=
Space 8c. Si Calcu	e heating pace cool lated fo Jan loss rate	g required oling record for June, when Feb	ement in quirement July and Mar llculated	kWh/m² August. Apr using 2	193.69 Pyear See Tal May 5°C inter	ole 10b Jun rnal temp	Jul perature	0 Tota Aug and exte	0 l per year Sep	427.9 (kWh/year	761.86) = Sum(96) Nov e from T	8) _{15,912} = Dec able 10)		=
Space 8c. Space Calcu Heat (100)m=	e heating pace considered for Jan loss rate	g require oling rec r June, Feb e Lm (ca	ement in quirement July and Mar lculated	kWh/m² nt August. Apr	193.69 2/year See Tal May	o ole 10b Jun	Jul	0 Tota	0 I per year	427.9 (kWh/year	761.86 r) = Sum(90	8) _{15,912} =		(99)
Space 8c. Space Calcu Heat (100)m= Utilisa	e heating pace cool lated fo Jan loss rate 0	g required oling record for June, when Feb	ement in quirement July and Mar lculated	kWh/m² August. Apr using 2	193.69 Pyear See Tal May 5°C inter	ole 10b Jun rnal temp	Jul perature	0 Tota Aug and exte	0 l per year Sep	427.9 (kWh/year	761.86) = Sum(96) Nov e from T	8) _{15,912} = Dec able 10)		(99)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m=	e heating pace coulated fo Jan loss rate 0 ation face	g require r June, Feb e Lm (ca	ement in quirement July and Mar Ilculated 0 pss hm 0	kWh/m² August. Apr using 2:	193.69 2/year See Tal May 5°C inter 0	0 Jun rnal temp 1236.71	Jul perature 973.58	O Tota Aug and exte	0 l per year Sep ernal ten 0	427.9 (kWh/year Oct nperatur 0	761.86) = Sum(90) Nov e from T	Dec (able 10)		(100)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m=	e heating pace coulated fo Jan loss rate 0 ation face	g require r June, Feb e Lm (ca	ement in July and Mar Ilculated 0	kWh/m² August. Apr using 2:	193.69 2/year See Tal May 5°C inter 0	0 Jun rnal temp 1236.71	Jul perature 973.58	O Tota Aug and exte	0 l per year Sep ernal ten 0	427.9 (kWh/year Oct nperatur 0	761.86) = Sum(90) Nov e from T	Dec (able 10)		(100)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heating pace coulated fo Jan loss rate 0 ation face 0 Il loss, h	g require r June, . Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar Ilculated 0 pss hm 0 Vatts) = (kWh/m² August. Apr using 29 0 (100)m >	See Tal May 5°C inter 0 (101)m	0 ole 10b Jun rnal temp 1236.71 0.8	Jul perature 973.58 0.87	0 Tota Aug and exte 998.92 0.84	Sep ernal ten 0	427.9 (kWh/year Oct nperatur 0	761.86 Nov e from T 0	Dec able 10)		(100) (101)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heating cace cool lated fo Jan loss rate 0 ation face 0 Il loss, h 0 (solar o	g require r June, . Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar Ilculated 0 pss hm 0 Vatts) = (kWh/m² August. Apr using 29 0 (100)m >	See Tal May 5°C inter 0 (101)m	0 ole 10b Jun rnal temp 1236.71 0.8 992.54 eather re	Jul perature 973.58	Aug and exte 998.92 0.84 839.48 e Table	Sep ernal ten 0	427.9 (kWh/year Oct nperatur 0	761.86 Nov e from T 0	Dec able 10)		(100) (101)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heating pace cool lated fo Jan loss rate 0 ation face 0 Il loss, h 0 (solar o	g require r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (V 0 gains ca	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (kWh/m² August. Apr using 29 0 (100)m > for appli	See Tal May 5°C inter 0 (101)m 0 cable we	0 ole 10b Jun nal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, see	0 Tota Aug and exte 998.92 0.84 839.48 e Table 1104.24	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	761.86 Nov e from T 0	Dec able 10) 0 0	62.13	(100) (101) (102)
Space 8c. Space Reat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heating pace cooling lated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar o	g require oling rec r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (kWh/m² August. Apr using 29 0 (100)m > for appli	See Tal May 5°C inter 0 (101)m 0 cable we	0 ole 10b Jun nal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, see	0 Tota Aug and exte 998.92 0.84 839.48 e Table	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	761.86 Nov e from T 0 0 0	Dec able 10) 0 0	62.13	(100) (101) (102)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heating pace cooling lated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar o	g require oling rec r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo	kWh/m² August. Apr using 29 0 (100)m > for appli	See Tal May 5°C inter 0 (101)m 0 cable we	0 ole 10b Jun nal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, see	0 Tota Aug and exte 998.92 0.84 839.48 e Table	Sep	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	761.86 Nov e from T 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0	62.13	(100) (101) (102)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heating pace cool plated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar of c cooling 04)m to 0	g require coling rec r June, . Feb e Lm (ca 0 etor for lo 0 emLm (V 0 gains ca 0 g require zero if (ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo (104)m <	kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m	ole 10b Jun rnal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, se 1186.64 continue	Aug and exte 998.92 0.84 839.48 e Table 1104.24	0 per year Sep ernal ten 0 0 10 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	761.86) = Sum(9) Nov e from T 0 0 0 0 1,0,4)	Dec able 10) 0 0 102)m] 0	62.13 (<i>(41)m</i>	(100) (101) (102) (103)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heating pace cool lated fo Jan loss rate 0 ation face 0 Il loss, h 0 c (solar of the cooling of the	g require poling red r June, v Feb e Lm (ca 0 etor for lo 0 emLm (W 0 gains ca 0 g require zero if (ement in quirement July and Mar Mar Ilculated 0 oss hm 0 Vatts) = (0 oss hm 0 lculated 0 oss hm 0 lculated	kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m	ole 10b Jun rnal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, se 1186.64 continue	Aug and exte 998.92 0.84 839.48 e Table 1104.24	0 per year Sep ernal ten 0 0 10 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	761.86 Nov e from T 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 102)m] 0	62.13	(100) (101) (102) (103)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi	e heating cace cool lated fo Jan loss rate 0 ation face 0 s (solar of 0 e cooling 04)m to 0 d fraction	g require oling rec r June, v Feb Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require zero if (0	ement in July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 oment for (104)m < 0 oss blee 10b	kWh/m² August. Apr using 20 0 (100)m > 0 for appli 0 r month, 3 x (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole co)m	0 ole 10b Jun rnal temp 1236.71 0.8 992.54 eather re 1237.72 dwelling, 176.53	0 Jul perature 973.58 0.87 849.72 egion, se 1186.64 continuo	0 Tota Aug and exte 998.92 0.84 839.48 e Table 1104.24 bus (kW	0 per year Sep ernal ten 0 0 10) 0 (h) = 0.0.0 0 Total f C =	0 (kWh/year of the latest of t	761.86 Nov e from T 0 0 0 0 104) area ÷ (4	Dec able 10) 0 0 102)m] x	62.13 (<i>(41)m</i>	(100) (101) (102) (103)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heating pace cool lated fo Jan loss rate 0 ation face 0 Il loss, h 0 c (solar of the cooling of the	g require poling red r June, v Feb e Lm (ca 0 etor for lo 0 emLm (W 0 gains ca 0 g require zero if (ement in quirement July and Mar Mar Ilculated 0 oss hm 0 Vatts) = (0 oss hm 0 lculated 0 oss hm 0 lculated	kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m	ole 10b Jun rnal temp 1236.71 0.8 992.54 eather re 1237.72	Jul perature 973.58 0.87 849.72 egion, se 1186.64 continue	Aug and exte 998.92 0.84 839.48 e Table 1104.24	0 Sep Sep O O O O O O O O Total f C = O O	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	761.86 Nov e from T 0 0 0 0 1,04) area ÷ (4	Dec able 10) 0 0 102)m] 0	62.13 (<i>(41)m</i>	(100) (101) (102) (103)



73.51

(109)

Mecserve Ltd Panagiotis Dalapas 020 3141 5800

TFEE WorkSheet: New dwelling design stage

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Target Fabric Energy Efficiency (TFEE)

Space cooling	requirement for	month = ($104)m \times ($	$(105) \times ($	(106)m

(107)m=	0	0	0	0	0	44.13	62.67	49.25	0	0	0	0		
									Total	= Sum(107)	=	156.05	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	ear/				(107)	÷ (4) =			1.8	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	only un	der spec	cial cond	itions, se	ee sectio	n 11)				
Fabrio	Energy	y Efficier	псу						(99) -	+ (108) =	=		63.92	(109)



APPENDIX 4. DER WORKSHEET OF TYPICAL APARTMENT (BE LEAN)



DER WorkSheet: New dwelling design stage

020 3141 5800 panos.dalapas @mecser	ve.com			9		. o.a.g.				
			Use	r Details:						
Assessor Name: Software Name:	Panagiotis D Stroma FSAI	•	Proper		a Num are Ve	rsion:	Bo Loan	Versio	030082 on: 1.0.4.16	
Address :	Apartment 3, 2	26 Netherhal	•	•	•		De Lean			
Overall dwelling dime	•	20, 110111011101	Cardor	10, 20112	2011, 111	.0012				
Ground floor				a(m²) 86.86	(1a) x		ight(m) 2.8	(2a) =	Volume(m³) 243.21	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1c	d)+(1e)+(1	n)	86.86	(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3c	l)+(3e)+	.(3n) =	243.21	(5)
2. Ventilation rate:										_
	main heating	seconda heating	ry	other		total			m³ per hour	•
Number of chimneys	0	+ 0	7 + [0	 	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0		0	j = [0	x	20 =	0	(6b)
Number of intermittent fa	ns	L				0	x ′	10 =	0	(7a)
Number of passive vents						0	x '	10 =	0	(7b)
Number of flueless gas fi	res				L	0	X 4	40 =	0	」 (7c)
-										
								Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fan	s = (6a) + (6b) + (6b)	7a)+(7b)+	(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in the		intended, procee	ed to (17),	otherwise (continue fr	om (9) to ((16)			7.00
Additional infiltration	ie aweiling (113)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or ti	mber frame o	r 0.35 fo	r mason	ry constr	uction	[(0)	TAOLT =	0	(11)
if both types of wall are p	resent, use the value	corresponding t			•					
deducting areas of openii If suspended wooden to) 1 (seal	ed) else	enter 0				0	(12)
If no draught lobby, en	•	ŕ	. i (oca	ou), 0.00	ornor o				0	(13)
Percentage of window	•								0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	•		•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabil	•					. , .			0.25	(18)
Air permeability value applie Number of sides sheltere	•	test nas been do	ne or a de	gree aır pe	ermeability	is being u	sea		4	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorporate	ing shelter factor	r		(21) = (18	3) x (20) =				0.18	(21)
Infiltration rate modified f	or monthly wind	speed								_
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Factor (22a)m = $(22)m \div 4$ (22a)m= 1.27 1.25 1.23 1.08 0.95 0.95 0.92 1.08 | 1.12 | 1.18



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Adjusted infiltra	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21		
Calculate effect If mechanica		_	rate for t	he applio	cable ca	se						0.5	(23a)
If exhaust air he			endix N. (2	3b) = (23a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23a)
If balanced with		•	,	, ,	,	. ,		,	, (===,			79.9	(23c)
a) If balance		-	-	_					2h)m + ('23h) 🗴 [1 <i>– (23c</i>)		(230)
(24a)m= 0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.3	0.31	. 100]	(24a)
b) If balance							<u> </u>	<u> </u>	<u> </u>	<u> </u>			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	ouse ext	ract ven	tilation c	r positiv	e input v	/entilatio	n from c	L outside				l	
if (22b)m				•	•				5 × (23k	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v				•	•							1	
if (22b)m		<u> </u>	<u> </u>		`				-	•		l	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air			<u> </u>	<u> </u>	, ,			`	Γ			I	(0-1)
(25)m= 0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.3	0.31		(25)
3. Heat losses	s and he	at loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-ł		X k J/K
Doors					1.92	х	1	=	1.92				(26)
Windows Type	1				2.11	x1,	/[1/(1.4)+	0.04] =	2.8	=			(27)
Windows Type	2				2.08	x1,	/[1/(1.4)+	0.04] =	2.76	=			(27)
Windows Type	3				5.73	x1,	/[1/(1.4)+	0.04] =	7.6	=			(27)
Windows Type	4				1.57	x1.	/[1/(1.4)+	0.04] =	2.08				(27)
Windows Type	5				1.57	x1,	/[1/(1.4)+	0.04] =	2.08	=			(27)
Windows Type					1.57	x1,	/[1/(1.4)+	0.04] =	2.08	=			(27)
Windows Type					1.57	_	/[1/(1.4)+	L	2.08	=			(27)
Windows Type					3.91	_		l.	5.18	=			(27)
Windows Type					5.73		/[1/(1.4)+	l.	7.6	=			(27)
Floor	Ü					=				≓ ┌			(28)
Walls Type1	00.4		05.0		8.57	×	0.15	-	1.2855			┥	(29)
Walls Type1	96.4	_	25.84	=	70.59	=	0.18	- ⁼	12.71	<u> </u>		┥	=
•	27.8	_	1.92	=	25.97	=	0.2	=	5.21	<u> </u>		┥ ├─	(29)
Roof	38.4		0		38.42	2 ×	0.15	=	5.76				(30)
Total area of el			<i>m</i>		171.3		. (1/1/4/11 :	-1 005				(31)
* for windows and ** include the area		-				ated using	i tormula 1	/[(1/U-valu	ie)+0.04] a	as given in	n paragraph	3.2	
Fabric heat los							(26)(30)) + (32) =				61.14	(33)
Heat capacity (•	•					((28)	.(30) + (3	2) + (32a).	(32e) =	15472.53	(34)
Thermal mass	,	•	P = Cm ÷	· TFA) in	kJ/m²K			Indica	tive Value	: Medium		250	(35)
For dooign assess	-									(TMD ::- T			 ' ′

