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11-12 INGESTRE ROAD, LONDON, NW5 1UX Energy Statement

Client:	Four Quarters (Ingestre Road) Ltd		
Engineer:		nsulting Engineers Limited Temple Chambers le Avenue	
	Tel: Email: Web:	020 7822 2300 enquiries@createconsultingengineers.co.uk www.createconsultingengineers.co.uk	
Report By:	Alicja Kre	glewska, MSc, OCDEA, DEA, NDEA	
Checked By:	Deborah I	Elliott, BSc (Hons), BREEAM AP, OCDEA, DEA	
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11-12 INGESTRE ROAD, LONDON, NW5 1UX Energy Statement Revision C

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Registration of Amendments

Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By
Rev A 04/07/18	Updated to address comments from BMP	AK	СВ
Rev B 13/07/18	Reference to overheating report updated	AK	СВ
Rev C 04/09/18	Reference to National Planning Policy Framework updated	AK	DE

EXECUTIVE SUMMARY

Create Consulting Engineers Ltd has been appointed to provide an Energy Statement to support the forthcoming planning application for a proposed Extra Care Development at the site of the former care home at 11 - 12 Ingestre Road, London, NW5 1UX. This report has been developed to detail the energy strategy for the development and demonstrates how it relates to the following guidance documents:

- The London Plan, March 2016:
 - Chapter 5: London's response to climate change;
- Sustainable Design and Construction SPD, February 2009;
- Camden Local Plan, June 2017;
- Camden Planning Guidance CPG 3: Sustainability, July 2015, updated March 2018.

The new build proposal comprises six storey plus single storey basement building accommodating 50 Assisted Living residential apartments with associated communal and support facilities and ancillary cafe, salon and mini gym, together with external amenity spaces, car lift, basement parking, laundry, plant, CCTV, lighting, access, landscaping, infrastructure and other ancillary works.

The energy assessment within the report has been prepared following the principles of the London Plan Energy Hierarchy: 'Be Lean', 'Be Clean' and 'Be Green'.

'Be Lean': The strategy aims to reduce energy demands by first incorporating suitable passive design measures, followed by proposed enhancements to provide a highly efficient building fabric and efficient heating system. The proposed energy conservation measures will reduce the new build dwellings' Fabric Energy Efficiency (DFEE) below the Target Fabric Energy Efficiency (TFEE) by **10%**. The Dwellings Emission Rate (DER) and Building Emission Rate (BER) are marginally higher than the Target Emission Rate (TER) figures dictated by the Building Regulations. These have been calculated based on gas heated spaces as required by the GLA's guidance on preparing energy statements. This figure will be revised at detailed design stage when building services design is fully developed. The design will be progressed prioritising energy efficiency of the building fabric and services.

'Be Clean': The opportunity for the proposed development to link into an existing or planned decentralised energy network has been considered. The development is not located within immediate proximity of a proposed district heat network, however the design and layout of the building's plant room will be such that it will facilitate the possible future connection of the development to an energy network.

'Be Green': A feasibility study has been undertaken to establish the most suitable renewable technology for integration within the proposed development. Air source heat pumps and photovoltaic systems have been deemed the most viable and practical options for the scheme. The proposed heat pumps will provide heating to all spaces and cooling to the non-domestic areas. A PV array of approximately 27kWp for the site is initially proposed to maximise the roof space and energy reduction achieved.

A highly optimised energy strategy based on passive design, building fabric performance and building services systems and controls, and suitable Low and Zero Carbon systems will allow the scheme to achieve an **improvement over Part L 2013 of approximately 21.9%.** The London Plan CO₂ emissions reduction requirement (35% Improvement over Part L 2013) is not considered achievable for the scheme due to the practical constraints of the site (limited roof area available for PV).

The table below summarises the energy and CO_2 emission reductions for the stages of the energy hierarchy for the proposed Ingestre Road development.

Carbon Dioxide Emissions –	Carbon Dioxide Emissions [tonnes/year] (tonnes CO₂ per annum)		
Domestic & Non-Domestic areas	Regulated	Unregulated	
Baseline: Part L 2013 of the Building			
Regulations Compliant	184.42	252.64	
Development (community gas – GLA	184.42		
guidance)			
Be Lean - energy demand reduction	190.87	252.64	
Be Green - ASHP	154.68	252.64	
Be Green – 27kWp PV	144.04	252.64	
Improvement over Part LA: 2013	40.38	Tonnes CO ₂ per annum	
	21.90	%	

Copy of Table 5.5: Energy hierarchy reductions – Whole development

The 'zero carbon' target has not been achieved for the proposed residential part of the development on-site therefore the Client will commit to meeting the shortfall by making contributions to the Camden Council carbon offsetting fund. The funds secured by the council will be ring-fenced to deliver carbon emissions savings off site through a variety of projects and will be secured through Section 106 legal agreements.

1.0 INTRODUCTION

1.1 Create Consulting Engineers Ltd has been commissioned by Four Quarters (Ingestre Road) Ltd to produce an Energy Statement to support the planning application for a proposed Extra Care Development at the site of the former care home at 11 - 12 Ingestre Road, London NW5 1UX.

Site Location and Description

- 1.2 The former Ingestre Road Care Home for the Elderly (C2 Use Class) included 48 self-contained bedrooms for residents. It closed in 2013, when the then residents were relocated to more modern and fit for purpose elderly person's accommodation at Maitland Park.
- 1.3 The Site is located at 11 12 Ingestre Road in the London Borough of Camden. Please refer to Figure 1 below for site location.

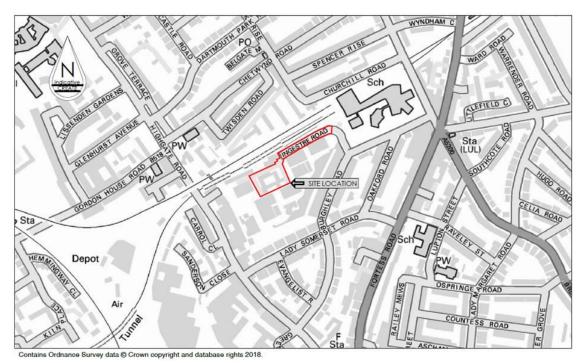


Figure 1: Site location plan

1.4 The site is surrounded by residential buildings and is located in close proximity to Tufnell Park tube station to the east and Kentish Town tube station to the south-east. Hampstead Heath Park is located approximately 500 meters to the north-west of the site.

Proposed Development

1.5 The proposal comprises demolition of existing buildings and the erection of a six storey, plus single storey basement, building accommodating 50 Assisted Living residential apartments with associated communal and support facilities and ancillary cafe, salon and mini gym,

together with external amenity spaces, car lift, basement parking, laundry, plant, CCTV, lighting, access, landscaping, infrastructure and other ancillary works.

1.6 This report details information gathered from consultation with the design team.

Objectives

- 1.7 The objectives of this report are to:
 - Demonstrate how the proposed development will meet the policy requirements of the London Borough of Camden and of the London Plan, including its associated Energy Hierarchy (Policy 5.2: 'Minimising carbon dioxide emissions') and Cooling Hierarchy (Policy 5.9: 'Overheating and Cooling').
 - Identify the most suitable passive and energy efficient design approach for the scheme, the feasibility of Low and Zero Carbon (LZC) technologies and operational Best Practice.
 - Identify the drivers relating to an energy efficient design over and above minimum compliance with current Building Regulations and other appropriate regional and national policies.

Report Structure

- 1.8 This introductory section is followed by a review of national and local current and future policies on energy, good practice review and project requirements. A detailed assessment of the estimated energy consumption and associated carbon dioxide emissions is provided, with passive design measures along with energy efficient equipment. This relates to the 'Be Lean' element of the proposed Energy Hierarchy. Low and Zero Carbon technologies are reviewed in detail for feasibility within the scheme, relating to the 'Be Clean' and 'Be Green' elements of the Energy Hierarchy.
- 1.9 Section 7 provides a summary and conclusion on the energy strategy for the scheme.

2.0 CURRENT AND FUTURE PLANNING POLICIES/GOOD PRACTICE REVIEW AND PROJECT REQUIREMENTS

National Planning Policy Framework (July 2018)

- 2.1 The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations. The ministerial foreword of this NPPF highlights that 'the purpose of planning is to contribute to the achievement of sustainable development' and that at the heart of the framework is a presumption in favour of sustainable development.
- 2.2 Sustainable development is defined in the NPPF as comprising developments "meeting the needs of the present without compromising the ability of future generations to meet their own needs" in line with the definition of the Brundtland Commission ('Our Common Future', 1987). The NPPF also refers to the three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways an economic objective, a social objective and an environmental objective.

The London Plan, March 2016

2.3 This Spatial Development Strategy for Greater London includes objectives to reduce the capital's impact on, and exposure to, the effect of climate change. The policies that are appropriate to the Ingestre Road proposals are detailed in the following sections.

Policy 5.2: 'Minimising Carbon Dioxide Emissions'

- 2.4 Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:
 - *'Be Lean'*: reduction of the energy demand and associated emissions using a passive design approach and high specification plant;
 - *'Be Clean'*: further reducing energy demand and associated emissions by incorporating viable Low Carbon technologies;
 - *'Be Green'*: meeting a proportion of the residual demand via renewable energy technologies, where feasible.

Policy 5.6: 'Decentralised Energy in Development proposals'

2.5 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.

- 2.6 Major development proposals should select energy systems in accordance with the following hierarchy:
 - 1. Connection to existing heating or cooling networks;
 - 2. Site wide CHP network;
 - 3. Communal heating and cooling.
- 2.7 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.

Policy 5.7: 'Renewable Energy'

2.8 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. Major developments should seek to reduce carbon dioxide emissions by at least 20% through the use of on-site renewable energy generation, where feasible.

Policy 5.9: 'Overheating and Cooling'

- 2.9 Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy.
 - 1. Minimise internal heat generation through energy efficient design;
 - 2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
 - 3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
 - 4. Passive ventilation;
 - 5. Mechanical ventilation;
 - 6. Active cooling systems (ensuring they are the lowest carbon options).

Greater London Authority (GLA) Supplementary Planning Guidance (SPG) on Sustainable Design and Construction (April 2014)

2.10 This Supplementary Planning Guidance (SPG) provides guidance on what measures developers can include in their building designs and operations to achieve the carbon dioxide and water consumption targets set out in the London Plan. This SPG also provides guidance on how boroughs can take forward the new approaches set out in the London Plan, such as carbon-dioxide off-setting, retrofitting and 'air quality neutral'. This guidance document includes 3 main sections:

- Chapter 2: 'Resource Management' (Land, Site Layout and Building Design, Energy and CO₂ emissions, Renewable Energy, Water Efficiency, Materials and Waste, Nature conservation and biodiversity);
- Chapter 3: 'Adapting to climate change and greening the city' (Tackling increased temperature and drought, Increasing green cover and trees, Flooding);
- Chapter 4: 'Pollution Management Land, Air, Noise, Light and Water'.

Energy and Carbon Dioxide Emission - Mayor's Priorities

2.11 The overall carbon dioxide emissions from a development should be minimised through the implementation of the energy hierarchy set out in London Plan Policy 5.2. To avoid complexity and extra costs for developers, the Mayor will adopt a flat carbon dioxide improvement target beyond Part L 2013 of 35% to both residential and non-residential development. Developers should aim to achieve Part L 2013 Building Regulations requirements through design and energy efficiency alone, as far as is practical.

Draft New London Plan

- 2.12 A draft new London Plan was published by the Mayor for consultation in December 2017. The consultation period ended on 2 March 2018.
- 2.13 The information published by the Mayor of London states that "the current 2016 Plan (The London Plan consolidated with alterations since 2011) is still the adopted Development Plan, but the Draft London Plan is a material consideration in planning decisions. The significance given to it is a matter for the decision maker, but it gains more weight as it moves through the process to adoption."
- 2.14 Policy SI2 within the proposed Chapter 9: Sustainable Infrastructure confirms the London principles for minimising greenhouse gas emissions. It requires that all developments follow the energy hierarchy and meet the new target of net-zero carbon. This target will be applicable for all developments from 2019, as detailed in already published Guidance on preparing energy assessments (2016). The net-zero carbon target is already applicable to residential development. Please refer to paragraphs below for details.

Greater London Authority (GLA) guidance on preparing energy assessments (March 2016)

- 2.15 The March 2016 revision to the GLA guidance on preparing energy statements clarifies energy targets in the context of Government announcements regarding 'zero carbon' policy.
- 2.16 "'Zero carbon' homes are homes forming part of major development applications where the residential element of the application achieves at least 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100%, are to be off-set through cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere."

- 2.17 The GLA will continue to require that non-domestic development seek to achieve a 35 per cent reduction against Part L 2013.
- 2.18 The zero carbon target defined above will be implemented for Stage 1 schemes submitted to planning authorities on or after 1 October 2016.
- 2.19 To summarise, the emission reduction targets that the GLA will apply to applications are as follows:
 - Stage 1 schemes received by the Mayor on or after the 1st October 2016 'Zero carbon' (as defined above) for residential development and 35% below Part L 2013 for commercial development

Camden Local Plan Adoption version (June 2017)

Policy D1 Design

2.20 The Council will require that development is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation plus is of sustainable and durable construction and adaptable to different activities and land uses.

Policy CC1 Climate Change Mitigation

- 2.21 *"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."*
- 2.22 "The council will promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy and will require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met."
- 2.23 "The Council will expect developments of five or more dwellings and/or more than 500 sqm of any gross internal floor space to achieve a 20% reduction in carbon dioxide emissions from onsite renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible."
- 2.24 The policy also requires that all major developments are supported by an energy statement which will demonstrate that the London Plan energy hierarchy is adhered to.

Camden Planning Guidance CPG 3: Sustainability (July 2015, updated March 2018)

2.25 The document supports the policies in Camden's Local Development Framework. The CPG provides information on ways to achieve carbon reductions and more sustainable developments. It details the information that should be included in energy statements and further explains the energy hierarchy that should be applied to all developments.

Building Regulations Approved Document Part L1: 2013

- 2.26 Part L of the current Building Regulations considers the reduction of carbon emissions in new and existing buildings. The proposals for the site consist of the creation of new non-domestic areas and dwellings. The new dwellings fall under Part L1A and the new non-domestic areas under Part L2A of the Building Regulations (Conservation of fuel and power in new dwellings).
- 2.27 The overall structure of compliance with the 2013 Building Regulations includes five criteria to comply with for all new residential dwellings:
 - Criterion 1 The Dwelling Emission Rate/Building Emission Rate (DER/BER) should be better than the Target Emission Rate (TER) and the Dwelling Fabric Energy Efficiency (DFEE) should be better than the Target Fabric Energy Efficiency (TFEE);
 - Criterion 2 Limit on design flexibility;
 - **Criterion 3** Limiting effects of heat gain in summer;
 - **Criterion 4** Commissioning and air-tightness;
 - **Criterion 5** Efficient operation of buildings.
- 2.28 The new Building Regulations came into force on 6th April 2014. For new homes, the changes introduced within the new version of Part L1A:2013 will deliver a 6% improvement on the previous 2010 standards across the build mix for residential scheme. The Part L 2013 specifications for non-domestic buildings have been strengthened to deliver 9% carbon dioxide savings across the new non-domestic mix relative to Part L 2010.
- 2.29 The detailed energy strategy for the scheme will be developed to ensure the scheme meets the relevant requirements of the Building Regulations.

3.0 ENERGY EFFICIENCY STRATEGY – 'BE LEAN'

Introduction

- 3.1 The proposed energy strategy has, as its first priority, minimised energy consumption through the performance of the building envelope and services. The following section details the energy efficiency features of the development. The cooling hierarchy set out within the London Plan has been followed.
- 3.2 This analysis includes:
 - Building Regulations Approved Document ADL1A and L2A (2013) initial compliance assessment, identifying the potential for the design to comply with and exceed Building Regulations requirements.
 - An energy demand assessment of the proposed scheme contained within this document provides carbon dioxide emissions estimates from the analysis of passive energy efficiency enhancements and Low and Zero Carbon potential. This will utilise Building Regulations 2013 carbon dioxide factors.
- 3.3 In further detail, the energy efficiency strategy of the scheme has been achieved by incorporating the following design and technology features:

Energy Efficiency Features Proposed

Physical Form and Orientation of the Building

- 3.4 While the orientation of the development is fixed due to it being erected in place of the existing block, the facade of the new block has been optimised in order to provide a balance of thermal control, both from within and outside of the building.
- 3.5 Passive solar design involves adapting the internal layout and glazing to best respond to the local climate and annual sun path, with the aim of reducing energy demands and improving occupant comfort through the use of heat and light from the sun. All of the flats and non-domestic areas accommodate large windows permitting maximum daylight penetration into the new dwellings.
- 3.6 Good levels of natural daylight will be achieved for the majority of the scheme. This will reduce reliance on artificial lighting and thus limit energy consumption.

Overheating

3.7 A detailed analysis of overheating has been completed for all habitable areas of the Ingestre Road development by Create Consulting Engineers Ltd and will be submitted in support of this planning application.

- 3.8 The report concludes that overheating in all kitchen, living rooms and bedrooms within the residential part of the development pass all of the overheating criteria as detailed in TM59: Design Methodology for the assessment of overheating risk in homes. The risk of overheating is reduced through the inclusion of moderate overshading in the form of balconies and as a result of shading provided by the existing residential blocks. Additionally, glazed areas have been designed to maximise openable areas to enable effective ventilation of the rooms.
- 3.9 It has been identified that some non-domestic areas are at risk of overheating. This occurs largely due to internal gains (lighting and equipment) and auxiliary ventilation gains. Comfort cooling proposed for non-domestic areas as part of the design will ensure thermal comfort in these spaces is achieved.

Building Envelope Specification and Thermal Performance

3.10 Building fabric thermal transmittance is measured by the U-value of each building element in Watts/m²/K. The U-value describes how well a building element conducts heat. It measures the rate of heat transfer through a building element over a given area, under standardised conditions: the lower the U-value, the better the insulating ability. Table 3.1 and 3.2 below detail the U-values for the development at 11-12 Ingestre Road in relation to Building Regulations minimum standards.

Building Element/Characteristic	Proposed values	Building Regulations Part L1A: 2013 Requirements
Exterior walls and ground contact walls in basement - U value (W/m²K)	0.18	0.30
Walls to unheated spaces (W/m ² K)	0.18	
Floor over unheated spaces and ground floor	0.12	0.25
Flat Roof - U value (W/m ² K)	0.12	0.20
Windows - U value (W/m ² K)	1.3	2.0
Doors to unheated areas - U value (W/m²K)	1.0	2.0
Design Air Permeability(m³/hr/m² @50Pa)	4	10
Thermal Bridges	ACDs where available	n/a

Table 3.1: Proposed building fabric performance for residential units

Thermal Mass

3.11 Utilising the thermal mass of a building can help to regulate internal temperatures and temper heating and cooling loads by absorbing and radiating heat, thus reducing annual energy consumption. To exploit the thermal mass of the building, either direct or indirect contact is required between the structure and the occupied space, via exposed surfaces or high energy exchange systems. There is limited opportunity to exploit thermal mass indirectly; this is because the internal finishes such as carpets and dry-lining will reduce the effectiveness of the building's structure as an energy store.

3.12 The proposed development, with a concrete frame construction filled with steel stud walls and insulating boards, and finished internally with plasterboard, will have a medium thermal mass.

Air Tightness and Ventilation Strategy

- 3.13 Air permeability is a measure of infiltration. It indicates how often the entire air quantity in a building is exchanged with outside air within 1 hour without any ventilation in place. Any air exchange with outside air is carrying heat energy away from the building, resulting in a higher heating load. Lower air permeability levels are desirable for conserving heat energy and in the case of mechanical ventilation systems for reducing fan power consumption. Infiltration is different from ventilation. Infiltration is essentially unwanted air exchanges through imperfections in the building fabric while ventilation is the air exchanges intended by the designer.
- 3.14 As detailed in Tables 3.1 and 3.2 the air permeability of the proposed development has been assumed to be 4 m³/m²@50PA/hr for all dwellings.
- 3.15 All the residential units will utilize natural ventilation with trickle vents and extractor fans to all kitchens and wet rooms.
- 3.16 The ventilation system proposed for the non-domestic areas is via mechanical ventilation with heat recovery (MVHR) with high efficiency in the region of 80% and low SFP (specific fan power) to limit energy use. The chosen system will be fitted with CO₂ sensors modulating air flow based on space occupancy. The exact make and model will be confirmed at detailed design stage.

London Plan Cooling Hierarchy

- 3.17 The section above details how the different measures that have been recommended have followed the London Plan cooling hierarchy developed in Policy 5.9 'Overheating and Cooling'.
- 3.18 In summary, they will:
 - Minimise internal heat generation through energy efficient design & reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration and insulation:
 - Optimised solar transmittance of the glazing units (g-value 0.4 0.5);
 - Overhangs in form of balconies.

3.19 Furthermore, the buildings will incorporate:

- Mechanical ventilation
 - High efficiency Mechanical Ventilation with Heat Recovery (MVHR) for nondomestic spaces;
- Active cooling systems (ensuring they are the lowest carbon options)
 - Provided in the gym, fitness room, reception area and lounge, café, hairdressers and all hobby rooms.
 - Based on the results of the thermal modelling study, comfort cooling will be considered for the flats with high risk of overheating.

Lighting and Appliances

- 3.20 High efficiency low energy lighting and controls have been specified throughout. All residential spaces will utilise 100% low energy lighting. The lighting controls in most of the communal spaces will comprise occupancy sensing switches with daylight dimming function fitted to some of the rooms.
- 3.21 Highly efficient lighting has been proposed for the commercial part of the scheme: > 60 luminaire lumens per circuit watts with occupancy sensing and/or daylight dimming controls (parasitic power of 0.05 W/m²).
- 3.22 Power factor correction equipment will be installed (Power Factor > 0.95) resulting in a reduced demand being placed upon the grid.
- 3.23 The commercial areas will be fitted with sub-metering for all major energy loads, including lighting and heating to allow the facilities manager to accurately track consumption and to adjust building use accordingly.
- 3.24 Lighting has been designed in accordance with CIBSE (Chartered Institute of Building Service Engineers) Guide A: Environmental Design and ILP (Institute of Lighting Professionals) Guidance for the Reduction of Obtrusive Light. The former describes recommended lux levels within various spaces (i.e. Bedroom, Living Room etc.) whilst the latter provides guidance on minimising obtrusive light.
- 3.25 Unnecessary light spill will be reduced by avoiding the use of external decorative lighting; providing fittings only where they are required for security and maintenance purposes. External luminaires have been chosen to minimise sky glow and overspill and located to ensure that only the level of lighting that is required is achieved.
- 3.26 A simple building user guide on the operation and environmental performance of the building and systems will be developed for the occupant and non-technical building manager.

3.27 All appliances, if provided, will be very energy efficient (A to A+++ rated). Information on the EU Energy Efficiency Labelling Scheme will be provided in the assisted living dwelling.

The Choice and Design of Building Systems and Plant

- 3.28 The building systems and plant have been designed by McKee Associates to optimise the efficiency of the systems by matching installed capacity to anticipated building demand. Items of equipment, which make up the building's mechanical building services installation, will be specified to achieve high annual energy efficiency in operation and will be serviced regularly to maintain their performance.
- 3.29 The proposed method of supplying heating and hot water to the dwellings will be via community air source heat pumps (ASHP). Each flat will be separately sub-metered. Space heating will be provided via underfloor heat distribution pipes in lounge, dining area, kitchen and bathrooms, and via low temperature radiators in bedrooms. The efficiency of the proposed system will be in the region of 350-400% and the heating system will be controlled by a programmer and TRVs.
- 3.30 All non-domestic areas will be heated by reverse cycle heat pumps that will also provide cooling to some of the spaces. The access corridors to all flats will be heated by fan assisted radiators linked to the community heating system.

Carbon Dioxide and Energy Reductions - Part L1A compliance – Residential units

Standard Assessment Procedure and GLA Guidance

- 3.31 The Standard Assessment Procedure (SAP 2012) which formed the basis for demonstrating dwelling compliance with Part L1 of the Building Regulations 2013 for new dwellings has been used for the development at Ingestre Road to estimate the savings achieved through the energy efficiency features proposed and to predict the annual CO₂ emissions of the dwellings (using NHER Plan Assessor version 6.2.3 Part L1A certified compliance software). The CO₂ emissions of the unregulated elements (cooking and appliances) have been estimated based on the methodology developed in Appendix L of SAP 2012.
- 3.32 The GLA guidance on preparing energy assessments clarifies the calculation methodology for residential and non-domestic developments to ensure the consistency of the calculations across all boroughs.
- 3.33 The energy assessment must first establish the regulated CO₂ emissions assuming the development complies with Part L 2013 of the Building Regulations. When determining this baseline, it should be assumed that the heating would be provided by gas boilers and that any active cooling would be provided by electrically powered equipment.

3.34 The 'Be Lean' case should assume that the heating is provided by gas boilers and that any active cooling would be provided by electrically powered equipment. The boilers should be assumed to have an efficiency of 89.5% for residential and controls aligned with the Part L notional building assumptions. This is to demonstrate the CO₂ emissions savings achieved through incorporation of passive design and efficient building fabric.

Dwellings modelled

- 3.35 A sample of representative dwellings has been modelled for the re-developed scheme based on the latest set of architectural drawings from Barton Willmore.
 - A-1-01 MF end terrace x 17
 - A-1-02 MF mid terrace x 5
 - A-2-05 2 bed above non-domestic heated space x 6
 - A-4-01 2 bed heat loss roof x 8
 - A-4-02 2 bed mid terrace heat loss roof x 2
 - A-5-01 2 bed TF x 6
 - A-5-04 2 bed TF with glazed/paneled walls x 2
 - A-G-01 GF 2 bed end terrace x 2
 - A-G-02 GF 2 bed mid terrace x 1
 - A-G-04 GF 1 bed x 1

Results of the CO2 emissions estimation – 'Be Lean' case

3.36 The total CO₂ emissions been estimated based on the results from the energy modelling for the proposed dwellings. Please refer to Table 3.2 below:

Carbon Dioxide Emissions –	Carbon Dioxide Emissions [tonnes/year]		
Energy Hierarchy	Regulated	Unregulated	
Baseline: Part L 2013 of the Building			
Regulations Compliant	62.4	56.75	
Development (community gas – GLA	02.4		
guidance)			
Be Lean - After energy demand	62.94	56.75	
reduction	02.94	50.75	
Improvement over Part LA: 2013	-0.63	Tonnes CO ₂ per annum	
improvement over Fart LA. 2013	-1	%	

Table 3.2: CO₂ emissions and energy consumption for the 'Be Lean' case

3.37 The estimated CO₂ emissions calculated for the 'Be Lean' scenario are higher than the target emissions for the dwellings. This is largely due to the assumptions for efficiencies of heating and cooling system and lack of accredited construction details for majority of party walls thermal bridging junctions.

3.38 It has been demonstrated, however, that the optimised building fabric specified for the dwellings has led to an overall projected improvement over Part L Fabric Energy Efficiency (FEE) standard of **over 10%.** Please refer to Tables 3.4 below for summary of the results and Appendix A for detailed SAP calculations.

Dwelling Type	Multiplier	Floor Area (m²)	Target Fabric Emission Efficiency (TFEE) (kWh/m²/yr)	Dwelling Fabric Energy Efficiency (DFEE) (kWh/m²/yr)	Improvement over PartL1A:2010 - 'Be Lean' TFEE criteria
A-1-01 MF end terrace	17	74.40	40.51	39.93	1.4%
A-1-02 MF mid terrace	5	76.52	27.85	25.72	7.6%
A-2-05 2 bed above non-domestic	6	88.78	47.48	36.04	24.1%
A-4-01 2 bed heat loss roof	8	74.40	42.07	40.98	2.6%
A-4-02 2 bed mid terrace heat loss roof	2	76.52	30.85	25.92	16.0%
A-5-01 2 bed TF	6	86.50	54.74	43.01	21.4%
A-5-04 2bed TF glazed walls	2	72.67	58.27	58.29	0.0%
A-G-01 GF 2 bed end terrace	2	74.40	62.65	56.59	9.7%
A-G-02 GF 2 bed mid terrace	1	76.52	47.15	40.44	14.2%
A-G-04 GF 1 bed	1	54.41	49.31	39.75	19.4%
Average - Area Weighted per dwelling type			42.87	38.55	10.08%

Table 3.3: Improvement over Part L – FEE criterion – energy efficiency features only

3.39 It is worth noting that due to the current calculation methodology used for Part L compliance and the GLA Energy Assessment methodology, the CO₂ savings achieved through the provision of energy efficient appliances (unregulated loads) are not included, hence the CO₂ savings presented in this report are considered to be conservative. The unregulated CO₂ emissions have been considered similar for all the different stages of the London Plan energy hierarchy. It is however expected that this scheme will lead to unregulated CO₂ emissions significantly lower than those of a standard Part L 2013 compliant scheme.

Carbon Dioxide and Energy Reductions - Part L2A compliance – Non-domestic areas

IES Thermal Modelling

3.40 IES VE uses National Calculation Methodology (NCM) and SBEM platform to demonstrate building compliance for non-residential buildings with Part L2A of the Building Regulations 2013. These calculations have been used to estimate the energy efficiency features required for Part L compliance, as well as to predict the annual building regulated energy demand, consumption and CO₂ emissions of the community areas.

- 3.41 The SBEM calculations determine a Building Emissions Rate or 'BER'. This value is compared to the energy requirements and emissions of a notional building of the same shape and dimensions which determines a compliant building (the Target Emission Rate or 'TER'). The BER must be equal to or less than the TER.
- 3.42 Following the GLA guidance on preparing Energy Statements, when determining the building's baseline, it should be assumed that the heating would be provided by gas boilers (91% efficient) and that any active cooling would be provided by electrically powered equipment. The non-domestic areas have been modelled to follow this guidance.

Results of the CO2 emissions estimation – 'Be Lean' case

3.43 The total CO₂ emissions has been estimated based on the results from the energy modelling for the proposed community areas. Please refer to Table 3.4 below:

Carbon Dioxide Emissions –	Carbon Dioxide Emissions [tonnes/year]		
Non-domestic spaces	Regulated	Unregulated	
Baseline: Part L 2013 of the Building			
Regulations Compliant			
Development (community gas for	122.02	195.89	
heating, ASHP for cooling – GLA			
guidance)			
Be Lean - After energy demand			
reduction (better efficiencies for	127.93	195.89	
cooling and mechanical ventilation)			
Improvement over Part LA: 2013	-5.91	Tonnes CO ₂ per annum	
improvement over Part LA. 2015	-4.8	%	

Table 3.4: CO₂ emissions and energy consumption for the 'Be Lean' case

3.44 The estimated CO₂ emissions calculated for the 'Be Lean' scenario are higher than the target emissions for the gas heated spaces. It has been identified that the highest energy consumption by end use is in area of hot water supply and lighting. This is largely due to the assumptions for heating and lighting controls and heat distribution losses made at this stage of the design. These areas will be addressed and optimised at detailed design stage. A full lighting design will provided to optimise the system's performance and to ensure accuracy of the modelling.