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f



(52)

(53)

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Volume factor from Table 2a

Temperature factor from Table 2b

	ad of a dei	tailed calcu	ulation.										
nermal bridge				using Ap	pendix ł	<					ſ	27.28	(3
letails of therma	,	•		• .	•						l		`
otal fabric he	at loss							(33) +	(36) =			88.42	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 25.97	25.62	25.27	23.52	23.16	21.41	21.41	21.06	22.11	23.16	23.87	24.57		(3
at transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
)m= 114.39	114.04	113.69	111.93	111.58	109.82	109.82	109.47	110.53	111.58	112.28	112.98		
							•		Average =		12 /12=	111.84	(3
at loss para						<u> </u>	1		= (39)m ÷				
)m= 1.32	1.31	1.31	1.29	1.28	1.26	1.26	1.26	1.27	1.28	1.29	1.3		— ,
ımber of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.29	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
						erage =	(25 x N)			95	.48		(4
duce the annua	e hot wa al average	hot water	usage by	5% if the d	welling is	erage = designed i	(25 x N)	+ 36		95	.48		(4
duce the annua more that 125 Jan	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		95	.48		(4
duce the annua more that 125 Jan	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	95			(4
duce the annual more that 125 Jan t water usage in	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	95			(4
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	usage by some day (all was Apr ach month 93.57	5% if the dater use, I May Vd,m = factors 89.75	Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57	Oct 97.39 Fotal = Sur	Nov 101.21 m(44) ₁₁₂ =	Dec 105.03	1145.77	
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per 101.21 hot water	hot water person per Mar day for ea 97.39 used - cal	usage by some day (all was Apr ach month 93.57	5% if the dater use, t May $Vd,m = fac$ 89.75 $totallow the date of the date of$	Jun ctor from 7 85.93	erage = designed to ld) Jul Fable 1c x 85.93	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 b kWh/mor	Oct 97.39 Total = Suith (see Ta	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1	Dec 105.03 c, 1d)	1145.77	(4
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	usage by some day (all was Apr ach month 93.57	5% if the dater use, I May Vd,m = factors 89.75	Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun th (see Ta	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84	1145.77	(4
Jan t water usage ii 105.03 ergy content of 155.76	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22	Mar day for ea 97.39 used - calc	Apr ach month 93.57 culated mo	5% if the dater use, I May Vd,m = fact 89.75 onthly = 4.	Jun Standard	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Suith (see Ta	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in 105.03 ergy content of stantaneous w)m= 23.36	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 rater heatin 20.43	Mar day for ea 97.39 used - calc	Apr ach month 93.57 culated mo	5% if the dater use, I May Vd,m = fact 89.75 onthly = 4.	Jun Standard	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun th (see Ta	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in 105.03 ergy content of material and the stantaneous w material and th	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 vater heatin 20.43 loss:	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09	Apr ach month 93.57 culated mo 122.55 of use (no	5% if the dater use, I May $Vd,m = factor 689.75$ Onthly = 4. 117.59 o hot water 17.64	Jun storage), 15.22	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 16.38	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09	Nov 101.21 m(44) ₁₁₂ = shles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage ii iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 eater heatin 20.43 loss: e (litres)	Mar day for ea 97.39 used - calc 140.57 ag at point 21.09	Apr ach month 93.57 culated mo 122.55 of use (no	May Vd,m = fact 89.75 20 hot water 17.64 Diar or W	Jun tor from 7 85.93 190 x Vd,r 101.47 storage), 15.22	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 7m / 3600 107.9 boxes (46) 16.19 within sa	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 16.38	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09	Nov 101.21 m(44) ₁₁₂ = shles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in more that 125 Jan t water usage in m= 105.03 ergy content of m= 155.76 estantaneous w m= 23.36 exter storage orage volum community h	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so	May $Vd,m = fac$ 89.75 May M	Jun storage), 15.22 /WHRS not and co.	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage in Jan	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 vater heatin 20.43 loss: e (litres) eating a p stored	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so	May $Vd,m = fac$ 89.75 May M	Jun storage), 15.22 /WHRS not and co.	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage in Jan	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta hot water	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so nk in dw er (this in	5% if the detater use, If May $Vd,m = fact$ 89.75 $totallow the state of t$	Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		
Jan t water usage in Jan	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 rater heatin 20.43 loss: e (litres) eating a o stored loss: urer's de	Mar day for ear 97.39 used - calc 140.57 ag at point 21.09 includin nd no tal hot water eclared leared leared leared services of the servic	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in	5% if the detater use, If May $Vd,m = fact$ 89.75 $totallow the state of t$	Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)
Jan t water usage in t yater storage to rage volum to ommunity he therwise if no tater storage If manufact the manufact t	e hot was all average litres per	Mar 97.39 used - calc 140.57 ag at point 21.09 includin nd no ta hot water	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b	May $Vd,m = fac$ 89.75 $0 the distance of t$	Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = 10bles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
t water usage in the water usage in the water usage in the water of the water storage orage volume community here is the water storage orage usage if manufact is the water storage or in the water storage or in the water storage of the water	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ag at point 21.09 includin nd no tal hot water eclared lo	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder I	May $Vd,m = factorization May$ $Vd,m = factorization Ma$	Jun ctor from 7 85.93 190 x Vd,r. 101.47 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of dd) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boil	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = 10bles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)
Jan t water usage in Jan t water usage in Jan 105.03 105.76 155.	e hot was all average litres per	Mar Mar 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta hot water eclared le storage eclared of	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	May $Vd,m = factorization May$ $Vd,m = factorization Ma$	Jun ctor from 7 85.93 190 x Vd,r. 101.47 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of dd) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boil	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)



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Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 0 $ Enter (50) or (54) in (55)	(54) (55)										
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,										
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0	(56)										
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H											
(57)m= 0 0 0 0 0 0 0 0 0 0 0	(57)										
Primary circuit loss (annual) from Table 3	(58)										
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m											
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)											
(59)m= 0 0 0 0 0 0 0 0 0 0 0	(59)										
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m											
(61)m= 50.96 46.03 49.63 46.14 45.74 42.38 43.79 45.74 46.14 49.63 49.32 50.96	(61)										
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m + (61)m$	m										
(62)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8	(62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)											
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)											
(63)m= 0 0 0 0 0 0 0 0 0 0	(63)										
Output from water heater											
(64)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8											
Output from water heater (annual) ₁₁₂ 2068.74	(64)										
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 $\times (46)$ m + (57) m + (59) m											
(65)m= 64.53 56.8 59.15 52.29 50.53 44.33 42.21 47.31 47.84 54.72 58.51 62.89	(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):											
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											
Metabolic gains (Table 5), Watts	(66)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(66) (67)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)										
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)										

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.



DER WorkSheet: New dwelling design stage

Orientat	ion:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	X	3.91	x	19.64	x	0.63	x	0.7	=	23.47	(76)
East	0.9x	1	x	5.73	x	19.64	x	0.63	x	0.7	=	34.39	(76)
East	0.9x	1	x	3.91	x	38.42	x	0.63	x	0.7	=	45.91	(76)
East	0.9x	1	x	5.73	x	38.42	x	0.63	x	0.7	=	67.28	(76)
East	0.9x	1	X	3.91	x	63.27	x	0.63	x	0.7	=	75.61	(76)
East	0.9x	1	x	5.73	x	63.27	x	0.63	x	0.7] =	110.8	(76)
East	0.9x	1	x	3.91	x	92.28	x	0.63	x	0.7	=	110.27	(76)
East	0.9x	1	X	5.73	x	92.28	x	0.63	x	0.7	=	161.6	(76)
East	0.9x	1	X	3.91	x	113.09	x	0.63	x	0.7	=	135.14	(76)
East	0.9x	1	X	5.73	x	113.09	x	0.63	x	0.7	=	198.04	(76)
East	0.9x	1	x	3.91	x	115.77	x	0.63	x	0.7	=	138.34	(76)
East	0.9x	1	X	5.73	x	115.77	x	0.63	x	0.7	=	202.73	(76)
East	0.9x	1	X	3.91	x	110.22	x	0.63	x	0.7	=	131.7	(76)
East	0.9x	1	X	5.73	x	110.22	x	0.63	x	0.7	=	193.01	(76)
East	0.9x	1	X	3.91	x	94.68	x	0.63	x	0.7	=	113.13	(76)
East	0.9x	1	x	5.73	x	94.68	x	0.63	x	0.7	=	165.79	(76)
East	0.9x	1	X	3.91	x	73.59	X	0.63	x	0.7] =	87.94	(76)
East	0.9x	1	X	5.73	x	73.59	x	0.63	x	0.7	=	128.87	(76)
East	0.9x	1	X	3.91	x	45.59	x	0.63	x	0.7	=	54.48	(76)
East	0.9x	1	X	5.73	x	45.59	X	0.63	x	0.7] =	79.83	(76)
East	0.9x	1	X	3.91	x	24.49	x	0.63	x	0.7	=	29.26	(76)
East	0.9x	1	X	5.73	x	24.49	X	0.63	x	0.7	=	42.88	(76)
East	0.9x	1	X	3.91	X	16.15	X	0.63	X	0.7	=	19.3	(76)
East	0.9x	1	X	5.73	x	16.15	X	0.63	x	0.7	=	28.28	(76)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	x	0.63	X	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	x	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	x	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	x	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	X	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	X	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	97.53	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	_	52.89	(78)
South	0.9x		X	1.57	x	110.23	x	0.63	x	0.7] =	52.89	(78)
South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)



DER WorkSheet: New dwelling design stage

South	par103.0	иатара	3 @110030170	,.0011	ı									
South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.0x 0.77 x 1.57 x 104.89	South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South	South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89	South	0.9x	0.77	X	1.57	x	114.87	X	0.63	x	0.7	=	55.12	(78)
South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 448.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.8	South	0.9x	0.77	X	1.57	X	114.87	X	0.63	x	0.7	=	55.12	(78)
South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.	South	0.9x	0.77	X	1.57	x	114.87	X	0.63	x	0.7	=	55.12	(78)
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South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 104.89 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0	South	0.9x	0.77	X	1.57	X	110.55	X	0.63	x	0.7	=	53.04	(78)
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South 0.9x 0.77	South	0.9x	0.77	X	1.57	X	104.89	X	0.63	x	0.7	=	50.33	(78)
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South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78	South	0.9x	0.77	X	1.57	X	101.89	X	0.63	x	0.7	=	48.89	(78)
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South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 12.48	South	0.9x	0.77	X	1.57	X	55.42	X	0.63	x	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>55.42</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>26.59</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	55.42	X	0.63	X	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.11	X	19.64	X	0.63	X	0.7	=	12.66	(80)
West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.08	X	19.64	X	0.63	X	0.7	=	12.48	(80)
West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	5.73	X	19.64	X	0.63	X	0.7	=	34.39	(80)
West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	2.11	X	38.42	X	0.63	X	0.7	=	24.78	(80)
West 0.9x 0.77 × 2.11 × 63.27 × 0.63 × 0.7 = 40.8		0.9x	0.77	X	2.08	X	38.42	X	0.63	X	0.7	_	24.42	(80)
0.17		0.9x	0.77	X	5.73	X	38.42	X	0.63	X	0.7	=	67.28	(80)
West 0.9x 0.77 x 2.08 x 63.27 x 0.63 x 0.7 = 40.22	West	0.9x	0.77	X	2.11	X	63.27	X	0.63	X	0.7	=	40.8	(80)
	West	0.9x	0.77	X	2.08	X	63.27	X	0.63	X	0.7	=	40.22	(80)



DER WorkSheet: New dwelling design stage

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West	0.9x	0.77	,	<	5.73	3	x	6	3.27	x	0.63	×		0.7		=	110.8	(80)
West	0.9x	0.77	,	(2.11		X	9	2.28	x	0.63	x	Ī	0.7		=	59.51	(80)
West	0.9x	0.77	,	(2.08	3	X	9	2.28	x	0.63	x	Ī	0.7		=	58.66	(80)
West	0.9x	0.77	,	(5.73	3	X	9	2.28	x	0.63	X	Ī	0.7		=	161.6	(80)
West	0.9x	0.77	,	,	2.11		X	1	13.09	x	0.63	x	Ī	0.7		=	72.93	(80)
West	0.9x	0.77	,	(2.08	3	X	1	13.09	X	0.63	x	Ī	0.7		=	71.89	(80)
West	0.9x	0.77	,	(5.73	3	X	1	13.09	x	0.63	x	Ī	0.7		=	198.04	(80)
West	0.9x	0.77	,	,	2.11		X	1	15.77	x	0.63	x	Ē	0.7		=	74.65	(80)
West	0.9x	0.77	,	(2.08	3	X	1	15.77	X	0.63	x	Ī	0.7		=	73.59	(80)
West	0.9x	0.77	,	(5.73	3	X	1	15.77	X	0.63	x	Ē	0.7		=	202.73	(80)
West	0.9x	0.77	,	,	2.11		X	1	10.22	x	0.63	x	Ē	0.7		=	71.07	(80)
West	0.9x	0.77	,	ζ.	2.08	3	X	1	10.22	x	0.63	x	Ē	0.7		=	70.06	(80)
West	0.9x	0.77		(5.73	3	X	1	10.22	x	0.63	x	Ī	0.7		=	193.01	(80)
West	0.9x	0.77		,	2.11		X	9	4.68	x	0.63	x	F	0.7		=	61.05	(80)
West	0.9x	0.77	,	(2.08	3	X	9	4.68	x	0.63	x	Ē	0.7		=	60.18	(80)
West	0.9x	0.77	,	(5.73	3	X	9	4.68	X	0.63	x	F	0.7		=	165.79	(80)
West	0.9x	0.77		(2.11		X	7	3.59	X	0.63	x	F	0.7		=	47.45	(80)
West	0.9x	0.77	,	(2.08	3	X	7	3.59	x	0.63	x	Ē	0.7		=	46.78	(80)
West	0.9x	0.77	,	(5.73	3	X	7	3.59	X	0.63	x	F	0.7		=	128.87	(80)
West	0.9x	0.77		(2.11		X	4	5.59	X	0.63	x	F	0.7		=	29.4	(80)
West	0.9x	0.77	,	(2.08	3	X	4	5.59	X	0.63	x	F	0.7		=	28.98	(80)
West	0.9x	0.77	,	(5.73	3	X	4	5.59	X	0.63	x	F	0.7		=	79.83	(80)
West	0.9x	0.77	,	,	2.11		X	2	24.49	X	0.63	×	F	0.7		=	15.79	(80)
West	0.9x	0.77		(2.08	3	X	2	4.49	X	0.63	×	F	0.7		=	15.57	(80)
West	0.9x	0.77	,	(5.73	3	X	2	4.49	X	0.63	x	F	0.7		=	42.88	(80)
West	0.9x	0.77	,	(2.11		X	1	6.15	X	0.63	x	F	0.7		=	10.41	(80)
West	0.9x	0.77	,	(2.08	3	X	1	6.15	X	0.63	x	F	0.7		=	10.27	(80)
West	0.9x	0.77	,	,	5.73	3	X	1	6.15	X	0.63	×	F	0.7		=	28.28	(80)
	_																	_
Solar g	ains in	watts, ca	alculate	d	for each	montl	1			(83)m	= Sum(74)m	າ(82)ເ	n					
(83)m=	207.13	376.62	565.43		763.2	896.51	9	04.22	866.16	767.	27 635.45	431.	02	252.75	174	.08		(83)
Total g		nternal a	nd sola	ar	(84)m =	(73)m	+ (83)m	, watts								1	
(84)m=	612.54	779.92	954.15		1128.41	1237.77	12	222.41	1169.8	1077	.67 958.25	777.	55	626.26	567	.58		(84)
7. Mea	an inter	nal temp	erature	e (I	heatings	seaso	n)											
Temp	erature	during h	eating	pe	eriods in	the liv	ing	area t	from Tal	ole 9,	Th1 (°C)						21	(85)
Utilisa	tion fac	tor for g	ains for	· liv	ving area	a, h1,r	n (s	ee Ta	ble 9a)				_					
	Jan	Feb	Mar		Apr	May	\perp	Jun	Jul	Αι	ıg Sep	0	ct	Nov	D	ес		
(86)m=	1	0.99	0.96		0.89	0.74		0.56	0.41	0.4	6 0.72	0.9	4	0.99	1			(86)
Mean	interna	l temper	ature ir	ı li	ving are	a T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19.64	19.88	20.23	Ţ	20.63	20.87	2	20.97	21	20.9	99 20.92	20.5	55	20.01	19	.6		(87)
Temp	erature	durina h	eatina	pe	riods in	rest o	f dw	vellina	from Ta	able 9	, Th2 (°C)						•	
(88)m=	19.83	19.83	19.83	Ť	19.85	19.85	_	19.87	19.87	19.8		19.8	35	19.85	19.	84		(88)
L		l .		ㅗ													1	



DER WorkSheet: New dwelling design stage

l Itilicatio	on factor f	or da	ins for r	est of d	welling	h2 m (se	a Tahla	9a)						
	0.99 0.9	<u> </u>	0.95	0.85	0.68	0.47	0.31	0.35	0.63	0.92	0.99	1		(89)
` ′	nternal ten	L npera	ture in t	the rest	of dwell	ina T2 (f		ps 3 to 7	in Tabl	e 9c)				
		.85	19.19	19.57	19.78	19.86	19.87	19.87	19.82	19.51	18.99	18.58		(90)
<u> </u>	I					•			f	LA = Livin	g area ÷ (4	1) =	0.43	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$														
	19.04 19		19.64	20.02	20.25	20.34	20.35	20.35	20.29	19.96	19.43	19.01		(92)
Apply a	djustment	to th	e mean	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
(93)m= 1	18.89 19	.14	19.49	19.87	20.1	20.19	20.2	20.2	20.14	19.81	19.28	18.86		(93)
8. Space heating requirement														
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
								. 1		<u> </u>				
		eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	on factor f				0.00	1 0 40	0.04	0.00	0.05	0.04	0.00	4		(94)
` ′	0.99 0.9		0.95	0.85	0.69	0.49	0.34	0.38	0.65	0.91	0.98	1		(94)
	gains, hm(08.33 76		003.04	963.85	856.93	600.93	393.66	412.95	624.31	711.18	616.64	564.75		(95)
` ′	average						393.00	412.93	024.31	711.16	010.04	304.73		(55)
	4.3 4.		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	ss rate for					l					7.1	7.2		(00)
			1476.61	1228.29	936.91	613.47	395.33	415.95	667.96	1027.26	1367.1	1656.66		(97)
(97)m= 1669.45 1623.9 1476.61 1228.29 936.91 613.47 395.33 415.95 667.96 1027.26 1367.1 1656.66 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m											.000.00		,	
	Ť	<u> —</u> т	426.74	190.4	59.51	0	0	0	0	235.17	540.33	812.38		
` '						<u>!</u>		Tota	per year	(kWh/year) = Sum(9	8) _{15,912} =	3631.17	(98)
Space h	neating re	auirei	ment in	k\/\/h/m²	/vear					` ,	,	,	41.8	(99)
·		•			•		م مان مان م	maiora C	LID)				71.0	
	gy require	ment	s – Inai	viduai n	eating s	ystems i	nciuaing	micro-C	HP)					
•	h eating: n of space	heat	from se	econdar	//supple	ementary	svstem						0	(201)
	of space			-		,	-	(202) = 1 -	- (201) =				1	(202)
				-	, ,			(204) = (20		(203)] =				-
	of total h		_	•				(204) – (20) x [1 —	(203)] =			1	(204)
	cy of main	•											90.5	(206)
Efficiend	cy of seco	ndary	y/supple	ementar	y heatin	g system	າ, %						0	(208)
	Jan F	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	neating re		<u>`</u> T	alculate	d above)								
7	89.47 577	7.18	426.74	190.4	59.51	0	0	0	0	235.17	540.33	812.38		
(211)m =	= {[(98)m x	(204	l)] } x 1	00 ÷ (20	6)									(211)
8	72.34 637	7.77	471.53	210.38	65.75	0	0	0	0	259.85	597.05	897.66		
								Total	(kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4012.35	(211)
Space h	Space heating fuel (secondary), kWh/month												_	
	x (201)]	x 10	00 ÷ (20	8)							,			
(215)m=	0 (0	0	0	0	0	0	0	0	0	0		_
								Total	(kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)



DER WorkSheet: New dwelling design stage

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Water	heating	ı

Output from water heater (calculated above)													
2	06.71 182.25	190.2	168.7	163.33	143.85	137.82	153.64	155.33	176.88	188.22	201.8		
Efficienc	y of water he	ater										81.2	(216)
(217)m=	88.4 88.08	87.41	85.88	83.49	81.2	81.2	81.2	81.2	86.26	87.9	88.48		(217)
Fuel for water heating, kWh/month													
$(219)m = (64)m \times 100 \div (217)m$													
(219)m= 2	33.84 206.92	217.59	196.44	195.63	177.16	169.73	189.21	191.3	205.06	214.13	228.06		_
	Total = Sum(219a) ₁₁₂ =												
Annual t	Annual totals kWh/year											kWh/year	_
Space heating fuel used, main system 1												4012.35	
Water he	eating fuel use	ed										2425.06	
Electricity	y for pumps,	fans and	electric	keep-ho	t								_
mechar	nical ventilatio	n - balar	iced, ext	ract or p	ositive ir	nput fron	n outside	Э			159.48		(230a)
central	heating pump):									30		(230c)
boiler w	ith a fan-assi	sted flue									45		(230e)
Total ele	ctricity for the	above, I	kWh/yea	r			sum	of (230a).	(230g) =			234.48	(231)
Electricity	y for lighting											367.13	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	866.67 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	523.81 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1390.48 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	121.7 (267)
Electricity for lighting	(232) x	0.519 =	190.54 (268)
Total CO2, kg/year	sum	of (265)(271) =	1702.72 (272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	19.6 (273)
El rating (section 14)			83 (274)



APPENDIX 5. DER WORKSHEET OF TYPICAL APARTMENT (BE GREEN)



DER WorkSheet: New dwelling design stage

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			User	Details:						
Assessor Name: Software Name:	Panagiotis Stroma FS	•	Properi	Stroma Softwa	are Ver	sion:	Be Gree	Versio	0030082 on: 1.0.4.16	
Address :	Apartment 3	3, 26, Netherha					De Olee	11		
1. Overall dwelling dim	ensions:				·					
Ground floor				a(m²) 86.86	(1a) x	Av. Hei	ght(m) .8	(2a) =	Volume(m³ 243.21	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+((1d)+(1e)+(1	n) 8	36.86	(4)			_		
Dwelling volume					(3a)+(3b)	+(3c)+(3d))+(3e)+	.(3n) =	243.21	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	r
Number of chimneys	0	+ 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	╡ + 🖹	0	j = [0	x	20 =	0	(6b
Number of intermittent fa	ans	-				0	x	10 =	0	(7a
Number of passive vent	S					0	x	10 =	0	 (7b
Number of flueless gas t						0	x	40 =	0	` (7c
3										
								Air cl	nanges per ho	our
Infiltration due to chimne	eys, flues and fa	ans = $(6a)+(6b)+$	(7a)+(7b)+((7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has			ed to (17),	otherwise o	ontinue fro	om (9) to (16)			_
Number of storeys in t	the dwelling (ns	;)					. (0)		0	(9)
Additional infiltration Structural infiltration: () 25 for stool or	timbor frama (r 0 25 fo	r maaanr	v oonatr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p					•	uction			0	(11
deducting areas of open	ings); if equal user	0.35								
If suspended wooden	•	` ,	0.1 (seale	ed), else	enter 0				0	(12
If no draught lobby, er	•								0	(13
Percentage of window	s and doors dr	aught stripped							0	(14
Window infiltration				0.25 - [0.2					0	(15
Infiltration rate				(8) + (10)					0	(16
Air permeability value	• •		•	•	•	etre of ei	nvelope	area	5	(17
If based on air permeab	•					- h - :	1		0.25	(18
Air permeability value appli Number of sides shelter	·	on test nas been do	one or a de	gree air pei	теаріііту і	s being us	ea			7(10
Shelter factor	eu			(20) = 1 -	0.075 x (1	9)] =			0.7	(19
Infiltration rate incorpora	iting shelter fac	tor		(21) = (18)		·-			0.18	(21
Infiltration rate modified	•				•				0.10	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

3.8

0.95

0.95

0.92

1.08

1.12

1.18

1.08

Wind Factor (22a)m = (22)m $\div 4$ (22a)m = 1.27 | 1.25 | 1.23

5.1

(22)m=

Monthly average wind speed from Table 7



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Adjusted infiltra	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.16	0.18	0.19	0.2	0.21		
Calculate effect		_	rate for t	he applio	cable ca	se						0.5	(23a)
If exhaust air he			endix N. (2	3b) = (23a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23a)
If balanced with		•	,	, ,	,	. ,		,	, (===,			79.9	(23c)
a) If balance		-	-	_					2h)m + ('23h) 🗴 [1 <i>– (23c</i>)		(230)
(24a)m= 0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.3	0.31	. 100]	(24a)
b) If balance							<u> </u>	<u> </u>	<u> </u>	<u> </u>			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole ho	ouse ext	ract ven	tilation c	r positiv	e input v	/entilatio	n from c	L outside				l	
if (22b)m				•	•				5 × (23k	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v				•	•							1	
if (22b)m		<u> </u>	<u> </u>		`			 	-	•		l	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air			<u> </u>	<u> </u>	, ,			`	Γ			I	(0-1)
(25)m= 0.32	0.32	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.3	0.31		(25)
3. Heat losses	s and he	at loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-ł		X k J/K
Doors					1.92	х	1	=	1.92				(26)
Windows Type	1				2.11	x1,	/[1/(1.4)+	0.04] =	2.8	=			(27)
Windows Type	2				2.08	x1,	/[1/(1.4)+	0.04] =	2.76	=			(27)
Windows Type	3				5.73	x1,	/[1/(1.4)+	0.04] =	7.6	=			(27)
Windows Type	4				1.57	x1.	/[1/(1.4)+	0.04] =	2.08	=			(27)
Windows Type	5				1.57	x1,	/[1/(1.4)+	0.04] =	2.08	=			(27)
Windows Type					1.57	x1,	/[1/(1.4)+	0.04] =	2.08	=			(27)
Windows Type					1.57	_	/[1/(1.4)+	L	2.08	=			(27)
Windows Type					3.91	_		l.	5.18	=			(27)
Windows Type					5.73		/[1/(1.4)+	l.	7.6	=			(27)
Floor	Ü					=				≓ ┌			(28)
Walls Type1	00.4		05.0		8.57	×	0.15	-	1.2855			┥	(29)
Walls Type1	96.4	_	25.84	=	70.59	=	0.18	- ⁼	12.71	<u> </u>		┥	=
•	27.8	_	1.92	=	25.97	=	0.2	=	5.21	<u> </u>		┥ ├─	(29)
Roof	38.4		0		38.42	2 ×	0.15	=	5.76				(30)
Total area of el			<i>m</i>		171.3		. (1/1/4/11 :	-1 005				(31)
* for windows and ** include the area		-				ated using	i tormula 1	/[(1/U-valu	ie)+0.04] a	as given in	n paragraph	3.2	
Fabric heat los							(26)(30)) + (32) =				61.14	(33)
Heat capacity (•	•					((28)	.(30) + (3	2) + (32a).	(32e) =	15472.53	(34)
Thermal mass	,	•	P = Cm ÷	· TFA) in	kJ/m²K			Indica	tive Value	: Medium		250	(35)
For dooign assess	-									(TMD ::- T			 ' ′