Conclusions

3.45 To achieve the Camden Local Plan and London Plan Policy 5.7 target of 35% CO₂ emissions reduction for the scheme, the proposed development will incorporate renewable or low carbon technology. A feasibility study of different renewable systems to determine their suitability for the scheme is presented in Section 5 of this report.

4.0 'BE CLEAN': SUPPLY ENERGY EFFICIENTLY

- 4.1 Connection to a decentralised energy network and the use of combined heat and power is a recognised method of generating energy more efficiently. The London Plan Policy 5.5: 'Decentralised Energy Networks' and Camden Council Policy CC1: 'Climate change mitigation' require development proposals to explore the opportunities to link into an existing or planned decentralised energy network using the London Heat Map tool. Where an existing decentralised energy network is not present, an assessment of the feasibility of establishing a decentralised energy system for the proposed development should be undertaken; including an assessment of the feasibility of a Combined Heat and Power (CHP) communal heating system.
- 4.2 The feasibility of connecting to an existing network and specification of a Combined Heat and Power system has been assessed within the following section.

Decentralised Energy Networks

- 4.3 The London Heat Map tool is an interactive tool that allows users to identify opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study. All information has been updated and the map is now in a user friendly format using an interactive GIS system. This tool details the existing and proposed major heat loads and supplies within London as well as existing and proposed heat distribution networks.
- 4.4 The London Heat Map tool indicates the location of a future decentralised energy network approximately 3 kilometres from the Ingestre Road site (Please refer to Figure 4.1). The site is not located within a viable distance of the heat networks; therefore connection to a decentralised energy network is considered unfeasible at the present time.

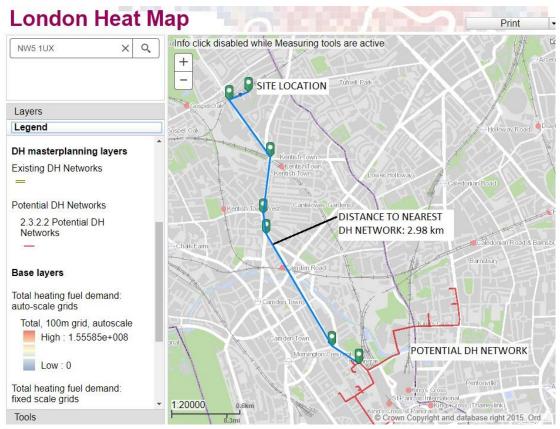


Figure 4.1: Location of the proposed site in relation to potential energy networks.

- 4.5 However, the development will utilise a central communal heating system, distributing a heating flow to the residential units. The use of a communal heating system is a pre-requisite for the possible connection of the building's heating system to a decentralised energy network at a later date. The heat source would utilise sequenced high efficiency air source heat pumps.
- 4.6 The plant rooms will be approximately 125m² total in size, located in the basement. The design and layout of the building's plant room will be such that it will facilitate the possible future connection of the development to an energy network. Please refer to figure 4.2 for location of the proposed plant rooms.

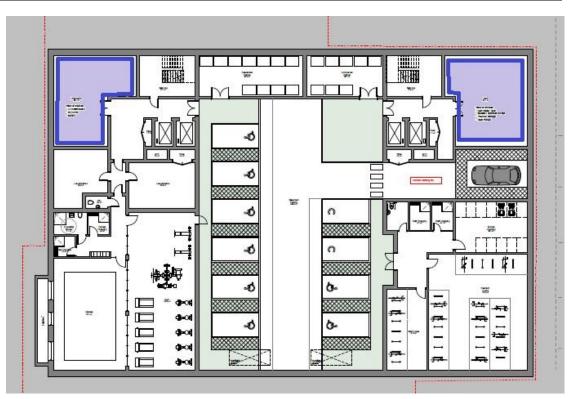


Figure 4.2: Location of basement plant rooms (based on drawing by Barton Willmore)

- 4.7 The following design features will be included in the proposed heating system design to allow for future connections to a district heating system:
 - Reservation of space for a valve pit at site boundary (1.2m x 1.2m x 1.0m high);
 - Reservation of space in riser ducts for future district heating flow and return pipes (estimated pipe diameter 150mm with thermal insulation);
 - Reservation of space in the basement plant rooms for future heat exchange equipment.

5.0 'BE GREEN': USE RENEWABLE ENERGY

- 5.1 The final step in the energy hierarchy requires that the clean generation of energy by renewable energy technologies be examined. The London Plan Policy 5.7: 'Renewable Energy' and London Borough of Camden Local Plan Policy CC1: 'Climate change mitigation' require the incorporation of on-site renewable energy generation to provide a percentage reduction in the carbon emissions from the proposed development. The London Plan requires all developments to achieve a 'reduction in carbon dioxide emissions of 20% from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible'.
- 5.2 ASHPs are considered the most suitable option for providing heating and cooling to the development. This strategy has been adopted after a consultation with the appointed M&E engineer. The advice from the M&E consultant confirmed that CHP heating system, if installed in the building, would not be fully utilised based on the planned use of the spaces and therefore would result in inefficient running of the unit. Community gas boiler would not provide any carbon reduction over the Building Regulations compliant case.
- 5.3 For these reasons the Client's preferred option for reducing carbon dioxide emissions is through the application of community air source heat pumps (ASHP) and photovoltaic panels (PV) to the roofs of the newly constructed block.

Proposed Renewable Technology – ASHP

- 5.4 Heat Pumps, utilising low grade heat, provide high efficiency, low carbon heating. They are a thermodynamic device based on the vapour compression cycle. The four elements of the refrigeration circuit are: the evaporator, compressor, heat exchanger and condenser. The heat, which is extracted from the medium goes through a number of processes, and is distributed throughout individual dwellings through a standard wet central heating system. Heat pumps utilise electricity to drive their pumps and compressor units. They are essentially a form of efficient electric heating. The efficiency of a heat pump is rated by its coefficient of performance (CoP).
- 5.5 The CoP is a measure of the electricity input to the system and the heat energy extracted. Several factors affect the CoP of a heat pump; the consistency of the heat source and the required output temperature. A consistent heat source (such as the ground) will deliver greater efficiencies than a heat source that varies seasonally. Also, heat pump efficiency is greatest when the required output temperature rise is lowest; hence heat pumps are commonly paired with under floor heating systems that require lower flow temperatures than conventional radiator emitters.

- 5.6 Air Source Heat Pumps (ASHP) will be used to provide heating for the domestic and nondomestic areas of the development. Community areas will also utilise reverse cycle heat pumps to provide cooling for these spaces.
- 5.7 Air Source Heat Pumps extract energy from air and therefore require space for external units. The roof of the proposed block is suitable for location of the external units of the system. It is proposed that between 6 and 10 Mitsubishi Ecodan heat pumps with heating CoP of 3.50 will be fitted on the building. The estimated cooling efficiency will be in a region of EER >=5.
- 5.8 The heat distribution will be via underfloor pipe system and low temperature radiators in residential areas and access corridors. Non-domestic areas will be served by terminal units concealed in the suspended ceiling.
- 5.9 Carbon emissions savings achieved by the proposed ASHPs have been calculated in line with the GLA guidance on preparing energy statements and have been compared to a gas heated development to ensure the consistency of calculations in all boroughs is achieved.
- 5.10 Heat pumps use electricity, which has a higher carbon emission factor than natural gas, and therefore the savings achieved are more conservative than the savings that would have been achieved if the system was compared to a conventional electric heating. Please refer to tables 5.1 and 5.2 for details of the savings achieved by the proposed ASHP.

Carbon Dioxide Emissions –	Carbon Dioxide Emissions [tonnes/year]		
Domestic areas	Regulated	Unregulated	
Baseline: Part L 2013 of the Building		56.75	
Regulations Compliant	62.4		
Development (community gas – GLA	02.4		
guidance)			
Be Lean - energy demand reduction	62.94 56.75		
Be Green - ASHP	42.55	56.75	
	19.85 – 0.63 (difference		
	between BR and Be Lean;	Tonnes CO₂ per annum	
Improvement over Part LA: 2013	needed to meet BR) =		
	19.22		
	30.80	%	

 Table 5.1: Energy hierarchy reductions – Residential areas

Carbon Dioxide Emissions –	Carbon Dioxide Emissions [tonnes/year]		
Non-domestic spaces	Regulated	Unregulated	
Baseline: Part L 2013 of the Building			
Regulations Compliant	122.02	195.89	
Development (community gas – GLA	122.02		
guidance)			
Be Lean - energy demand reduction	127.93	195.89	
Be Green - ASHP	105.68	195.89	
	16.34 – 5.91 (difference		
	between BR and Be Lean;	Tonnes CO₂ per annum	
Improvement over Part LA: 2013	needed to meet BR) =	Tonnes CO2 per annum	
	10.43		
	8.54	%	

Table 5.2: Energy hierarchy reductions – Non-domestic areas

- 5.11 Total CO₂ emissions reduction over the Building Regulations achieved through incorporation of ASHPs are estimated to be 30.8% and 8.54% for domestic and non-domestic areas respectively. The calculations take into account the contribution of the proposed heat pumps to help the spaces meet the Building Regulations in the first instance. The remaining reduction achieved by the system counts towards the carbon reduction from renewable sources.
- 5.12 The London Plan requirement to reduce CO₂ emissions over the Building Regulations by 35% has been targeted for all areas. The proposed ASHP will not suffice to meet the policy target and therefore additional LZC technology has been considered for the scheme.
- 5.13 The client's preferred renewable technology to compliment the proposed ASHP is photovoltaic panels system. Its suitability and energy reduction achieved is further demonstrated in paragraphs below.

Proposed Renewable Technology – PV panels

- 5.14 Photovoltaic cells directly convert sunlight into electrical current using semiconductors. The output of a cell is directly proportional to the intensity of the light received by the active surface of the cell. The location and positioning of PV cells is therefore critical to achieving acceptable performance. Exposure to sunlight causes electricity to flow through the cells. Mono-crystalline PV cells provide higher levels of electricity generating performance over other panel types. PV panels can be incorporated into a range of building designs and positions, provided they are located in a shade-free environment and facing as close to south as possible.
- 5.15 Photovoltaics are generally technically suitable for all types of developments. Their use can be limited due to their high capital cost. However, with the introduction of the Feed in Tariff, the high capital cost could be balanced with the running cost savings and the fixed tariff offered during a set period of time.

- 5.16 The following issues are considered in relation to the feasible integration of PV:
 - Low maintenance;
 - Simple installation;
 - Self-cleaning if tilted at an angle of 10 degrees or more;
 - Photovoltaic panels are typically straightforward to integrate into a building's services strategy and would not conflict with an ASHP installation;
 - Performance output and emissions reduction is greater for PV over solar thermal systems for this arrangement, panel area and specific project loads;
 - Access issues;
 - Lift overrun / Access hatch/ services termination;
 - Improved Return on Investment and payback periods due to Feed-In Tariffs.
- 5.17 Areas of PV modules vary between manufacturers, however on average a 1 PV module covers an area of approximately 1.5m². PV panels are produced in various sizes with power outputs ranging from 0.165kWp to 0.3kWp per module. The most commonly used modules in domestic application generate approximately 0.2-0.25kW of electricity.
- 5.18 The available roof area suitable for locating the PV panels is constrained by the orientation and roof layout of the development. Additionally, a deduction for access, man safe systems and services termination should be included. As a 'rule of thumb' a usable roof area is 75% of the available roof area for the block.
- 5.19 The aim is to maximise the size of the proposed PV system and therefore as much roof area as possible will be utilised for the installation of the solar collectors. Please see the roof layout below for indicative location of PV panels.

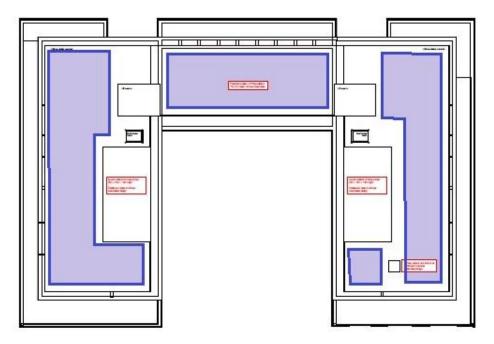


Figure 5.1: Indicative PV panels layout on flat roofs (based on drawing by Barton Willmore)

- 5.20 The calculation below is based on good practice that estimates that a 1kWp PV system laid horizontally requires a spatial area of $12m^2$ (this takes into account access and shading requirements for panels at max. 15° inclination).
- 5.21 It has been calculated that usable roof area and maximum size of the PV system for the development is as follow:
 - Usable roof area: approx. 435m² x 75% = 324m²
 - Estimated max size of PV system: 324/12 = 27kWp
- 5.22 Based on calculation methodology included in SAP 2012 document, 1kWp of PV in a horizontal position generates approximately 760kWh of electricity per year, which translates to 394kg of CO₂ savings per year.

Predicted PV system size to meet London Plan target the scheme

5.23 The London Plan policy target of 35% CO₂ reduction over the Building Regulations for the development would require installation of a minimum of 88.6kWp PV system on the roof of the proposed building, as detailed in table 5.3

Carbon Dioxide Emissions – Domestic & Non-domestic spaces	Carbon Dioxide Emissions (tonnes CO2 per annum)		
[tonnes/year]	Regulated Domestic	Regulated Non-domestic	
Baseline: Part L 2013 of the Building			
Regulations Compliant	62.4	122.02	
Development	02.4	122.02	
(community gas – GLA guidance)			
Be Lean - energy demand reduction	62.94	127.93	
Be Green - ASHP	42.55	105.68	
	19.85 – 0.63 (to meet BR) =	16.34 – 5.91 (for BR) =	
Improvement over Part LA: 2013	19.22	10.43	
	30.80%	8.54%	
35% over BR target (London Plan)	0.35 x 62.4 = 21.84	0.35 x 122.02 = 42.71	
CO ₂ to be offset by PV	21.84 - 19.22 = 2.62	42.71 - 10.43 = 32.28	
Total CO₂ to be offset by PV	34.9		
CO ₂ emissions saved by 1kWp	0.204		
horizontally laid PV facing South	0.394		
PV needed for residential part to	– 2.62/0.394 = 6.65 kWp		
meet 35% CO ₂ emissions reduction –			
used for 'zero carbon' offset			
payment calculations (see section 6)			
Total PV needed for the scheme	34.9/0.394 = 88.58 kWp		

 Table 5.3: PV needed to achieve London Plan policy target

5.24 The maximum calculated size of the PV system that could be fitted on the roof will be confirmed at detailed design stage, taking into account the appointed installer's calculations to allow for local wind speed and additional safety access to the PV panels. It is however estimated that the available roof area will not suffice for the PV system calculated above.

Feasible PV system size for the development and CO2 reduction achieved

5.25 If the flat roof of the development is fitted with PV to its maximum, the estimated size of the system will be 27kWp (please refer to paragraphs 5.18-5.21 for calculations). This translates to approximately 108 panels fitted at 10-15 degrees. System of this size would generate circa 20.5 MWh of electricity per year, offsetting approximately 10.64 tonnes of CO₂ each year. Please refer to the table 5.4 & 5.5 below for detailed calculations.

	Carbon Dioxide Emissions	
Ingestre Road development	Regulated Domestic and	
	Regulated Non-domestic	
Baseline: Part L 2013 of the Building		
Regulations Compliant Development	184.42	
(community gas – GLA guidance)	104.42	
[tonnes/year]		
Be Lean - energy demand reduction	190.87	
[tonnes/year]		
Be Green - ASHP [tonnes/year]	148.23	
Improvement over Part LA: 2013	36.19 – 6.45 (to meet BR) = 29.74	
[tonnes/year]	16.13%	
CO ₂ emissions saved by 27kWp horizontally	27 x 0.394 = 10.64	
laid PV facing South [tonnes/year]	27 x 0.394 - 10.04	
Total reduction achieved [tonnes/year]	29.74 + 10.64 = 40.38	
Total reduction achieved [%]	21.90	

Table 5.4: CO_2 reductions achieved for the scheme with 27kWp PV system

Carbon Dioxide Emissions –	Carbon Dioxide Emissions (tonnes CO ₂ per annum)		
Domestic & Non-Domestic areas	Regulated	Unregulated	
Baseline: Part L 2013 of the Building			
Regulations Compliant	184.42	252.64	
Development (community gas – GLA	104.42		
guidance)			
Be Lean - energy demand reduction	190.87	252.64	
Be Green - ASHP	154.68	252.64	
Be Green – 27kWp PV	144.04	252.64	
Improvement over Part LA: 2013	40.38	Tonnes CO ₂ per annum	
improvement over Part LA. 2013	21.90	%	

 Table 5.5: Energy hierarchy reductions – Whole development

- 5.26 A highly optimised energy strategy based on passive design, building fabric performance and building services systems and controls, and suitable Low and Zero Carbon systems will allow the whole scheme to achieve an improvement over Part L 2013 of approximately 21.90%. The increase in CO₂ emissions reduction has not been considered achievable for the scheme due to the practical constraints of the site (limited roof area available for PV).
- 5.27 The reduction in total CO₂ emissions has been fully achieved by the proposed LZC technologies, therefore the requirements of the London Plan Policy 5.7 (20% CO₂ reduction from renewable sources) has been met.
- 5.28 The energy strategy of the scheme has considered measures to adapt and mitigate effects of climate change, in particular through an optimised design minimising risk of overheating (compliant with the London Plan Cooling Hierarchy) and the specification of energy efficiency systems and LZC leading to significant CO₂ emission reductions (40.38 tonnes of CO₂/yr).

Other Technologies Considered in the Study

Solar Thermal Hot Water Panels	Not Suitable
--------------------------------	--------------

- 5.29 Solar hot water systems (SHW) use the energy radiated by the sun and convert it into useful heat in the form of hot water.
- 5.30 Heat is transferred and stored in a central thermal store. The solar panel system would ideally supply approximately 45-55% of the developments domestic hot water requirement; the remainder of energy required for domestic hot water would be supplied by the gas boilers.
- 5.31 Solar thermal panels are ideal for dwellings with a highly insulated building envelope as the energy demand for heating water is relatively high in comparison to space heating demand.
- 5.32 The roof of the block is flat and therefore the collectors would have to be mounted on frames tilted at least 30 degrees facing south, south-west or south-east leading to an optimum hot water output. This would result in higher visual impact of the system.
- 5.33 The roof of the redeveloped blocks has a limited area and will not suffice to accommodate enough solar thermal panels to provide heat for all of the flats within the block.
- 5.34 A SHW in conjunction with ASHP system would not reduce CO₂ emissions by 35% as required by the London Plan Policy 5.2 and therefore an additional technology would have to be incorporated into the design of the blocks, compromising on space and increasing the overall cost of the construction.
- 5.35 For these reasons a solar hot water system is not recommended for the site.

Gas CHP (Combined Heat and Power)

Not Suitable

- 5.36 A conventionally fuelled CHP system would utilise a prime mover such as a diesel engine or gas turbine to drive an electrical generator. The heat generated by the prime mover during this process would be utilised in a community heating network.
- 5.37 Gas CHP systems are energy efficient and considered as low carbon technologies. For CHP to be viable, it must run almost continuously and thus requires a permanent heat demand (hence its suitability for swimming pools, hospitals etc).
- 5.38 The proposed development, with highly insulated building envelope, will not have a high heat demand throughout a year. The heating base load would be domestic hot water, which is estimated to be fairly low for both domestic and non-domestic areas.
- 5.39 It has been advised by the appointed M&E engineer that the proposed development would not fully utilise the energy generated by CHP engine and therefore would result in inefficient running of the system.
- 5.40 It is therefore not recommended that gas fired-CHP be considered for this site.

Bio-fuels Not Suitable

- 5.41 Bio-fuels have the potential to contribute to the reduction of CO₂ emissions of various developments by using this fuel within a boiler or CHP plant. Biofuels are considered to have low or zero CO₂ intensities as theoretically the CO₂ released when these fuels are combusted is no greater than the CO₂ that has been absorbed from the atmosphere when the plants grew.
- 5.42 However, there are a number of issues which must be considered with this type of fuel in urban locations:
 - Potential air quality impacts with combusting bio-fuels in urban areas, in particular elevated NOx emissions and particulates and must be addressed.
 - Transporting this type of fuel increases lorry movements into and out of London, affecting congestion and transport emissions. The relatively rapid degradation of biodiesel would require appropriately sized on-site storage tanks with regular fuel deliveries.
 - Importantly, the actual bio-diesel CO₂ intensity cannot be guaranteed due to variations in fuel stock supply, demand, the energy input processing the fuel and CO₂ emissions due to growing, harvesting and processing the base fuel.
 - Biofuel availability is currently uncertain due to unknown future supply and demand. Whilst an increase in demand for larger developments may stimulate the supply

chain, availability could change with variation in demand. Transport is likely to have the most significant impact on the biofuel industry over emerging building demand.

- Socio-economic issues from growing and harvesting feedstock, with potential impacts on food production, particularly for biodiesel that is imported. Solid biofuels have a lesser impact in this area.
- On-site fuel storage requirements requiring additional space, along with regular access to the on-site fuel storage area.
- Increased plant maintenance is generally required, adding to costs and plant down-time.
- 5.43 Consequently biofuels for combustion within a boiler are not appropriate for the scheme.

Wind Turbines

Not Suitable

- 5.44 Although a wind turbine could be sized to meet the requirements of this development, there are numerous factors that would discount its suitability in this setting. Typically wind turbines perform poorly in urban environments as surrounding buildings and features dissipate much of the useful energy of the wind before it can be extracted by the turbine. The tower would also require a large amount of free space for the erecting and periodic maintenance of the turbine. This is likely to be an issue with this site.
- 5.45 Environmental concerns such as noise and shadow flicker are also problematic in populated areas. While modern turbines have low levels of noise generation, even at high rotational speeds, the noise generated may still be an issue for local residents, particularly given the close proximity of the turbine. Given the dense urban setting of this development, shadow flicker is likely to be a problem for the residents of the proposed development. A wind turbine would not be a viable option for this development.

6.0 'ZERO CARBON' TARGET

- 6.1 The March 2016 revision to the GLA guidance on preparing energy statements clarifies energy targets in the context of Government announcements regarding 'zero carbon' policy.
- 6.2 "'Zero carbon' homes are homes forming part of major development applications where the residential element of the application achieves at least 35% reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100%, are to be off-set through cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere."
- 6.3 Camden Council has adopted a higher price for their Carbon Offset Fund, which is set as ± 90 per tonne of CO₂ emitted per year over a period of 30 years, i.e. $\pm 2,700$ per tonne per year.
- 6.4 The cash contribution to the Carbon Offsetting Fund has been calculated for the proposed residential part of the development based on the results of the energy modelling for the flats. The non-domestic areas are not required to meet the 'zero carbon' target, as explained is Section 2 of this report. Please refer to Table 6.1 below for details of the calculations.

London Plan Energy Hierarchy – Residential Part	CO2 emissions (tonnes/year)	Regulated CO2 Savings (tonnes/year)	% CO ₂ emissions reduction over 'Base Case'
Base Case: Part L 2013 of the Building Regulations Compliant Development – (TER)	62.40	n/a	n/a
Be Lean - energy efficiency measures	62.94	-0.63	-1.01%
Be Green – renewable energy ASHPs	42.55	19.22	30.80%
Be Green - renewable energy 6.65kWp PV (allocated for domestic areas)	39.93	21.84	35%
Cumulative CO2 savings (tonnes/year)	21.84		
Annual savings (tonnes/year)	62.4 - 21.84 = 40.56		
Cumulative savings for off-set payment (tonnes CO ₂)	30 years x 40.56 = 1,216.8		
Cash contribution (£)	£90 x 1216.8 = £109,512		

 Table 6.1: Carbon Offsetting Fund estimated calculations for residential part of the

 development

6.5 The on-site 'zero carbon' target has not been achieved for the proposed residential part of the development therefore the Client will commit to meet the shortfall off-site by paying towards Camden Council's carbon offsetting fund. The funds secured by the council will be ring-fenced to deliver carbon emissions savings off site through a variety of projects and will be secured through Section 106 legal agreements.

7.0 CONCLUSION

- 7.1 This report has been developed to detail the energy efficient features of the development and demonstrates how they relate to the relevant planning policy documents including the London Borough of Camden Local Plan Adoption version (June 2017) and the London Plan.
- 7.2 The energy assessment follows the principles of the London Plan Energy Hierarchy: 'Be Lean', 'Be Clean' and 'Be Green'. The overriding objective in the formulation of the energy strategy for the scheme has been to maximise the viable reductions in total carbon dioxide emissions within the framework of the energy hierarchy.
- 7.3 The energy strategy of the scheme has considered measures to adapt and mitigate effects of climate change leading to significant CO₂ emission reductions, in particular through an optimised design minimising risk of overheating, the specification of energy efficiency systems and the use of LZC technologies.
- 7.4 A highly optimised energy strategy based on passive design, building fabric performance and building services systems and controls, and suitable Low and Zero Carbon systems will allow the scheme to achieve an **improvement over Part L 2013 of approximately 21.9%.** The London Plan CO₂ emissions reduction requirement (35% Improvement over Part L 2013) is not considered achievable for the scheme due to the practical constraints of the site (limited roof area available for PV).
- 7.5 The proposed LZC technologies for the scheme (ASHP and array of Photovoltaics (PV) modules) achieve 21.9% CO₂ emissions reduction, which exceed the requirements of the London Plan Policy 5.7: 'Renewable Energy' and Camden Local Plan Policy CC1: 'Climate change mitigation'.
- 7.6 The 'zero carbon' target introduced by the Mayor for domestic schemes will be met through financial contribution towards the Carbon Offsetting Fund.

8.0 DISCLAIMER

- 8.1 This report details information gathered from consultation with the design team and Four Quarters (Ingestre Road) Ltd. All information provided has been accepted in good faith as being accurate and representative of the proposed scheme at the time of review.
- 8.2 Create Consulting Engineers disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.
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APPENDICES

APPENDIX A



Assessor name	Miss Alicja Kre	lewska				As	sessor num	iber	4134		
Client						La	st modified		13/06	/2018	
Address	A 1 01 Ingestre	Road, London,	NW5 1XE								
	_										
1. Overall dwelling dimens	sions										
			А	area (m²)			age storey ight (m)		Vo	olume (m³)	
Lowest occupied				74.40	(1a) x		2.50] (2a) =		186.00	(3a)
Total floor area	(1a) + (1b)	+ (1c) + (1d)(1n) =	74.40	(4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	186.00	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0] x 40 =		0	(6a)
Number of open flues							0] x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	;						0	x 40 =		0	(7c)
-									Air	changes pe	r
					(74) . (20] . (5)		hour	
Infiltration due to chimneys If a pressurisation test has b					د (7b) + (vise continu		30	÷ (5) =		0.16	(8)
Air permeability value, q50,					of envelope		0 (10)			4.00	(17)
If based on air permeability			8), other vi							0.36	(18)
Number of sides on which t			bj, otner		0)					3	(19)
Shelter factor	ne uwening is she						1 -	[0.075 x (19		0.78	(20)
Infiltration rate incorporation	a shaltar factor						1-	(18) x (2		0.78	(21)
Infiltration rate modified fo	-	heed.						(10) X (2	0) –	0.28	_ (21)
Jan	Feb M		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee		л дрі	Ividy	Jun	501	Aug	Зер	000	NOV	Dec	
5.10	5.00 4.9	0 4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	5.00 4.3	4.40	4.30	5.80	5.80	5.70	4.00	4.30	4.50	4.70	_ (22)
1.28	1.25 1.2	3 1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (al					0.95	0.95	1.00	1.00	1.15	1.10	_ (220)
0.36	0.35 0.3		0.30	0.27	0.27	0.26	0.28	0.30	0.32	0.33	(22b)
Calculate effective air chang	I I		0.50	0.27	0.27	0.20	0.20	0.50	0.52	0.55	_ (220)
If mechanical ventilation			ı							N/A	(23a)
If balanced with heat red	-			ctor from T	able 4h					N/A	(23c)
d) natural ventilation or		-							L		
0.56	0.56 0.5		0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(24d)
Effective air change rate - e				0.54	0.54	0.55	0.54	0.55	0.55	0.00	_ (270)
0.56	0.56 0.5		0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(25)
0.50	0.00	0.00	0.55	1 0.04	0.04	0.00	1 3.3 4	5.55	5.55	0.00	