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f



(52)

(53)

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Volume factor from Table 2a

Temperature factor from Table 2b

	ad of a dei	tailed calcu	ulation.										
nermal bridge				using Ap	pendix ł	<					ſ	27.28	(3
letails of therma	,	•		• .	•						l		`
otal fabric he	at loss							(33) +	(36) =			88.42	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 25.97	25.62	25.27	23.52	23.16	21.41	21.41	21.06	22.11	23.16	23.87	24.57		(3
at transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
)m= 114.39	114.04	113.69	111.93	111.58	109.82	109.82	109.47	110.53	111.58	112.28	112.98		
							•		Average =		12 /12=	111.84	(3
at loss para						<u> </u>	1		= (39)m ÷				
)m= 1.32	1.31	1.31	1.29	1.28	1.26	1.26	1.26	1.27	1.28	1.29	1.3		— ,
ımber of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.29	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
						erage =	(25 x N)			95	.48		(4
duce the annua	e hot wa al average	hot water	usage by	5% if the d	welling is	erage = designed i	(25 x N)	+ 36		95	.48		(4
duce the annua more that 125 Jan	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		95	.48		(4
duce the annua more that 125 Jan	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	95			(4
duce the annual more that 125 Jan t water usage in	e hot wa al average litres per p Feb	hot water person per Mar	usage by some day (all w	5% if the d ater use, f May	welling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us	se target o	95			(4
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	usage by some day (all was Apr ach month 93.57	5% if the dater use, I May Vd,m = factors 89.75	Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57	Oct 97.39 Fotal = Sur	Nov 101.21 m(44) ₁₁₂ =	Dec 105.03	1145.77	
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per 101.21 hot water	hot water person per Mar day for ea 97.39 used - cal	usage by some day (all was Apr ach month 93.57	5% if the dater use, t May $Vd,m = fac$ 89.75 $totallow the date of the date of$	Jun ctor from 7 85.93	erage = designed to ld) Jul Fable 1c x 85.93	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 b kWh/mor	Oct 97.39 Total = Suith (see Ta	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1	Dec 105.03 c, 1d)	1145.77	(4
Jan t water usage in 105.03	e hot wa al average litres per p Feb n litres per	hot water person per Mar day for ea	usage by some day (all was Apr ach month 93.57	5% if the dater use, I May Vd,m = factors 89.75	Jun ctor from 7	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43) 89.75	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun 127.25	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84	1145.77	(4
Jan t water usage ii 105.03 ergy content of 155.76	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22	Mar day for ea 97.39 used - calc	Apr ach month 93.57 culated mo	5% if the dater use, I May Vd,m = fact 89.75 onthly = 4.	Jun Standard	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Suith (see Ta	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in 105.03 ergy content of stantaneous w)m= 23.36	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 rater heatin 20.43	Mar day for ea 97.39 used - calc	Apr ach month 93.57 culated mo	5% if the dater use, I May Vd,m = fact 89.75 onthly = 4.	Jun Standard	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9	+ 36 a water us Sep 93.57 0 kWh/mor 109.19	Oct 97.39 Total = Sun 127.25	Nov 101.21 m(44) ₁₁₂ = 1bles 1b, 1 138.9	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in 105.03 ergy content of material and the stantaneous w material and th	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 vater heatin 20.43 loss:	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09	Apr ach month 93.57 culated mo 122.55 of use (no	5% if the dater use, If May $Vd,m = factorizes$ 89.75 $total total tota$	Jun storage), 15.22	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 16.38	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09	Nov 101.21 m(44) ₁₁₂ = shles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage ii iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 eater heatin 20.43 loss: e (litres)	Mar day for ea 97.39 used - calc 140.57 ag at point 21.09	Apr ach month 93.57 culated mo 122.55 of use (no	May Vd,m = fact 89.75 20 hot water 17.64 Diar or W	Jun ctor from 7 85.93 190 x Vd,r 101.47 storage), 15.22	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 7m / 3600 107.9 boxes (46) 16.19 within sa	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 0 to (61) 16.38	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09	Nov 101.21 m(44) ₁₁₂ = shles 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84		(4
Jan t water usage in more that 125 Jan t water usage in 105.03 ergy content of m= 155.76 estantaneous w m= 23.36 exter storage orage volum community h	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so	May $Vd,m = fac$ 89.75 May M	Jun storage), 15.22 /WHRS not and co.	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage in Jan	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 vater heatin 20.43 loss: e (litres) eating a p stored	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so	May $Vd,m = fac$ 89.75 May M	Jun storage), 15.22 /WHRS not and co.	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ =	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
Jan t water usage in Jan	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta hot water	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so nk in dw er (this in	5% if the detater use, If May $Vd,m = fact$ 89.75 $totallow the state of t$	Jun ctor from 7 85.93 190 x Vd,r. 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = ables 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		
Jan t water usage in Jan	e hot wa al average litres per p Feb n litres per 101.21 hot water 136.22 rater heatin 20.43 loss: e (litres) eating a o stored loss: urer's de	Mar day for ear 97.39 used - calc 140.57 ag at point 21.09 includin nd no tal hot water eclared leared leared leared services of the servic	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in	5% if the detater use, If May $Vd,m = fact$ 89.75 $totallow the state of t$	Jun ctor from 7 85.93 190 x Vd,r. 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed of ld) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous co	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 0 kWh/mor 109.19 16.38 ame vess	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)
Jan t water usage in t yater storage to rage volum to ommunity he therwise if no tater storage If manufact the manufact t	e hot was all average litres per	Mar 97.39 used - calc 140.57 ag at point 21.09 includin nd no ta hot water	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b	May $Vd,m = fac$ 89.75 $0 the distance of t$	Jun ctor from 7 85.93 190 x Vd,r. 101.47 storage), 15.22 /WHRS nter 110 nstantar	erage = designed in did) Jul Fable 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46, 16.19 within sa (47)	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = 10bles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4
t water usage in the water usage in the water usage in the water of the water storage orage volume community here is the water storage orage usage if manufact is the water storage or in the water storage or in the water storage of the water	e hot was all average litres per	Mar day for ea 97.39 used - calc 140.57 ag at point 21.09 includin nd no tal hot water eclared lo	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder I	May $Vd,m = factor size for the department of $	Jun ctor from 7 85.93 190 x Vd,r. 101.47 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of dd) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boil	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = 10bles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)
Jan t water usage in Jan t water usage in Jan 105.03 105.76 155.	e hot was all average litres per	Mar Mar 97.39 used - calc 140.57 ng at point 21.09 includin nd no ta hot water eclared le storage eclared of	Apr ach month 93.57 culated mo 122.55 of use (no 18.38 ag any so ank in dw er (this in oss facto 2b , kWh/ye cylinder I om Tabl	May $Vd,m = factor size for the department of $	Jun ctor from 7 85.93 190 x Vd,r. 101.47 15.22 /WHRS nter 110 nstantar wn (kWh	erage = designed of dd) Jul Table 1c x 85.93 m x nm x E 94.03 enter 0 in 14.1 storage litres in neous con/day): known:	(25 x N) to achieve Aug (43) 89.75 07m / 3600 107.9 boxes (46) 16.19 within sa (47) ombi boil	+ 36 a water us Sep 93.57 109.19 16.38 ame vess ers) ente	Oct 97.39 Total = Sunth (see Tail 127.25) Total = Sunth 19.09 Sel	Nov 101.21 m(44) ₁₁₂ = sbles 1b, 1 138.9 m(45) ₁₁₂ = 20.84	Dec 105.03 = c, 1d) 150.84 = 22.63		(4)



DER WorkSheet: New dwelling design stage

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Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 0 $ Enter (50) or (54) in (55)	(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$, ,
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0 0	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 0 0 0 0 0 0 0 0 0 0 0	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m	
(61)m= 50.96 46.03 49.63 46.14 45.74 42.38 43.79 45.74 46.14 49.63 49.32 50.96	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m + (61)m$	m
(62)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 206.71 182.25 190.2 168.7 163.33 143.85 137.82 153.64 155.33 176.88 188.22 201.8	
Output from water heater (annual) ₁₁₂ 2068.74	(64)
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + (61) m] + 0.8 $\times (46)$ m + (57) m + (59) m	
(65)m= 64.53 56.8 59.15 52.29 50.53 44.33 42.21 47.31 47.84 54.72 58.51 62.89	(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):	
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	
Metabolic gains (Table 5), Watts	(66)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(66) (67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	, ,
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 129.01	(67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.



DER WorkSheet: New dwelling design stage

Orientat	ion:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	X	3.91	x	19.64	x	0.63	x	0.7	=	23.47	(76)
East	0.9x	1	x	5.73	x	19.64	x	0.63	x	0.7	=	34.39	(76)
East	0.9x	1	x	3.91	x	38.42	x	0.63	x	0.7	=	45.91	(76)
East	0.9x	1	x	5.73	x	38.42	x	0.63	x	0.7	=	67.28	(76)
East	0.9x	1	X	3.91	x	63.27	x	0.63	x	0.7	=	75.61	(76)
East	0.9x	1	x	5.73	x	63.27	x	0.63	x	0.7	=	110.8	(76)
East	0.9x	1	x	3.91	x	92.28	x	0.63	x	0.7	=	110.27	(76)
East	0.9x	1	X	5.73	x	92.28	x	0.63	x	0.7	=	161.6	(76)
East	0.9x	1	X	3.91	x	113.09	x	0.63	x	0.7	=	135.14	(76)
East	0.9x	1	x	5.73	X	113.09	x	0.63	x	0.7	=	198.04	(76)
East	0.9x	1	x	3.91	x	115.77	x	0.63	x	0.7	=	138.34	(76)
East	0.9x	1	X	5.73	x	115.77	x	0.63	x	0.7	=	202.73	(76)
East	0.9x	1	X	3.91	x	110.22	x	0.63	x	0.7	=	131.7	(76)
East	0.9x	1	X	5.73	x	110.22	x	0.63	x	0.7	=	193.01	(76)
East	0.9x	1	X	3.91	x	94.68	x	0.63	X	0.7	=	113.13	(76)
East	0.9x	1	x	5.73	x	94.68	x	0.63	x	0.7	=	165.79	(76)
East	0.9x	1	X	3.91	x	73.59	X	0.63	X	0.7	=	87.94	(76)
East	0.9x	1	X	5.73	x	73.59	x	0.63	X	0.7	=	128.87	(76)
East	0.9x	1	X	3.91	x	45.59	x	0.63	x	0.7	=	54.48	(76)
East	0.9x	1	X	5.73	x	45.59	X	0.63	X	0.7	=	79.83	(76)
East	0.9x	1	X	3.91	x	24.49	x	0.63	X	0.7	=	29.26	(76)
East	0.9x	1	X	5.73	X	24.49	X	0.63	X	0.7	=	42.88	(76)
East	0.9x	1	X	3.91	X	16.15	X	0.63	X	0.7	=	19.3	(76)
East	0.9x	1	X	5.73	X	16.15	X	0.63	X	0.7	=	28.28	(76)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	x	46.75	X	0.63	X	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	X	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	X	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	x	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	97.53	x	0.63	X	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	x	0.7	=	46.8	(78)
South	0.9x		X	1.57	x	97.53	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	97.53	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South	0.9x		X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South	0.9x	0.77	X	1.57	x	110.23	X	0.63	X	0.7	=	52.89	(78)



DER WorkSheet: New dwelling design stage

South	par103.0	иатара	3 @110030170	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ı									
South 0, 0, 0, 77	South	0.9x	0.77	x	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South 08x 0.77 x x 1.57 x 114.87 x 0.63 x 0.7 = 55.12 South 0.9x 0.77 x x 1.57 x 114.87 x 0.63 x 0.7 = 55.12 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 10.601 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 10.601 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.801 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.809 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 10.409 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 1.57 x 10.409 x 0.63 x 0.7 =	South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
South	South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
South 0.9% 0.77 x 1.57 x 101.055 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 448.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 448.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 488.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South 0.9% 0.77 x 1.57 x 1.57 x 105.89 x 0.63 x 0.7 = 188.89 South	South	0.9x	0.77	X	1.57	X	114.87	x	0.63	x	0.7	=	55.12	(78)
South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 60.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 60.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 60.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 1.57 x 1.57 x 50.40 x 0.63 x 0.7 = 39.63 South 0.9% 0.77 x 50.40 x 0.60 x 0.60 x 0.60 x 0.7 = 39.63 South 0.9% 0.77 x 50.40 x 0.60 x 0.60 x 0.60 x 0.7 = 39.63 South 0.9% 0.77 x 50.40 x 0.60 x 0.60 x 0.60 x 0.7 = 39.63 South 0.9% 0.77 x 50.40 x 0	South	0.9x	0.77	X	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
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South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 52.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 5.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 5.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 5.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 5.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 5.	South	0.9x	0.77	X	1.57	X	110.55	x	0.63	x	0.7	=	53.04	(78)
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South 0.9x 0.77	South	0.9x	0.77	X	1.57	X	108.01	x	0.63	x	0.7	=	51.83	(78)
South 0.9x 0.77	South	0.9x	0.77	X	1.57	X	108.01	x	0.63	x	0.7	=	51.83	(78)
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South 0.9x 0.77	South	0.9x	0.77	X	1.57	X	104.89	x	0.63	x	0.7	=	50.33	(78)
South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 </td <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>104.89</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>50.33</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	104.89	x	0.63	x	0.7	=	50.33	(78)
South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 </td <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>104.89</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>50.33</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	104.89	x	0.63	x	0.7	=	50.33	(78)
South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 14.66 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 14.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78	South	0.9x	0.77	X	1.57	X	101.89	x	0.63	x	0.7	=	48.89	(78)
South 0.9x 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59	South	0.9x	0.77	X	1.57	x	101.89	x	0.63	x	0.7	=	48.89	(78)
South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59	South	0.9x	0.77	X	1.57	X	101.89	x	0.63	x	0.7	=	48.89	(78)
South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38	South	0.9x	0.77	X	1.57	X	101.89	x	0.63	X	0.7	=	48.89	(78)
South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38	South	0.9x	0.77	X	1.57	X	82.59	X	0.63	X	0.7	=	39.63	(78)
South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38	South	0.9x	0.77	X	1.57	X	82.59	x	0.63	x	0.7	=	39.63	(78)
South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38	South	0.9x	0.77	X	1.57	X	82.59	X	0.63	X	0.7	=	39.63	(78)
South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 <	South	0.9x	0.77	X	1.57	X	82.59	x	0.63	X	0.7	=	39.63	(78)
South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 <	South	0.9x	0.77	X	1.57	X	55.42	x	0.63	x	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 <t< td=""><td>South</td><td>0.9x</td><td>0.77</td><td>X</td><td>1.57</td><td>X</td><td>55.42</td><td>X</td><td>0.63</td><td>X</td><td>0.7</td><td>=</td><td>26.59</td><td>(78)</td></t<>	South	0.9x	0.77	X	1.57	X	55.42	X	0.63	X	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78	South	0.9x	0.77	X	1.57	X	55.42	x	0.63	X	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63	South	0.9x	0.77	X	1.57	X	55.42	x	0.63	X	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>x</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	x	0.63	X	0.7	=	19.38	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.11	X	19.64	X	0.63	X	0.7	=	12.66	(80)
West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.08	X	19.64	X	0.63	X	0.7	=	12.48	(80)
West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	5.73	X	19.64	X	0.63	X	0.7	=	34.39	(80)
West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	2.11	X	38.42	x	0.63	X	0.7	=	24.78	(80)
West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	2.08	X	38.42	x	0.63	X	0.7	_	24.42	(80)
		0.9x	0.77	X	5.73	X	38.42	X	0.63	X	0.7	=	67.28	(80)
West 0.9x 0.77 x 2.08 x 63.27 x 0.63 x 0.7 = 40.22	West	0.9x	0.77	X	2.11	X	63.27	x	0.63	X	0.7	=	40.8	(80)
	West	0.9x	0.77	X	2.08	X	63.27	X	0.63	X	0.7	=	40.22	(80)



DER WorkSheet: New dwelling design stage

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West	0.9x	0.77)	(5.73	3	x	6	3.27	x	0.63)		0.7		=	110.8	(80)
West	0.9x	0.77	,	, [2.1	1	X	9	2.28	x	0.63	<u> </u>	ξĒ	0.7		=	59.51	(80)
West	0.9x	0.77	,	آ	2.08	3	X	9	2.28	x	0.63	—	· [0.7		=	58.66	(80)
West	0.9x	0.77	,	(5.73	3	X	9	2.28	x	0.63	<u> </u>	· [0.7		=	161.6	(80)
West	0.9x	0.77	,	, [2.1′	1	X	1	13.09	x	0.63	<u> </u>	₹	0.7		=	72.93	(80)
West	0.9x	0.77	,	, <u> </u>	2.08	3	X	1	13.09	X	0.63	<u> </u>	⟨┌	0.7		=	71.89	(80)
West	0.9x	0.77	,	, [5.73	3	X	1	13.09	x	0.63	<u> </u>	₹	0.7		=	198.04	(80)
West	0.9x	0.77	,	, <u> </u>	2.1′	1	X	1	15.77	x	0.63	<u> </u>	₹	0.7		=	74.65	(80)
West	0.9x	0.77	,	, <u> </u>	2.08	3	X	1	15.77	X	0.63	<u> </u>	⟨┌	0.7		=	73.59	(80)
West	0.9x	0.77)	, <u> </u>	5.73	3	X	1	15.77	X	0.63	<u> </u>	⟨┌┌	0.7		=	202.73	(80)
West	0.9x	0.77	,	ָ 	2.1′	1	X	1	10.22	x	0.63	<u> </u>	ζΪ	0.7		=	71.07	(80)
West	0.9x	0.77	,	ָּ ן	2.08	8	X	1	10.22	x	0.63	,	, [0.7		=	70.06	(80)
West	0.9x	0.77	,	ָּ ן	5.73	3	X	1	10.22	x	0.63	,	, <u> </u>	0.7		=	193.01	(80)
West	0.9x	0.77	,	ָּ 	2.1	1	X	9	4.68	x	0.63	<u> </u>	ζĪ	0.7		=	61.05	(80)
West	0.9x	0.77	,	ָ 	2.08	3	X	9	4.68	x	0.63	,	,	0.7		=	60.18	(80)
West	0.9x	0.77	,	ָּ ל	5.73	3	X	9	4.68	X	0.63	<u> </u>	,	0.7		=	165.79	(80)
West	0.9x	0.77	,	ָּ ן	2.1	1	X	7	3.59	X	0.63	<u> </u>	ζĒ	0.7		=	47.45	(80)
West	0.9x	0.77	,	ָּ 	2.08	8	X	7	3.59	x	0.63	,	,	0.7		=	46.78	(80)
West	0.9x	0.77	,	ָּ [5.73	3	X	7	3.59	X	0.63	<u> </u>	, <u> </u>	0.7		=	128.87	(80)
West	0.9x	0.77	,	ָּ ן	2.1	1	X	4	5.59	X	0.63	<u> </u>	ζĒ	0.7		=	29.4	(80)
West	0.9x	0.77	,	ָּ ן	2.08	B	X	4	5.59	X	0.63		, <u> </u>	0.7		=	28.98	(80)
West	0.9x	0.77	,	ָּ [5.73	3	X	4	5.59	X	0.63	<u> </u>	, <u> </u>	0.7		=	79.83	(80)
West	0.9x	0.77	,	ָּ ל	2.1	1	X	2	24.49	X	0.63	<u> </u>	Γ	0.7	\equiv	=	15.79	(80)
West	0.9x	0.77	,	ָ ֡֓֞֞֞֝֞֓֡֓֞֡֓֡	2.08	в	X	2	4.49	X	0.63	,	,	0.7		=	15.57	(80)
West	0.9x	0.77	,	ָּ [5.73	3	X	2	4.49	X	0.63	<u> </u>	, <u> </u>	0.7		=	42.88	(80)
West	0.9x	0.77	,	ָּ ל	2.1	1	X	1	6.15	X	0.63	<u> </u>	ζĠ	0.7	\equiv	=	10.41	(80)
West	0.9x	0.77	,	ָּ ן	2.08	B	X	1	6.15	X	0.63		, <u> </u>	0.7		=	10.27	(80)
West	0.9x	0.77	,	ָּ [5.73	3	X	1	6.15	X	0.63	<u> </u>	ζĒ	0.7		=	28.28	(80)
	L												_					_
Solar g	ains in	watts, ca	alculate	d f	for each	mont	h			(83)m	= Sum(74)m	า(82)	m				_	
(83)m=	207.13	376.62	565.43		763.2	896.51	9	04.22	866.16	767.	27 635.45	431	.02	252.75	174.	80		(83)
Total g		nternal a	nd sola	ır ((84)m =	(73)m	+ (83)m	, watts								•	
(84)m=	612.54	779.92	954.15	Ĺ	1128.41	1237.7	7 12	222.41	1169.8	1077	.67 958.25	777	.55	626.26	567.	58		(84)
7. Me	an inter	nal temp	erature	e (ł	neating	seaso	n)											
Temp	erature	during h	eating	ре	riods in	the liv	ing	area	from Tal	ole 9,	Th1 (°C)						21	(85)
Utilisa	ition fac	tor for g	ains for	liν	ing are	a, h1,r	n (s	ee Ta	ble 9a)									_
	Jan	Feb	Mar	ļ	Apr	May	<u> </u>	Jun	Jul	Αι	ıg Sep	0	ct	Nov	De	ЭС		
(86)m=	1	0.99	0.96		0.89	0.74		0.56	0.41	0.4	6 0.72	0.9	94	0.99	1			(86)
Mean	interna	l temper	ature ir	liv	ving are	a T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19.64	19.88	20.23		20.63	20.87		20.97	21	20.9	99 20.92	20.	55	20.01	19.	6		(87)
Temp	erature	during h	eating	ре	riods in	rest o	f dv	vellina	from Ta	able 9	, Th2 (°C)						=	
(88)m=	19.83	19.83	19.83	T	19.85	19.85	_	19.87	19.87	19.8	<u> </u>	19.	85	19.85	19.8	34		(88)
																	i	



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l Itilisatio	on factor fo	r gaine for	rest of d	welling	h2 m (se	a Tahla	0a)						
	0.99 0.98	-	0.85	0.68	0.47	0.31	0.35	0.63	0.92	0.99	1		(89)
` /	ternal temp		<u> </u>	<u> </u>	ing T2 (f	<u>!</u>							. ,
	18.6 18.8		19.57	19.78	19.86	19.87	19.87	19.82	19.51	18.99	18.58		(90)
	!	I	1	!	1	!	<u> </u>	1	fLA = Livin	g area ÷ (4	1) =	0.43	(91)
Mean int	ternal temp	erature (fo	or the wh	ole dwe	ellina) = f	LA × T1	+ (1 – fL	A) × T2					
	9.04 19.2		20.02	20.25	20.34	20.35	20.35	20.29	19.96	19.43	19.01		(92)
	djustment t	the mea	n interna	l I tempei	rature fro	m Table	4e, whe	re appro	opriate				
· · · · · —	8.89 19.1		19.87	20.1	20.19	20.2	20.2	20.14	19.81	19.28	18.86		(93)
8. Space	e heating re	equiremen	t										
	the mean				ned at st	ep 11 of	Table 9b	o, so tha	nt Ti,m=(76)m an	d re-calc	ulate	
	ation facto	$\overline{}$		ı —	1		i -			i			
	Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	on factor fo	-	1		1		I I		I				(0.1)
` ′	0.99 0.98		0.85	0.69	0.49	0.34	0.38	0.65	0.91	0.98	1		(94)
	ains, hmG	<u>`</u>	T .	r <u> </u>	T	I			I				(05)
` ′	08.33 765		963.85	856.93	600.93	393.66	412.95	624.31	711.18	616.64	564.75		(95)
	average e		i 		1	100	40.4	444	100	7.4	4.0		(06)
` ′	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)
	ss rate for n		1228.29	1	613.47	=[(39)m 395.33	415.95	- (96)m 667.96	1027.26	1367.1	1656.66		(97)
` ′	neating requ		ļ			Į	!			<u> </u>	1030.00		(07)
· —	89.47 577.1		190.4	59.51	0	0.02	0	0	235.17	540.33	812.38		
(00)=	00.11	120.7 1	100.1	00.01					(kWh/year			3631.17	(98)
0 1			1340 /				Tota	i per year	(KVVII/yCai) = Odin(S	O)15,912 —		=
Space n	neating requ	urement ir	i kvvh/m	/year								41.8	(99)
9a. Energ	gy requiren	nents – Inc	lividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space h	neating: of space h	oot from a	ooondor	v/oupple	montor	, avatam					ı		(201)
	•				ememary	•	(202) 4	(004)				0	(201)
	of space h		-	` '			(202) = 1 -					1	(202)
Fraction	of total he	ating from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficienc	cy of main	space hea	ting syste	em 1								90.5	(206)
Efficienc	cy of secon	dary/supp	lementar	y heatin	g systen	າ, %						0	(208)
Γ.	Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	neating requ	uirement (calculate	d above	·)								
78	89.47 577.1	8 426.74	190.4	59.51	0	0	0	0	235.17	540.33	812.38		
(211)m =	{[(98)m x (204)] } x	100 ÷ (20	06)									(211)
87	72.34 637.7	7 471.53	210.38	65.75	0	0	0	0	259.85	597.05	897.66		
	•	•					Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	=	4012.35	(211)
Space h	eating fuel	(seconda	ry), kWh/	month							'		_
= {[(98 <u>)</u> m	x (201)] }	(100 ÷ (20	08)										
(215)m=	0 0	0	0	0	0	0	0	0	0	0	0		
							Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)



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Wa	ter	hea	ting

Output from w	ater hea	ter (calc	ulated al	oove)									
206.71	182.25	190.2	168.7	163.33	143.85	137.82	153.64	155.33	176.88	188.22	201.8		
Efficiency of w	ater hea	iter										81.2	(216)
(217)m= 88.4	88.08	87.41	85.88	83.49	81.2	81.2	81.2	81.2	86.26	87.9	88.48		(217)
Fuel for water (219)m = (64)	m x 100												
(219)m= 233.84	206.92	217.59	196.44	195.63	177.16	169.73	189.21	191.3	205.06	214.13	228.06		_
							Tota	I = Sum(2	19a) ₁₁₂ =			2425.06	(219)
Annual totals									k\	Wh/year	•	kWh/year	-
Space heating	fuel use	ed, main	system	1								4012.35	
Water heating	fuel use	d										2425.06	
Electricity for p	oumps, f	ans and	electric	keep-ho	t								
mechanical v	entilation	n - balan	ced, ext	ract or p	ositive ir	nput fron	n outside	€			159.48		(230a)
central heatir	ng pump	<u>.</u>									30		(230c)
boiler with a f	fan-assis	sted flue									45		(230e)
Total electricity	y for the	above, ł	kWh/yea	r			sum	of (230a).	(230g) =			234.48	(231)
Electricity for I	ighting											367.13	(232)
Electricity gen	erated b	y PVs										-600.79	(233)
40- 000		1 11 11	1.1		and the state		OLID						-

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	866.67 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	523.81 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1390.48 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	121.7 (267)
Electricity for lighting	(232) x	0.519 =	190.54 (268)
Energy saving/generation technologies			
Item 1		0.519	-311.81 (269)
Total CO2, kg/year	sum	of (265)(271) =	1390.91 (272)
Dwelling CO2 Emission Rate	(272)) ÷ (4) =	16.01 (273)
El rating (section 14)			86 (274)