3. Heat losses and heat loss parameter										
Element	Gross area, m ²	Openings m ²	Net ar A, m		U-value W/m²K	A x U W/		alue, ˈm².K	Ахк, kJ/K	
Window			30.1	.5 x	1.24	= 37.26				(27)
External wall			37.2	21 x	0.18	= 6.70				(29a)
Party wall			47.0	00 x	0.00	= 0.00	7			(32)
Total area of external elements ΣA , m ²			67.3	6			_			(31)
Fabric heat loss, $W/K = \sum(A \times U)$						(26)	(30) + (3	2) =	43.96	(33)
Heat capacity Cm = Σ(A x κ)					(28)	(30) + (32) +	(32a)(32	e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m ² K									250.00	(35)
Thermal bridges: $\Sigma(L \times \Psi)$ calculated using App	endix K								16.87	(36)
Total fabric heat loss							(33) + (3	6) =	60.83	(37)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-
Ventilation heat loss calculated monthly 0.33	x (25)m x (5)									
34.60 34.45 34.30	33.60	33.47	32.86	32.86	32.75	33.10	33.47	33.74	34.01	(38)
Heat transfer coefficient, W/K (37)m + (38)m										.
95.43 95.28 95.13	94.43	94.30	93.69	93.69	93.58	93.92	94.30	94.56	94.84]
		I I				Average = Σ(39)112/2	12 =	94.43	(39)
Heat loss parameter (HLP), W/m ² K (39)m \div (4						0 2.	, ,], ,
1.28 1.28 1.28	1.27	1.27	1.26	1.26	1.26	1.26	1.27	1.27	1.27]
	I					Average = ∑(40)112/2	12 =	1.27	(40)
Number of days in month (Table 1a)							-, ,](-,
31.00 28.00 31.00	30.00	31.00	30.00	3. 1	3. 7	30.00	31.00	30.00	31.00	(40)
				7]()
4. Water heating energy requirement										
0 01 1										
Assumed occupancy, N			X						2.35	(42)
	ay Vd,average	,25 x N) +							2.35 89.97] (42)] (43)
Assumed occupancy, N	ay Vd,average Apr	,25 x N) + Mav		Jul	Aug	Sep	Oct	Nov		
Assumed occupancy, N Annual average hot water usage in litres per d	Apr	Mav	36 Ju	Jul	Aug	Sep	Oct	Nov	89.97	
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar	Apr th Vd,m = fact	Mav	36 Ju	Jul 80.97	Aug 84.57	Sep 88.17	Oct 91.77	Nov 95.36	89.97	
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon	Apr th Vd,m = fact	Mav tor	36 Ju		-			95.36	89.97 Dec	
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon	Apr th Vd,m = fact	Mav tor	36 Ju le 1c x 3)	80.97	84.57		91.77	95.36	89.97 Dec 98.96] (43)
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77	Apr th Vd,m = fact 98,17 n x n x Tr	Mav Or worn Tab 84.57	36 Ju le 1c x 3)	80.97	84.57		91.77	95.36	89.97 Dec 98.96] (43)
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1	Apr th Vd,m = fact 98,17 n x n x Tr x	May :orom Tab 84.57 3600 k/m	36 Ju le 1c x 3)	80.97 ables 1b,	84.57 1c 1d)	88.17	91.77 Σ(44)1?	95.36 12 = 130.88	89.97 Dec 98.96 1079.59] (43)
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1	Apr th Vd,m = fact 98,17 n x n x Tr x	May :orom Tab 84.57 3600 k/m	36 Ju le 1c x 3)	80.97 ables 1b,	84.57 1c 1d)	88.17	91.77 Σ(44)1 119.90	95.36 12 = 130.88	89.97 Dec 98.96 1079.59 142.13] (43)] (44)]
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1 146.76 128.36 132.4	Apr th Vd,m = fact 9 98.17 n x n x T r x 5 1 47	May :orom Tab 84.57 3600 k/m	36 Ju le 1c x 3)	80.97 ables 1b,	84.57 1c 1d)	88.17	91.77 Σ(44)1 119.90	95.36 12 = 130.88	89.97 Dec 98.96 1079.59 142.13] (43)] (44)]
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m	Apr th Vd,m = fact 2 28,17 m x n x x True 5 1 7 17.32	Mav 110.80	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 142.13 1415.52] (43)] (44)] (45)
Assumed occupancy, N Annual average hot water usage in litres per day I an Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$, 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87	Apr th Vd,m = fact 2 28,17 m x n x x True 5 1 7 17.32	Mav 110.80	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (43)] (44)] (44)] (45)] (46)
Assumed occupancy, N Annual average hot water usage in litres per d Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, 1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V	Apr th Vd,m = fact 2 28,17 m x n x T T x. 5 1,47 7 17.32 VWHRS storage	Mav 110.80	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (43)] (44)] (45)] (46)
Assumed occupancy, N Annual average hot water usage in litres per day I an Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$, 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss:	Apr th Vd,m = fact 98,17 m x n x Truc 5 1 7 17.32 VWHRS storage nown	Mav 101	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (43)] (44)] (45)] (46)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$, r 146.76 128.36 132.4 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn	Apr th Vd,m = fact 98,17 m x n x Truc 5 1 7 17.32 VWHRS storage nown	Mav 101	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 1415.52 21.32 2.00] (43)] (44)] (44)] (45)] (45)] (46)] (47)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2	Apr th Vd,m = fact 98,17 m x n x Truc 5 1 7 17.32 VWHRS storage nown	Mav 101	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 1412.13 1415.52 21.32 2.00 0.02] (43)] (44)] (44)] (45)] (45)] (46)] (47)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, r 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a	Apr th Vd,m = fact 98.17 m x n x x Truck 5 1 7 17.32 VWHRS storage nown kWh/litre/day	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 ge within sam	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1079.59 142.13 21.32 2.00 0.02 3.91] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)
Assumed occupancy, N Annual average hot water usage in litres per day I an Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not ke Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b	Apr th Vd,m = fact 98.17 m x n x x Truck 5 1 7 17.32 VWHRS storage nown kWh/litre/day	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 ge within sam	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 98.96 1∪79.59 1415.52 21.32 2.00 0.02 3.91 1.00] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)] (53)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, a 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not ku Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day)	Apr th Vd,m = fact 98.17 m x n x x Tr x 5 1, 47 7 17.32 VWHRS storage hown kWh/litre/day (47) x (51) x (5	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 ge within sam	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 098.96 1079.59 142.13 21.32 2.00 0.02 3.91 1.00 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Assumed occupancy, N Annual average hot water usage in litres per day I an Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, 1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55)	Apr th Vd,m = fact 98.17 m x n x x Tr x 5 1, 47 7 17.32 VWHRS storage hown kWh/litre/day (47) x (51) x (5	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 ge within sam	36 Ju le 1c x 3) o 7 sonth (see Ta 95.61 14.34	80.97 ables 1b, 88.60	84.57 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 12 = 130.88 12 =	89.97 Dec 098.96 1079.59 142.13 21.32 2.00 0.02 3.91 1.00 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)
Assumed occupancy, N Annual average hot water usage in litres per day I an Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, 1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not ke Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55) Water storage loss calculated for each month <u>3.69 3.33 3.69</u>	Apr th Vd,m = fact 98.17 m x n x Truc 5 1, 47 17.32 VWHRS storage hown (kWh/litre/day (47) x (51) x (9 (55) x (41)m 3.57	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 16.62 192 within sam (y) 52) x (53) 3.69	36 Ju le 1c x 3) 9 / 1 nonth (see Ta 95.61 14.34 ne vessel 3.57	80.97 ables 1b, 88.60 13.29 3.69	84.57 1c 1d) 101.67 15.25	88.17	91.77 Σ(44)1 119.90 Σ(45)1 17.99	95.36 12 = 130.88 12 = 19.63	89.97 Dec 098.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00 0.12 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,1 146.76 128.36 132.4 Distribution loss 0.15 x (45)m 22.01 19.25 19.87 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55) Water storage loss calculated for each month	Apr th Vd,m = fact 98.17 m x n x Truc 5 1, 47 17.32 VWHRS storage hown (kWh/litre/day (47) x (51) x (9 (55) x (41)m 3.57	Mav 101m Tab 84.57 3600 K/m 110.80 16.62 16.62 192 within sam (y) 52) x (53) 3.69	36 Ju le 1c x 3) 9 / 1 nonth (see Ta 95.61 14.34 ne vessel 3.57	80.97 ables 1b, 88.60 13.29 3.69	84.57 1c 1d) 101.67 15.25	88.17	91.77 Σ(44)1 119.90 Σ(45)1 17.99	95.36 12 = 130.88 12 = 19.63	89.97 Dec 098.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00 0.12 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)

Primary circuit lo	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for ea	ach month f	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	alculated f	or each mc	onth 0.85 x	: (45)m + (4	l6)m + (57)r	m + (59)m +	(61)m			<u></u>	-
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08	(62)
Solar DHW input] (/
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wat					1	1	0.00	0.00	0.00	0.00	0.00	0.00] (03)
Output nom wa			. ,	, ,		T	445.55	120.62	120.00	110.05	450.00	100.00	7
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08]
										∑(64)1	.12 = 1	732.81	(64)
Heat gains from	water heat	ing (kWh/n	nonth) 0.25	5 × [0.85 ×	(45)m + (61 	L)m] + 0.8 ×	< [(46)m + (!	57)m + (59)	m]				_
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.36	55.07	61.43	64.38	68.82	(65)
5. Internal gain	c												
5. Internal gain		E.L		A				•	6	0.4	NI	Dee	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)												-
	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	(66)
Lighting gains (ca	alculated in	Appendix	L, equation	L9 or L9a),	also see Ta	able 5							_
	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19.00	(67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L1	13a), also s	ee Table 5							
	207.34	209.49	204.07	192.53	177.96	164.26	1,55.12	1, .96	158.39	169.93	184.50	198.19	(68)
Cooking gains (c	alculated in	Appendix	L, equation	L15 or L15	a), also see	e Table 5							
	34.74	34.74	34.74	34.74	34.74	34.74	2	34.7	34.74	34.74	34.74	34.74	(69)
Pump and fan ga	ins (Table 5	ia)	•										-
	0.00	0.00	0.00	0.00		0.0	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap] (-7
	-93.92	-93.92	-93.92	-93.92	-93.07	-93.	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)
Water heating g			55.52	55.52	55.	- 55	55.52	55.52	55.52	55.52	55.52	55.52](, 1)
water neating g			00 17	2 30	78.4 ^r		69 57	74.41	76.40	02 56	80.42	92.49] (7 2)
Total internal ga	94.56	92.49	88.17			3	68.57	/4.41	76.49	82.56	89.42	92.49	(72)
Total internal ga					'1)m + ('			1					7
	378.61	376.62	363.81	3.	322.23	302.00	288.80	294.56	305.12	325.98	349.96	367.91	(73)
6. Solar gains													
Ū			Access f	actor	Area	So	lar flux		g	FF		Gains	
			Table		m²		V/m²	spec	ific data	specific o	lata	W	
								or T	able 6b	or Table	6C		
SouthWest			0.7	7 X	16.68	x 3	36.79 x	0.9 x 0).63 x	0.80	=	214.36	(79)
SouthEast			0.7	7 X	3.47	x 3	36.79 x	0.9 x 0).63 x	0.80	=	44.59	(77)
NorthWest			0.7	7 X	10.00	x1	L1.28 x	0.9 x ().63 x	0.80	=	39.41	(81)
Solar gains in wa	itts ∑(74)m	(82)m											_
C	298.36	521.30	748.04	985.13	1156.62	1171.66	1119.87	988.35	829.58	585.52	359.75	253.79	(83)
Total gains - inte				500.10	1100.01	11, 1,00	1110107		010100	000.01	000000] (00)
	676.97	897.92	1111.85	1328.29	1478.85	1473.65	1408.67	1282.91	1134.70	911.50	709.71	621.70	(84)
	070.97	897.92	1111.85	1328.29	14/8.85	14/3.05	1408.07	1282.91	1134.70	911.50	709.71	021.70] (84)
7. Mean intern	al te <u>mperat</u>	ture <u>(heati</u>	ng s <u>eason)</u>										
Temperature du				area from T	able 9, Th1	L(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_ · · · /
Utilisation factor				•	•				1				
	ioi gailis li	or inving all	.u 111,111 (SE	c rubie 3d)									

	0.99	0.96	0.90	0.76	0.57	0.40	0.29	0.33	0.55	0.85	0.97	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	.)								_
	19.86	20.17	20.53	20.83	20.96	20.99	21.00	21.00	20.97	20.75	20.23	19.79	(87)
Temperature du	ring heating	g periods ir	n the rest of	dwelling fr	rom Table 9	9, Th2(°C)							_
	19.85	19.86	19.86	19.87	19.87	19.87	19.87	19.87	19.87	19.87	19.86	19.86	(88)
Utilisation facto	r for gains f	or rest of d	welling n2,	m									_
	0.99	0.95	0.87	0.71	0.51	0.33	0.22	0.25	0.47	0.81	0.96	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						
	18.38	18.83	19.31	19.69	19.83	19.87	19.87	19.87	19.85	19.61	18.92	18.29	(90)
Living area fract	ion								Liv	ving area ÷	(4) =	0.36	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	(1 - fLA) x ⁻	Т2							
	18.91	19.31	19.75	20.10	20.23	20.27	20.27	20.27	20.25	20.02	19.38	18.82	(92)
Apply adjustmer	nt to the me	an interna	l temperatu	ure from Ta	ble 4e whe	ere appropr	iate						
	18.91	19.31	19.75	20.10	20.23	20.27	20.27	20.27	20.25	20.02	19.38	18.82	(93)
0 Correction	· · · · ·												
8. Space heatir				-				_	_	•			
11411-11-1- f+	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	-	-		0 -0	0.50			0.00	0.50] (2.1)
	0.98	0.95	0.87	0.72	0.53	0.36	0.24	0.00	0.50	0.81	0.96	0.99	94)
Useful gains, ηm			1	074.40] (0-1)
No. at he has a second	664.27	849.67	966.64	954.19	782.38	528.24	34 1	361.7	565.40	740.29	679.82	613.26	95)
Monthly average		-	1								-		1
	4.30	4.90	6.50	8.90	11.70	14.60	_ ~0	10	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo		-	1							1	1	1	1
	1393.82	1372.61	1260.12	1057.32	804.72	13	344.13	2.45	577.83	887.98	1161.56	1386.91	_ (97)
Space heating re	-		1			m				1	1	T	-
	542.79	351.42	218.35	74.25	16.62	0.00	7.00	0.00	0.00	109.88	346.86	575.59]
									∑(98	8)15, 10		2235.75] (98) _
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	30.05	(99)
9b. Energy req	uirements -	communit	ty heating	hen.									
Fraction of space	e heat from	secondary	/suppleme	n ty syst .	1) (m. 11	L)				'0' if r	none	0.00	(301)
Fraction of space										1 - (30		1.00	(302)
Fraction of com	munity heat	from heat	pump									1.00	(303a)
Fraction of total	-			t pump						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ing metho	, d (Table 4c((3)) for com	munity spa	ace heating						1.00	(305)
Factor for charg		-				C C						1.00	(305a)
Distribution loss	-				÷							1.05	(306)
	· · · · · · · · · · · · · · · · · · ·	, -									L] (,
Space heating													
Annual space he	ating requi	rement						2	235.75]			(98)
Space heat from										x (305) x (30	06) = 2	2347.54	(307a)
•], ,
Water heating													
Annual water he	ating requi	rement						1	732.81]			(64)
Water heat from										」 (305a) x (30	06) = 🗌	1819.45	(310a)
Electricity used f							0.01			310a)(310		41.67	(313)
								L()	/ (0	,	~ L		_ 、/

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

		_
	0.00	(331)
	326.44	(332)
:	4493.43	(338)

Fuel cost £/year 99.54

77.14

43.06

120.00

339.74

0.42

1.20

83.33 83

В

Emissions (kg/year)

617.91

21.63

639.53

639.53

169.42

808.96

10.87

90.92

91

В

Primary energy (kWh/year)

3655.05

127.93

3782.97

3782.97

1002.18

4785.16

64.32

(340a)

(342a)

(350)

(351)

(355)

(356)

(357)

(358)

(367a)

(367)

(372)

(373)

(376)

(379) (383)

(384)

(385)

(367a)

(367)

(372)

(373)

(376)

(379)

(383)

(384)

Total delivered energy for all uses	(307) + (309) + (31	0) + (312) + (315) + (331) +	(332)(337b) = [
10b. Fuel costs - community heating scheme				
	Fuel kWh/year		Fuel price	
Space heating from heat pump	2347.54	x	4.24	x 0.01 =
Water heating from heat pump	1819.45	x	4.24	x 0.01 =
Electricity for lighting	326.44	x	13.19	x 0.01 =
Additional standing charges				[
Total energy cost			(340a)(342e) +	- (345)(354) = [
11b. SAP rating - community heating scheme				
Energy cost deflator (Table 12)				[
Energy cost factor (ECF)				[
SAP value				[
SAP rating (section 13)				[
SAP band				[
12b. CO ₂ emissions - community heating scheme	•			
	Energy kWh/year		∠mission factor	
Emissions from other sources (space heating)				
Efficiency of heat pump	35 0			
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a) =	1190.5.	x	0.519	=
Electrical energy for community heat distribution	41.67	x	0.519	= [
Total CO2 associated with community systems				[
Total CO2 associated with space and water heating				[
Electricity for lighting	326 /	x	0.519	= [
Total CO ₂ , kg/year				(376)(382) = [
Dwelling CO ₂ emission rate				(383) ÷ (4) = [
El value				[
El rating (section 14)				[
El band				[
13b. Primary energy - community heating scheme				
	Energy kWh/year		Primary factor	
Primary energy from other sources (space heating)				
Efficiency of heat pump	350.00			
Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) =	1190.57	x	3.07	= [
Electrical energy for community heat distribution	41.67	x	3.07	= [
Total primary energy associated with community systems				[

Total primary energy associated with space and water heating

Electricity for lighting

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

326.44

х

3.07



Assessor name	Miss Alicja Kreglew	ska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 1 02 Ingestre Roa	ıd, London, N	NW5 1XE								
1. Overall dwelling dimen	sions										
			Α	rea (m²)			age storey eight (m)		Vo	lume (m³)	
Lowest occupied				76.52] <mark>(1a)</mark> x		2.50] (2a) =		191.30	(3a)
Total floor area	(1a) + (1b) + (1	.c) + (1d)(1	.n) =	76.52] (4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	191.30	(5)
2. Ventilation rate											
Number of objection							0			³ per hour	
Number of chimneys Number of open flues							0	x 40 = x 20 =		0	(6a) (6b)
Number of intermittent fan	c						3	x 20 = x 10 =		30] (00)] (7a)
Number of passive vents	5					$\sim \leftarrow$	0	x 10 =		0	(7a)
Number of flueless gas fires							0	x 40 =		0	(75)
Number of nucless gas mes	,						0]		changes pe	_ · ·
										hour	I
Infiltration due to chimneys	s, flues, fans, PSVs		(6a)	+ (6b) + (7a	(7b) + (7c) =	30) ÷ (5) =		0.16	(8)
If a pressurisation test has b	been carried out or is	intended, p	ceed to	, UL. W	ise continu	e from (9) t	o (16)				
Air permeability value, q50,	expressed in cubic m	etres per ho	our per squ	iare me	of envelope	e area				4.00	(17)
If based on air permeability	value, then (18) = [(20] + (8), other vie	se /1 (1	5)					0.36	(18)
Number of sides on which t	he dwelling is shelter									3	(19)
Shelter factor							1 -	[0.075 x (19	9)] =	0.78	(20)
Infiltration rate incorporation	ng shelter factor							(18) x (2	0) =	0.28	(21)
Infiltration rate modified fo	r monthly wind speed	4:									
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee	ed from Table U2				-						_
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4				1	i	1	i			1	7
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (a	-			-		-		· · · · · · · · · · · · · · · · · · ·			٦
0.35	0.35 0.34	0.30	0.30	0.26	0.26	0.26	0.28	0.30	0.31	0.32	(22b)
Calculate effective air chang											1
If mechanical ventilation	-	• •								N/A	(23a)
If balanced with heat red		-			able 4h					N/A	(23c)
d) natural ventilation or					0.55	o =-	0.5			0.5-] (0 - 1)
0.56	0.56 0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)
Effective air change rate - e				0.52	0.50	0.52	0.54	0.54	0.55	0.55	
0.56	0.56 0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)



3. Heat losses and heat loss parameter									
Element	Gross area, m²	Openings m ²	Net a A, r		U-value W/m²K	A x U W/	К к-valu kJ/m²	• •	
Window			19.9	92 x	1.24	= 24.62			(27)
External wall			12.	70 x	0.18	= 2.29			(29a)
Party wall			64.0	09 x	0.00	= 0.00			(32)
Total area of external elements ∑A, m ²			32.	62					(31)
Fabric heat loss, W/K = ∑(A × U)						(26)	(30) + (32)	= 26.90	(33)
Heat capacity Cm = Σ(A x κ)					(28)	(30) + (32) +	(32a)(32e)	= N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K								250.00	(35)
Thermal bridges: $\Sigma(L \times \Psi)$ calculated using App	endix K							10.94	(36)
Total fabric heat loss							(33) + (36)	= 37.84	(37)
Jan Feb Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov Dec	_
Ventilation heat loss calculated monthly 0.33	(25)m x (5)								
35.49 35.34 35.19	34.49	34.35	33.74	33.74	33.63	33.98	34.35	34.62 34.90	(38)
Heat transfer coefficient, W/K (37)m + (38)m									
73.33 73.18 73.03	72.33	72.20	71.59	71.59	71.47	71.82	72.20	72.46 72.74	
						Average = ∑(39)112/12	= 72.33	(39)
Heat loss parameter (HLP), W/m ² K (39)m \div (4)									
0.96 0.96 0.95	0.95	0.94	0.94	0.94	0.93	0.94	0.94	0.95 0.95	
						Average = ∑(40)112/12	= 0.95	(40)
Number of days in month (Table 1a)									
31.00 28.00 31.00	30.00	31.00	30.00	3. 7	3. 1	30.00	31.00	30.00 31.00	(40)
									_
4. Water heating energy requirement									
Assumed occupancy, N								2.39	(42)
Assumed occupancy, N Annual average hot water usage in litres per da	y Vd,average							91.05	(42) (43)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar	Apr	Mav	36 Ju	Jul	Aug	Sep	Oct		
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon	Apr th Vd,m = factor	Mav orom Tab	36 Ju		-			91.05 Nov Dec	
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar	Apr th Vd,m = factor	Mav	36 Ju		Aug 85.58	Sep 89.23	92.87	91.05 Nov Dec 96.51 100.15	(43)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87	Apr th Vd,m = factor 99,23	Mav orom Tab 85.59	36 Ju le 1c x 3)	81.94	85.58			91.05 Nov Dec 96.51 100.15	
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r	Apr th Vd,m = fact 99.23	Mav orom Tab 85.55	36 Ju le 1c x 3) o 4	81.94 Tables 1b,	85.58 1c 1d)	89.23	92.87 9 Σ(44)112	91.05 Nov Dec 96.51 100.15 = 1092.55	(43) (44)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87	Apr th Vd,m = fact 99.23	Mav orom Tab 85.59	36 Ju le 1c x 3)	81.94	85.58		92.87 9 Σ(44)112 121.34 1	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83	(43) (44)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0	Apr th Vd,m = fact 99.23	Mav orom Tab 85.55	36 Ju le 1c x 3) o 4	81.94 Tables 1b,	85.58 1c 1d)	89.23	92.87 9 Σ(44)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83	(43) (44)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m	Apr th Vd,m = fact 99.23 h x ri x Tr 3 4 1 86	May or norm Tab 85.5° 600 k. 1/m 112.13	36 Ju le 1c x 3) s 4 sonth (see 1 96.76	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51	(43) (44) (45)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11	Apr th Vd,m = fact ?9,23 n x n x Tr 3 1 1, 86	May orom Tab 85.55 600 k/m 112.13 16.82	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b,	85.58 1c 1d)	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58	(43) (44) (44) (45) (46)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V	Apr th Vd,m = fact ?9,23 n x n x Tr 3 1 1, 86	May orom Tab 85.55 600 k/m 112.13 16.82	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51	(43) (44) (45)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss:	Apr th Vd,m = fact (99.23 (1. 86 (17.53 (WHRS storage)	May orom Tab 85.55 600 k/m 112.13 16.82	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58	(43) (44) (44) (45) (46)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,r 148.52 129.90 134.0 Distribution loss $0.15 \times (45)m$ 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn	Apr th Vd,m = fact (29,23) (h x r x T (37) (4 1, 186) (17.53) (WHRS storage hown	May orom Tab 85.55 600 K/m 112.13 16.82 e within san	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00	(43) (44) (44) (45) (46) (47)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2	Apr th Vd,m = fact (29,23) (h x r x T (37) (4 1, 186) (17.53) (WHRS storage hown	May orom Tab 85.55 600 K/m 112.13 16.82 e within san	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02	(43) (44) (44) (45) (46) (47)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a	Apr th Vd,m = fact (29,23) (h x r x T (37) (4 1, 186) (17.53) (WHRS storage hown	May orom Tab 85.55 600 K/m 112.13 16.82 e within san	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02 3.91	(43) (44) (44) (45) (45) (46) (47) (51) (52)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b	Apr th Vd,m = fact (• 9.23 (1 • 86 (1 • 86 (17.53 (WHRS storage Nown kWh/litre/day	May orom Tab 85.5° 6600 Ki/m 112.13 16.82 e within sam	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02 3.91 1.00	(43) (44) (44) (45) (46) (47) (51) (52) (53)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day)	Apr th Vd,m = fact (• 9.23 (1 • 86 (1 • 86 (17.53 (WHRS storage Nown kWh/litre/day	May orom Tab 85.5° 6600 Ki/m 112.13 16.82 e within sam	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02 3.91 1.00 0.12	(43) (44) (44) (45) (45) (46) (47) (51) (52) (53) (54)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55)	Apr th Vd,m = fact (- 09,23) (- 1, - 86) (- 1, - 86) (- 17.53) (-	May orom Tab 85.5° 6600 Ki/m 112.13 16.82 e within sam	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51	81.94 Tables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02 3.91 1.00	(43) (44) (44) (45) (46) (47) (51) (52) (53)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55) Water storage loss calculated for each month	Apr th Vd,m = fact (29,23) (1, 20, 23) (1, 20, 23) (1, 20, 23) (1, 20, 24) (1,	May orom Tab 85.5 600 K/m 112.13 16.82 e within san /) 52) x (53)	36 Ju le 1c x 3) o 4 onth (see 96.76 14.51 ne vessel	81.94 Tables 1b, 89.66 13.45	85.58 1c 1d) 102.89	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112 18.20	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 3.91 1.00 0.12 0.12 0.12	(43) (44) (44) (45) (45) (46) (47) (51) (52) (53) (54) (55)
Assumed occupancy, N Annual average hot water usage in litres per day Ian Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55) Water storage loss calculated for each month <u>3.69 3.33 3.69</u>	Apr th Vd,m = fact (- 09,23) (- 09,23) (May orom Tab 85.5° 6600 Ki/m 112.13 16.82 e within sam /) 52) x (53)	36 Ju le 1c x 3) s 4 onth (see 1 96.76 14.51 ne vessel 3.57	81.94 Tables 1b, 89.66 13.45 3.69	85.58 1c 1d) 102.89 15.43	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112 18.20	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 0.02 3.91 1.00 0.12	(43) (44) (44) (45) (45) (46) (47) (51) (52) (53) (54)
Assumed occupancy, N Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mon 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,r 148.52 129.90 134.0 Distribution loss 0.15 x (45)m 22.28 19.48 20.11 Storage volume (litres) including any solar or V Water storage loss: b) Manufacturer's declared loss factor is not kn Hot water storage loss factor from Table 2 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage (kWh/day) Enter (50) or (54) in (55) Water storage loss calculated for each month	Apr th Vd,m = fact (- 09,23) (- 09,23) (May orom Tab 85.5° 6600 Ki/m 112.13 16.82 e within sam /) 52) x (53)	36 Ju le 1c x 3) s 4 onth (see 1 96.76 14.51 ne vessel 3.57	81.94 Tables 1b, 89.66 13.45 3.69	85.58 1c 1d) 102.89 15.43	89.23	92.87 9 Σ(44)112 121.34 1 Σ(45)112 18.20 3.69	91.05 Nov Dec 96.51 100.15 = 1092.55 32.45 143.83 = 1432.51 19.87 21.58 2.00 3.91 1.00 0.12 0.12 0.12	(43) (44) (44) (45) (45) (46) (47) (51) (52) (53) (54) (55)

Primary circuit lo	oss for each	month from	n Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (!	59)
Combi loss for ea	ach month f	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 ((61)
Total heat requir	ed for wate	er heating c	alculated f	or each mo	nth 0.85 x	(45)m + (40	6)m + (57)r	n + (59)m +	(61)m				
·	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78 (6	62)
Solar DHW input						122.01	110.01	125.01	150.20	110.25	130.33	170.70	521
					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C 21
Outrout from uno	0.00	0.00	0.00	0.00	1	1	0.00	0.00	0.00	0.00	0.00	0.00 (6	63)
Output from wat		I	· ·	, ,	, , ,			1					
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	
										∑(64)1	.12 = 1	749.80 (6	64)
Heat gains from	water heati	ing (kWh/m	onth) 0.25	5 × [0.85 ×	(45)m + (61	1)m] + 0.8 ×	[(46)m + (5	57)m + (59)	m]				
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38 (6	65)
5. Internal gain									_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)												
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68 (66)
Lighting gains (ca	alculated in	Appendix L	, equation	L9 or L9a),	also see Ta	able 5							
	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12.30	15.61	18.22	19.43 (6	67)
Appliance gains	calculated	in Appendix	L, equatio	on L13 or L1	L3a), also s	ee Table 5							
	212.01	214.21	208.67	196.87	181.97	167.97	158.61	17 .41	161.96	173.76	188.66	202.66 (6	68)
Cooking gains (ca	alculated in	Appendix L	, equation	L15 or L15	a), also see	e Table 5							
	34.97	34.97	34.97	34.97	34.97	34.97	2 ,	34.9.	34.97	34.97	34.97	34.97 (6	69)
Pump and fan ga	ins (Table 5	5a)			1					I	1] ·	
1 0	0.00	, 0.00	0.00	0.00	<i>C</i>	0.0	0.00	0.00	0.00	0.00	0.00	0.00 (70)
Losses e.g. evapo			0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	, 0,
200000 0.8. 0100	-95.74	-95.74	-95.74	-95.74	-95,7		-95.74	-95.74	-95.74	-95.74	-95.74	-95.74 (71)
Water beating g			-93.74	-95.74	-93.7		-93.74	-95.74	-95.74	-93.74	-95.74	-95.74	/1)
Water heating g			00.00	22.04	70.00		60.05	74.00	77.00	02.20	00.14	02.26	70)
	95.35	93.25	88.88		79.0	6	69.05	74.96	77.06	83.20	90.14	93.26 (7	72)
Total internal ga)m + ('								
	385.17	383.15	370.11	191	327.03	307.05	293.61	299.43	310.21	331.48	355.93	374.25	73)
6. Solar gains													
			Access f	actor	Area	Sol	ar flux		a	FF		Gains	
			Table		m²		//m²	spec	g ific data	specific c	lata	W	
								or T	able 6b	or Table	6c		
SouthWest			0.7	7 X	16.45	x 3	6.79 x	0.9 x 0).63 x	0.80	=	211.40 (79)
SouthEast			0.7	7 X	3.47	 	6.79 x	0.9 x 0).63 x	0.80		44.59 (7	77)
Solar gains in wa	tts ∑(74)m	(82)m											
C	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08 (8	83)
Total gains - inte				/05120	010/01	012.00	/01/01	120.00	0.0101	.01.00	00000		,
				1099 20	1155 70	1120.08	1096 12	1025 72	056.22	012.41	662.55	F02 22 (0.4.)
	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	002.55	593.32 (8	84)
7. Mean intern	al te <u>mperat</u>	ture <u>(heati</u> r	ig season)										
Temperature du	ring heating	g periods in	the living a	area from T	able 9. Th1	1(°C)						21.00 (8	85)
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor							*	- O					
	0.99	0.96	0.89	0.75	0.57	0.40	0.29	0.32	0.51	0.82	0.97	0.99 (8	86)
	0.33	0.90	0.09	0.75	0.57	0.40	0.29	0.52	0.51	0.02	0.97	0.55	50]

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Mean internal to	emp of livir	ng area T1 (s	teps 3 to 7	in Table 90	c)								
	20.25	20.50	20.75	20.92	20.99	21.00	21.00	21.00	20.99	20.89	20.53	20.19	(87)
Temperature du	uring heatin	g periods in	the rest of	dwelling f	rom Table	9, Th2(°C)							
	20.12	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.13	20.13	20.13	20.12	(88)
Utilisation facto	or for gains	for rest of d	welling n2,	m									
	0.99	0.95	0.87	0.71	0.52	0.35	0.23	0.26	0.45	0.78	0.96	0.99	(89)
Mean internal to	emperature	e in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	∋c)						
	19.13	19.49	19.83	20.05	20.12	20.14	20.14	20.14	20.13	20.02	19.55	19.06	(90)
Living area fract	ion								Li	ving area ÷	(4) =	0.35	(91)
Mean internal to	emperature	e for the wh	ole dwellin	g fLA x T1 +	+(1 - fLA) x	Т2							
	19.52	19.84	20.15	20.35	20.42	20.44	20.44	20.44	20.43	20.32	19.89	19.45	(92)
Apply adjustme	nt to the m	ean internal	temperatu	ure from Ta	ble 4e whe	ere appropr	iate						
	19.52	19.84	20.15	20.35	20.42	20.44	20.44	20.44	20.43	20.32	19.89	19.45	(93)
8. Space heating				-				-	-		. .	-	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	_				1 -	1		1	-			1	٦
	0.98	0.95	0.87	0.72	0.54	0.37	0.25	0.28	0.47	0.79	0.96	0.99	(94)
Useful gains, ηn	-	1			1	1				1		1	٦
	630.15	775.06	837.88	781.70	621.46	417.03	274.50	288.4	451.73	638.96	633.53	586.22	95)
Monthly averag										1	1	1	٦
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	<u>+0</u>	14.10	10.60	7.10	4.20	96) (96)
Heat loss rate fo		-			1					1		T	-
	1116.21	1093.60	996.63	828.37	629.50	417.74	2	288.5	454.64	702.09	927.03	1109.54	(97)
Space heating re	-				5)m] x (41)					1		1	7
	361.63	214.06	118.11	33.60		0.0	0.00	0.00	0.00	46.97	211.32	389.35	
									∑(98	8)15, 10		1381.02	」(98) □
Space heating re	equirement	: kWh/m²/ye	ear				Ť			(98)	÷ (4)	18.05	(99)
9b. Energy req	uirements	- communit	v heating a	cheme									
Fraction of space					m (table 🖬					'0' if ı	none	0.00	(301)
Fraction of space			· · · · · · · · · · · · · · · · · · ·			_,				1 - (30		1.00	(302)
Fraction of com										V -	· ,	1.00	(303a)
Fraction of total	-			: pum						(302) x (303	3a) =	1.00	(304a)
Factor for contr					nmunity sp	ace heating				. , .	,	1.00	(305)
Factor for charg			-									1.00	(305a)
Distribution loss	-											1.05	(306)
	,	,	,	0,							L		
Space heating													
Annual space he	eating requi	irement						1	381.02]			(98)
Space heat from								L		x (305) x (30	06) = 1	450.07	(307a)
								(50	, (==),	(= >=) (5)	·,] (
Water heating													
Annual water he	eating requ	irement						1	749.80	1			(64)
Water heat from										」 (305a) x (30	06) = 1	1837.29	(310a)
Electricity used							0.01	(° ', 1 × [(307a)			, <u> </u>	32.87	(313)
Licenterry used	. St ficut uls						0.01	- ·· [(50/a)			~/] -	32.07	

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

0.00	(331)
333.80	(332)
3621.17	(338)

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	1450.07	x	4.24	x 0.01 =	61.48	(340
Water heating from heat pump	1837.29	x	4.24	x 0.01 =	77.90	(342
Electricity for lighting	333.80	x	13.19	x 0.01 =	44.03	(350
Additional standing charges					120.00	(351
Total energy cost			(340a)(342e) + (345)(354) =	303.41	(355
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356
Energy cost factor (ECF)					1.05	(357
SAP value					85.37	
SAP rating (section 13)					85	(358
SAP band					В	
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		Er sion factor		Emissions (kg/year)	
missions from other sources (space heating)						
fficiency of heat pump	350.00					(36
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a)	= 95 5	x	0.519	=	487.47	(36
Electrical energy for community heat distribution	32.87	x	0.519	=	17.06	(37
Total CO2 associated with community systems					504.53	(37
Total CO2 associated with space and water heating					504.53	(37
Electricity for lighting	333.80	x	0.519	=	173.24	(37
Total CO ₂ , kg/year				(376)(382) =	677.77	(38
Dwelling CO ₂ emission rate				(383) ÷ (4) =	8.86	(38
El value					92.53	
El rating (section 14)					93	(38
El band					А	
13b. Primary energy - community heating scheme						
	Energy		Primary factor		Primary energy	/
	kWh/year				(kWh/year)	
Primary energy from other sources (space heating)	kWh/year				(kWh/year)	

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =

Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution Total primary energy associated with community systems

Total primary energy associated with space and water heating

Electricity for lighting

Efficiency of heat pump

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

2883.49

100.92

2984.41

2984.41

1024.77

4009.18

52.39

(367a)

(367)

(372)

(373)

(376)

(379)

(383)

(384)

350.00

939.25

32.87

333.80

3.07

3.07

3.07

=

=

=

х

х

х



Assessor name	Miss Alicja Kreglew	ska				As	sessor num	iber	4134		
Client						La	st modified		13/06	/2018	
Address	A 2 05 above hobb	y room Inges	stre Road,	London, N\	W5 1XE						
1. Overall dwelling dimen	sions										
			A	rea (m²)			age storey eight (m)		Vo	lume (m³)	
Lowest occupied				88.78](1a) x		2.50] (2a) =		221.95	(3a)
Total floor area	(1a) + (1b) + (1	.c) + (1d)(1	.n) =	88.78] (4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	221.95	(5)
2. Ventilation rate								_			
									m	ⁱ per hour	
Number of chimneys							0	x 40 =		0	(6a)
, Number of open flues						N 7	0	x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	5						0	x 40 =		0	(7c)
									Air d	hanges per hour	r
Infiltration due to chimneys	s. flues. fans. PSVs		(6a)	+ (6b) + (7	. (7b) + (7c) =	30	÷ (5) =		0.14	(8)
If a pressurisation test has b		intended, p			rise continu] (-)		-	
Air permeability value, q50,					of envelope					4.00	(17)
If based on air permeability), otherwis							0.34	(18)
Number of sides on which t	he dwelling is shelter									3	(19)
Shelter factor			\sim				1 -	[0.075 x (19	9)] =	0.78	(20)
Infiltration rate incorporation	ng shelter factor							(18) x (2	0) =	0.26	(21)
Infiltration rate modified fo	r monthly wind speed	d:									
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee	ed from Table U2										_
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4					1	1	1				-
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (a					1						-
0.33	0.32 0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31	(22b)
Calculate effective air chang											٦
If mechanical ventilation	-									N/A	(23a)
If balanced with heat red		-			able 4h					N/A	(23c)
d) natural ventilation or				1	0.50	0.52	0.50		0.54	0.55	
0.55	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 - e				0.52	0.52	0.52	0.52		0.54	0.55	
0.55	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 a	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U W		value, /m².K	Ахк, kJ/K	
Window						23.	.79 x	1.24	= 29.40)			(27)
Exposed floor						88.	.78 x	0.06	= 5.33				(28b
External wall						28.	.81 x	0.18	= 5.19				(29a)
Party wall						32.	.04 x	0.00	= 0.00				(32)
Roof						16.	.11 x	0.12	= 1.93				(30)
Total area of ext	ernal elem	ents ∑A, m²	!			157	.49						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(2	6)(30) + (32) =	41.84	(33)
Heat capacity Cr	n = Σ(А x к))						(28)	.(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (⁻	ſMP) in kJ/r	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) c	alculated us	sing Appen	dix K								15.04	(36)
Total fabric heat	loss									(33) + (36) =	56.88	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcul	ated month	ly 0.33 x (2	25)m x (5)									
	40.64	40.48	40.33	39.61	39.48	38.85	38.85	38.74	39.09	39.48	39.75	40.03	(38)
Heat transfer co	efficient, V	V/K (37)m +	+ (38)m										
	97.52	97.37	97.21	96.49	96.36	95.73	95.73		95.98	96.36	96.63	96.92	
									\verage =	<u>∑(</u> 39)112	/12 =	96.49	(39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)										
	1.10	1.10	1.09	1.09	1.09	1.08	1.08	J8	1.08	1.09	1.09	1.09	
									Average =	<u>∑(40)112</u>	/12 =	1.09	(40)
Number of days	in month (Table 1a)			•								
	31.00	28.00	31.00	30.00	31.00	3 7	31.00	1.00	30.00	31.00	30.00	31.00	(40)
A Motor boot													
4. Water heating		equiremen	L									2.64	
Assumed occupa		icogo in litr	ac nor day l	/d average		26						2.61 96.16	(42)
Annual average	Jan	Feb	es per day Mar	Apr	+ (Nav	30	Jul	Aug	Sep	Oct	Nov	90.10 Dec	(43)
Hot water usage						ole 1c x (43		Aug	Seh	000	NOV	Dec	
not water usage	105.77	101.92	98.08	4.27	90	86.54	86.54	90.39	94.23	98.08	101.92	105.77	7
	105.77	101.92	98.08	↓ + .2	90.5	80.54	00.34	90.39	54.25	<u>Σ(44)1</u>	·	1153.87	 (44)
Energy content	of hot wate	or used = 1.1	18 x Vd m x	nm x a/	3600 kWh/m	onth (see	Tahlos 1h	1c 1d)		2(44)1	12	1155.87	_ (44)
Lifergy contents	156.86	137.19	141.56	123.42	118.42	102.19	94.69	108.66	109.96	128.15	139.88	151.91	7
	150.80	137.13	141.50	125.42	110.42	102.19	94.09	108.00	109.90	<u>Σ(45)1</u>	·	1512.90	 (45)
Distribution loss	0 15 x (45	Jm								Ζ(43)1	12	1312.90	_ (43)
Distribution 1055	23.53	20.58	21.23	18.51	17.76	15.33	14.20	16.30	16.49	19.22	20.98	22.79	(46)
Storage volume							14.20	10.50	10.45	15.22	20.50	2.00	(47)
Water storage lo		ading any 5		1113 31014		ne vesser						2.00	_ (+/)
b) Manufacturer		l loss factor	is not know	vn									
Hot water sto					V)							0.02	(51)
Volume facto	-			vii, iiti c, uu	¥7							3.91	(52)
Temperature												1.00	(52)
Energy lost fr			/h/dav) (47	7) x (51) x (52) x (53)							0.12	(55)
Enter (50) or (54		conse (KM	,,, (+)	, ^ (3±) ^ (0.12	(55)
Water storage lo		ed for each	month (59	5) x (41)m							Ĺ	0.12	
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
	5.05	5.55	5.05	5.57	5.05	3.37	5.05	5.05	5.57	5.05	5.57	5.05	

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56) 3.69 3.33 3.69 3.57 3.69 3.57 3.69 3.69 3.57 3.69 3.57 3.69 (57)Primary circuit loss for each month from Table 3 23.26 23.26 21.01 23.26 22.51 22.51 23.26 23.26 22.51 23.26 22.51 23.26 (59)Combi loss for each month from Table 3a, 3b or 3c 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (61)Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m 183.80 149.50 145.37 178.85 161.53 168.51 128.27 121.64 135.61 136.04 155.10 165.96 (62)Solar DHW input calculated using Appendix G or Appendix H 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (63)Output from water heater for each month (kWh/month) (62)m + (63)m 183.80 161.53 168.51 149.50 145.37 128.27 136.04 165.96 121.64 135.61 155.10 178.85 1830.19 ∑(64)1...12 = (64)Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] 73.71 65.09 68.63 61.90 60.93 54.84 53.04 57.69 57.43 64.17 67.37 72.07 (65) 5. Internal gains Feb Mar Oct Jan Apr May Jun Jul Aug Sep Nov Dec Metabolic gains (Table 5) 130.43 130.43 130.43 130.43 130.43 130.43 130.47 130.4 130.43 130.43 130.43 130.43 (66)Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 21.11 18.75 15.25 11.55 8.63 7.29 7.87 13.74 17.44 20.35 21.70 (67)3 Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 203.26 180.90 236.82 239.27 233.08 219.90 17 174. 194.08 210.73 226.37 187.61 (68)Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Ta 5 36.04 36.04 36.04 36.04 36.0 36.04 36.04 36.04 36.04 36.04 36.04 (69)Pump and fan gains (Table 5a) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0 (70)Losses e.g. evaporation (Table 5) -104.35 -104.35 -104.35 °4.35 -104,7 .35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 (71) Water heating gains (Table 5) 99.08 96.86 81.5 76.17 71.30 77.54 79.76 86.25 93.58 96.86 92.24 5.9 (72) Total internal gains (66)m + (67)m + (68)m + (69)m +))m + (71)m + (72)m 419.13 417.01 402.70 379 355.92 333.20 318.46 324.61 336.52 359.90 386.79 407.06 (73) 6. Solar gains Access factor Solar flux FF Gains Area g Table 6d m² W/m² specific data specific data w or Table 6b or Table 6c 0.77 36.79 SouthEast х 16.66 x 0.9 x 0.63 0.80 _ 214.10 (77) x х 0.77 NorthWest х 7.13 11.28 x 0.9 x 0.63 0.80 = 28.10 (81) х x Solar gains in watts $\Sigma(74)$ m...(82)m 242.20 421.88 602.03 787.50 919.99 930.02 889.69 788.30 665.86 472.96 291.80 206.17 (83)Total gains - internal and solar (73)m + (83)m 1208.16 1112.91 1002.38 661.33 838.89 1004.73 1167.04 1275.90 1263.22 832.86 678.58 613.23 (84) 7. Mean internal temperature (heating season) 21.00 (85) Temperature during heating periods in the living area from Table 9, Th1(°C) Feb Nov Dec Jan Mar Apr May Jun Jul Aug Sep Oct

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Utilisation factor for gains for living area n1,m (see Table 9a)			
0.99 0.98 0.94 0.84 0.67 0.48 0.35 0.39 0.63 0.91	0.99	1.00	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	0.99	1.00	_ (80)
	20.28	19.91	(07)
	20.28	19.91	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)		20.01	
20.00 20.00 20.01 20.01 20.02 20.02 20.02 20.02	20.01	20.01	(88)
Utilisation factor for gains for rest of dwelling n2,m			٦ ()
0.99 0.98 0.93 0.80 0.61 0.41 0.27 0.31 0.55 0.87	0.98	1.00	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		-	_
18.63 18.98 19.41 19.80 19.97 20.01 20.02 20.02 20.00 19.73	19.10	18.56	(90)
Living area fraction Living area	÷ (4) =	0.44	(91)
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2			_
19.22 19.52 19.89 20.24 20.40 20.44 20.45 20.43 20.17	19.62	19.16	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate			
19.22 19.52 19.89 20.24 20.40 20.44 20.45 20.45 20.43 20.17	19.62	19.16	(93)
8. Space heating requirement			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov	Dec	
Utilisation factor for gains, nm		1	_
0.99 0.97 0.93 0.81 0.63 0.44 0.30 0.35 0.59 0.88	0.98	0.99	(94)
Useful gains, ηmGm, W (94)m x (84)m			_
655.38 816.28 930.85 947.62 804.50 555.33 368.07 3' 28 589.38 732.97	663.89	609.32	(95)
Monthly average external temperature from Table U1			
4.30 4.90 6.50 8.90 11.70 14.60 1 16.4 14.10 10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (9 1			
1454.91 1423.63 1301.98 1094.21 82 559. 368.55 387.22 607.07 922.52	1209.63	1449.60	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (9 n] x (41)m			
594.85 408.14 276.12 105.54 25.27 0.0 0.00 0.00 141.03	392.93	625.17	
Σ(98)15, 10	12 =	2569.05	(98)
Space heating requirement kWh/m ² /year (98	3) ÷ (4)	28.94	(99)
			_
9b. Energy requirements - community heating score			_
Fraction of space heat from secondary/supplementaystem (table 11) '0' i	f none	0.00	(301)
Fraction of space heat from community system 1 - (301) =	1.00	(302)
Fraction of community heat from heat pump		1.00	(303a)
Fraction of total space heat from community heat pump(302) x (3	03a) =	1.00	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating			
Annual space heating requirement 2569.05			(98)
Space heat from heat pump (98) x (305) x (306) =	2697.51	(307a)
	·		
Water heating			
			(
			(64)
	306) =	1921 70	(64) (310a)
Annual water heating requirement 1830.19 Water heat from heat pump (64) x (303a) x (305a) x (Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(312e)		46.19	(64)] (310a)] (313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L) Total delivered energy for all uses

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = 4992

0.00 (331) 372.85 (332) 4992.06 (338)

(307) + (309) + (310) + (312) + (315) + (331) + (3

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	2697.51	x	4.24	x 0.01 =	114.37	(340a)
Water heating from heat pump	1921.70	x	4.24	x 0.01 =	81.48	(342a)
Electricity for lighting	372.85	x	13.19	x 0.01 =	49.18	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	365.03	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.15	(357)
SAP value					84.01]
SAP rating (section 13)					84	(358)
SAP band					В]
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		Fmission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of heat pump	350.0	·			[(367a)
CO2 emissions from heat pump $[(307a)+(310a)] \times 100 \div (367) =$	1319.77	x	0.519	=	684.96	(367) (367)
Electrical energy for community heat distribution		x	0.519	=	23.97	(372)
Total CO2 associated with community systems					708.94	(373)
Total CO2 associated with space and water heat					708.94	(376)
Electricity for lighting	372.85	x	0.519	=	193.51	(379)
Total CO ₂ , kg/year				(376)(382) =	902.45	(383)
Dwelling CO ₂ emission rate				(383) ÷ (4) =	10.16 90.96	_ (384) _
El rating (section 14)					90.96	
El band					B	_ (385) _
	*				В	
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	/
Primary energy from other sources (space heating)	[]					
Efficiency of heat pump	350.00				· · · · · · · · · · · · · · · · · · ·	(367a)
Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) =		x	3.07	=	4051.71	(367)
Electrical energy for community heat distribution	46.19	x	3.07	=	141.81	(372)
Total primary energy associated with community systems					4193.52	(373)
Total primary energy associated with space and water heating	[]				4193.52	(376)
Electricity for lighting	372.85	x	3.07	=	1144.65	(379)
Primary energy kWh/year					5338.16	(383)
Dwelling primary energy rate kWh/m2/year					60.13	(384)



Assessor name	Miss Alicja K	Greglewska				As	sessor num	ber	4134		
Client						Las	st modified		13/06	/2018	
Address	A 4 01 Inges	tre Road, Lon	don, NW5 1XE								
1. Overall dwelling dimens	sions										
				Area (m²)			age storey ight (m)		Va	lume (m³)	
Lowest occupied				74.40] (1a) x		2.50	(2a) =		186.00	(3a)
Total floor area	(1a) + (1	1b) + (1c) + (1	.d)(1n) =	74.40	(4)						
Dwelling volume						(3a)	+ (3b) + (3e	c) + (3d)(3	n) =	186.00	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	5						0	x 40 =		0	(7c)
									Air	changes per hour	r
Infiltration due to chimneys	flues fans D	SV/c	16:	a) + (6b) + (7	(7b) + (7c) -	30	÷ (5) =		0.16	(8)
If a pressurisation test has b					vise continu			. (3) -		0.10] (0)
Air permeability value, q50,					of envelope		5 (10)			4.00	(17)
If based on air permeability)] + (8), other			uicu				0.36	(18)
Number of sides on which t			5] ((6), othe)		0)					3	(10)
Shelter factor		shellere					1 -	[0.075 x (19	a)] = [0.78	(20)
Infiltration rate incorporation	ag choltor fact	or					1 -	(18) x (2		0.28	(20)
Infiltration rate modified fo								(10) X (2	0) – [0.28	_ (21)
Jan	Feb		pr May	Jun	Jul	Δυσ	Sep	Oct	Nov	Dec	
Monthly average wind spee			pr May	Jun	Jui	Aug	Seh	000	NOV	Dec	
5.10			40 4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	5.00	4.90 4.	40 4.50	5.80	5.60	5.70	4.00	4.50	4.50	4.70	_ (22)
1.28	1.25	1.23 1.	10 1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (al					0.95	0.93	1.00	1.00	1.15	1.10	_ (22a)
0.36	-		31 0.30	0.27	0.27	0.26	0.28	0.30	0.32	0.33	(22b)
Calculate effective air chang				0.27	0.27	0.20	0.20	0.50	0.52	0.35	_ (220)
If mechanical ventilation	-									N/A	(23a)
If balanced with heat red	-			actor from T	ahle 4h					N/A N/A	(23a)
d) natural ventilation or		-	-							11/74	_ (230)
0.56	· · · · ·		55 0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(24d)
Effective air change rate - e	· · · · · ·				0.54	0.55	0.54	0.55	0.55	0.35	_ (24U)
		0.56 0.		0.54	0.54	0.53	0.54	0.55	0.55	0.55	(25)
0.50	0.50	0.50 0.		0.54	0.54	0.55	0.54	0.55	0.55	0.55	_ (23)



3. Heat losses a	and heat lo	ss paramet	er.										
Element			а	Gross rea, m²	Openings m ²	Net a A, i		U-value W/m²K	A x U V		value, /m².K	Ахк, kJ/K	
Window						30.	15 x	1.24	= 37.2	6			(27)
External wall						37.	21 x	0.18	= 6.70)			(29a)
Party wall						47.	00 x	0.00	= 0.00)			(32)
Roof						24.	36 x	0.12	= 2.92	 !]			(30)
Total area of ext	ernal elem	ents ∑A, m²	2			91.	72						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(2	6)(30) + (32) =	46.88	(33)
Heat capacity Cr	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass pa		MP) in kJ/r	m²K									250.00	(35)
Thermal bridges				dix K								15.59	(36)
Total fabric heat			0 11							(33) + (36) =	62.47	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ıly 0.33 x (2					, C					
	34.60	34.45	34.30	33.60	33.47	32.86	32.86	32.75	33.10	33.47	33.74	34.01	(38)
Heat transfer co													
	97.07	96.92	96.77	96.07	95.94	95.33	95.33	95.21	95.56	95.94	96.20	96.48	7
										Σ(39)112	·	96.07	(39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)							2()	,		
	1.30	1.30	1.30	1.29	1.29	1.28	1.2	1.2	1.28	1.29	1.29	1.30	7
	1.00	2.00	2.00		1 2.25	1.10				Σ(40)112	·	1.29	(40)
Number of days	in month (Fable 1a)							, in clicage	2()	,	1.20	
, .	31.00	28.00	31.00	30.00	31.00	30.00		31.00	30.00	31.00	30.00	31.00	(40)
	01.00	20.00	01.00	00.00	1 02:00 1					01.00	00.00	01.00	
4. Water heati	ng energy r	equiremen	it					•					
Assumed occupa	ancy, N											2.35	(42)
Annual average	hot water u	isage in litr	es per day '	Vd,average	(25 x M"	-0-						89.97	(43)
	Jan	Feb	Mar	Apr	way	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach mont ^µ	' m = fact	tor from Tab	le 1 . (43)							
	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96	
										∑(44)1.	12 =	1079.59	(44)
Energy content	of hot wate	r used = 4.2	18 x Vd,m x	nm (m/3	3600 kWh/m	onth (see	Tables 1b	o, 1c 1d)					
	146.76	128.36	132.45	115 7	110.80	95.61	88.60	101.67	102.88	119.90	130.88	142.13	
										∑(45)1.	12 =	1415.52	(45)
Distribution loss	0.15 x (45)m											
	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	HRS storag	ge within sam	ne vessel						2.00	(47)
Water storage lo	oss:												
b) Manufacture	r's declared	loss factor	is not know	vn									
Hot water st	orage loss f	actor from	Table 2 (kV	Vh/litre/da	y)							0.02	(51)
Volume facto	or from Tab	le 2a										3.91	(52)
Temperature	e factor from	n Table 2b										1.00	(53)
Energy lost fi	rom water s	torage (kW	/h/day) (47	7) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54	l) in (55)											0.12	(55)
													-
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									
Water storage lo	oss calculate	ed for each 3.33	month (55 3.69	5) x (41)m 3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit le	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month	from Table	3a, 3b or 30	C									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	alculated fo	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)n	n + (59)m ·	+ (61)m				
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08	(62)
Solar DHW inpu													(/
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa						ļ Į	0.00	0.00	0.00	0.00	0.00	0.00	(03)
output nom wa	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08	
	1/5./1	132.70	139.40	141.55	137.75	121.09	115.55	128.02	128.90			1	(64)
lloat gains from	water beat	ing (k) N/h /m	onth) 0.25		(4E) m + (61	\ml + 0.8 v	[(46) - (1	-7)m + (F0)ml	∑(64)1	12 =	732.81	(64)
Heat gains from	-									64.42	64.20	60.00	(65)
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.36	55.07	61.43	64.38	68.82	(65)
5. Internal gair	IS												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains				•									
Sector Barris	117.40	117.40	117.40	117.40	117.40	117.40	117.40	11-10	117.40	117.40	117.40	117.40	(66)
Lighting gains (c							117.40		117.40	117.40	117.40	117.40	(00)
	18.48	16.42	13.35			6.38		8.06	12.02	15.27	17.00	19.00	(67)
				10.11	7.56		6.	8.96	12.03	15.27	17.82	19.00	(67)
Appliance gains					· · · · · · · · · · · · · · · · · · ·				170.00	100.00			(60)
	207.34	209.49	204.07	192.53	177.96	164.26	12	1 96	158.39	169.93	184.50	198.19	(68)
Cooking gains (c					· · · · · ·							,	
	34.74	34.74	34.74	34.74	34.74	74	34.74	1.74	34.74	34.74	34.74	34.74	(69)
Pump and fan ga													
	0.00	0.00	0.00	0.00	0.00	0.00	<u> </u>	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap	oration (Tal	ole 5)											
	-93.92	-93.92	-93.92	-93.92	-93.92	-93.¢	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)
Water heating g	ains (Table	5)											
	94.56	92.49	88.17	82.30	78.49	73.13	68.57	74.41	76.49	82.56	89.42	92.49	(72)
Total internal ga	ins (66)m +	- (67)m + (6	8)m + (69)r	n (70°, -	+ (71)n+ (7	72)m							
	378.61	376.62	363.81	3. 16	322.23	302.00	288.80	294.56	305.12	325.98	349.96	367.91	(73)
6. Solar gains	_		_		-		-						
			Access fa Table		Area m²		ar flux //m²	spec	g sific data	FF specific d	ata	Gains W	
			Tuble	04			,	•	able 6b	or Table			
SouthWest			0.77	7 X [16.68	x 30	6.79 x	0.9 x	0.63 x	0.80	=	214.36	(79)
SouthEast			0.77		3.47				0.63 x				(77)
NorthWest			0.77		10.00				0.63 x				(81)
Solar gains in wa	atts 5(74)m	(82)m	0.77		10.00		1.20		0.05	0.00		55.41	(01)
Solar gains in we	298.36	. ,	749.04	095 12	1156.62	1171 66	1110.07	000.25	020 50	FOF FO	250.75	252.70	(02)
Total gains into		521.30	748.04	985.13	1156.62	1171.66	1119.87	988.35	829.58	585.52	359.75	253.79	(83)
Total gains - inte				1000.00	1470.05	1470.05	1400.07	1202.07	1124 70	014 50	700 74	C24 70	(0.4)
	676.97	897.92	1111.85	1328.29	1478.85	1473.65	1408.67	1282.91	1134.70	911.50	709.71	621.70	(84)
7. Mean intern	al tempera	ture <u>(heati</u> i	ng s <u>eason)</u>										
Temperature du				irea from T	able 9, Th1	(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
				•				Ŭ					

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Utilisation factor for gains for living area n1,m (see Table 9a)	
	0.30 0.34 0.56 0.86 0.97 0.99 (86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	
19.83 20.15 20.51 20.82 20.95 20.99 2	21.00 21.00 20.97 20.73 20.20 19.77 (87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)	
19.84 19.84 19.84 19.85 19.85 19.86	19.86 19.86 19.85 19.85 19.85 19.84 (88)
Utilisation factor for gains for rest of dwelling n2,m	
0.99 0.95 0.88 0.71 0.51 0.34	0.22 0.26 0.48 0.81 0.96 0.99 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
18.32 18.77 19.27 19.66 19.81 19.85	19.86 19.86 19.83 19.58 18.87 18.23 (90)
Living area fraction	Living area ÷ (4) = 0.36 (91)
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	
18.86 19.26 19.71 20.07 20.22 20.26	20.26 20.26 20.24 19.99 19.34 18.78 (92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	ie in the second s
18.86 19.26 19.71 20.07 20.22 20.26	20.26 20.26 20.24 19.99 19.34 18.78 (93)
8. Space heating requirement	
Jan Feb Mar Apr May Jun	Jul Aug Sep Oct Nov Dec
Utilisation factor for gains, ηm	
0.98 0.95 0.87 0.72 0.54 0.36	0.25 0.29 0.50 0.82 0.96 0.99 (94)
Useful gains, ηmGm, W (94)m x (84)m	
664.36 850.48 969.79 961.89 792.31 535.96 3	348.65 3 .69 572.68 744.02 680.26 613.29 (95)
Monthly average external temperature from Table U1	
4.30 4.90 6.50 8.90 11.70 14.60	1 <u>16.4</u> 14.10 10.60 7.10 4.20 (96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (9 1	
1413.37 1391.96 1278.21 1073.28 8* 539.2 3	349.07 367.71 586.61 900.84 1177.92 1406.50 (97)
Space heating requirement, kWh/month 0.024 x [(97)m - (9 n] x (41)m	
557.26 363.88 229.47 80.20 18.55 0.0	0.00 0.00 0.00 116.68 358.31 590.14
	Σ(98)15, 1012 = <u>2314.49</u> (98)
Space heating requirement kWh/m ² /year	(98) ÷ (4) 31.11 (99)
9b. Energy requirements - community heating scheme	
Fraction of space heat from secondary/supplementa, ystem (table 11)	'0' if none 0.00 (301)
Fraction of space heat from community system	1 - (301) = 1.00 (302)
Fraction of community heat from heat pump	1.00 (303a)
Fraction of total space heat from community heat pump	$(302) \times (303a) = 1.00$ (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	(302) × (3038) - (3048) 1.00 (305)
Factor for charging method (Table 4c(3)) for community water heating	1.00 (305a)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Distribution loss factor (Table 120) for community nearing system	1.03 (500)
Space heating	
Annual space heating requirement	2314.49 (98)
Space heat from heat pump	(98) x (304a) x (305) x (306) = 2430.22 (307a)
Space near noni near pullip	(30/3) - (30/3) × (300) - (2430.22 (30/3)
Water heating	
Annual water heating requirement	1732.81 (64)
Annuar water nearing requirement	1/32.01 (04)
	$(64) \times (2022) \times (2052) \times (206) = 1010 \text{ AE}$
Water heat from heat pump Electricity used for heat distribution	$(64) \times (303a) \times (305a) \times (306) = 1819.45 $ (310a) $0.01 \times [(307a)(307e) + (310a)(310e)] = 42.50 $ (313)