APPENDIX 6. DFEE WORKSHEET OF TYPICAL APARTMENT



DFEE WorkSheet: New dwelling design stage

020 3141 5800 panos.dalapas @mecse	erve.cor		WOI KO	nicet. i	iew u	weiling	desig	ii stag	G			
					User	r Details:						
Assessor Name: Software Name:		nagiotis oma FS	•	2	Proper		a Num are Vei	rsion:	Be Lean	Versio	030082 on: 1.0.4.16	
Address :	Ana	artment :	3 26 Ne	etherhall		•			Do Louii			
Overall dwelling dim), 20, 1 1 0	ou lorrian	Garaor	10, 20112	O11 , 111	TOOTE				
<u> </u>					Are	a(m²)		Av. He	ight(m)		Volume(m ³	')
Ground floor					8	36.86	(1a) x	2	2.8	(2a) =	243.21	(3a)
Total floor area TFA = (1a)+(1k	o)+(1c)+	(1d)+(1e	e)+(1n) [86.86	(4)					
Dwelling volume							(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	243.21	(5)
2. Ventilation rate:												
		main		econdar	/	other		total			m³ per hou	r
Number of chimneys	Ĺ	neating 0	-	neating 0] + [0] = [0	x 4	10 =	0	(6a)
Number of open flues	F	0	- + -	0] + [0	i = F	0	x 2	20 =	0	(6b)
Number of intermittent f	fans							3	x 1	10 =	30	(7a)
Number of passive vent	ts						F	0	x 1	10 =	0	(7b)
Number of flueless gas	fires						F	0	x 4	10 =	0	(7c)
							L					
							_			Air ch	anges per ho	our —
Infiltration due to chimn If a pressurisation test has	-						continuo fr	30		÷ (5) =	0.12	(8)
Number of storeys in				ей, ргосеес	10 (17),	Oli lei Wise	Jonanu e II	om (9) to (10)		0	(9)
Additional infiltration		·····9 (····	-,						[(9)-	·1]x0.1 =	0	(10)
Structural infiltration:	0.25 fo	r steel o	r timber i	frame or	0.35 fo	r mason	ry constr	uction	1(-)	•	0	(11)
if both types of wall are	present,	use the va	lue corres				•					` ′
deducting areas of oper If suspended wooden				ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e			,	,	`	,,					0	(13)
Percentage of window	ws and	doors dr	aught st	ripped							0	(14)
Window infiltration						0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate						(8) + (10)	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value	e, q50, e	expresse	ed in cub	oic metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeab	oility val	ue, then	(18) = [(1	7) ÷ 20]+(8), otherw	vise (18) =	(16)				0.37	(18)
Air permeability value appl	lies if a pı	ressurisati	on test has	s been don	e or a de	gree air pe	rmeability	is being us	sed			
Number of sides shelter	red										4	(19)
Shelter factor							[0.075 x (1	19)] =			0.7	(20)
Infiltration rate incorpora	•					(21) = (18) x (20) =				0.26	(21)
Infiltration rate modified			· ·	г		1	1	1	<u> </u>		1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed 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 (22a)m = (22)m ÷ 4 (22a)m = $(1.27 \ 1.25 \ 1.23 \ 1.1 \ 1.08 \ 0.95 \ 0.95 \ 0.92 \ 1 \ 1.08 \ 1.12 \ 1.18$



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Adjusted infiltra	ation rate	e (allowir	na for sh	nelter an	d wind s	epeed) =	(21a) x	(22a)m					
0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
Calculate effect		•	ate for t	he appli	cable ca	se	!	!	<u> </u>	!			
If mechanica				al.) (aa	/	(4		. (22)	\			0	(23a)
If exhaust air he) = (23a)			0	(23b)
If balanced with		-	-	_								0	(23c)
a) If balance						<u> </u>	- ` ` 	i `	 	- 	- ` ` `	÷ 100]	(0.4=)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	r	T T			1	, , `	r ´`	í `	 	r ´			(24b)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h		tract ven : (23b), tł		-	-				5 v (23h	<i>)</i>			
(24c)m = 0	0.0 %	0	0	0	0	0	0) = (22)	0	0 % (20)	0	0		(24c)
d) If natural	<u> </u>		ole hous			L ventilatio	n from l	ļ					
,		en (24d)r			•				0.5]				
(24d)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effective air	change	rate - en	ter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3. Heat losse	s and he	eat loss p	aramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l		k-value kJ/m²-l		A X k kJ/K
Doors		` ,				_			•	<u> </u>			(00)
					1.92	X	1	=	1.92				(26)
Windows Type	e 1				2.11		1 /[1/(1.4)+		2.8				(26)
Windows Type Windows Type						x1,		0.04] =					
• •	2				2.11	x1,	/[1/(1.4)+	0.04] = 0.04] =	2.8				(27)
Windows Type	e 2 e 3				2.11	x1, x1, x1,	/[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04]	2.8				(27) (27)
Windows Type	e 2 e 3 e 4				2.11 2.08 5.73 1.57	x10 x10 x10 x10	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	[-0.04] = [-0.04] = [-0.04] = [-0.04] = [-0.04] = [-0.04] = [-0.04]	2.8 2.76 7.6 2.08				(27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	2 3 2 4 2 5				2.11 2.08 5.73 1.57	x10 x10 x10 x10 x10 x10 x10	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.8 2.76 7.6 2.08 2.08				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type	2 2 3 4 4 5 5 6 6				2.11 2.08 5.73 1.57 1.57	x1. x1. x1. x1. x1. x1. x1.	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 = \\ 0.04 = \\ 0.04 = \\ 0.04 = \\ 0.04 = \\ 0.04 = \\ 0.04 = \\ 0.04 = \\ \end{array}$	2.8 2.76 7.6 2.08 2.08 2.08				(27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	2 2 3 4 4 5 5 6 6 7				2.11 2.08 5.73 1.57 1.57 1.57	x1,	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.8 2.76 7.6 2.08 2.08 2.08 2.08				(27) (27) (27) (27) (27) (27) (27)
Windows Type	2 2 3 4 4 5 5 6 6 7 8 8				2.11 2.08 5.73 1.57 1.57 1.57 3.91	x1.	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type	2 2 3 4 4 5 5 6 6 7 8 8				2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73	x1.	/[1/(1.4)+ /[1/(1.4)+	$\begin{array}{c} 0.04 \\ 0.$	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18			7 -	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Floor	2 2 3 4 4 5 5 6 6 7 8 8 9 9	2	25.0	4]	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57	x1,	/[1/(1.4)+ /[1/(1.4)+	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type	2 2 3 3 4 4 4 5 5 6 6 7 8 8 9 9 9 6 4		25.8	=	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57 70.59	x1.	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.18	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type	2 2 3 4 4 4 5 5 6 6 6 7 8 8 9 9 9 6.4 27.8	9	1.92	=	2.11 2.08 5.73 1.57 1.57 1.57 3.91 5.73 8.57 70.59	x1.	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.2	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Types Floor Walls Type1 Walls Type2 Roof	9 2 3 3 4 4 4 5 5 6 6 6 7 6 8 8 9 9 9 6.4 27.8 38.4	9		=	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42	x1,	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.18	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855				(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e	9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	9 2 , m ²	1.92		2.11 2.08 5.73 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42	x1,	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.18 0.2	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21 5.76		naragranh		(27) (27) (27) (27) (27) (27) (27) (27)
Windows Types Floor Walls Type1 Walls Type2 Roof	9 2 3 3 4 4 4 5 5 6 6 7 7 6 8 8 9 9 9 6.4 27.8 38.4 Uroof window	2 , m ² ows, use et	1.92	ndow U-va	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42 171.3 alue calculations	x1,	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.18 0.2	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21 5.76		paragraph	3.2	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Floor Walls Type1 Walls Type2 Roof Total area of e *for windows and	9 2 3 4 4 9 5 6 6 9 7 9 8 8 9 9 9 6 4 27.8 38.4 selements	2 , m² pws, use el sides of ini	1.92 0 ffective witernal wall	ndow U-va	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42 171.3 alue calculations	x1.	/[1/(1.4)+ /[1/(1.4)+ 0.15 0.18 0.2	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21 5.76		paragraph	3.2	(27) (27) (27) (27) (27) (27) (27) (27)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of es * for windows and ** include the area	96.4 96.4 96.4 27.8 38.4 27.8 1 roof windows on both ss, W/K =	9 2 , m² ows, use el sides of ind = S (A x l	1.92 0 ffective witernal wall	ndow U-va	2.11 2.08 5.73 1.57 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42 171.3 alue calculations	x1.	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.18 0.2 0.15	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21 5.76	as given in			(27) (27) (27) (27) (27) (27) (27) (27)
Windows Types Floor Walls Type1 Walls Type2 Roof Total area of es * for windows and ** include the area Fabric heat los	96.4 96.4 96.4 27.8 38.4 27.8	9 2 , m² pws, use et sides of interest S (A x k)	1.92 0 ffective witernal walk	ndow U-va	2.11 2.08 5.73 1.57 1.57 1.57 3.91 5.73 8.57 70.59 25.97 38.42 171.3 alue calculatitions	x1.	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.15 0.18 0.2 0.15	- 0.04] = [- 0.04	2.8 2.76 7.6 2.08 2.08 2.08 2.08 5.18 7.6 1.2855 12.71 5.21 5.76	as given in 2) + (32a).		61.14	(27) (27) (27) (27) (27) (27) (27) (27)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f



Jan

Feb

Energy lost from water storage, kWh/year

If community heating see section 4.3

Temperature factor from Table 2b

Volume factor from Table 2a

b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day)

Mar

Apr

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can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (36)27.28 if details of thermal bridging are not known (36) = $0.15 \times (31)$ Total fabric heat loss (33) + (36) =88.42 (37)Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)$ m x (5)Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)(38)m =44.58 44.41 44.24 43.45 43.3 42.6 42.6 42.47 42.87 43.3 43.91 43.6 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m =133 132.83 132.66 131.86 131.71 131.02 131.02 130.89 131.29 131.71 132.01 132.33 (39)Average = $Sum(39)_{1...12}/12=$ 131.86 Heat loss parameter (HLP), W/m²K (40)m = (39)m \div (4)1.53 1.52 1.51 1.51 (40)m =1.51 1.51 1.52 1.52 1.52 (40)Average = $Sum(40)_{1...12}/12=$ 1.52 Number of days in month (Table 1a)

Jul

Jun

Sep

Aug

Oct

Nov

0

0

0

0

(50)

(51)

(52)

(53)

Dec

May

(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/y	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		58]	(42)
Reduce	the annua	al average	hot water	ge in litre usage by a day (all w	5% if the α	lwelling is	designed i	` ,		se target o		5.48		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)		•		•	•	
(44)m=	105.03	101.21	97.39	93.57	89.75	85.93	85.93	89.75	93.57	97.39	101.21	105.03		
Eneray (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd.r	n x nm x F	Tm / 3600		Total = Su oth (see Ta			1145.77	(44)
(45)m=	155.76	136.22	140.57	122.55	117.59	101.47	94.03	107.9	109.19	127.25	138.9	150.84	1	
(40)111=	100.70	100.22	140.07	122.00	117.00	101.47	04.00	107.0		Total = Su			1502.29	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Total – Su	III(4 3)112 -	-	1302.29	(10)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Storag		e (litres)		ng any so			ŭ		ame ves	sel		0]	(47)
Otherw	•	stored			•			` '	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWh	n/day):					0]	(48)
Tempe	rature f	actor fro	m Table	2b								0]	(49)