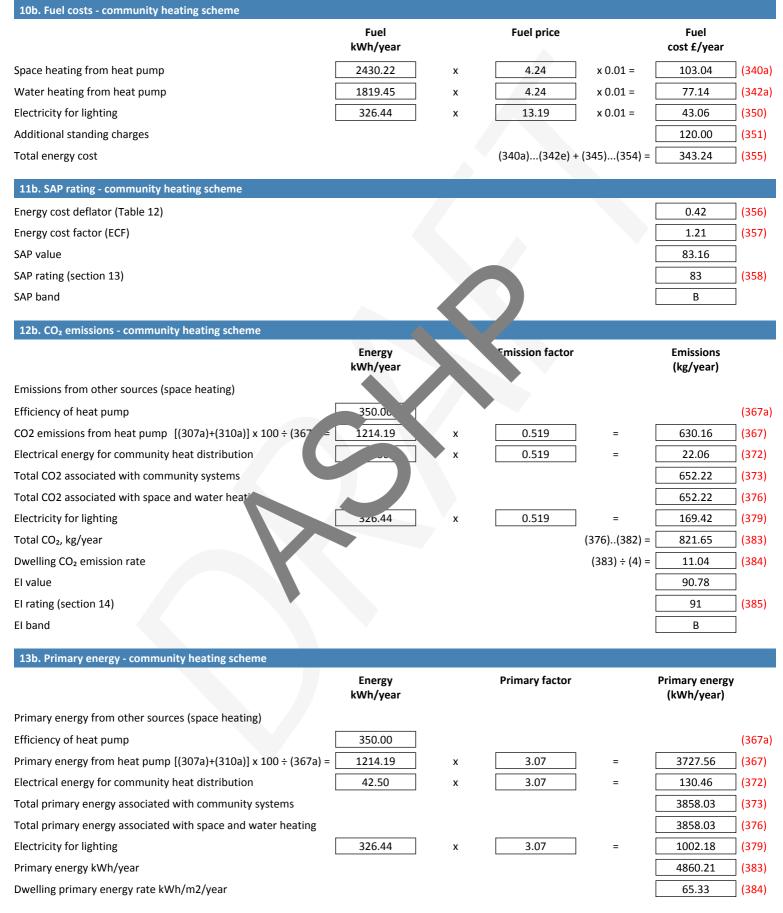
Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

```
(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = 4576.11
```

0.00 (331) 326.44 (332) 4576.11 (338)





Assessor name	Miss Alicja Kreglev	/ska				As	sessor num	iber	4134		
Client						La	st modified		13/06	/2018	
Address	A 4 02 Ingestre Ro	ad, London, I	NW5 1XE								
1. Overall dwelling dimens	sions										
			Α	area (m²)			age storey eight (m)		Vo	olume (m³)	
Lowest occupied				76.52	<mark>](1a)</mark> x		2.50] (2a) =		191.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1	Ln) =	76.52	(4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	191.30	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0] x 40 =		0	(6a)
Number of open flues							0] x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	 (7b)
Number of flueless gas fires	5						0	x 40 =		0	(7c)
								1	Air	changes pe	r
					//			1 (-)		hour	7 (2)
Infiltration due to chimneys		intended a			c (7b) + (30	÷ (5) =		0.16	(8)
If a pressurisation test has b					ise continu		0(16)			4.00	
Air permeability value, q50,					of envelope	e area				4.00	(17)
If based on air permeability			s), other vi	se (1 . (1	6)					0.36	(18)
Number of sides on which t	he dwelling is shelte							[0 0== (//		3	(19)
Shelter factor							1 -	[0.075 x (19		0.78	_ (20)
Infiltration rate incorporation								(18) x (2	0) =	0.28	(21)
Infiltration rate modified fo						_	-	•		_	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee		1		1							
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4		1.10	1.00	0.05	0.05	0.00	1.00	4.00	1.42	1.10	
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (al					0.00	0.00	0.00		0.04	0.00	
0.35	0.35 0.34	0.30	0.30	0.26	0.26	0.26	0.28	0.30	0.31	0.32	(22b)
Calculate effective air chang											
If mechanical ventilation	-	• •								N/A	(23a)
If balanced with heat red		-			able 4h					N/A	(23c)
d) natural ventilation or		-								1] (a. 1)
0.56	0.56 0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)
Effective air change rate - e	· · · · ·			0	0 = 5	0			•		_ (a=)
0.56	0.56 0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)



3. Heat losses a	and heat los	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U W		/alue, /m².K	Ахк, kJ/K	
Window						19.	92 x	1.24	= 24.62				(27)
External wall						12.	70 x	0.18	= 2.29				(29a)
Party wall						64.	09 x	0.00	= 0.00				(32)
Roof						9.6	65 x	0.12	= 1.16				(30)
Total area of ext	ternal eleme	ents ∑A, m²				42.	27						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26	5)(30) + (32) =	28.06	(33)
Heat capacity Cr	m = ∑(А x к)							(28)	.(30) + (32) +	- (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/n	۱²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	lculated us	ing Appen	dix K								10.11	(36)
Total fabric heat	t loss									(33) + (36) =	38.17	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	35.49	35.34	35.19	34.49	34.35	33.74	33.74	33.63	33.98	34.35	34.62	34.90	(38)
Heat transfer co	efficient, W	/K (37)m +	(38)m										
	73.66	73.50	73.35	72.65	72.52	71.91	71.91	71.80	72.15	72.52	72.79	73.06	
									Average = ∑	(39)112,	/12 =	72.65	(39)
Heat loss param	eter (HLP),	W/m²K (39)m ÷ (4)										
	0.96	0.96	0.96	0.95	0.95	0.94	0.5	0.9	0.94	0.95	0.95	0.95	
									Average = ∑	(40)112,	/12 =	0.95	(40)
Number of days	in month (1	able 1a)											
	31.00	28.00	31.00	30.00	31.00	30.00	.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heati													
Assumed occupa		equiremen										2.20	
		cago in litre	a nor dou l	(d average								2.39	(42)
Annual average	Jan	Feb	Mar	Apr		Jun	Jul	Aug	Sep	Oct	Nov	91.05 Dec	(43)
Hot water usage					tor from Tab			Aug	зер	000	NOV	Dec	
not water usage	100.15	96.51	92.87	89.25	85.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	٦
	100.15	90.51	92.87	89.25	<u>8</u> C.CA	81.94	01.94	63.38	89.23	<u>Σ(44)1</u>	·	1092.55	(44)
Energy content	of hot wate	r used = 4.1	.8 x Vd,m x	nm (m/s	3600 kWh/m	onth (see	Tables 1t	o, 1c 1d)		2(44)1	.12	1092.33	_ (44)
	148.52	129.90	134.04	116 5	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	
										∑(45)1	.12 =	1432.51	(45)
Distribution loss	0.15 x (45)	m											
	22.28	19.48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume	(litres) inclu	iding any so	olar or WW	'HRS storag	ge within sam	ne vessel						2.00	(47)
Water storage lo	oss:												
b) Manufacture	r's declared	loss factor	is not knov	vn									
Hot water sto	orage loss fa	actor from ⁻	Table 2 (kV	/h/litre/da	y)							0.02	(51)
Volume facto	or from Tabl	e 2a										3.91	(52)
Temperature	e factor fron	n Table 2b										1.00	(53)
Energy lost fi	rom water s	torage (kW	h/day) (47	7) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54	l) in (55)											0.12	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
						[(4]]							

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit l	loss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	each month	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi] (- ,
·	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	(62)
Solar DHW inpu						122.04	110.01	125.04	150.20	140.25	150.55	170.70] (02)
	r		1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.1.1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	r		-	 I								<u>т </u>	7
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	
										∑(64)1	12 = 1	1749.80	(64)
Heat gains from	water heat	ing (kWh/m	nonth) 0.25	5 × [0.85 ×	(45)m + (61)m] + 0.8 ×	: [(46)m + (57)m + (59)	m]				_
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38	(65)
E Internal acti													
5. Internal gain									_				
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)												-
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	110-58	119.68	119.68	119.68	119.68	(66)
Lighting gains (c	calculated in	Appendix L	., equation	L9 or L9a),	also see Ta	ble 5							
	18.90	16.79	13.65	10.34	7.73	6.52	7.	9.16	12.30	15.61	18.22	19.43	(67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L1	13a), also se	ee Table 5							
	212.01	214.21	208.67	196.87	181.97	167.97	1 61	1 41	161.96	173.76	188.66	202.66	(68)
Cooking gains (o	calculated in	Appendix I	L, equation	L15 or L15	a), also see	Table 5							-
	34.97	34.97	34.97	34.97	34.97	97	34.97	4.97	34.97	34.97	34.97	34.97	(69)
Pump and fan g] (,
	0.00	0.00	0.00	0.00	0.00	0.00	٦.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap			0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00] (/0)
LUSSES E.g. Evap	, 	,	05.74	05.74			05.74	05.74	05.74	05 74	05.74	05.74] (74)
	-95.74		-95.74	-95.74	-95.74	-95.7	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Water heating g	- ·												7
	95.35	93.25	88.88	82.94	79.09	73.66	69.05	74.96	77.06	83.20	90.14	93.26	(72)
Total internal ga	ains (66)m +	+ (67)m + (6	8)m + (69)	m (70°	+ (71)n+ (7	72)m							_
	385.17	383.15	370.11	3. 05	327.69	307.05	293.61	299.43	310.21	331.48	355.93	374.25	(73)
6. Solar gains													
6. Solar gains							<i>c</i> i						
			Access f Table		Area m²		ar flux V/m²	speci	g ific data	FF specific d	lata	Gains W	
						-	,	•	able 6b	or Table			
SouthWest			0.7	7 X	16.45	x 3	6.79 x	0.9 x C).63 x	0.80	=	211.40	(79)
SouthEast			0.7		3.47				0.63 x			44.59	(77)
Solar gains in w	atts 5(71)m	(82)m	0.7		5.47		<u></u>		, x	0.00](,,)
			500.02	720.25	020.02	022.02	702 52	726.20	646.02	401.02	200.02	210.00	
	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08	(83)
Total gains - inte	r												٦
	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	662.55	593.32	(84)
7. Mean interr	nal tempera	ture (heatii	ng season)										
Temperature du				aroa from T	able 0 The	(°C)						21.00] (or)
remperature di							11	A	6 a -	0t		21.00	(85)
Lindle of the	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or tor gains f	or living are	ea n1,m (se	e Table 9a)									

	0.99	0.96	0.89	0.75	0.57	0.41	0.29	0.32	0.52	0.82	0.97	0.99	(86)
Mean internal te	emp of living	g area T1 (s	steps 3 to 7	in Table 9c	.)								_
	20.24	20.50	20.74	20.92	20.98	21.00	21.00	21.00	20.99	20.89	20.53	20.19	(87)
Temperature du	iring heating	g periods ir	the rest of	dwelling fr	om Table 9	9, Th2(°C)							-
	20.11	20.12	20.12	20.13	20.13	20.13	20.13	20.14	20.13	20.13	20.12	20.12	(88)
Utilisation facto	r for gains fo	or rest of d	welling n2,	n							•		-
	0.99	0.95	0.87	0.71	0.52	0.35	0.23	0.26	0.45	0.78	0.96	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	T2 (follow	steps 3 to	7 in Table 9	e)						-
	19.12	19.48	19.82	20.04	20.11	20.13	20.13	20.13	20.13	20.02	19.54	19.05	(90)
Living area fract	ion		•						Liv	ving area ÷	(4) =	0.35	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	(1 - fLA) x T	Т2							_
	19.51	19.83	20.14	20.35	20.42	20.43	20.43	20.43	20.43	20.32	19.88	19.44	(92)
Apply adjustmer	nt to the me	an interna	l temperatu	ire from Ta	ble 4e whe	ere appropr	iate						
	19.51	19.83	20.14	20.35	20.42	20.43	20.43	20.43	20.43	20.32	19.88	19.44	(93)
		_										·	_
8. Space heatir									_				
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	_	-								1		1	1
	0.98	0.95	0.87	0.72	0.54	0.37	0.25	0.00	0.47	0.79	0.96	0.99	(94)
Useful gains, ηm			1							1			1
	630.21	775.40	838.94	783.79	623.75	418.71	275	289.5	453.47	640.29	633.74	586.26	(95)
Monthly average		-	1							1			7
	4.30	4.90	6.50	8.90	11.70	14.60	_ ~0	_ 10	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo		-	i							1	1	- I	-
	1120.40	1097.74	1000.49	831.74	632.10	- 45	275.71	9.69	456.50	704.87	930.55	1113.74	(97)
Space heating re			1	[(97)m - (9!	5)m ¹	m		~		1	r	1	7
	364.70	216.61	120.19	34.52	6.21	0.00	2.00	0.00	0.00	48.05	213.70	392.45]
									∑(98	8)15, 10		1396.43] (98) _
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	18.25	(99)
9b. Energy req	uirements -	communit	ty heating	hen.									
Fraction of space				n tv svs	1)	.)				'0' if r	none	0.00	(301)
Fraction of space										1 - (30		1.00	(302)
Fraction of com										,	,	1.00	(303a)
Fraction of total	-			gmug						(302) x (303	3a) =	1.00	(304a)
Factor for contro	·		,		munity spa	ace heating				(, (1.00	(305)
Factor for charg		-										1.00	(305a)
Distribution loss	-				-							1.05	(306)
Distribution 1055			community	neuting sy	stem							1.05] (300)
Space heating													
Annual space he	eating requir	rement						1	396.43	1			(98)
Space heat from										」 x (305) x (30	26) =	1466.26	(307a)
								(,] (,
Water heating													
Annual water he	eating requi	rement						1	749.80]			(64)
Water heat from										」 (305a) x (30)6) =	1837.29	(310a)
Electricity used f							0.01			(303 <i>a)</i> x (30 310a)(310		33.04	(313)
	. Si neur uist						0.01				-11 =	55.07	

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	0.00	(331)
	333.80	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	3637.35	(338)

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	1466.26	x	4.24	x 0.01 =	62.17	(340a)
Water heating from heat pump	1837.29	x	4.24	x 0.01 =	77.90	(342a)
Electricity for lighting	333.80	x	13.19	x 0.01 =	44.03	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	304.10	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.05	(357)
SAP value					85.34]
SAP rating (section 13)					85	(358)
SAP band					В]
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		_mission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of heat pump	3. 7					(367a)
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a) =	943.8	x	0.519	=	489.87	(367)
Electrical energy for community heat distribution	33.04	x	0.519	=	17.15	(372)
Total CO2 associated with community systems					507.01	(373)
Total CO2 associated with space and water heating					507.01	(376)
Electricity for lighting	333 °	x	0.519	=	173.24	(379)
Total CO ₂ , kg/year				(376)(382) =	680.26	(383)
Dwelling CO₂ emission rate				(383) ÷ (4) =	8.89	(384)
El value					92.50]
El rating (section 14)					92	(385)
El band					А]
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources (space heating)						
Efficiency of heat pump	350.00					(367a)
Primary energy from heat pump [($307a$)+($310a$)] x 100 ÷ ($367a$) =	943.87	х	3.07	=	2897.68	(367)
Electrical energy for community heat distribution	33.04	х	3.07	=	101.42	(372)
Total primary energy associated with community systems					2999.10	(373)
Total primary energy associated with space and water heating					2999.10	(376)
Electricity for lighting	333.80	х	3.07	=	1024.77	(379)
Primary energy kWh/year					4023.87	(383)
Dwelling primary energy rate kWh/m2/year					52.59	(384)



Assessor name	Miss Alicja Kregle	wska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 5 01 Ingestre Ro	oad, London,	NW5 1XE								
1. Overall dwelling dimens	sions										
			А	area (m²)			age storey eight (m)		Vo	lume (m³)	
Lowest occupied				86.50] (1a) x		2.50] (2a) =		216.25	(3a)
Total floor area	(1a) + (1b) +	(1c) + (1d)(1	1n) =	86.50] (4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	216.25	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues							0	 x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	;						0	x 40 =		0	(7c)
									Air	changes pe	r
Infiltration due to chimneys	flues fans PSV/s		(62)	+(6h)+(7)	。 (7b) + (7c) =	30	÷ (5) =	—	hour	(8)
If a pressurisation test has b		sintended r			vise continu] . (3) –		0.14] (0)
Air permeability value, q50,					of envelope		0 (10)			4.00	(17)
If based on air permeability			8), other vi							0.34	(18)
Number of sides on which t			,,, other		0)					3	(10)
Shelter factor	ne dwennig is shere						1 -	[0.075 x (19	a)] = [0.78	(20)
Infiltration rate incorporatir	a shelter factor						1	(18) x (2		0.26	(20)
Infiltration rate modified fo		-d-						(10) × (2	0, -	0.20	_ (21)
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee		Ch.	inay	Jun	541	AMB	JCP	000		Dee	
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	5.00 4.50	4.40	4.50	5.00	5.00	5.70	4.00	4.50	4.50	4.70	_ (22)
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (al					0.55	0.55	1.00	1.00	1.15	1.10] (220)
0.33	0.33 0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.30	0.31	(22b)
Calculate effective air chang	1 1		0.20	0.20	0.25	J.27	5.20	0.20	5.50	0.51	
If mechanical ventilation										N/A	(23a)
If balanced with heat red	-	• •		ctor from T	able 4h					N/A	(23c)
d) natural ventilation or		-							L	,	
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 - e				0.00	1 0.00		1 2.00		5.51		_ (= .0)
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)
0.00	0.00	0.01		0.00	0.00		2.00	5.61	5.5 1	0.00	_ ()



3. Heat losses a	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U W/		/alue, /m².K	Ахк, kJ/K	
Window						29	.06 x	1.24	= 35.91				(27)
External wall						25	.62 x	0.18	= 4.61				(29a)
Party wall						54	.80 x	0.00	= 0.00				(32)
Roof						86	.50 x	0.12	= 10.38				(30)
Total area of ext	ernal elem	ents ∑A, m²	:			141	18						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26))(30) + (3	32) =	50.90	(33)
Heat capacity Cr	n = ∑(А x к)							(28)	(30) + (32) +	(32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								21.37	(36)
Total fabric heat	loss									(33) + (3	36) = 🗌	72.27	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	39.68	39.52	39.37	38.66	38.52	37.90	37.90	37.79	38.14	38.52	38.79	39.08	(38)
Heat transfer co	efficient, W	//K (37)m ⊣	+ (38)m										
	111.95	111.79	111.64	110.93	110.79	110.17	110.17	110.06	110.41	110.79	111.06	111.35]
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)					\frown	Average = ∑	(39)112/	/12 =	110.93	(39)
	1.29	1.29	1.29	1.28	1.28	1.27	1.2	1.2	1.28	1.28	1.28	1.29]
									Average = ∑	(40)112/	/12 =	1.28	(40)
Number of days	in month (Table 1a)											
	31.00	28.00	31.00	30.00	31.00	30.00	.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heati	ng opergy r	oquiromon	+						7				
Assumed occupa		equiremen										2.57	(42)
Annual average		isage in litre	es per day '	Vd,average	(25 x ™							95.35	(43)
	Jan	Feb	Mar	Apr	way	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	in litres pe	r day for ea	ach mont ^r	' m = fact	tor from Tab	le 1 . (43)						
	104.88	101.07	97.26	93.4-	89.63	85.81	85.81	89.63	93.44	97.26	101.07	104.88	
Energy content of	of hot wate	r used = 4.3	18 x Vd.m x	nm m/s	3600 kWh/m	onth (see	Tables 1b). 1c 1d)		∑(44)1	.12 =	1144.20	(44)
- 0,	155.54	136.04	140.38	122 3	117.43	101.33	93.90	107.75	109.04	127.08	138.71	150.63	٦
										∑(45)1	·	1500.22	 (45)
Distribution loss	0.15 x (45)m								2(-)			
	23.33	20.41	21.06	18.36	17.61	15.20	14.09	16.16	16.36	19.06	20.81	22.59	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	/HRS storag	e within san	ne vessel						2.00	(47)
Water storage lo	DSS:												
b) Manufacturer	's declared	loss factor	is not know	wn									_
Hot water sto	orage loss f	actor from	Table 2 (kV	Vh/litre/da	y)							0.02	(51)
Volume facto	or from Tab	le 2a										3.91	(52)
Temperature	factor from	n Table 2b										1.00	(53)
Energy lost fr	rom water s	storage (kW	/h/day) (47	7) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54	, , ,											0.12	(55)
Water storage lo		1			,				· · · ·				-
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69 (5	7)
Primary circuit l	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (5	9)
Combi loss for e	each month	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (6	1)
Total heat requi	ired for wate	er heating o	alculated f	or each mo	onth 0.85 x	(45)m + (46	6)m + (57)r	n + (59)m	+ (61)m				
	182.49	160.38	167.33	148.46	144.38	127.41	120.85	134.70	135.12	154.02	164.79	177.58 (6	2)
Solar DHW inpu	t calculated	using Appe	endix G or A	Appendix H									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (6	3)
Output from wa	iter heater f	or each mo	onth (kWh/r	month) (62	2)m + (63)n	า							
	182.49	160.38	167.33	148.46	144.38	127.41	120.85	134.70	135.12	154.02	164.79	177.58	
										∑(64)1	12 = 1	.817.51 (6	4)
Heat gains from		. .		5 × [0.85 ×	(45)m + (61 '	L)m] + 0.8 ×	[(46)m + (5	57)m + (59)m]				
	73.28	64.70	68.23	61.56	60.60	54.56	52.78	57.39	57.12	63.81	66.99	71.64 (6	5)
5. Internal gain	าร												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)				-			_					
-	128.74	128.74	128.74	128.74	128.74	128.74	128.74	120-74	128.74	128.74	128.74	128.74 (6	6)
Lighting gains (c	alculated in	Appendix I		L9 or L9a),	also see Ta	able 5						· · · ·	
	20.73	18.41	14.97	11.33	8.47	7.15	7.	10.0	13.48	17.12	19.98	21.30 (6	7)
Appliance gains	(calculated	in Appendi	x L, equatic	on L13 or L1	L3a), also s	ee Table 5						· ·	
	232.49	234.90	228.82	215.88	199.54	184.19	1 93	1 52	177.60	190.54	206.88	222.23 (6	8)
Cooking gains (c	alculated in	Appendix	L, equation	L15 or L15	a), also see	Table 5						· ·	Ť.
	35.87	35.87	35.87	35.87	35.87	87	35.87	5.87	35.87	35.87	35.87	35.87 (6	9)
Pump and fan g	ains (Table 5	5a)										<u> </u>	
	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00 (7	0)
Losses e.g. evap	oration (Tal	ole 5)						•	•				
	-102.99	-102.99	-102.99	-102.99	-102.99	-102.	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99 (7	1)
Water heating g	ains (Table	5)											
	98.49	96.29	91.71	85.45	°1.46	75.77	70.94	77.13	79.33	85.77	93.03	96.30 (7	2)
Total internal ga	ains (66)m +	- (67)m + (6	i8)m + (69)ı	m (70°	+ (71)n. + (72)m							
	413.33	411.22	397.13	3, 33	351.09	328.73	314.22	320.32	332.03	355.05	381.51	401.45 (7	3)
6. Solar gains			-		-		-						
			Access f Table		Area m²		ar flux //m²	spec	g cific data	FF specific d	lata	Gains W	
							-	•	able 6b	or Table			
SouthWest			0.7	7 X	23.26	x 3	6.79 x	0.9 x	0.63 x	0.80	=	298.92 (7	9)
NorthWest			0.7	7 X	5.80	x 1	1.28 x	0.9 x	0.63 x	0.80	=	22.86 <mark>(</mark> 8	1)
Solar gains in wa	atts ∑(74)m	(82)m											
	321.77	555.69	780.48	1000.86	1151.90	1157.14	1109.96	995.20	856.48	619.59	386.79	274.48 (8	3)
Total gains - inte	ernal and so	lar (73)m +	(83)m										
	735.10	966.91	1177.61	1375.19	1502.99	1485.87	1424.18	1315.52	1188.51	974.64	768.31	675.93 <mark>(8</mark>	4)
7. Mean interr	al tompora	turo (bosti	ng saasan)										
				area from T	able 0 The	(°C)						21.00 (8	5)
Temperature du	Jan	Feb	Mar	Area from 1 Apr	May	Jun	Jul	۸۳۵	Sep	Oct	Nov	21.00 (8) Dec	וכ
Utilisation facto				-	•	Juli	Jui	Aug	Seh		NUV	Del	
	n ioi gallis li	or inving all	.a 111,111 (Se	c iable 9d)									

	0.99	0.97	0.92	0.81	0.64	0.47	0.34	0.38	0.61	0.88	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	:)	•		•			•		-
	19.79	20.09	20.44	20.76	20.93	20.99	21.00	21.00	20.96	20.69	20.16	19.73	(87)
Temperature du	ring heating	g periods ir	the rest of	dwelling fr	rom Table 9	9, Th2(°C)							
	19.85	19.85	19.85	19.85	19.86	19.86	19.86	19.86	19.86	19.86	19.85	19.85	(88)
Utilisation factor	r for gains f	or rest of d	welling n2,	m					1]
	0.99	0.96	0.90	0.77	0.58	0.39	0.25	0.29	0.52	0.84	0.97	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						_
	18.27	18.70	19.19	19.61	19.80	19.85	19.86	19.86	19.83	19.54	18.81	18.19	(90)
Living area fracti	ion								Li	ving area ÷	(4) =	0.57	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	-(1 - fLA) x T	Г2							-
	19.14	19.49	19.90	20.26	20.44	20.50	20.51	20.51	20.47	20.19	19.58	19.06	(92)
Apply adjustmer	nt to the me	an interna	l temperatu	ure from Ta	ble 4e whe	ere appropr	iate				•	•	-
	19.14	19.49	19.90	20.26	20.44	20.50	20.51	20.51	20.47	20.19	19.58	19.06	(93)
		•	•			•		·	•		•	•	-
8. Space heatin	ng requirem												
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	-				1					1		1	7
	0.99	0.96	0.90	0.78	0.61	0.43	0.30		0.57	0.86	0.97	0.99	(94)
Useful gains, ηm					r					1		1	1
	725.18	929.01	1064.16	1078.40	919.11	641.88	42.	449.8	676.92	833.87	744.83	669.36	(95)
Monthly average		emperatur	1							1		1	-
	4.30	4.90	6.50	8.90	11.70	14.60	_ 50	_ 10	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo			i							1	1	1	-
	1661.13	1631.19	1495.75	1260.43	968.68	87	430.47	1.95	703.72	1062.90	1386.07	1655.14	(97)
Space heating re	-	I	1			m			1	1			-
	696.35	471.87	321.10	131.06	36.88	0.00	٦.00	0.00	0.00	170.40	461.69	733.42]
									∑(98	8)15, 10		3022.77] (98) _
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	34.95	(99)
9b. Energy requ	uirements -	communit	ty heating	hen.									
Fraction of space	e heat from	secondary	/suppleme	n v sys .	1) (m. 11	.)				'0' if ı	none	0.00	(301)
Fraction of space										1 - (30		1.00	(302)
Fraction of com	nunity heat	from heat	pump									1.00	(303a)
Fraction of total	-			t pump						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ging metho	d (Table 4c((3)) for com	munity spa	ace heating						1.00	(305)
Factor for chargi	ing method	(Table 4c(3	3)) for comr	nunity wate	er heating	-						1.00	(305a)
Distribution loss	•				-							1.05	(306)
			·	0,], ,
Space heating													
Annual space he	ating requi	rement						3	022.77]			(98)
Space heat from	heat pump)						(98	3) x (304a) :	_ x (305) x (30	06) =	3173.91	(307a)
													_
Water heating													
Annual water he	ating requi	rement						1	817.51]			(64)
Water heat from	n heat pum	D						(64)	x (303a) x	_ (305a) x (30	06) =	1908.39	(310a)
Electricity used f	for heat dist	ribution					0.01	. × [(307a)	.(307e) + (3	310a)(310	e)] =	50.82	(313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	3173.91	х	4.24	x 0.01 =	134.57	(340a)
Water heating from heat pump	1908.39	x	4.24	x 0.01 =	80.92	(342a)
Electricity for lighting	366.04	x	13.19	x 0.01 =	48.28	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	383.77	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.23	(357)
SAP value					82.90]
SAP rating (section 13)					83	(358)
SAP band					В]
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		∠mission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of heat pump	3, 0					(367a)
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a)	= 1452.0	x	0.519	=	753.63	(367)
Electrical energy for community heat distribution	50.82	x	0.519	=	26.38	(372)
Total CO2 associated with community systems					780.01	(373)
Total CO2 associated with space and water heating					780.01	(376)
Electricity for lighting	366.0	x	0.519	=	189.97	(379)
Total CO ₂ , kg/year				(376)(382) =	969.98	(383)
Dwelling CO ₂ emission rate				(383) ÷ (4) =	11.21	(384)
El value					90.12]
El rating (section 14)					90	(385)
El band					В	
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources (space heating)						
Efficiency of heat pump	350.00					(367a)
Primary energy from heat pump [($307a$)+($310a$)] x 100 ÷ ($367a$)	= 1452.08	x	3.07	=	4457.90	(367)
Electrical energy for community heat distribution	50.82	x	3.07	=	156.03	(372)
Total primary energy associated with community systems					4613.93	(373)
Total primary energy associated with space and water heating					4613.93	(376)
Electricity for lighting	366.04	x	3.07	=	1123.74	(379)
Primary energy kWh/year					5737.66	(383)
Dwelling primary energy rate kWh/m2/year					66.33	(384)



ClientLast modified13/06/2013AddressA 5 04 Ingestre Road, London, NW5 1XEA construction of the state of the
I. Overall dwelling dimensions Area (m ²) Average storey height (m) Volume (m ³) owest occupied otal floor area $(1a) + (1b) + (1c) + (1d)(1n) = \overline{72.67}$ (4) $(3a) + (3b) + (3c) + (3d)(3n) = 181.68$ (5) c. Ventilation rate $(3a) + (3b) + (3c) + (3d)(3n) = 181.68$ (5) c. Ventilation rate 0 $x40 =$ 0 $(6a)$ umber of chimneys tumber of passive vents 0 $x40 =$ 0 $(7a)$ umber of flueless gas fires 0 $x10 =$ 0 $(7c)$ filtration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7a) + (7b) + (7c) = 20$ $\div (5) =$ 0.11 (8) a pressurisation test has been carried out or is intended, p. creed to the rown, twise continue from (9) to (16) (17) 0.31 (18) under of sides on which the dwelling is shelterin (19) $(1-[0.075 \times (19)]) =$ 0.78 (20) ifurtation rate incorporating shelter factor (12) (12) (12) (21)
Area (m²)Average storey height (m)Volume (m²)owest occupied otal floor area tal 10 + (1b) + (1c) + (1d)(1n) = 72.67 (1a)(1a) + (1b) + (1c) + (1d)(1n) = 72.67 (1a)(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (1a) = 181.68 (1a) = 181.68(3a) 2. Ventilation rate (3a) + (3b) + (3c) + (3d)(3n) = 181.68 (1a) = 181.68(5) 2. Ventilation rate 0 $x 40 =$ 0(6a)umber of chinneys tumber of passive vents 0 $x 40 =$ 0(6b) 0 $x 10 =$ 0 (7c) 0 $x 40 =$ 0 (7c) 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 based on air permeability value, then (18) = [(-20] + (8), other rise (15) (16) 0 0 1 based on air permeability value, then (18) = [(-20] + (8), other rise (15) (16) 0 0 1 based on air permeability value, then (18) = $(0$ 0 0 1
Area (m²)Average storey height (m)Volume (m²)owest occupied otal floor area tal 10 + (1b) + (1c) + (1d)(1n) = 72.67 (1a)(1a) + (1b) + (1c) + (1d)(1n) = 72.67 (1a)(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (1a) = 181.68 (1a) = 181.68(3a) 2. Ventilation rate (3a) + (3b) + (3c) + (3d)(3n) = 181.68 (1a) = 181.68(5) 2. Ventilation rate 0 $x 40 =$ 0(6a)umber of chinneys tumber of passive vents 0 $x 40 =$ 0(6b) 0 $x 10 =$ 0 (7c) 0 $x 40 =$ 0 (7c) 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 or persavirsation test has been carried out or is intended, p toced to x now twise continue from (9) to (16) 0 1 based on air permeability value, then (18) = [(-20] + (8), other rise (15) (16) 0 0 1 based on air permeability value, then (18) = [(-20] + (8), other rise (15) (16) 0 0 1 based on air permeability value, then (18) = $(0$ 0 0 1
height (m)covest occupied 72.67 (1a) x 2.50 (2a) = 181.68 (3a)otal floor area(1a) + (1b) + (1c) + (1d)(1n) = 72.67 (4) $(3a) + (3b) + (3c) + (3d)(3n) =$ 181.68 (5)welling volume $(3a) + (3b) + (3c) + (3d)(3n) =$ 181.68 (5) 2. Ventilation rate m ³ per houroutput to the distance of the distance
total floor area $(1a) + (1b) + (1c) + (1d)(1n) = 72.67 (4)$ welling volume $(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (5)$ 2. Ventilation rate The properties $(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (5)$ 2. Ventilation rate The properties $(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (5)$ 2. Ventilation rate The properties $(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (5)$ 2. Ventilation rate The properties $(3a) + (3b) + (3c) + (3d)(3n) = 181.68 (5)$ The properties $(3a) + (3b) + (3c) + (3c) + (3c) + (3c) = 0 (6a)$ The properties $(3a) + (3b) + (3c) + (3c) + (3c) + (3c) = 0 (6a)$ The properties $(3a) + (3b) + (3c) + (3c) + (3c) = 0 (7c)$ The properties $(3a) + (3b) + (3c) + (7c) + (3c) = 0 (7c)$ The properties $(3a) + (3b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + (7c) + (7c) = 20 (7c) + (5) = 0 (7c)$ The properties $(3a) + (6b) + (7c) + ($
welling volume $(3a) + (3c) + (3d)(3n) = 181.68$ (5) 2. Ventilation rate $\begin{array}{c} & & & & & & & & & & & & & & & & & & &$
2. Ventilation rate Tumber of chimneys Tumber of open flues Tumber of open flues Tumber of intermittent fans Tumber of intermittent fans Tumber of intermittent fans Tumber of passive vents Tumber of flueless gas fires The flueless gas fires The flueless gas fires The flueless flueles, fans, PSVs The flueless flueles, flu
Image: number of chimneys 0 $x 40 =$ 0 $(6a)$ number of open flues 0 $x 20 =$ 0 $(6b)$ number of intermittent fans 2 $x 10 =$ 20 $(7a)$ number of passive vents 0 $x 10 =$ 0 $(7b)$ number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ number of flueless gas fires $(6a) + (6b) + (7c) + (7c) =$ 20 $(5) =$ 0.11 (8) afiltration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7c) + (7c) =$ 20 $(5) =$ 0.11 (8) a reassurisation test has been carried out or is intended, proceed to strong on whise continue from (9) to (16) 0.31 (18) ir permeability value, q50, expressed in cubic metres per hour per square metro of envelope area 4.00 (17) (17) 0.31 (18) 0.31 (18) (18) to or port sides on which the dwelling is shelters $1 - [0.075 \times (19)] =$ 0.78 (20) $(18) \times (20) =$ 0.24 (21)
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number of open flues 0 $x 20 =$ 0 $(6b)$ number of intermittent fans 2 $x 10 =$ 20 $(7a)$ number of passive vents 0 $x 10 =$ 0 $(7b)$ number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ number of sides on which the dwelling is shelter: $(6a) + (6b) + (7c) / (7b) + (7c) =$ 20 $\div (5) =$ 0.11 (8) a pressurisation test has been carried out or is intended, p. ceed to sur your wise continue from (9) to (16) 0.31 (18) in permeability value, q50, expressed in cubic metres per hour-per square met of envelope area 4.00 (17) ibased on air permeability value, then $(18) = [(x-20] + (8), $ otherwise (1x (16) 0.31 (18) number of sides on which the dwelling is shelter: $1 - [0.075 \times (19)] =$ 0.78 (20) number of sides on which the dwelling is shelter: $1 - [0.075 \times (19)] =$ 0.24 (21)
umber of open flues 0 $x 20 =$ 0 $(6b)$ lumber of intermittent fans 2 $x 10 =$ 20 $(7a)$ lumber of passive vents 0 $x 10 =$ 0 $(7b)$ lumber of flueless gas fires 0 $x 40 =$ 0 $(7c)$ lumber of flueless gas fires 0 $x 40 =$ 0 $(7c)$ militration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7c + (7b) + (7c) =$ 20 $\div (5) =$ 0.11 (8) f a pressurisation test has been carried out or is intended, p. creed to sur your wise continue from (9) to (16) 1.000 (17) in permeability value, q50, expressed in cubic metres per hour-per square met of envelope area 4.00 (17) ibased on air permeability value, then $(18) = [(10, 20] + (8),$ otherwise (10, (16)) 0.31 (18) umber of sides on which the dwelling is shelters $1 - [0.075 \times (19)] =$ 0.78 (20) infiltration rate incorporating shelter factor $(18) \times (20) =$ 0.24 (21)
Lumber of intermittent fans 2 $x 10 =$ 20 $(7a)$ Lumber of passive vents 0 $x 10 =$ 0 $(7b)$ Lumber of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $x 40 =$ 0 $(7c)$ Air changes per hour 0 $1 - 0$ 0.11 (8) To pressurisation test has been carried out or is intended, paceed to x_1, x_2, x_3, x_4 wise continue from (9) to (16) 0.311 (18) I' permeability value, q50, expressed in cubic metres per hour-per square metro of envelope area 4.00 (17) I' based on air permeability value, then $(18) = [(x-20] + (8), otherwise (10 - (16))$ 0.311 (18) I' based on air permeability value, the dwelling is shelters 3 (19) I' based on air permeability value, the dwelling is shelters 3 (19) I' flitration rate incorporating shelter factor $1 - [0.075 \times (19)] =$ 0.24 (20) $(12) =$ (21) $(12) =$
number of flueless gas fires 0 x 40 = 0 $(7c)$ Air changes per hournfiltration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7a + (7b) + (7c) = 20 \div (5) = 0.11(8)Fa pressurisation test has been carried out or is intended, proceed to support, on, owise continue from (9) to (16)(17)ir permeability value, q50, expressed in cubic metres per hour-per square metro of envelope area4.00(17)based on air permeability value, then (18) = [(x - 20] + (8), otherwise (10 - (16))(18)(19)umber of sides on which the dwelling is shelter1 - [0.075 \times (19)] = 0.78(20)nfiltration rate incorporating shelter factor(18) \times (20) = (0.24)(21)$
number of flueless gas fires 0 x 40 = 0 $(7c)$ Air changes per hournfiltration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7a + (7b) + (7c) = 20 \div (5) = 0.11(8)Fa pressurisation test has been carried out or is intended, proceed to support, on, owise continue from (9) to (16)(17)ir permeability value, q50, expressed in cubic metres per hour-per square metro of envelope area4.00(17)based on air permeability value, then (18) = [(x - 20] + (8), otherwise (10 - (16))(18)(19)umber of sides on which the dwelling is shelter1 - [0.075 \times (19)] = 0.78(20)nfiltration rate incorporating shelter factor(18) \times (20) = (0.24)(21)$
Air changes per hourafiltration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7a + (7b) + (7c) = 20 \div (5) = 0.11$ (8)a pressurisation test has been carried out or is intended, proceed to exprove wise continue from (9) to (16)ir permeability value, q50, expressed in cubic metres per hour per square metro of envelope area 4.00 (17)based on air permeability value, then (18) = [(x = 20] + (8), otherwise (14, (16) 0.31 (18)umber of sides on which the dwelling is shelters 3 (19)helter factor $1 - [0.075 \times (19]] = 0.78$ (20)afiltration rate incorporating shelter factor $(18) \times (20) = 0.24$ (21)
Infiltration due to chimneys, flues, fans, PSVs $(6a) + (6b) + (7c + (7b) + (7c) = 20 + (5) = 0.11 + (8))$ If a pressurisation test has been carried out or is intended, proceed to reac, our evise continue from (9) to (16)If permeability value, q50, expressed in cubic metres per hour per square metric of envelope area $4.00 + (17) + (18) = (12 + 20) + (8), otherwise (12 + (16))$ If based on air permeability value, then $(18) = [(12 + 20) + (8), otherwise (12 + (16))$ $0.31 + (18) + (18) = (12 + 20) + (18), otherwise (12 + (16))$ Inductor of sides on which the dwelling is shelters $3 + (19) + (12 + (16)) + $
f a pressurisation test has been carried out or is intended, paceed to tak, one twise continue from (9) to (16)ir permeability value, q50, expressed in cubic metres per hour per square metric of envelope area 4.00 (17)i based on air permeability value, then $(18) = [(x = 20] + (8)$, otherwise (1 = (16) 0.31 (18)i umber of sides on which the dwelling is shelters3 (19)helter factor $1 - [0.075 \times (19)] = 0.78$ (20)i filtration rate incorporating shelter factor $(18) \times (20) = 0.24$ (21)
ir permeability value, q50, expressed in cubic metres per hour per square metro of envelope area 4.00 (17)based on air permeability value, then $(18) = [(x - 20] + (8)$, otherwise $(1 - 16)$ 0.31 (18)umber of sides on which the dwelling is shelter 3 (19)helter factor $1 - [0.075 \times (19)] = 0.78$ (20)if iltration rate incorporating shelter factor $(18) \times (20) = 0.24$ (21)
3^{1} based on air permeability value, then $(18) = [(12, 20] + (8), otherwise (12, 20] + (16)$ 0.31 (18) 1^{1} burber of sides on which the dwelling is shelter 3 (19) $1 - [0.075 \times (19)] = 0.78$ (20) $1 - [0.075 \times (19)] = 0.24$ (21)
Jumber of sides on which the dwelling is shelter 3 (19)helter factor $1 - [0.075 \times (19)] = 0.78$ (20)nfiltration rate incorporating shelter factor $(18) \times (20) = 0.24$ (21)
helter factor $1 - [0.075 \times (19)] =$ 0.78 (20)nfiltration rate incorporating shelter factor $(18) \times (20) =$ 0.24 (21)
$(18) \times (20) = 0.24 $ (21)
nfiltration rate modified for monthly wind speed:
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Ionthly average wind speed from Table U2
5.10 5.00 4.90 4.40 4.30 3.80 3.80 3.70 4.00 4.30 4.50 4.70 (22)
Vind factor (22)m ÷ 4
1.28 1.25 1.23 1.10 1.08 0.95 0.93 1.00 1.08 1.13 1.18 (22a)
djusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m
0.31 0.30 0.29 0.26 0.26 0.23 0.23 0.22 0.24 0.26 0.27 0.28 (22b)
alculate effective air change rate for the applicable case:
If mechanical ventilation: air change rate through system N/A (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h N/A (23c)
d) natural ventilation or whole house positive input ventilation from loft
0.55 0.55 0.54 0.53 0.53 0.53 0.53 0.52 0.53 0.53 0.54 0.54 (24d)
ffective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)

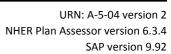


3. Heat losses a	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U W		/alue, /m².K	Ахк, kJ/K	
Window						25.	.07 x	1.24	= 30.98				(27)
External wall						30.	.28 x	0.18	= 5.45				(29a)
Party wall						38.	.70 x	0.00	= 0.00				(32)
Roof						72.	.67 x	0.12	= 8.72				(30)
Total area of ext	ternal elem	ents ∑A, m²				128	.02						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26	5)(30) + (32) =	45.15	(33)
Heat capacity Cr	m = ∑(А x к)							(28)	.(30) + (32) +	- (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/n	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	ing Appen	dix K								17.76	(36)
Total fabric heat	t loss									(33) + (36) =	62.91	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	32.79	32.68	32.57	32.07	31.98	31.54	31.54	31.46	31.71	31.98	32.17	32.37	(38)
Heat transfer co	efficient, W	//K (37)m +	- (38)m										
	95.70	95.59	95.48	94.98	94.88	94.44	94.44	94.36	94.61	94.88	95.07	95.27]
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)					\frown	Average = ∑	(39)112,	/12 =	94.98	(39)
	1.32	1.32	1.31	1.31	1.31	1.30	1.5	<u>1.3</u> r	1.30	1.31	1.31	1.31	
									Average = ∑	(40)112,	/12 =	1.31	(40)
Number of days	in month (⁻	Table 1a)											
	31.00	28.00	31.00	30.00	31.00	30.00	.00	31.00	30.00	31.00	30.00	31.00	(40)
1 Motor boot													
4. Water heati		equiremen	L									2.21	
Assumed occupa		isaga in litre	a nar dau'	Vd avorag								2.31	(42)
Annual average	Jan	Feb	Mar	Apr	(25 x №"	Jun	Jul	Aug	Sep	Oct	Nov	09.04 Dec	_ (43)
Hot water usage					-			Aug	JCP	000	NOV	Dee	
	97.95	94.39	90.82	87.20	\$3.70	80.14	, 80.14	83.70	87.26	90.82	94.39	97.95	٦
	57.55	54.55	50.02	07.20	5.70	00.14	00.14	03.70	07.20	Σ(44)1	·	1068.51	(44)
Energy content	of hot wate	r used = 4.1	18 x Vd,m x	nm (m/s	3600 kWh/m	onth (see	Tables 1k	o, 1c 1d)		2()20		1000.01](,
	145.25	127.04	131.09	114 7	109.66	94.63	87.69	100.63	101.83	118.67	129.54	140.67	7
										∑(45)1	.12 =	1400.99	(45)
Distribution loss	0.15 x (45)m											_
	21.79	19.06	19.66	17.14	16.45	14.19	13.15	15.09	15.27	17.80	19.43	21.10	(46)
Storage volume	(litres) inclu	uding any so	olar or WW	/HRS storag	ge within san	ne vessel						2.00	(47)
Water storage lo	oss:												_
b) Manufacture	r's declared	loss factor	is not knov	wn									
Hot water sto	orage loss f	actor from ⁻	Table 2 (kV	Vh/litre/da	y)							0.02	(51)
Volume facto	or from Tab	le 2a										3.91	(52)
Temperature	e factor from	n Table 2b										1.00	(53)
Energy lost f	rom water s	storage (kW	'h/day) (47	7) x (51) x (52) x (53)							0.12	(54)
Enter (50) or (54	1) in (55)											0.12	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
						5/ V							

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.	69	3.57		3.69	3.57	3.69	(57)
Primary circuit l	loss for each	month from	m Table 3												_
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23	.26	22.51		23.26	22.51	23.26	(59)
Combi loss for e	each month	from Table	3a, 3b or 3	с											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	00	0.00		0.00	0.00	0.00	(61)
Total heat requi	ired for wate	er heating c	alculated f	or each mo	onth 0.85 x	(45)m +	(46)m + (5	7)m + (5	9)m +	(61)m					
	172.20	151.38	158.04	140.37	136.61	120.71	114.64	127	7.57	127.91		145.62	155.62	167.62	(62)
Solar DHW inpu	it calculated	using Appe	ndix G or A	Appendix H											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.	00	0.00		0.00	0.00	0.00	(63)
Output from wa	ater heater f	or each mo	nth (kWh/	month) (62	2)m + (63)m	ı									
	172.20	151.38	158.04	140.37	136.61	120.71	114.64	127	7.57	127.91		145.62	155.62	167.62	
												∑(64)1	12 =	1718.28	(64)
Heat gains from	n water heat	ing (kWh/m	onth) 0.2	5 × [0.85 ×	(45)m + (61	.)m] + 0.8	× [(46)m +	- (57)m	+ (59)	m]					
	69.85	61.71	65.15	58.86	58.02	52.33	50.72	55	.02	54.72	Τ	61.02	63.93	68.33	(65)
5. Internal gain												_			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	A	ug	Sep		Oct	Nov	Dec	
Metabolic gains	, ,	T		r										1	-
	115.46	115.46	115.46	115.46	115.46	115.46	115.46	5 11	16	115.46		115.46	115.46	115.46	(66)
Lighting gains (o	[_						1	-
	18.14	16.11	13.10	9.92	7.41	6.26	6.	8.	79	11.80		14.98	17.49	18.64	(67)
Appliance gains	(calculated	in Appendi>	-	r	13a), also se	ee Table !	_								_
	203.45	205.56	200.24	188.91	174.62	161.18	1 20		<u>9</u>	155.41		166.74	181.03	194.47	(68)
Cooking gains (o	calculated in	Appendix L	., equation	L15 or L15	a), also see	Table 5									_
	34.55	34.55	34.55	34.55	34.55	55	34.55	1	.55	34.55		34.55	34.55	34.55	(69)
Pump and fan g	ains (Table 5	ba)													_
	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.	00	0.00		0.00	0.00	0.00	(70)
Losses e.g. evap	oration (Tal	ole 5)												_	_
	-92.37	-92.37	-92.37	-92.37	-92.37	-92.?	-92.37	-92	2.37	-92.37		-92.37	-92.37	-92.37	(71)
Water heating g	gains (Table	5)													_
	93.89	91.83	87.56	81.76	77.99	72.68	68.17	73	.95	76.00		82.01	88.80	91.84	(72)
Total internal ga	ains (66)m +	- (67)m + (6	8)m + (69)	m (70° .	+ (71)n. + (7	72)m									
	373.11	371.14	358.54	3. 22	317.65	297.75	284.77	290).47	300.85		321.37	344.96	362.59	(73)
6. Solar gains															
0. 50101 80113			Access	actor	Area	c	olar flux			a		FF		Gains	
			Table		m ²	5	W/m ²		speci	g fic data		specific d	ata	W	
									or Ta	able 6b		or Table	6c		
SouthEast			0.7	7 X	13.39	x	36.79	x 0.9 x	0).63	x	0.80	=	172.08	(77)
NorthWest			0.7	7 X	6.14	x	11.28	x 0.9 x	C).63	x	0.80	=	24.20	(81)
NorthEast			0.7	7 X	3.44	x	11.28	x 0.9 x	C).63	x	0.80	=	13.56	(75)
SouthWest			0.7	7 X	2.10	x	36.79	x 0.9 x	0).63	x	0.80	=	26.99	(79)
Solar gains in w	atts ∑(74)m	(82)m													
Solar gains in w	atts ∑(74)m 236.82	(82)m 415.93	602.40	802.23	949.52	965.07	921.10) 807	7.79	671.06		468.67	285.93	201.19	(83)
Solar gains in w Total gains - inte	236.82	415.93	602.40	802.23	949.52	965.07	921.10	0 807	7.79	671.06		468.67	285.93	201.19	(83)
-	236.82	415.93	602.40	802.23	949.52	965.07 1262.82			7.79 8.25	671.06 971.91		468.67 790.03	285.93 630.89	201.19] (83)] (84)
Total gains - inte	236.82 ernal and so 609.93	415.93 lar (73)m + 787.06	602.40 (83)m 960.93												_
-	236.82 ernal and so 609.93 nal tempera	415.93 lar (73)m + 787.06 ture (heatir	602.40 (83)m 960.93 ng season)	1140.45	1267.17	1262.82									_

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains	for living are	a n1,m (se	e Table 9a)									
0.99	0.98	0.93	0.82	0.65	0.47	0.34	0.39	0.63	0.90	0.98	0.99	(86)
Mean internal temp of livi	ng area T1 (s	teps 3 to 7	in Table 9c)									
19.75	20.03	20.39	20.73	20.92	20.99	21.00	21.00	20.95	20.65	20.12	19.69	(87)
Temperature during heatir	ng periods in	the rest of	dwelling fro	om Table 9	9, Th2(°C)				-			
19.83	19.83	19.83	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.83	19.83	(88)
Utilisation factor for gains	for rest of d	welling n2,	m						-			
0.99	0.97	0.91	0.78	0.58	0.39	0.25	0.29	0.54	0.86	0.97	0.99	(89)
Mean internal temperatur	e in the rest	of dwelling	T2 (follow	steps 3 to	7 in Table 9	Əc)						
18.21	18.61	19.10	19.56	19.77	19.83	19.84	19.84	19.81	19.47	18.74	18.12	(90)
Living area fraction								Liv	ving area ÷	(4) =	0.39	(91)
Mean internal temperatur	e for the who	ole dwellin	g fLA x T1 +((1 - fLA) x ⁻	Т2							
18.82	19.17	19.61	20.02	20.23	20.29	20.30	20.30	20.26	19.94	19.28	18.74	(92)
Apply adjustment to the m	ean internal	temperatu	ure from Tab	ole 4e whe	ere appropr	iate						
18.82	19.17	19.61	20.02	20.23	20.29	20.30	20.30	20.26	19.94	19.28	18.74	(93)
8. Space heating requirer	nent											
Jan	Feb	Mar	Apr	May	Jun	Jul	A	Sep	Oct	Nov	Dec	
Utilisation factor for gains,	ηm							-				
0.99	0.96	0.91	0.79	0.61	0.42	0.	0.33	0.57	0.86	0.97	0.99	(94)
Useful gains, nmGm, W (9	4)m x (84)m		I I							1	ł	1.
601.52	757.92	872.98	897.35	767.58	530.82	3 18	3 89	558.49	681.99	612.00	558.05	(95)
Monthly average external			e U1							1] , ,
4.30	4.90	6.50	8.90	11.70	50	16.60	5.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean int			I		(96)mj							
1389.12	1363.88	1251.59	1056.36	309.08	537.12	19.05	367.55	582.55	885.91	1158.11	1385.37	(97)
Space heating requiremen	1			m] x //								
585.97	407.20	281.69	114.49	30.88	0.0	0.00	0.00	0.00	151.71	393.20	615.52]
	107.20	201.05	111.15	30.00		0.00	0.00		B)15, 10	·	2580.66	(98)
Space heating requiremen	t kWh/m²/ve	ar						2(50			35.51	(99)
space neuting requirement									(50)	• (-)	55.51	(55)
9b. Energy requirements	- community	y heating s	ch									
Fraction of space heat fror	n secondary/	/suppleme	ntary sten	n (table 11	L)				'0' if ı	none	0.00	(301)
Fraction of space heat fror	n community	/ system							1 - (30	01) =	1.00	(302)
Fraction of community hea	t from heat	pump									1.00	(303a)
Fraction of total space hea	t from comm	nunity heat	: pump						(302) x (303	3a) =	1.00	(304a)
Factor for control and char	ging method	l (Table 4c((3)) for com	munity spa	ace heating						1.00	(305)
Factor for charging metho	d (Table 4c(3)) for comr	nunity wate	r heating							1.00	(305a)
Distribution loss factor (Ta	ble 12c) for a	community	heating sys	stem							1.05	(306)
												-
Space heating												
Annual space heating requ	irement						2	580.66]			(98)
Space heat from heat pum	р						(98) x (304a) x	_ x (305) x (30	06) = 2	709.69	(307a)
							·	,				
Water heating												
Annual water heating requ	irement						1	718.28]			(64)
Water heat from heat pum	р						(64)	x (303a) x	(305a) x (30	06) = 1	804.19	(310a)

Electricity used for heat distribution		0.01 × [(307a)(307e) + (310	a)(310e)] =	45.14	(313)
Electricity for pumps, fans and electric keep-hot (Table 4f)					
Total electricity for the above, kWh/year				0.00	(331)
				320.31	(332)
Electricity for lighting (Appendix L)	(207) . (200) . (21	10) . (212) . (215) . (221) . (2			
Total delivered energy for all uses	(307) + (309) + (31	10) + (312) + (315) + (331) + (33	32)(337b) = 4	1834.20	(338)
10b. Fuel costs - community heating scheme					
	Fuel kWh/year	Fuel price		Fuel st £/year	
Share besting from best num	2709.69	x 4.24		114.89] (240-)
Space heating from heat pump					(340a)
Water heating from heat pump	1804.19	x 4.24		76.50	(342a)
Electricity for lighting	320.31	x 13.19		42.25	(350)
Additional standing charges				120.00	(351)
Total energy cost		(340a)(342e) + (3	345)(354) =	353.64	(355)
11b. SAP rating - community heating scheme					
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)				1.26	(357)
SAP value				82.39]
SAP rating (section 13)				82	(358)
SAP band				В]
					1
12b. CO ₂ emissions - community heating scheme					
	Energy kW. ear	E. Ssion factor		missions ‹g/year)	
Emissions from other sources (space heating)					
Efficiency of heat pump	350.00				(367a)
CO2 emissions from heat pump $[(307a)+(310a)] \times 100 \div (3(-1)) =$		x 0.519	=	669.34	(367)
Electrical energy for community heat distribution	45.14	x 0.519		23.43	(372)
Total CO2 associated with community systems	45.14	x <u>0.515</u>		692.77	(373)
Total CO2 associated with space and water heath				692.77	(376)
	320.31				
Electricity for lighting	320.31	x 0.519		166.24	(379)
Total CO ₂ , kg/year		(859.01	(383)
Dwelling CO ₂ emission rate				11.82] (384)]
El value				90.22]]
El rating (section 14)				90] (385) _
El band				В	
13b. Primary energy - community heating scheme					
	Energy	Primary factor		ary energy	,
	kWh/year		(k)	Nh/year)	
Primary energy from other sources (space heating)					
Efficiency of heat pump	350.00				(367a)
Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) =		x <u>3.07</u>		3959.32	(367)
Electrical energy for community heat distribution	45.14	x 3.07	=	138.58	(372)
Total primary energy associated with community systems			4	1097.90	(373)
Total primary energy associated with space and water heating			4	1097.90	(376)
Electricity for lighting					1 (
	320.31	x 3.07	=	983.36	(379)
Primary energy kWh/year	320.31	x 3.07		983.36 5081.26	(379) (383)





Assessor name	Miss Alicja Kreglev	/ska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A G 01 Ingestre Ro	ad, London,	NW5 1XE								
1. Overall dwelling dimens	sions										
			А	area (m²)			age storey eight (m)		Vo	olume (m³)	
Lowest occupied				74.40] (1a) x		3.00] (2a) =		223.20	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1	Ln) =	74.40] (4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	223.20	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0] x 40 =		0	(6a)
Number of open flues							0] x 20 =		0	(6b)
Number of intermittent fan	S						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	5						0	x 40 =		0	(7c)
									Air	changes pe	r
Infiltration due to chimneys	flues fame DEV/s		16.0	+ (6b) + (7	(7b) + (70) -	30) · (r) -		hour 0.13	(8)
If a pressurisation test has l		intended r			vise continu			÷ (5) =		0.15] (0)
Air permeability value, q50,					of envelope		0 (10)			4.00	(17)
If based on air permeability), other vi							0.33	(18)
Number of sides on which t			o, other a		0)					3	(19)
Shelter factor	ne dwening is shelte						1	[0.075 x (19))] – [/(0.78	(20)
	ag chalter factor						1 -			0.78	(21)
Infiltration rate incorporation Infiltration rate modified for		d.						(18) x (2	0) – [0.20	_ (21)
Jan	Feb Mar		May	lun	Jul	A 110	Son	Oct	Nov	Dec	
Monthly average wind spee		Apř	Iviay	Jun	Jui	Aug	Sep	000	NOV	Dec	
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	5.00 4.90	4.40	4.50	5.60	5.80	5.70	4.00	4.50	4.50	4.70	_ (22)
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1 1 2	1.18	(222)
Adjusted infiltration rate (al					0.95	0.95	1.00	1.06	1.13	1.10	(22a)
					0.25	0.24	0.26	0.20	0.20	0.20] (22b)
0.33 Calculate effective air chang	0.32 0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.30	(22b)
									[NI/A	(22-)
If mechanical ventilation	-	•	r in use fo	ctor from T	able 1h					N/A	(23a)
If balanced with heat read d) natural ventilation or		-			aule 411					N/A	(23c)
-					0.52	0.52	0.50	0.54	0.54	0.55	(24-1)
0.55	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 - e	· · · · ·			0.52	0.52	0.52	0.50	0.54	0.54	0.55	(25)
0.55	0.55 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)