 $(48) \times (49) =$



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Energy lost from wa	ter storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in	(55)									0		(55)
Water storage loss of	alculated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 0 0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains dedic	ated solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss	annual) fro	om Table	e 3	-	-	-	-	-		0		(58)
Primary circuit loss	alculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by facto	r from Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m = 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculate	ed for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required f	or water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 132.39 115.7	9 119.49	104.17	99.95	86.25	79.93	91.72	92.81	108.16	118.07	128.21		(62)
Solar DHW input calculat	ed using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional lines	if FGHRS	and/or V	WWHRS	applies	, see Ap	pendix (3)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	eater											
(64)m= 132.39 115.7	9 119.49	104.17	99.95	86.25	79.93	91.72	92.81	108.16	118.07	128.21		
-	-		-	-	-	Outp	out from w	ater heate	r (annual)₁	12	1276.95	(64)
Heat gains from wat	er heating,	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1 + 0 8 v	(1/46)m	ı (57)m	. (EO)m	1	
				_ [· (.0)	1 (01)11	ıj + 0.0 /	(40)111	+ (37)111	+ (59)111]	
(65)m= 33.1 28.9	29.87	26.04	24.99	21.56	19.98	22.93	23.2	27.04	29.52	32.05]	(65)
(65)m= 33.1 28.9 include (57)m in c		26.04	24.99	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
	alculation	26.04 of (65)m	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
include (57)m in c	alculation ee Table 5	26.04 of (65)m 5 and 5a	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
include (57)m in c	alculation ee Table 5 ble 5), Wat	26.04 of (65)m 5 and 5a	24.99 only if c	21.56	19.98	22.93	23.2	27.04	29.52	32.05		(65)
include (57)m in c 5. Internal gains (s Metabolic gains (Tal	ee Table 5 ble 5), Wat	26.04 of (65)m 5 and 5a	24.99 only if c	21.56 cylinder is	19.98	22.93 dwelling	23.2 or hot w	27.04 rater is fr	29.52 rom com	32.05 munity h		(65)
include (57)m in constraints. 5. Internal gains (5) Metabolic gains (Tall Jan Fe)	ee Table 5 ble 5), Wat Mar 1 129.01	26.04 of (65)m 5 and 5a tts Apr 129.01	24.99 only if c : May 129.01	21.56 ylinder is Jun 129.01	19.98 s in the o	22.93 dwelling Aug 129.01	23.2 or hot w Sep 129.01	27.04 rater is fr	29.52 rom com	32.05 munity h		
include (57)m in constraints of the second o	ee Table 5 ble 5), Wat Mar 1 129.01	26.04 of (65)m 5 and 5a tts Apr 129.01	24.99 only if c : May 129.01	21.56 ylinder is Jun 129.01	19.98 s in the o	22.93 dwelling Aug 129.01	23.2 or hot w Sep 129.01	27.04 rater is fr	29.52 rom com	32.05 munity h		
include (57)m in constraints of the constraints of	ee Table 5 ole 5), Wat o Mar 1 129.01 blated in Ap 6 15.02	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37	24.99 only if c): May 129.01 L, equat 8.5	21.56 cylinder is Jun 129.01 ion L9 o	Jul 129.01 129.01 1.75	22.93 dwelling Aug 129.01 lso see	23.2 or hot w Sep 129.01 Table 5 13.52	27.04 rater is fr Oct 129.01	29.52 rom com Nov 129.01	32.05 munity h		(66)
include (57)m in comparison of the following series of	ee Table 5 ble 5), Wat Mar 1 129.01 blated in Ap 1 15.02	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37	24.99 only if c): May 129.01 L, equat 8.5	21.56 cylinder is Jun 129.01 ion L9 o	Jul 129.01 129.01 1.75	22.93 dwelling Aug 129.01 lso see	23.2 or hot w Sep 129.01 Table 5 13.52	27.04 rater is fr Oct 129.01	29.52 rom com Nov 129.01	32.05 munity h		(66)
include (57)m in comparison of the following spans (58) 5. Internal gains (58) Metabolic gains (Tallor Jan Ferman Ferma	ee Table 5 ole 5), Wat o Mar 1 129.01 llated in Ap 6 15.02 alculated ir 6 229.5	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 Append 216.52	24.99 only if c : May 129.01 L, equat 8.5 dix L, eq 200.14	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74	Jul 129.01 r L9a), a 7.75 13 or L1 174.45	22.93 dwelling Aug 129.01 lso see 10.08 3a), also	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 rom com Nov 129.01	32.05 munity h Dec 129.01		(66) (67)
include (57)m in comparison of the following states of	ee Table 5 ole 5), Wat ole 5), Wat ole 129.01 llated in Ap ole 15.02 alculated ir ole 229.5 ulated in A	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 Append 216.52	24.99 only if c : May 129.01 L, equat 8.5 dix L, eq 200.14	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74	Jul 129.01 r L9a), a 7.75 13 or L1 174.45	22.93 dwelling Aug 129.01 lso see 10.08 3a), also	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 rom com Nov 129.01	32.05 munity h Dec 129.01		(66) (67)
include (57)m in comparison of the comparison of	alculation ee Table 5 ble 5), Wat ble Mar 1 129.01 blated in Ap 6 15.02 blculated in 6 229.5 blated in A 35.9	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9	24.99 only if c): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a)	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 rom com Nov 129.01 20.04	32.05 munity h Dec 129.01 21.37		(66) (67) (68)
include (57)m in comparison of the following state of the following	alculation ee Table 5 ble 5), Wat ble Mar 1 129.01 blated in Ap 6 15.02 blculated in 6 229.5 blated in A 35.9	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9	24.99 only if c): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a)	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11	29.52 rom com Nov 129.01 20.04	32.05 munity h Dec 129.01 21.37		(66) (67) (68)
include (57)m in comparison of the following state of the following	alculation of the property of	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0	24.99 only if c): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03), also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 rom com Nov 129.01 20.04 207.49	32.05 munity h Dec 129.01 21.37 222.89		(66) (67) (68) (69)
include (57)m in comparison of the following series of the following include (57)m in comparison of the following series of th	alculation of the color of the	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0	24.99 only if c): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03), also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 rom com Nov 129.01 20.04 207.49	32.05 munity h Dec 129.01 21.37 222.89		(66) (67) (68) (69)
include (57)m in comparison of the following state of the following	alculation of the policy of th	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0 tive value	24.99 only if colors May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9 0 ble 5)	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03), also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 rom com Nov 129.01 20.04 207.49 35.9	32.05 munity h Dec 129.01 21.37 222.89 0		(66) (67) (68) (69) (70)
include (57)m in comparison of the following state of the following	alculation of the ee Table 5 alculation of the ee Table 5 alculated in April 1 129.01 alculated in April 1 15.02 alculated in April 1 15.02 alculated in April 1 15.09 alculated in April 1 103.21 alc	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0 tive value	24.99 only if colors May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9 0 ble 5)	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03), also se 35.9	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9	29.52 rom com Nov 129.01 20.04 207.49 35.9	32.05 munity h Dec 129.01 21.37 222.89 0		(66) (67) (68) (69) (70)
include (57)m in comparison of the following spains (58) Metabolic gains (Tall Jan Fe (66)m= 129.01	alculation ee Table 5 ble 5), Wat a	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0 tive value -103.21	24.99 only if co): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9 0 ole 5) -103.21	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9 0	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 0, also se 35.9 0	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9 0 -103.21	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9 0 -103.21	29.52 rom com Nov 129.01 20.04 207.49 35.9 0	32.05 munity h Dec 129.01 21.37 222.89 0 -103.21		(66) (67) (68) (69) (70) (71)
include (57)m in comparison of the following spains (58) Metabolic gains (Tallough Jan Fe (66)m= 129.01	alculation of the ee Table 5 ble 5), Wat of Mar 1 129.01 tlated in April 15.02 alculated in April 229.5 ulated	26.04 of (65)m 5 and 5a tts Apr 129.01 opendix 11.37 n Append 216.52 ppendix 35.9 5a) 0 tive value -103.21	24.99 only if co): May 129.01 L, equat 8.5 dix L, eq 200.14 L, equat 35.9 0 es) (Tab	21.56 ylinder is Jun 129.01 ion L9 of 7.17 uation L 184.74 tion L15 35.9 0 ole 5) -103.21	Jul 129.01 r L9a), a 7.75 13 or L1 174.45 or L15a) 35.9 0	22.93 dwelling Aug 129.01 lso see 10.08 3a), also 172.03 0, also se 35.9 0	23.2 or hot w Sep 129.01 Table 5 13.52 o see Ta 178.12 ee Table 35.9 0 -103.21	27.04 rater is fr Oct 129.01 17.17 ble 5 191.11 5 35.9 0 -103.21	29.52 rom com Nov 129.01 20.04 207.49 35.9 0 -103.21	32.05 munity h Dec 129.01 21.37 222.89 0 -103.21		(66) (67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.



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Orientat	ion:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	X	3.91	x	19.64	x	0.63	x	0.7	=	23.47	(76)
East	0.9x	1	x	5.73	x	19.64	x	0.63	x	0.7	=	34.39	(76)
East	0.9x	1	x	3.91	x	38.42	x	0.63	x	0.7	=	45.91	(76)
East	0.9x	1	x	5.73	x	38.42	x	0.63	x	0.7	=	67.28	(76)
East	0.9x	1	X	3.91	x	63.27	x	0.63	x	0.7	=	75.61	(76)
East	0.9x	1	x	5.73	x	63.27	x	0.63	x	0.7] =	110.8	(76)
East	0.9x	1	x	3.91	x	92.28	x	0.63	x	0.7	=	110.27	(76)
East	0.9x	1	X	5.73	x	92.28	x	0.63	x	0.7	=	161.6	(76)
East	0.9x	1	X	3.91	x	113.09	x	0.63	x	0.7	=	135.14	(76)
East	0.9x	1	X	5.73	x	113.09	x	0.63	x	0.7	=	198.04	(76)
East	0.9x	1	x	3.91	x	115.77	x	0.63	x	0.7	=	138.34	(76)
East	0.9x	1	X	5.73	x	115.77	x	0.63	x	0.7	=	202.73	(76)
East	0.9x	1	X	3.91	x	110.22	x	0.63	x	0.7	=	131.7	(76)
East	0.9x	1	X	5.73	x	110.22	x	0.63	x	0.7	=	193.01	(76)
East	0.9x	1	X	3.91	x	94.68	x	0.63	x	0.7	=	113.13	(76)
East	0.9x	1	x	5.73	x	94.68	x	0.63	x	0.7	=	165.79	(76)
East	0.9x	1	X	3.91	x	73.59	X	0.63	x	0.7] =	87.94	(76)
East	0.9x	1	X	5.73	x	73.59	x	0.63	x	0.7	=	128.87	(76)
East	0.9x	1	X	3.91	x	45.59	x	0.63	x	0.7	=	54.48	(76)
East	0.9x	1	X	5.73	x	45.59	X	0.63	x	0.7] =	79.83	(76)
East	0.9x	1	X	3.91	x	24.49	x	0.63	x	0.7	=	29.26	(76)
East	0.9x	1	X	5.73	x	24.49	X	0.63	x	0.7	=	42.88	(76)
East	0.9x	1	X	3.91	X	16.15	X	0.63	X	0.7	=	19.3	(76)
East	0.9x	1	X	5.73	x	16.15	X	0.63	x	0.7	=	28.28	(76)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	X	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	x	0.63	X	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	X	46.75	x	0.63	x	0.7	=	22.43	(78)
South	0.9x	0.77	X	1.57	x	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	x	76.57	X	0.63	X	0.7	=	36.74	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	X	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	X	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	X	97.53	X	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	97.53	x	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	_	52.89	(78)
South	0.9x		X	1.57	x	110.23	x	0.63	x	0.7] =	52.89	(78)
South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)



DFEE WorkSheet: New dwelling design stage

South	par103.0	иатара	3 @110030170	,.0011	ı									
South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 114.67 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 106.01 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0.0x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.0x 0.77 x 1.57 x 104.89	South	0.9x	0.77	X	1.57	x	110.23	x	0.63	x	0.7	=	52.89	(78)
South	South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	=	55.12	(78)
South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 55.12 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 104.89	South	0.9x	0.77	X	1.57	x	114.87	X	0.63	x	0.7	=	55.12	(78)
South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 51.83 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0,8 0,77 x 1.57 x 104.89 x 0.63 x 0.7 = 448.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.89 South 0,8 0,77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 148.8	South	0.9x	0.77	X	1.57	X	114.87	X	0.63	x	0.7	=	55.12	(78)
South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 110.55 x 0.63 x 0.7 = 53.04 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 108.01 x 0.63 x 0.7 = 51.83 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 50.33 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 104.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.57 x 101.89 x 0.63 x 0.7 = 48.89 South 0.9% 0.77 x 1.57 x 1.	South	0.9x	0.77	X	1.57	x	114.87	X	0.63	x	0.7	=	55.12	(78)
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South 0.9x 0.77	South	0.9x	0.77	X	1.57	X	104.89	X	0.63	x	0.7	=	50.33	(78)
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South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 48.89 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 82.59 x 0.63 x 0.7 = 39.63 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 55.42 x 0.63 x 0.7 = 26.59 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 24.78	South	0.9x	0.77	X	1.57	X	101.89	X	0.63	x	0.7	=	48.89	(78)
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South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 12.48	South	0.9x	0.77	X	1.57	X	55.42	X	0.63	x	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>55.42</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>26.59</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	55.42	X	0.63	X	0.7	=	26.59	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
South 0.9x 0.77 x 1.57 x 40.4 x 0.63 x 0.7 = 19.38 West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 <td>South</td> <td>0.9x</td> <td>0.77</td> <td>X</td> <td>1.57</td> <td>X</td> <td>40.4</td> <td>X</td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>19.38</td> <td>(78)</td>	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.11 x 19.64 x 0.63 x 0.7 = 12.66 West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 2.08 x 19.64 x 0.63 x 0.7 = 12.48 West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	South	0.9x	0.77	X	1.57	X	40.4	X	0.63	X	0.7	=	19.38	(78)
West 0.9x 0.77 x 5.73 x 19.64 x 0.63 x 0.7 = 34.39 West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.11	X	19.64	X	0.63	X	0.7	=	12.66	(80)
West 0.9x 0.77 x 2.11 x 38.42 x 0.63 x 0.7 = 24.78 West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8	West	0.9x	0.77	X	2.08	X	19.64	X	0.63	X	0.7	=	12.48	(80)
West 0.9x 0.77 x 2.08 x 38.42 x 0.63 x 0.7 = 24.42 West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	5.73	X	19.64	X	0.63	X	0.7	=	34.39	(80)
West 0.9x 0.77 x 5.73 x 38.42 x 0.63 x 0.7 = 67.28 West 0.9x 0.77 x 2.11 x 63.27 x 0.63 x 0.7 = 40.8		0.9x	0.77	X	2.11	X	38.42	X	0.63	X	0.7	=	24.78	(80)
West 0.9x 0.77 × 2.11 × 63.27 × 0.63 × 0.7 = 40.8		0.9x	0.77	X	2.08	X	38.42	X	0.63	X	0.7	_	24.42	(80)
0.17		0.9x	0.77	X	5.73	X	38.42	X	0.63	X	0.7	=	67.28	(80)
West 0.9x 0.77 x 2.08 x 63.27 x 0.63 x 0.7 = 40.22	West	0.9x	0.77	X	2.11	X	63.27	X	0.63	X	0.7	=	40.8	(80)
	West	0.9x	0.77	X	2.08	X	63.27	X	0.63	X	0.7	=	40.22	(80)



19.66

(88)m=

19.67

19.67

19.67

19.68

19.68

19.68

19.68

19.68

19.68

19.67

19.67

(88)