Element			а	Gross rea, m²	Openings m ²	Net a A, m		U-value W/m ² K	A x U V	•	value, I/m².K	Ахк, kJ/K	
Window						30.1	.5 x	1.24	= 37.2	5			(27)
Exposed floor						74.4	10 x	0.12	= 8.93				(28b
External wall						59.5	58 X	0.18	= 10.72	2			(29a
Party wall						62.6	52 x	0.00	= 0.00				(32)
Total area of ext	ernal elem	ents ∑A, m ²	2			164.3	13						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(2	6)(30) +	(32) =	56.91	(33)
Heat capacity Cn	n = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	32e) =	N/A	(34)
Thermal mass pa		MP) in kJ/r	m²K									250.00	(35)
Thermal bridges				dix K								23.35	(36)
Total fabric heat			0 11							(33) +	(36) =	80.26	 (37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_ • •
Ventilation heat	loss calcula	ted month	nly 0.33 x (2	•									
	40.85	40.69	40.54	39.82	39.69	39.06	39.06	38.94	39.30	39.69	39.96	40.24	(38)
Heat transfer co													
	121.11	120.96	120.80	120.08	119.95	119.32	119.32	119.21	119.56	119.95	120.22	120.51	7
									Average =		·	120.08	 (39)
Heat loss param	eter (HLP).	W/m²K (39	9)m ÷ (4)							2()	,] (,
	1.63	1.63	1.62	1.61	1.61	1.60	1.6	1.61	1.61	1.61	1.62	1.62	7
	1.05	1.05	1.02	1.01	1.01	1.00	1.0		Average =		·	1.61] (40)
Number of days	in month (⁻	Table 1a)							Average -	2(40)112	/12 -	1.01] (40)
internoer of duys	31.00	28.00	31.00	30.00	31.00	30.00		21.00	30.00	21.00	30.00	31.00	
	51.00	20.00	31.00										
					51.00	,0:00	.00	31.00	30.00	31.00	50.00	51.00	_ (40)
4. Water heatir	ng energy r	equiremen	nt	1		50.00	.00	31.00	30.00	31.00	50.00	31.00	_ (40)
4. Water heatin Assumed occupa		equiremen	nt			50.00	.00	31.00	30.00	31.00		2.35	
	ancy, N					JU-00	.00	31.00	30.00	31.00			(42)
Assumed occupa	ancy, N					Jun	Jul	Aug	Sep	Oct		2.35	(42)
Assumed occupa	ancy, Ν hot water ι Jan	isage in litr Feb	es per day ' Mar	Vd,average Apr	(25 x M	Jun						2.35 89.97	(42)
Assumed occupa Annual average I	ancy, Ν hot water ι Jan	isage in litr Feb	es per day ' Mar	Vd,average Apr	(25 x M	Jun						2.35 89.97	(42)
Assumed occupa Annual average I	ncy, N hot water u Jan in litres pe	isage in litr Feb r day for ea	es per day Mar ach mont ^r	Vd,averago Apr 1 m = fact	(25 x M" ay tor from Tab	Jun Jun Je 1 (43)	Jul	Aug	Sep	Oct	Nov 95.36	2.35 89.97 Dec] (42)] (43)]
Assumed occupa Annual average l	ncy, N hot water u Jan in litres pe 98.96	Isage in litr Feb r day for ea 95.36	es per day Mar ach mont 91.77	Vd,average Apr Im = fact	(25 x M" ay tor from Tab	lo Jun le 1 (43) 80.97	Jul 80.97	Aug 84.57	Sep	Oct 91.77	Nov 95.36	2.35 89.97 Dec 98.96] (42)] (43)]
Assumed occupa Annual average l Hot water usage	ncy, N hot water u Jan in litres pe 98.96	Isage in litr Feb r day for ea 95.36	es per day Mar ach mont 91.77	Vd,average Apr Im = fact	(25 x M ay tor from Tab 84.57	lo Jun le 1 (43) 80.97	Jul 80.97	Aug 84.57	Sep	Oct 91.77	Nov 95.36	2.35 89.97 Dec 98.96] (42)] (43)]
Assumed occupa Annual average l Hot water usage	ncy, N hot water u Jan in litres pe 98.96 pf hot wate	r day for ea 95.36 r used = 4.	es per day Mar ach mont 91.77 18 x Vd,m x	Vd,averagi Apr 1 m = fact 88.17	(25 x N ⁻ ay tor from Tab 84.57 3600 kWh/m	10 Jun le 1 (43) 80.97 onth (see T	Jul 80.97 Tables 1b,	Aug 84.57 1c 1d)	Sep 88.17	Oct 91.77 Σ(44)1.	Nov 95.36 12 = 130.88	2.35 89.97 Dec 98.96 1079.59] (42)] (43)] (44)
Assumed occupa Annual average l Hot water usage	ancy, N hot water u Jan in litres pe 98.96 0f hot wate 146.76	r day for ea 95.36 r used = 4. 128.36	es per day Mar ach mont 91.77 18 x Vd,m x	Vd,averagi Apr 1 m = fact 88.17	(25 x N ⁻ ay tor from Tab 84.57 3600 kWh/m	10 Jun le 1 (43) 80.97 onth (see T	Jul 80.97 Tables 1b,	Aug 84.57 1c 1d)	Sep 88.17	Oct 91.77 Σ(44)1. 119.90	Nov 95.36 12 = 130.88	2.35 89.97 Dec 98.96 1079.59 142.13] (42)] (43)] (44)
Assumed occupa Annual average l Hot water usage Energy content o	ancy, N hot water u Jan in litres pe 98.96 0f hot wate 146.76	r day for ea 95.36 r used = 4. 128.36	es per day Mar ach mont 91.77 18 x Vd,m x	Vd,averagi Apr 1 m = fact 88.17	(25 x N ⁻ ay tor from Tab 84.57 3600 kWh/m	10 Jun le 1 (43) 80.97 onth (see T	Jul 80.97 Tables 1b,	Aug 84.57 1c 1d)	Sep 88.17	Oct 91.77 Σ(44)1. 119.90	Nov 95.36 12 = 130.88	2.35 89.97 Dec 98.96 1079.59 142.13] (42)] (43)] (44)] (45)
Assumed occupa Annual average l Hot water usage Energy content o	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01	Isage in litr Feb r day for ea 95.36 r used = 4. 128.36 m 19.25	es per day Mar ach month 91.77 18 x Vd,m x 132.45 19.87	Vd,averagi Apr 1 m = fact 88.17 nm (m/3 115 7 17.32	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62	onth (see T 95.61	Jul 80.97 ables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52] (42)] (43)] (44)] (44)] (45)] (46)
Assumed occupa Annual average l Hot water usage Energy content o Distribution loss	hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclu	Isage in litr Feb r day for ea 95.36 r used = 4. 128.36 m 19.25	es per day Mar ach month 91.77 18 x Vd,m x 132.45 19.87	Vd,averagi Apr 1 m = fact 88.17 nm (m/3 115 7 17.32	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (42)] (43)] (44)] (44)] (45)] (46)
Assumed occupa Annual average l Hot water usage Energy content o Distribution loss Storage volume Water storage lo	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclusss:	r day for ea 95.36 r used = 4. 128.36 m 19.25 uding any s	es per day v Mar ach month 91.77 18 x Vd,m x 132.45 19.87 olar or WW	Vd,average Apr 1 m = fact 88.17 115 7 115 7 17.32 /HRS storag	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (42)] (43)] (44)] (44)] (45)] (46)
Assumed occupa Annual average l Hot water usage Energy content o Distribution loss Storage volume Water storage lo b) Manufacturer	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45) 22.01 (litres) inclu oss: 's declared	r day for ea 95.36 r used = 4.: 128.36 m 19.25 uding any s loss factor	es per day v Mar ach montr 91.77 18 x Vd,m x 132.45 19.87 olar or WW	Vd,average Apr 1 m = fact 88.17 1 mm = fact 115 7 115 7 17.32 /HRS storage vn	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32] (42)] (43)] (44)] (44)] (45)] (46)] (47)
Assumed occupa Annual average l Hot water usage Energy content o Distribution loss Storage volume Water storage lo b) Manufacturer Hot water sto	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) incluses: 's declared orage loss family of the second	Isage in litr Feb r day for ea 95.36 r used = 4.1 128.36 0m 19.25 uding any s loss factor actor from	es per day v Mar ach montr 91.77 18 x Vd,m x 132.45 19.87 olar or WW	Vd,average Apr 1 m = fact 88.17 1 mm = fact 115 7 115 7 17.32 /HRS storage vn	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 1415.52 21.32 2.00 0.02] (42)] (43)] (43)] (44)] (44)] (45)] (45)] (47)] (51)
Assumed occupa Annual average I Hot water usage Energy content o Distribution loss Storage volume Water storage Ic b) Manufacturer Hot water sto Volume facto	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) incluoss: 's declared orage loss fa	r day for ea 95.36 r used = 4.: 128.36 m 19.25 uding any s loss factor actor from le 2a	es per day v Mar ach montr 91.77 18 x Vd,m x 132.45 19.87 olar or WW	Vd,average Apr 1 m = fact 88.17 1 mm = fact 115 7 115 7 17.32 /HRS storage vn	(25 x N ² ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 1415.52 21.32 2.00 0.02 3.91] (42)] (43)] (43)] (44)] (44)] (45)] (45)] (47)] (51)] (52)
Assumed occupa Annual average I Hot water usage Energy content o Distribution loss Storage volume Water storage Ic b) Manufacturer Hot water sto Volume facto Temperature	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclu oss: 's declared orage loss fa orage loss fa	Feb r day for ea 95.36 r used = 4.1 128.36 0m 19.25 uding any s loss factor actor from e 2a n Table 2b	es per day Mar ach mont 91.77 18 x Vd,m x 18 x Vd,m x 132.45 19.87 olar or WW Table 2 (kW	Vd,average Apr Im = fact 88.17 nmmmm/3 115 7 17.32 /HRS storage vn Vh/litre/day	(25 x M ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00] (42)] (43)] (43)] (44)] (44)] (45)] (45)] (47)] (51)] (51)] (52)] (53)
Assumed occupa Annual average I Hot water usage Energy content o Distribution loss Storage volume Water storage Io b) Manufacturer Hot water sto Volume facto Temperature Energy lost fr	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclu oss: 's declared orage loss fr factor from Tab factor from om water s	Feb r day for ea 95.36 r used = 4.1 128.36 0m 19.25 uding any s loss factor actor from e 2a n Table 2b	es per day Mar ach mont 91.77 18 x Vd,m x 18 x Vd,m x 132.45 19.87 olar or WW table 2 (kW	Vd,average Apr Im = fact 88.17 nmmmm/3 115 7 17.32 /HRS storage vn Vh/litre/day	(25 x M ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00 0.12] (42)] (43)] (43)] (44)] (44)] (44)] (45)] (45)] (47)] (51)] (52)] (53)] (54)
Assumed occupa Annual average I Hot water usage Energy content of Distribution loss Storage volume Water storage Ic b) Manufacturer Hot water stor Volume facto Temperature Energy lost fr Enter (50) or (54	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclu oss: 's declared orage loss fa or from Tab factor from om water s) in (55)	r day for ea 95.36 r used = 4. 128.36 m 19.25 uding any s loss factor actor from le 2a n Table 2b storage (kW	es per day v Mar ach mont 91.77 18 x Vd,m x 18 x Vd,m x 132.45 19.87 olar or WW 132.45	Vd,average Apr 1 m = fact 88.17 1 mm = fm/3 115 7 17.32 /HRS storage vn Vh/litre/day	(25 x M ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00	(40) (42) (43) (43) (44) (44) (45) (45) (46) (47) (51) (52) (52) (53) (54) (55)
Assumed occupa Annual average I Hot water usage Energy content o Distribution loss Storage volume Water storage Ic b) Manufacturer Hot water sto Volume facto Temperature Energy lost fr	ancy, N hot water u Jan in litres pe 98.96 of hot wate 146.76 0.15 x (45 22.01 (litres) inclu oss: 's declared orage loss fa or from Tab factor from om water s) in (55)	r day for ea 95.36 r used = 4. 128.36 m 19.25 uding any s loss factor actor from le 2a n Table 2b storage (kW	es per day v Mar ach mont 91.77 18 x Vd,m x 18 x Vd,m x 132.45 19.87 olar or WW 132.45	Vd,average Apr 1 m = fact 88.17 1 mm = fm/3 115 7 17.32 /HRS storage vn Vh/litre/day	(25 x M ay tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	onth (see T 95.61	Jul 80.97 Fables 1b, 88.60	Aug 84.57 1c 1d) 101.67	Sep 88.17 102.88	Oct 91.77 Σ(44)1. 119.90 Σ(45)1.	Nov 95.36 12 = 130.88 12 =	2.35 89.97 Dec 98.96 1079.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00 0.12] (42)] (43)] (43)] (44)] (44)] (44)] (45)] (45)] (47)] (51)] (52)] (53)] (54)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit le	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month	from Table	3a, 3b or 30	C									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	alculated fo	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)n	n + (59)m ·	+ (61)m				
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08	(62)
Solar DHW inpu													(/
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa			I			ļ Į	0.00	0.00	0.00	0.00	0.00	0.00	(03)
output nom wa	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08	
	1/5./1	132.70	139.40	141.55	137.75	121.09	115.55	128.02	128.90			1	(64)
lloat gains from	water beat	ing (k) N/h /m	onth) 0.25		(4E) m + (61	\ml + 0.8 v	[(46) - (1	-7)m + (F0)ml	∑(64)1	12 =	732.81	(64)
Heat gains from	-									64.42	64.20	60.00	(65)
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.36	55.07	61.43	64.38	68.82	(65)
5. Internal gair	IS												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains				•									
Sector Barris	117.40	117.40	117.40	117.40	117.40	117.40	117.40	11-10	117.40	117.40	117.40	117.40	(66)
Lighting gains (c							117.40		117.40	117.40	117.40	117.40	(00)
	18.48	16.42	13.35			6.38		8.06	12.02	15.27	17.00	19.00	(67)
				10.11	7.56		6.	8.96	12.03	15.27	17.82	19.00	(67)
Appliance gains					· · · · · · · · · · · · · · · · · · ·				170.00	100.00			(60)
	207.34	209.49	204.07	192.53	177.96	164.26	12	1 96	158.39	169.93	184.50	198.19	(68)
Cooking gains (c					· · · · · ·							,	
	34.74	34.74	34.74	34.74	34.74	74	34.74	1.74	34.74	34.74	34.74	34.74	(69)
Pump and fan ga													
	0.00	0.00	0.00	0.00	0.00	0.00	<u> </u>	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap	oration (Tal	ole 5)											
	-93.92	-93.92	-93.92	-93.92	-93.92	-93.¢	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	(71)
Water heating g	ains (Table	5)											
	94.56	92.49	88.17	82.30	78.49	73.13	68.57	74.41	76.49	82.56	89.42	92.49	(72)
Total internal ga	ins (66)m +	- (67)m + (6	8)m + (69)r	n (70°, -	+ (71)n+ (7	72)m							
	378.61	376.62	363.81	3. 16	322.23	302.00	288.80	294.56	305.12	325.98	349.96	367.91	(73)
6. Solar gains	_		_		-		-						
			Access fa Table		Area m²		ar flux //m²	spec	g sific data	FF specific d	ata	Gains W	
			Tuble	04			,	•	able 6b	or Table			
SouthWest			0.77	7 X [16.68	x 30	6.79 x	0.9 x	0.63 x	0.80	=	214.36	(79)
SouthEast			0.77		3.47				0.63 x				(77)
NorthWest			0.77		10.00				0.63 x				(81)
Solar gains in wa	atts 5(74)m	(82)m	0.77		10.00		1.20	0.5 x	0.05	0.00		55.41	(01)
	298.36	. ,	749.04	095 12	1156.62	1171 66	1110.07	000.25	020 50	FOF FO	250.75	252.70	(02)
Total gains into		521.30	748.04	985.13	1156.62	1171.66	1119.87	988.35	829.58	585.52	359.75	253.79	(83)
Total gains - inte				1000.00	1470.05	1470.05	1400.07	1202.07	1124 70	014 50	700 74	C24 70	(0.4)
	676.97	897.92	1111.85	1328.29	1478.85	1473.65	1408.67	1282.91	1134.70	911.50	709.71	621.70	(84)
7. Mean intern	al tempera	ture <u>(heati</u> i	ng s <u>eason)</u>										
Temperature du				irea from T	able 9, Th1	(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
				•				Ŭ					

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Utilisation fact	or for gains f	or living are	a n1 m (se	e Table 9a)									
othisation fact	0.99	0.97	0.93	0.83	0.67	0.50	0.37	0.42	0.65	0.90	0.98	0.99	(86)
Mean internal					1	0.50	0.57	0.42	0.05	0.50	0.50	0.55	_ (00)
	19.43	19.75	20.16	20.59	20.86	20.97	20.99	20.99	20.90	20.50	19.86	19.36	(87)
Temperature d							20.55	20.55	20.50	20.50	19.00	15.50	
i emperature e	19.59	19.59	19.60	19.60	19.60	19.61	19.61	19.61	19.61	19.60	19.60	19.60	(88)
Utilisation fact					19.00	15.01	15.01	15.01	15.01	15.00	15.00	15.00	
o this ation race	0.99	0.96	0.91	0.78	0.59	0.40	0.25	0.30	0.55	0.86	0.97	0.99	(89)
Mean internal		1				1		0.30	0.55	0.80	0.97	0.55	(05)
Weathinterna	17.58	18.04	18.62	19.18	19.49	19.59	19.61	19.61	19.55	19.09	18.21	17.49	(90)
Living area frag		10.04	18.02	19.10	19.49	19.59	19.01	19.01		ving area ÷	·	0.36	(90)
Living area frac		for the wh	olo dwallin	αfl Δ v T1 ι	(1 f(A) v	тэ			LI	ving area ÷	(4) =	0.30	[91]
Mean internal	-			-			20.10	20.10	20.02	10.50	10.00	10.15	(02)
Apply adjustm	18.24	18.65	19.17	19.68	19.97	20.08	20.10	20.10	20.03	19.59	18.80	18.15	(92)
Apply adjustme		1	-	1		1		20.40	20.02	10.50	10.00	10.15	
	18.24	18.65	19.17	19.68	19.97	20.08	20.10	20.10	20.03	19.59	18.80	18.15	(93)
8. Space heat	ing requiren	nent											
	Jan	Feb	Mar	Apr	May	Jun	lut	Aug	Sep	Oct	Nov	Dec	
Utilisation fact	or for gains,	ηm											
	0.98	0.95	0.90	0.78	0.62	0.43	0.29	0.34	0.58	0.86	0.96	0.99	(94)
Useful gains, η	mGm, W (94	4)m x (84)m											
	664.72	857.31	999.08	1041.80	911.13	638.18	415.05	17 .25	661.26	780.04	683.79	613.20	(95)
Monthly avera	ge external t	emperature	e from Tabl	e U1							1		
	4.30	4.90	6.50	8.90	11.70	14.60	1 1	16.4	14.10	10.60	7.10	4.20	(96)
Heat loss rate	for mean int	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	. (9. 1				4			
	1687.94	1663.10	1530.42	1294.76	90	653.	417.66	440.81	708.93	1078.80	1406.65	1681.57	(97)
Space heating			th 0.024 x	[(97)m - (9'	n] x (41))m				1		-	、 ,
	761.27	541.49	395.31	182.13	60.52	0.0	0.00	0.00	0.00	222.28	520.46	794.87	
		•						•	Σ(9	8)15, 10	.12 =	3478.34	(98)
Space heating	requirement	kWh/m²/ye	ear						2.	(98)		46.75	(99)
										. ,	.,		
9b. Energy re	quirements	- communit	y heating s	sc vme	$ \rightarrow $								
Fraction of spa	ce heat from	secondary,	/suppleme	nta yster	m (table 1	1)				'0' if ı	none	0.00	(301)
Fraction of spa	ice heat from	n communit	y system							1 - (30	01) =	1.00	(302)
Fraction of con	nmunity hea	t from heat	pump									1.00	(303a)
Fraction of tota	al space heat	from comr	nunity heat	t pump						(302) x (303	3a) =	1.00	(304a)
Factor for cont	rol and char	ging metho	d (Table 4c	(3)) for com	nmunity sp	ace heating	g					1.00	(305)
Factor for char	ging method	(Table 4c(3	3)) for com	munity wate	er heating							1.00	(305a)
Distribution los	ss factor (Tal	ole 12c) for	community	/ heating sy	stem							1.05	(306)
Space heating													
Annual space h	neating requi	rement						3	8478.34]			(98)
Space heat fro	m heat pum	c						(98	8) x (304a)	x (305) x (30	06) =	3652.25	(307a)
Water heating	i												
Annual water h	neating requ	irement						1	732.81]			(64)
Water heat fro													
	om heat pum	р						(64)	x (303a) x	(305a) x (30	06) =	1819.45	(310a)
Electricity used							0.01			(305a) x (30 310a)(310		1819.45 54.72	(310a) (313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = 5798.15

0.00

(331)

(332)

(338)

10b. Fuel costs - community heating scheme Fuel **Fuel price** Fuel kWh/year cost £/year 3652.25 Space heating from heat pump 4.24 x 0.01 = 154.86 (340a) х Water heating from heat pump 1819.45 4.24 x 0.01 = 77.14 (342a) х 326.44 13.19 x 0.01 = 43.06 (350)Electricity for lighting х Additional standing charges 120.00 (351)(340a)...(342e) + (345)...(354) = Total energy cost 395.06 (355)11b. SAP rating - community heating scheme Energy cost deflator (Table 12) 0.42 (356) 1.39 (357)Energy cost factor (ECF) 80.61 SAP value SAP rating (section 13) 81 (358)SAP band В 12b. CO₂ emissions - community heating scheme Emissions **Emission factor** Energy kWh/year (kg/year) Emissions from other sources (space heating) Efficiency of heat pump 350.00 (367a) CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367 1563.34 0.519 811.38 (367) х Electrical energy for community heat distribution 0.519 28.40 (372) 839.77 Total CO2 associated with community systems (373) Total CO2 associated with space and water heat 839.77 (376) Electricity for lighting z6.44 0.519 169.42 (379) (376)..(382) = 1009.20 (383) Total CO₂, kg/year (383) ÷ (4) = Dwelling CO₂ emission rate 13.56 (384)88.67 El value El rating (section 14) 89 (385)EI band В 13b. Primary energy - community heating scheme Energy **Primary factor** Primary energy kWh/year (kWh/year) Primary energy from other sources (space heating) 350.00 Efficiency of heat pump (367a) Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) = 1563.34 х 3.07 4799.47 (367)Electrical energy for community heat distribution 54.72 3.07 167.98 (372)х Total primary energy associated with community systems 4967.45 (373) Total primary energy associated with space and water heating 4967.45 (376) Electricity for lighting 326.44 3.07 1002.18 (379) (383) Primary energy kWh/year 5969.63 Dwelling primary energy rate kWh/m2/year 80.24 (384)



Assessor name	Miss Alicja Kreglews	ska				As	sessor num	ıber	4134		
Client						La	st modified		13/06	/2018	
Address	A G 02 Ingestre Roa	d, London, NW	'5 1XE								
	_										
1. Overall dwelling dimens	sions										
			Area	ı (m²)			age storey eight (m)		Va	lume (m³)	
Lowest occupied			76	.52	(1a) x		3.00] (2a) =		229.56	(3a)
Total floor area	(1a) + (1b) + (1	c) + (1d)(1n) =	= 76	.52	(4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3	n) =	229.56	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues						F	0	x 20 =		0	(6b)
Number of intermittent fan	s						3	x 10 =		30	_ (7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires	i						0	x 40 =		0	(7c)
								-	Air	changes per hour	r
Infiltration due to chimneys	s, flues, fans, PSVs		(6a) + (6b) + (7a	(7b) + (7c) =	30	÷ (5) =		0.13	(8)
If a pressurisation test has b	peen carried out or is i	ntended, p ce	ed to	wi.	se continu	e from (9) t	o (16)	-			_
Air permeability value, q50,	expressed in cubic m	etres per hou	per square	e mer d	f envelope	e area				4.00	(17)
If based on air permeability	value, then (18) = [(20] + (8), of	ther vise (1 (16)					0.33	(18)
Number of sides on which t	he dwelling is shelter									3	(19)
Shelter factor							1 -	[0.075 x (19	9)] =	0.78	(20)
Infiltration rate incorporatir	ng shelter factor							(18) x (2	0) =	0.26	(21)
Infiltration rate modified fo	r monthly wind speed	:									
Jan	Feb Mar	Apr I	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee	d from Table U2										_
5.10	5.00 4.90	4.40 4	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4							1				-
1.28	1.25 1.23		1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (al	-										
0.33	0.32 0.31		0.28	0.24	0.24	0.24	0.26	0.28	0.29	0.30	(22b)
Calculate effective air chang										NI / A	
If mechanical ventilation	-		uno fo at -	r from T-	hla 1h					N/A	(23a)
If balanced with heat reo d) natural ventilation or		-			bie 4fi					N/A	(23c)
-	-	· ·	0.54		0.52	0.52	0.52	0.54	0.54	0.55	(244)
0.55 Effective air change rate - e				0.53	0.53	0.53	0.53	0.54	0.54	0.55	(24d)
0.55	0.55 0.55	· · · ·	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)
0.55	0.55 0.55	0.54 (0.54	0.00	0.55	0.05	0.55	0.54	0.54	0.55	_ (23)



3. Heat losses a	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²		area m²	U-value W/m²K	A x U V	•	value, /m².K	Ахк, kJ/K	
Window						19	.92 x	1.24	= 24.6	2			(27)
Exposed floor						76	.52 x	0.12	= 9.18	3			(28b
External wall						23	.53 x	0.18	= 4.24	t I			(29a
Party wall						85	.38 x	0.00	= 0.00)			(32)
Total area of ext	ernal eleme	ents ∑A, m ²	2			119	9.97						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(2	26)(30) + (32) =	38.03	(33)
Heat capacity Cr	m = ∑(А x к)							(28).	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) ca	alculated u	sing Appen	dix K								16.12	(36)
Total fabric heat										(33) + (36) =	54.15	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ited month	ly 0.33 x (2	25)m x (5)									
	41.92	41.76	41.61	40.89	40.75	40.12	40.12	40.01	40.37	40.75	41.03	41.31	(38)
Heat transfer co	efficient, W	' //K (37)m⊣	+ (38)m		· ·							-	
	96.07	95.92	95.76	95.04	94.90	94.28	94.28	94.16	94.52	94.90	95.18	95.46	7
		I			1 1				Average =	Σ(39)112	/12 =	95.04	 (39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)										
	1.26	1.25	1.25	1.24	1.24	1.23	1.2	1.2	1.24	1.24	1.24	1.25	7
		1							Average =	 Σ(40)112,	/12 =	1.24	 (40)
Number of days	in month (1	Fable 1a)								, .			
	31.00	28.00	31.00	30.00	31.00	30.00		31.00	30.00	31.00	30.00	31.00	(40)
	L	1								•	1		
4. Water heati	ng energy r	equiremen	t					Ţ					_
Assumed occupa	ancy, N											2.39	(42)
Annual average	hot water u	isage in litr	es per day '	Vd,average	(25 x M	-0-						91.05	(43)
	Jan	Feb	Mar	Apr	way	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	in litres pe	r day for ea	ach mont ^µ	' m = fact	tor from ⊤ab	le 1 . (43	5)						_
	100.15	96.51	92.87	89.25	85.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	
										∑(44)1	.12 =	1092.55	(44)
Energy content	of hot wate	r used = 4.3	18 x Vd,m x	nm (m/3	3600 kWh/m	onth (see	Tables 1	o, 1c 1d)					_
	148.52	129.90	134.04	116 5	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	
										∑(45)1	.12 =	1432.51	(45)
Distribution loss	0.15 x (45))m											
	22.28	19.48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	'HRS storag	ge within san	ne vessel						2.00	(47)
Water storage lo	oss:												
b) Manufacturer	r's declared	loss factor	is not know	vn									
Hot water sto	orage loss fa	actor from	Table 2 (kV	/h/litre/da	y)							0.02	(51)
Volume facto	or from Tab	le 2a										3.91	(52)
Temperature	e factor fron	n Table 2b										1.00	(53)
Energy lost fr	rom water s	torage (kW	/h/day) (47	7) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54	l) in (55)											0.12	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
If the vessel con	tains dedica	ated solar s	torage or d	edicated W	VWHRS (56)r	n x [(47) -	Vs] ÷ (47). else (56)					

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit l	loss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	each month	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi] (- ,
·	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	(62)
Solar DHW inpu						122.04	110.01	125.04	150.20	140.25	150.55	170.70] (02)
	r		1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.1.1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	r		-	 I								<u>т </u>	7
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	
										∑(64)1	12 = 1	1749.80	(64)
Heat gains from	water heat	ing (kWh/m	nonth) 0.25	5 × [0.85 ×	(45)m + (61)m] + 0.8 ×	: [(46)m + (57)m + (59)	m]				_
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38	(65)
E Internal acti													
5. Internal gain									_				
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)												-
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	110-58	119.68	119.68	119.68	119.68	(66)
Lighting gains (c	calculated in	Appendix L	., equation	L9 or L9a),	also see Ta	ble 5							
	18.90	16.79	13.65	10.34	7.73	6.52	7.	9.16	12.30	15.61	18.22	19.43	(67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L1	13a), also se	ee Table 5							
	212.01	214.21	208.67	196.87	181.97	167.97	1 61	1 41	161.96	173.76	188.66	202.66	(68)
Cooking gains (o	calculated in	Appendix I	L, equation	L15 or L15	a), also see	Table 5							-
	34.97	34.97	34.97	34.97	34.97	97	34.97	4.97	34.97	34.97	34.97	34.97	(69)
Pump and fan g] (,
	0.00	0.00	0.00	0.00	0.00	0.00	٦.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap			0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00] (/0)
LUSSES E.g. Evap	, 	,	05.74	05.74			05.74	05.74	05.74	05.74	05.74	05.74] (74)
	-95.74		-95.74	-95.74	-95.74	-95.7	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Water heating g	- ·												7
	95.35	93.25	88.88	82.94	79.09	73.66	69.05	74.96	77.06	83.20	90.14	93.26	(72)
Total internal ga	ains (66)m +	+ (67)m + (6	8)m + (69)	m (70° .	+ (71)n+ (7	72)m							_
	385.17	383.15	370.11	3. 05	327.69	307.05	293.61	299.43	310.21	331.48	355.93	374.25	(73)
6. Solar gains													
6. Solar gains							<i>c</i> i						
			Access f Table		Area m²		ar flux V/m²	speci	g ific data	FF specific d	lata	Gains W	
						-	,	•	able 6b	or Table			
SouthWest			0.7	7 X	16.45	x 3	6.79 x	0.9 x C).63 x	0.80	=	211.40	(79)
SouthEast			0.7		3.47				0.63 x			44.59	(77)
Solar gains in w	atts 5(71)m	(82)m	0.7		5.47		<u></u>		, x	0.00](,,)
			500.02	720.25	020.02	022.02	702 52	726.20	646.02	401.02	200.02	210.00	
	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08	(83)
Total gains - inte	r												٦
	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	662.55	593.32	(84)
7. Mean interr	nal tempera	ture (heatir	ng season)										
Temperature du				aroa from T	able 0 The	(°C)						21.00] (or)
remperature di							11	A	6 a -	0t		21.00	(85)
Lindle of the	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or tor gains f	or living are	ea n1,m (se	e Table 9a)									

	0.99	0.98	0.94	0.85	0.70	0.52	0.38	0.42	0.64	0.89	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (steps 3 to 7	in Table 9c	.)								_
	19.83	20.10	20.42	20.73	20.91	20.98	21.00	20.99	20.95	20.69	20.19	19.78	(87)
Temperature du	iring heating	g periods ir	the rest of	dwelling fr	om Table 9	9, Th2(°C)		•				•	-
	19.88	19.88	19.88	19.89	19.89	19.89	19.89	19.90	19.89	19.89	19.89	19.88	(88)
Utilisation facto	r for gains for	or rest of d	welling n2,	m		•		•			•	•	-
	0.99	0.97	0.92	0.81	0.63	0.44	0.29	0.32	0.55	0.86	0.97	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						-
	18.36	18.74	19.18	19.59	19.81	19.88	19.89	19.89	19.86	19.56	18.87	18.28	(90)
Living area fract	ion		•			•			Li	ving area ÷	(4) =	0.35	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	(1 - fLA) x T	Г2							_
	18.87	19.21	19.61	19.99	20.19	20.27	20.28	20.28	20.24	19.95	19.33	18.80	(92)
Apply adjustmer	nt to the me	ean interna	l temperatu	ure from Ta	ble 4e whe	ere appropr	iate						
	18.87	19.21	19.61	19.99	20.19	20.27	20.28	20.28	20.24	19.95	19.33	18.80	(93)
8. Space heatir									_				
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	_									1	· · · · · ·	1	1
	0.99	0.96	0.91	0.81	0.65	0.47	0.32		0.58	0.86	0.97	0.99	(94)
Useful gains, ηm										1		1	1
	632.11	788.29	882.71	883.49	755.26	525.98	345 1	363.2	557.79	699.15	641.78	587.17	(95)
Monthly average		emperatur	1							1		1	1
	4.30	4.90	6.50	8.90	11.70	14.60	_ ~0	_ 10	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte		i							i	1		,
	1399.60	1372.92	1255.67	1053.70	805.99	08	346.57	4.94	580.38	887.57	1164.01	1393.58	(97)
Space heating re	equirement,	kWh/mor	th 0.024 x	[(97)m - (95	5)m ¹	m					1	1	-
	571.02	392.87	277.48	122.55	37.74	0.00	<u>0.00</u>	0.00	0.00	140.18	376.01	599.96	
									∑(98	8)15, 10		2517.81	(98)
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	32.90	(99)
9b. Energy req	uirements -	communit	ty heating	hen.									
Fraction of space				n v svs	1))				'0' if r	none	0.00	(301)
Fraction of space										1 - (30		1.00	(302)
Fraction of com										(-)	,	1.00	(303a)
Fraction of total	-			gmug						(302) x (303	3a) =	1.00	(304a)
Factor for contro	·		,	•	munity spa	ace heating				(, (1.00	(305)
Factor for charg												1.00	(305a)
Distribution loss	-				-							1.05	(306)
Distribution 1033		12 12 0 101	connuncy	incuting sy	stem						L	1.05] (300)
Space heating													
Annual space he	eating requi	rement						2	517.81]			(98)
Space heat from										」 x (305) x (30)6) = 🔤	2643.70	(307a)
								(,] ()
Water heating													
Annual water he	eating requi	rement						1	749.80]			(64)
Water heat from										」 (305a) x (30)6) =	1837.29	(310a)
Electricity used f							0.01			(303 <i>a)</i> x (30 310a)(310		44.81	(313)
	. Si neut uisi						0.01				~/] = [] (313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