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panos	aalapas	: @mecse	erve.cc	orri												
West	0.9x	0.77	,	· [5.73	,		63.27	x	0.63	X	0.7		= [110.8	(80)
West	0.9x	0.77)	· [2.11	,	(92.28	X	0.63	X	0.7		= [59.51	(80)
West	0.9x	0.77)	· [2.08)	(92.28	X	0.63	X	0.7		= [58.66	(80)
Vest	0.9x	0.77)	· [5.73	,	(92.28	X	0.63	X	0.7		= [161.6	(80)
Vest	0.9x	0.77)	、 [2.11] ,	· [113.09	X	0.63	X	0.7		= [72.93	(80)
Vest	0.9x	0.77	,	, [2.08] ,	· [113.09	X	0.63	X	0.7		= [71.89	(80)
Vest	0.9x	0.77)	· [5.73] ,	· [113.09	x	0.63	X	0.7		= [198.04	(80)
Vest	0.9x	0.77)	· [2.11	,	(115.77	X	0.63	X	0.7		= [74.65	(80)
Vest	0.9x	0.77)	· [2.08)	(115.77	X	0.63	X	0.7		= [73.59	(80)
Vest	0.9x	0.77)	· [5.73	,	(115.77	X	0.63	X	0.7		= [202.73	(80)
Vest	0.9x	0.77)	、 [2.11] ,	· [110.22	X	0.63	X	0.7		= [71.07	(80)
Vest	0.9x	0.77)	, [2.08	,	· [110.22	X	0.63	X	0.7		= [70.06	(80)
Vest	0.9x	0.77	,	, [5.73	,	· [110.22	X	0.63	X	0.7		= [193.01	(80)
Vest	0.9x	0.77		ζĺ	2.11] ,	· [94.68	x	0.63	X	0.7		= [61.05	(80)
Vest	0.9x	0.77	,	<u> </u>	2.08	,	· _	94.68	X	0.63	X	0.7		= [60.18	(80)
Vest	0.9x	0.77	,	<u> </u>	5.73	,	· [94.68	X	0.63	X	0.7		= [165.79	(80)
Vest	0.9x	0.77	,	<u>.</u> [2.11	<u> </u>	⟨ 🗀	73.59	x	0.63	X	0.7		= [47.45	(80)
Vest	0.9x	0.77	,	آ	2.08	Ī,	、一	73.59	x	0.63	×	0.7		= [46.78	(80)
Vest	0.9x	0.77	,	آ	5.73	Ϊ,	, <u> </u>	73.59	x	0.63	x	0.7		=	128.87	(80)
Vest	0.9x	0.77	,	ζĺ	2.11	,	· 🔚	45.59	x	0.63	X	0.7		= [29.4	(80)
Vest	0.9x	0.77	,	آ	2.08	,	· 🔚	45.59	x	0.63	×	0.7		= [28.98	(80)
Vest	0.9x	0.77)	ζĺ	5.73	,	, <u> </u>	45.59	x	0.63	x	0.7		= [79.83	(80)
Vest	0.9x	0.77	,	ζĪ	2.11	,	, <u> </u>	24.49	x	0.63	×	0.7		= [15.79	(80)
Vest	0.9x	0.77	,	, İ	2.08	,	, <u> </u>	24.49	х	0.63	×	0.7		<u> </u>	15.57	(80)
Vest	0.9x	0.77	,	ζĺ	5.73	,	, <u> </u>	24.49	x	0.63	x	0.7		= [42.88	(80)
Vest	0.9x	0.77	,	ζ	2.11	j ,	, <u> </u>	16.15	x	0.63	X	0.7		= [10.41	(80)
Vest	0.9x	0.77	,	آ	2.08	j ,	, <u> </u>	16.15	x	0.63	X	0.7		= [10.27	(80)
Vest	0.9x	0.77	,	, İ	5.73	,	, <u> </u>	16.15	x	0.63	×	0.7		= <u> </u>	28.28	(80)
	_			•					•		_			•		
Solar (ains in	watts, ca	lculate	d 1	for each mor	nth			(83)m	ı = Sum(74)m	.(82)m					
33)m=			565.43	ㅗ	763.2 896.5		904.2		767	.27 635.45	431.0	2 252.75	174.0	8		(83)
_				_	(84)m = (73)		• •									
84)m=	567.29	735.47	911.8		1088.96 1200.	.44	1187.	78 1136.92	104	1.9 921.02	737.3	5 582.98	523.1	3		(84)
7. Me	an inter	nal temp	erature	e (I	neating seas	on)										
Temp	erature	during h	eating	ре	riods in the	livin	g are	ea from Tal	ole 9	, Th1 (°C)					21	(85)
Utilisa	ation fac	tor for ga	ains for	· liv	/ing area, h1	,m	(see	Table 9a)								-
	Jan	Feb	Mar	\downarrow	Apr Ma	ау	Ju	n Jul	Α	ug Sep	Oct	: Nov	De	С		
86)m=	1	0.99	0.97		0.92 0.8	1 [0.65	0.49	0.5	55 0.8	0.96	0.99	1			(86)
Mean	internal	l tempera	ature ir	ı li	ving area T1	(fo	llow	steps 3 to 7	7 in T	able 9c)						
87)m=	19.33	19.57	19.95	T	20.4 20.7	Ť	20.9	-i	20.	 	20.33	19.73	19.2	8		(87)
Temr	erature	durina h	eating	pe	riods in rest	of c	well	ing from Ta	able ⁹	9. Th2 (°C)		-				
J.111p	J. 3.3.0			Ť						., (0)				_		(00)



DFEE WorkSheet: New dwelling design stage

			1	1		h2,m (se					ı			(0.0)
(89)m=	1	0.99	0.96	0.89	0.75	0.54	0.35	0.41	0.7	0.94	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.17	18.42	18.79	19.22	19.52	19.65	19.68	19.68	19.59	19.17	18.58	18.13		(90)
									f	LA = Livin	g area ÷ (4	ł) =	0.43	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.66	18.91	19.29	19.72	20.04	20.2	20.23	20.23	20.12	19.66	19.07	18.62		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m=	18.66	18.91	19.29	19.72	20.04	20.2	20.23	20.23	20.12	19.66	19.07	18.62		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ned at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m and	d re-calc	ulate	
the ut				using Ta					_	_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>	ains, hm			1						. 1		(0.4)
(94)m=	0.99	0.99	0.96	0.89	0.77	0.58	0.41	0.47	0.74	0.94	0.99	1		(94)
			· ·	4)m x (8	r -	000.44	400.00	407.00	070.55	200 50	570.40	504.00		(OF)
(95)m=	564.27	724.79	875.68	973.1	918.44	690.11	468.09	487.63	678.55	693.52	576.43	521.08		(95)
			ì	perature			40.0	40.4	444	40.0	74	4.0		(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			1	· ·		Lm , W =	- ` 		·		4500.04	4007.00		(97)
(97)m=	1910.4	1861.13				733.26	476.21	501.17	790.16	1193.82	1580.01	1907.93		(97)
•	e neatin	g require	ament io						\ (OF	\	1 \			
(02)m_	1001 52		ı	ı		1)m – (95	<u> </u>	r	1021 91		
(98)m=	1001.52	<u> </u>	610.46	326.97	134.12	o 0	th = 0.02	0	0	372.22	722.58	1031.81	4002.20	(0e)
, ,		763.62	610.46	326.97	134.12	1		0	0	372.22	r		4963.29	(98)
, ,		763.62	610.46	ı	134.12	1		0	0	372.22	722.58		4963.29 57.14	(98) (99)
Space	e heatin	763.62 g require	610.46	326.97 kWh/m²	134.12	1		0	0	372.22	722.58			= '
Space	e heatin	763.62 g require	610.46 ement in quiremer	326.97 kWh/m²	134.12 ² /year	0		0	0	372.22	722.58			= '
Space 8c. Sp Calcu	e heating pace con plated fo Jan	g require	ement in quirement July and Mar	326.97 kWh/m² nt August. Apr	134.12 ² /year See Tal May	0 ble 10b Jun	Jul	0 Tota	0 I per year	372.22 (kWh/year	722.58 r) = Sum(96	B) _{15,912} =		= '
Space 8c. Sp Calcu	e heating pace con plated fo Jan	g require	ement in quirement July and Mar	326.97 kWh/m² nt August. Apr	134.12 ² /year See Tal May	0 ble 10b Jun rnal temp	0 Jul perature	0 Tota Aug and exte	0 I per year	372.22 (kWh/year Oct	722.58 r) = Sum(96	B) _{15,912} =		(99)
Space 8c. Sp Calcu Heat (100)m=	e heating pace cool lated fo Jan loss rate	g require oling rec r June, c Feb e Lm (ca	ement in quirement July and Mar loulated	326.97 kWh/m² nt August. Apr	134.12 ² /year See Tal May	0 ble 10b Jun	Jul	0 Tota	0 I per year	372.22 (kWh/year	722.58 r) = Sum(96	B) _{15,912} =		= '
Space 8c. Space Calcu Heat (100)m= Utilisa	e heating pace consisted for Jan loss rate 0	g require coling rec r June, c Feb e Lm (ca	ement in quirement July and Mar loulated	kWh/m² August. Apr using 29	134.12 2/year See Tal May 5°C intel 0	oble 10b Jun rnal temp 1231.57	Jul perature 969.54	O Tota Aug and exte	0 l per year Sep ernal ten 0	372.22 (kWh/year Oct nperatur 0	722.58) = Sum(96) Nov e from T 0	Dec able 10)		(100)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m=	e heating pace cool lated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar liculated 0 pss hm 0	kWh/m² nt August. Apr using 25 0	134.12 2/year See Tal May 5°C inter 0	0 ble 10b Jun rnal temp 1231.57	0 Jul perature	0 Tota Aug and exte	0 l per year Sep	372.22 (kWh/year Oct	722.58) = Sum(96) Nov e from T	B) _{15,912} = Dec able 10)		(99)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu	e heating pace cool lated fo Jan loss rate 0 ation face 0 I loss, h	g require coling rec r June, c Feb e Lm (ca 0 ttor for lc	ement in July and Mar Ilculated 0 pss hm 0	326.97 kWh/m² August. Apr using 29 0 (100)m x	See Tal May 5°C intel 0	ble 10b Jun rnal temp 1231.57 0.87	Jul perature 969.54 0.92	Aug and exte	Sep ernal ten 0	Oct nperatur 0	722.58) = Sum(96) Nov e from T 0	Dec able 10)		(100) (101)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heating pace cool lated fo Jan loss rate 0 ation face 0 Il loss, h	g require r June, v Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar Ilculated 0 pss hm 0 Watts) = (kWh/m² ht August. Apr using 25 0 (100)m x	See Tal May 5°C inter 0 (101)m	0 ble 10b Jun rnal temp 1231.57 0.87	Jul perature 969.54 0.92	0 Tota Aug and exte 994.76	Sep ernal ten 0	372.22 (kWh/year Oct nperatur 0	722.58) = Sum(96) Nov e from T 0	Dec able 10)		(100)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	lated fo Jan loss rate 0 ation fac 0 I loss, h 0 (solar o	g require coling rec r June, c Feb e Lm (ca 0 ttor for lo mLm (V 0 gains ca	ement in quirement July and Mar Ilculated 0 pss hm 0 Vatts) = 0 Iculated	kWh/m² August. Apr using 29 0 (100)m x 0 for appli	See Tal May 5°C inter 0 (101)m 0 cable we	0 ble 10b Jun rnal temp 1231.57 0.87 1071.42 eather re	Jul perature 969.54 0.92 893.99 egion, se	Aug and exte 994.76 891.94 e Table	Sep ernal ten 0 0 10)	Oct nperatur 0 0	722.58 Nov e from T 0 0	Dec able 10) 0		(100) (101) (102)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heating pace cool lated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar o	g require r June, v Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (kWh/m² ht August. Apr using 25 0 (100)m x 0 for appli	See Tal May 5°C inter 0 (101)m 0 cable we	0 ble 10b Jun rnal temp 1231.57 0.87 1071.42 eather re 1485.16	Jul perature 969.54 0.92 893.99 egion, see 1423.67	0 Tota Aug and exte 994.76 0.9 891.94 e Table 1314.24	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	722.58 Nov e from T 0 0 0	Dec able 10) 0 0	57.14	(100) (101)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heating pace cooling lated fo Jan loss rate 0 ation face 0 s (solar solar so	g require oling rec r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo	326.97 kWh/m² August. Apr using 29 0 (100)m x ofor appli or month,	See Tal May 5°C inter 0 (101)m 0 cable w	0 ble 10b Jun rnal temp 1231.57 0.87 1071.42 eather re	Jul perature 969.54 0.92 893.99 egion, see 1423.67	0 Tota Aug and exte 994.76 0.9 891.94 e Table 1314.24	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	722.58 Nov e from T 0 0 0	Dec able 10) 0 0	57.14	(100) (101) (102)
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DFEE WorkSheet: New dwelling design stage

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(107)m=	0	0	0	0	0	74.47	98.52	78.55	0	0	0	0		
•									Total	= Sum(107)	=	251.54	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	year				(107)	÷ (4) =			2.9	(108)

8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 60.04 (109)



APPENDIX 7. SAP 2012 CARBON EMISSION FACTORS

As recommended by the GLA Energy Guidance Assessment, the updated SAP 10 emission factors have been used to reflect the fact that grid electricity has significantly decarbonised since the last update of Part L in April 2014. The following table presents the carbon savings achieved using the SAP 2012 emission factors for comparison, calculated using the GLA carbon emission reporting spreadsheet.

Table 12 Carbon Dioxide emissions reduction for the development

Regulated Ca	rbon dioxide emissions	26 Netherhall Gardens				
(Tonnes CO ₂	per annum)	(SAP 2012 carbon factors)				
Baseline Emi	ssions	6				
Be Lean	After energy demand reduction	6				
Be Clean	After CHP	6				
Be Green	After renewable energy	5				
Carbon Savin	gs over Baseline Emissions	1				
Carbon Redu	ction over Baseline Emissions	24%				

Table 13 Regulated carbon dioxide savings from each stage of the Energy Hierarchy

Regulated carbon dioxide savings	(Tonnes CO2 per annum)	(%)
Savings from energy demand reduction	1	8%
Savings from CHP	0	0%
Savings from renewable energy	1	16%
Total Cumulative Savings	1	24%