0.00	(331)
333.80	(332)
4814.80	(338)

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = 4814.80 (338)

10b Euo	l costs - comm	whity boati	naschomo
LUU, FUE	1 COSIS - COIIIII	iuiiilv lieali	

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	2643.70	x	4.24	x 0.01 =	112.09	(340a)
Water heating from heat pump	1837.29	x	4.24	x 0.01 =	77.90	(342a)
Electricity for lighting	333.80	х	13.19	x 0.01 =	44.03	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	- (345)(354) =	354.02	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.22	(357)
SAP value					82.93	
SAP rating (section 13)					83	(358)
SAP band					В	
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		-mission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of heat pump	35 0					(367a)
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a) =	1280.2	x	0.519	=	664.47	(367)
Electrical energy for community heat distribution	44.81	x	0.519	=	23.26	(372)
Total CO2 associated with community systems					687.72	(373)
Total CO2 associated with space and water heating					687.72	(376)
Electricity for lighting	333.0	×	0.519	=	173.24	(379)
Total CO ₂ , kg/year				(376)(382) =	860.97	(383)
Dwelling CO ₂ emission rate				(383) ÷ (4) =	11.25	(384)
El value					90.51	
El rating (section 14)					91	(385)
El band					В	
13b. Primary energy - community heating scheme					_	
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources (space heating)						
Efficiency of heat pump	350.00					(367a)
Primary energy from heat pump [(307a)+(310a)] x 100 ÷ (367a) =	1280.28	х	3.07	=	3930.47	(367)
Electrical energy for community heat distribution	44.81	x	3.07	=	137.57	(372)
Total primary energy associated with community systems					4068.04	(373)
Total primary energy associated with space and water heating					4068.04	(376)
Electricity for lighting	333.80	x	3.07	=	1024.77	(379)
Primary energy kWh/year					5092.81	(383)
Dwelling primary energy rate kWh/m2/year					66.56	(384)



Assessor name	Miss Alicja Kreglew	vska				As	sessor num	lber	4134		
Client						Las	st modified		13/06	/2018	
Address	A G 04 above gym	Ingestre Roa	d, London,	, NW5 1XE							
1. Overall dwelling dimen	sions										
			А	rea (m²)			age storey ight (m)		Vo	olume (m³)	
Lowest occupied				54.41] (1a) x		3.00] (2a) =		163.23	(3a)
Total floor area	(1a) + (1b) + (1	1c) + (1d)(1	Ln) =	54.41] (4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)(3n) =	163.23	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0	x 40 =	-	0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent fan	S						2	x 10 =	-	20	 (7a)
Number of passive vents							0	_] x 10 =	-	0	(7b)
Number of flueless gas fires	;						0	 x 40 =	-	0	(7c)
									Air	changes per hour	•
Infiltration due to chimneys	. flues. fans. PSVs		(6a)	+ (6b) + (7a	. (7b) + (7c) =	20	÷ (5) :	-	0.12	(8)
If a pressurisation test has l		intended, p				e from (9) to]] (-7
, Air permeability value, q50,					of envelope					4.00	(17)
If based on air permeability), other vis							0.32	(18)
Number of sides on which t										3	(19)
Shelter factor							1 -	[0.075 x (1	.9)] =	0.78	(20)
Infiltration rate incorporation	ng shelter factor							(18) x (20) =	0.25	(21)
Infiltration rate modified fo	r monthly wind speed	d:									
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee	d from Table U2										
5.10	5.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4											
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (a	llowing for shelter an	d wind facto	or) (21) x (2	2a)m							_
0.32	0.31 0.31	0.27	0.27	0.24	0.24	0.23	0.25	0.27	0.28	0.29	(22b)
Calculate effective air change	ge rate for the applica	able case:									_
If mechanical ventilation	a: air change rate thro	ough system								N/A	(23a)
If balanced with heat re		-			able 4h					N/A	(23c)
d) natural ventilation or	whole house positive	e input ventil	lation from	n loft							_
0.55	0.55 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.54	(24d)
	. () ()	(24-) (24	d) in (25)								
Effective air change rate - e	nter (24a) or (24b) or	(24C) OF (24	u) III (23)	1							(25)



3. Heat losses	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U W		value, I/m².K	Ахк, kJ/K	
Window						15.	56 x	1.24	= 19.23	3			(27)
Exposed floor						54.	41 x	0.06	= 3.26				(28b
External wall						21.	39 x	0.18	= 3.85				(29a
Party wall						76.	23 x	0.00	= 0.00				(32)
Total area of ext	ternal eleme	ents ∑A, m²	!			91.	36						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(2	6)(30) + ((32) =	26.34	(33)
Heat capacity C	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	 (35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								7.66	(36)
Total fabric heat	t loss									(33) + ((36) =	34.01	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ited month	ly 0.33 x (2	25)m x (5)									
	29.67	29.56	29.46	28.97	28.88	28.45	28.45	28.37	28.62	28.88	29.06	29.26	(38)
Heat transfer co			+ (38)m					-1	-				_ • •
	63.67	63.57	63.46	62.97	62.88	62.46	62.46	62.38	62.62	62.88	63.07	63.26	7
		1			I				Average =	Σ(39)112	/12 =	62.97	 (39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)						U .	2()	·		``
·	1.17	1.17	1.17	1.16	1.16	1.15	1.1	1.1	1.15	1.16	1.16	1.16	7
				_					Average =		·	1.16	 (40)
Number of days	; in month (1	Table 1a)									,		
	31.00	28.00	31.00	30.00	31.00	30.00		31.00	30.00	31.00	30.00	31.00	(40)
					1 1								
4. Water heati	ng energy r	equiremen	t					•					
Assumed occup	ancy, N											1.82	(42)
Annual average	hot water u	sage in litr	es per day '	Vd,average	(25 x M	-0-						77.43	(43)
	Jan	Feb	Mar	Apr	way	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach mont ^µ	' m = fact	tor from [⊤] ab	le 1 . (43)						
	85.17	82.07	78.97	75.80	72.78	69.68	69.68	72.78	75.88	78.97	82.07	85.17	
										∑(44)1.	12 =	929.11	(44)
Energy content	of hot wate	r used = 4.3	L8 x Vd,m x	nm (m/3	3600 kWh/m	onth (see	Tables 1b	o, 1c 1d)					
	126.30	110.47	113.99	99.	95.36	82.29	76.25	87.50	88.54	103.19	112.64	122.32	
										∑(45)1.	12 =	1218.22	(45)
Distribution loss	s 0.15 x (45)	m											
	18.95	16.57	17.10	14.91	14.30	12.34	11.44	13.12	13.28	15.48	16.90	18.35	(46)
Storage volume	(litres) inclu	iding any s	olar or WW	HRS storag	ge within san	ne vessel						2.00	(47)
Water storage le	oss:												
b) Manufacture	r's declared	loss factor	is not knov	vn									
Hot water st	orage loss fa	actor from	Table 2 (kV	/h/litre/da	y)							0.02	(51)
Volume facto	or from Tab	e 2a										3.91	(52)
Temperature	e factor fron	n Table 2b										1.00	(53)
Energy lost f	rom water s	torage (kW	/h/day) (47	/) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54		·										0.12	(55)
Water storage le	oss calculate	ed for each	month (55	5) x (41)m									
-	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit l	oss for each	month fro	m Table 3										_
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e		from Table	3a, 3b or 3		1							1], ,
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requ										0.00	0.00	0.00] (01)
	153.25	134.81	140.94	125.46	122.31	108.36	103.20	114.45	114.62	130.14	138.72	149.27	(62)
Solar DHW inpu						100.50	105.20	114.45	114.02	150.14	150.72	145.27] (02)
				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Output from we	0.00	0.00	0.00				0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa											100 -0		٦
	153.25	134.81	140.94	125.46	122.31	108.36	103.20	114.45	114.62	130.14	138.72	149.27]
										∑(64)1	12 = 1	1535.51	(64)
Heat gains from		ing (kWh/n	nonth) 0.25	5 × [0.85 ×	(45)m + (61)m] + 0.8 ×	[(46)m + (57)m + (59)	-			1	-
	63.55	56.20	59.46	53.91	53.26	48.22	46.91	50.65	50.30	55.87	58.32	62.23	(65)
5. Internal gai	ns												
Si internai Sai	Jan	Feb	Mar	Apr	May	lun	11	Δυσ	Son	Oct	Nov	Dec	
Matabalia gaing		FED	IVIdI	Apr	Мау	Jun	Jul	Aug	Sep	001	NOV	Dec	
Metabolic gains								01-00					7 (60)
	91.00	91.00	91.00	91.00	91.00	91.00	91.00		91.00	91.00	91.00	91.00	(66)
Lighting gains (o			-									T	-
	14.14	12.56	10.22	7.74	5.78	4.88	5.	6.86	9.20	11.68	13.64	14.54	(67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L1	L3a), also se	e Table 5							_
	158.66	160.31	156.16	147.33	136.18	125.70	1 70	1 05	121.20	130.03	141.18	151.66	(68)
Cooking gains (calculated in	Appendix	L, equation	L15 or L15	a), also see	Table 5							
	32.10	32.10	32.10	32.10	32.10	10	32.10	2.10	32.10	32.10	32.10	32.10	(69)
Pump and fan g	ains (Table S	5a)											
	0.00	0.00	0.00	0.00	0.00	0.00	٦.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap	oration (Tal	ole 5)											
	-72.80	-72.80	-72.80	-72.80	-72.80	-72.8	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	(71)
Water heating g	gains (Table	5)											-
	85.42	83.63	79.92	74.87	71.59	66.98	63.05	68.08	69.87	75.09	80.99	83.64	(72)
Total internal g	ains (66)m +				+ (71)+ (7			1], ,
0	308.53	306.81	296.60	2 24	263.85	, 247.86	237.33	242.29	250.57	267.11	286.12	300.14	(73)
	500.55	300.01	250.00		203.03	217.00	237.33	212.23	230.37	207.11	200.12	500.11] (, 5)
6. Solar gains													
			Access f	actor	Area		ar flux		g	FF		Gains	
			Table	6d	m²	v	//m²	-	ific data able 6b	specific d or Table		W	
													٦
SouthEast			0.7		7.78).63 x		=	99.98	_ (77)
NorthEast			0.7	7X	7.78	X 1	1.28 x	0.9 x 0).63 x	0.80	=	30.66	(75)
Solar gains in w	atts ∑(74)m	(82)m											_
	130.64	232.71	345.46	473.38	571.61	585.68	557.08	481.02	389.32	264.49	158.33	110.60	(83)
Total gains - int	ernal and so	lar (73)m +	(83)m										
	439.17	539.52	642.06	753.62	835.46	833.54	794.41	723.31	639.89	531.60	444.45	410.74	(84)
7.04													
7. Mean interr	-					(0							7,
Temperature du	0	51	Ũ		,			_	-	- ·		21.00	(85)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or for gains f	or living are	ea n1,m (se	e Table 9a)									

	0.99	0.98	0.94	0.84	0.66	0.47	0.34	0.39	0.64	0.91	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	:)				•			ł	-
	19.92	20.15	20.46	20.77	20.94	20.99	21.00	21.00	20.96	20.70	20.24	19.87	(87)
Temperature du		g periods ir			rom Table 9			1				1], ,
	19.94	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95	(88)
Utilisation factor	r for gains f		welling n2,	m	1		1	1	ł], ,
	0.99	0.97	0.93	0.80	0.60	0.40	0.26	0.31	0.56	0.87	0.98	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)	1				-], ,
	18.53	18.86	19.30	19.72	19.91	19.96	19.96	19.96	19.93	19.64	19.00	18.47	(90)
Living area fracti	ion	<u></u>			ļ				Liv	ving area ÷	(4) =	0.53	(91)
Mean internal te		for the wh	ole dwellin	g fLA x T1 +	-(1 - fLA) x ⁻	Т2				0	.,], ,
	19.27	19.55	19.92	20.28	20.46	20.51	20.52	20.51	20.48	20.21	19.66	19.22	(92)
Apply adjustmer	nt to the me	ean interna	l temperati	ure from Ta	ble 4e whe	ere appropr	iate					•	_
	19.27	19.55	19.92	20.28	20.46	20.51	20.52	20.51	20.48	20.21	19.66	19.22	(93)
	·			•	•	•			•			•	-
8. Space heatin	ng requirem	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains,	յՠ	1							•		-i	-
	0.99	0.97	0.93	0.81	0.63	0.44	0.31	0.05	0.60	0.88	0.97	0.99	(94)
Useful gains, ηm	1Gm, W (94)m x (84)m	1 										_
	434.04	523.79	594.38	611.75	525.44	365.62	24- `	255.7	384.73	468.87	433.23	407.14	(95)
Monthly average	e external t	emperatur	e from Tabl	e U1									_
	4.30	4.90	6.50	8.90	11.70	14.60	_ 50	_ 10	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	r mean inte	ernal tempe	erature, Lm	<i>,</i> W [(39)m	x [(93)m -	(96)m]							
	953.38	931.12	851.42	716.74	550.84	05	244.53	-6.67	399.74	604.21	792.42	950.01	(97)
Space heating re	equirement,	kWh/mon	th 0.024 x	[(97)m - (9	5)m ¹	m							
	386.39	273.73	191.24	75.59	18.90	0.00	٦.00	0.00	0.00	100.70	258.62	403.89]
									∑(98	8)15, 10	12 =	1709.06	(98)
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	31.41	(99)
9b. Energy requ	uirements	communit	v heating	hen.									
Fraction of space			-		11. 11)				'0' if r		0.00	(301)
Fraction of space				II y sy.	մ (ա. 11	-)				1 - (30		1.00	(302)
Fraction of comr										1 - (50)1) – [1.00	-
Fraction of total	-			t numn						(302) x (303	2-0 -	1.00	(303a)
Factor for contro	·		,	• •	munity co	aca haating				(502) X (503	5a) – [1.00	(304a)
		-				ace neating							(305)
Factor for chargi	•											1.00	(305a)
Distribution loss	Tactor (Tab	le 12c) for	community	reating sy	stem							1.05	(306)
Cross besting													
Space heating									700.00	1			(00)
Annual space he									.709.06] (205) (20		1704 54	(98)] (207)
Space heat from	neat pump)						(98	s) x (304a) x	x (305) x (30)6) = [1794.51	(307a)
Water basting													
Water heating	ating as a f	romt								1			
Annual water he									.535.51			1612.20	(64)
Water heat from										(305a) x (30		1612.28	(310a)
Electricity used f	or neat dist	ποιτιση					0.01	. × [(307a)	.(307e) + (3	310a)(310	e)] = [34.07] (313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

0.00	(331)
249.81	(332)
3656 60	(338)

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = <u>3656.60</u> (338)

10b. Fuel costs - community heating scheme

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from heat pump	1794.51	x	4.24	x 0.01 =	76.09	(340a)
Water heating from heat pump	1612.28	x	4.24	x 0.01 =	68.36	(342a)
Electricity for lighting	249.81	x	13.19	x 0.01 =	32.95	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	· (345)(354) =	297.40	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.26	(357)
SAP value					82.47]
SAP rating (section 13)					82	(358)
SAP band					В]
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		∠mission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of heat pump	32 0					(367a)
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a)) = 973.3	x	0.519	=	505.18	(367)
Electrical energy for community heat distribution	34.07	x	0.519	=	17.68	(372)
Total CO2 associated with community systems					522.86	(373)
Total CO2 associated with space and water heating					522.86	(376)
Electricity for lighting	249 9	x	0.519	=	129.65	(379)
Total CO ₂ , kg/year				(376)(382) =	652.51	(383)
Dwelling CO ₂ emission rate				(383) ÷ (4) =	11.99	(384)
El value					91.20]
El rating (section 14)					91	(385)
El band					В]
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources (space heating)						
Efficiency of heat pump	350.00					(367a)
Primary energy from heat pump [(307a)+(310a)] \times 100 \div (367a)) = 973.37	x	3.07	=	2988.25	(367)
Electrical energy for community heat distribution	34.07	x	3.07	=	104.59	(372)
Total primary energy associated with community systems					3092.84	(373)
Total primary energy associated with space and water heating					3092.84	(376)
Electricity for lighting	249.81	x	3.07	=	766.90	(379)
Primary energy kWh/year					3859.74	(383)
Dwelling primary energy rate kWh/m2/year					70.94	(384)



Assessor name	Miss Alicja	ı Kreglewsl	ка				As	sessor numl	ber	4134		
Client							Las	st modified		13/06	/2018	
Address	A 1 01 Inge	estre Road	l, London,	NW5 1XE								
1. Overall dwelling dimens	sions											
				A	rea (m²)			age storey ight (m)		VC	olume (m³)	
Lowest occupied					74.40	(1a) x		2.50	(2a) =		186.00	(3a)
Total floor area	(1a) +	- (1b) + (1c	:) + (1d)(1n) =	74.40	(4)						
Dwelling volume							(3a)	+ (3b) + (3c) + (3d)(3	n) =	186.00	(5)
2. Ventilation rate												
2. Ventilation rate											³ per hour	
Number of chimneys								0	v 40 -			
Number of chimneys								0	x 40 =		0] (6a)
Number of open flues Number of intermittent fam	-							0	x 20 =		0] (6b)
	S							3	x 10 =		30] (7a)
Number of passive vents								0	x 10 =		0] (7b)] (-)
Number of flueless gas fires	,							0	x 40 =		0] (7c)
										AI	changes per hour	
Infiltration due to chimneys	s, flues, fans,	PSVs		(6a)	+ (6b) + (7a	ı) + (7b) + (7c) =	30	÷ (5) =		0.16	(8)
If a pressurisation test has b			ntended, p	roceed to (17), otherwi	ise continu	e from (9) to	o (16)				
Air permeability value, q50,	, expressed ir	n cubic me	tres per h	our per squ	iare metre d	of envelope	e area				4.00	(17)
If based on air permeability	value, then	(18) = [(17) ÷ 20] + ({	8), otherwis	se (18) = (16	5)					0.36	(18)
Number of sides on which t	he dwelling i	is sheltere	d								3	(19)
Shelter factor								1 -	0.075 x (19	9)] =	0.78	-
Infiltration rate incorporatir	ng shelter fac	ctor										(20)
	0								(18) x (2	0) =	0.28	(20) (21)
Infiltration rate modified for									(18) x (2	0) =	0.28	
Infiltration rate modified for Jan			Apr	May	Jun	Jul	Aug	Sep	(18) x (2 Oct	0) = Nov	0.28 Dec	
	r monthly wi Feb	ind speed: Mar		May	Jun	Jul	Aug	Sep				
Jan	r monthly wi Feb	ind speed: Mar		May	Jun 3.80	Jul 3.80	Aug 3.70	Sep				
Jan Monthly average wind spee	r monthly wi Feb ed from Table	ind speed: Mar e U2	Apr	·			-		Oct	Nov	Dec] (21)
Jan Monthly average wind spee 5.10	r monthly wi Feb ed from Table	ind speed: Mar e U2	Apr	·			-		Oct	Nov	Dec] (21)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4	r monthly wi Feb ed from Table 5.00 1.25	ind speed: Mar e U2 4.90 1.23	Apr 4.40 1.10	4.30	3.80 0.95	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec] (21)] (22)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28	r monthly wi Feb ed from Table 5.00 1.25	ind speed: Mar e U2 4.90 1.23	Apr 4.40 1.10	4.30	3.80 0.95	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec] (21)] (22)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al	r monthly wi Feb ed from Table 5.00 1.25 Ilowing for sh 0.35	ind speed: Mar e U2 4.90 1.23 helter and 0.34	Apr 4.40 1.10 wind facto 0.31	4.30 1.08 or) (21) x (2	3.80 0.95 2a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50	Dec 4.70] (21)] (22)] (22a)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.36	Feb ed from Table 5.00 1.25 Ilowing for sh 0.35 ge rate for th	ind speed: Mar e U2 4.90 1.23 helter and 0.34 he applicab	Apr 4.40 1.10 wind facto 0.31 ole case:	4.30 1.08 or) (21) x (2 0.30	3.80 0.95 2a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50	Dec 4.70] (21)] (22)] (22a)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.36 Calculate effective air change	Feb ed from Table 5.00 1.25 Ilowing for sh 0.35 ge rate for th n: air change	ind speed: Mar e U2 4.90 1.23 helter and 0.34 ne applicab rate throu	Apr 4.40 1.10 wind facto 0.31 ole case:	4.30 1.08 or) (21) x (2 0.30	3.80 0.95 2a)m 0.27	3.80 0.95 0.27	3.70 0.93	4.00	Oct 4.30	Nov 4.50	Dec 4.70 1.18 0.33] (21)] (22)] (22a)] (22b)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.36 Calculate effective air change If mechanical ventilation	r monthly wi Feb ed from Table 5.00 1.25 Ilowing for sh 0.35 ge rate for th h: air change covery: efficie	ind speed: Mar e U2 4.90 1.23 helter and 0.34 he applicab rate throu	Apr 4.40 1.10 wind facto 0.31 ole case: ugh system allowing for	4.30 1.08 or) (21) x (2 0.30 n or in-use factors	3.80 0.95 2a)m 0.27	3.80 0.95 0.27	3.70 0.93	4.00	Oct 4.30	Nov 4.50	Dec 4.70 1.18 0.33] (21)] (22)] (22a)] (22b)] (22b)] (23a)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.36 Calculate effective air change If mechanical ventilation If balanced with heat reco	r monthly wi Feb ed from Table 5.00 1.25 Ilowing for sh 0.35 ge rate for th h: air change covery: efficie	ind speed: Mar e U2 4.90 1.23 helter and 0.34 he applicab rate throu	Apr 4.40 1.10 wind facto 0.31 ole case: ugh system allowing for	4.30 1.08 or) (21) x (2 0.30 n or in-use factors	3.80 0.95 2a)m 0.27	3.80 0.95 0.27	3.70 0.93	4.00	Oct 4.30	Nov 4.50	Dec 4.70 1.18 0.33] (21)] (22)] (22a)] (22b)] (22b)] (23a)
Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.36 Calculate effective air change If mechanical ventilation If balanced with heat ree d) natural ventilation or	r monthly wi Feb ed from Table 5.00 1.25 llowing for sh 0.35 ge rate for th a: air change covery: efficie whole house 0.56	ind speed: Mar e U2 4.90 1.23 helter and 0.34 ne applicab rate throu ency in % a e positive i 0.56	Apr 4.40 1.10 wind facto 0.31 ole case: ugh system allowing for nput venti 0.55	4.30 1.08 or) (21) x (2 0.30 or in-use factorial ilation from 0.55	3.80 0.95 2a)m 0.27 ctor from Ta	3.80 0.95 0.27 able 4h	3.70 0.93 0.26	4.00	Oct 4.30 1.08 0.30	Nov 4.50 1.13 0.32	Dec 4.70 1.18 0.33 N/A N/A] (21)] (22)] (22a)] (22a)] (22b)] (23a)] (23c)



		s paramete											
Element				Gross rea, m²	Openings m ²	Net a A, r		U-value W/m²K	A x U W	•	/alue, /m².K	Ахк, kJ/K	
Window						30.	15 x	1.24	= 37.26				(27)
External wall						37.2	21 x	0.18	= 6.70				(29a)
Party wall						47.0	00 x [0.00	= 0.00				(32)
Total area of exte	rnal eleme	nts ∑A, m²				67.3	36						(31)
Fabric heat loss, V	N/K = Σ(A ×	< U)							(26	5)(30) + (3	32) =	43.96	(33)
Heat capacity Cm	= ∑(А х к)							(28)	.(30) + (32) +	+ (32a)(32	2e) =	N/A	(34)
Thermal mass par	rameter (TN	MP) in kJ/m	²K									250.00	(35)
Thermal bridges:	<u>Σ(L x Ψ) ca</u>	lculated usi	ing Append	dix K								16.87	(36)
Total fabric heat lo	oss									(33) + (3	36) =	60.83	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat lo	oss calculat	ted monthly	y 0.33 x (2	25)m x (5)									
	34.60	34.45	34.30	33.60	33.47	32.86	32.86	32.75	33.10	33.47	33.74	34.01	(38)
Heat transfer coef	fficient, W,	/K (37)m +	(38)m										
	95.43	95.28	95.13	94.43	94.30	93.69	93.69	93.58	93.92	94.30	94.56	94.84]
									Average = ∑	(39)112/	/12 =	94.43	(39)
Heat loss paramet	ter (HLP), V	N/m²K (39))m ÷ (4)										
	1.28	1.28	1.28	1.27	1.27	1.26	1.26	1.26	1.26	1.27	1.27	1.27	
									Average = ∑	(40)112/	/12 =	1.27	(40)
Number of days ir	n month (T	able 1a)									i	-	-
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heating	g energy re	quirement											
Assumed occupan	ncy, N											2.35	(42)
Assumed occupan Annual average ho		sage in litre	s per day \	/d,average	e = (25 x N) +	36						2.35 89.97	(42) (43)
•		sage in litre Feb	s per day \ Mar	/d,average Apr	e = (25 x N) + May	36 Jun	Jul	Aug	Sep	Oct	Nov		
•	ot water us Jan	Feb	Mar	Apr	May	Jun		Aug	Sep	Oct	Nov	89.97	
Annual average ho	ot water us Jan	Feb	Mar	Apr	May	Jun		Aug 84.57	Sep 88.17	Oct 91.77	Nov 95.36	89.97	
Annual average ho	ot water us Jan in litres per	Feb day for ead	Mar ch month	Apr Vd,m = fact	May tor from Tab	Jun le 1c x (43)		-			95.36	89.97 Dec	
Annual average ho	ot water us Jan in litres per 98.96	Feb day for ead 95.36	Mar ch month 9 91.77	Apr Vd,m = fact 88.17	May tor from Tab 84.57	Jun le 1c x (43) 80.97	80.97	84.57		91.77	95.36	89.97 Dec 98.96] (43)
Annual average ho Hot water usage in	ot water us Jan in litres per 98.96	Feb day for ead 95.36	Mar ch month 9 91.77	Apr Vd,m = fact 88.17	May tor from Tab 84.57	Jun le 1c x (43) 80.97	80.97	84.57		91.77	95.36	89.97 Dec 98.96 1079.59] (43)
Annual average ho Hot water usage in	ot water us Jan in litres per 98.96	Feb day for ead 95.36 used = 4.18	Mar ch month V 91.77 8 x Vd,m x	Apr Vd,m = fact 88.17 nm x Tm/3	May tor from Tab 84.57 3600 kWh/m	Jun le 1c x (43) 80.97 onth (see	80.97 Tables 1b	84.57	88.17	91.77 Σ(44)1	95.36 .12 = 130.88	89.97 Dec 98.96 1079.59] (43)
Annual average ho Hot water usage in	ot water us Jan in litres per 98.96 f hot water 146.76	Feb day for ead 95.36 used = 4.18 128.36	Mar ch month V 91.77 8 x Vd,m x	Apr Vd,m = fact 88.17 nm x Tm/3	May tor from Tab 84.57 3600 kWh/m	Jun le 1c x (43) 80.97 onth (see	80.97 Tables 1b	84.57	88.17	91.77 Σ(44)1 119.90	95.36 .12 = 130.88	89.97 Dec 98.96 1∪79.59 4 142.13] (43)] (44)]
Annual average ho Hot water usage in Energy content of	ot water us Jan in litres per 98.96 f hot water 146.76	Feb day for ead 95.36 used = 4.18 128.36	Mar ch month V 91.77 8 x Vd,m x	Apr Vd,m = fact 88.17 nm x Tm/3	May tor from Tab 84.57 3600 kWh/m	Jun le 1c x (43) 80.97 onth (see	80.97 Tables 1b	84.57	88.17	91.77 Σ(44)1 119.90	95.36 .12 = 130.88	89.97 Dec 98.96 1/79.59 142.13 1415.52 21.32] (43)] (44)]
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclu	Feb day for ead 95.36 used = 4.18 128.36 m 19.25	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32	May tor from Tab 84.57 3600 kWh/m 110.80 16.62	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	89.97 Dec 98.96 1079.59 1415.52] (43)] (44)] (45)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (Ii Water storage los	ot water us Jan in litres per 98.96 f hot water 146.76 0.15 x (45)1 22.01 itres) inclus	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 HRS storag	May tor from Tab 84.57 3600 kWh/m 110.80 16.62	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	89.97 Dec 98.96 1/79.59 142.13 1415.52 21.32] (43)] (44)] (45)] (46)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45)1 22.01 itres) incluss: s declared l	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor in	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 HRS storage	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	89.97 Dec 98.96 1∪79.59 142.13 1415.52 21.32 2.00] (43)] (44)] (44)] (45)] (46)] (47)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (Ii Water storage los b) Manufacturer's Hot water stor	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) incluss: s declared l rage loss fa	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor in cord from T	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 HRS storage	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	B9.97 Dec 98.96 1/79.59 1412.13 1415.52 21.32 2.00] (43)] (44)] (44)] (45)] (46)] (47)] (51)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's Hot water stor Volume factor	ot water us Jan in litres per 98.96 f hot water 146.76 0.15 x (45)1 22.01 itres) inclus is: s declared l rage loss fa from Table	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor is ctor from T e 2a	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 HRS storage	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	BB.97 Dec 98.96 1/79.59 142.13 1415.52 21.32 2.00 0.02 3.91] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclus s: s declared l rage loss fa from Table factor from	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor in ctor from T e 2a table 2b	Mar ch month V 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 'HRS storage vn /h/litre/da	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam y)	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	B9.97 Dec 98.96 1/79.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)] (53)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (Ii Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f Energy lost fro	ot water us Jan in litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclus is: s declared l rage loss fa from Table factor from om water st	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor in ctor from T e 2a table 2b	Mar ch month V 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 'HRS storage vn /h/litre/da	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam y)	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	89.97 Dec 98.96 1/79.59 142.13 142.13 21.32 2.00 3.91 1.00 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f Energy lost fro Enter (50) or (54)	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclus s: s declared l rage loss fa from Table factor from om water st in (55)	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor in ctor from T e 2a torage (kWł	Mar ch month V 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know rable 2 (kW h/day) (47	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 'HRS storage vn /h/litre/da	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam y)	Jun le 1c x (43) 80.97 onth (see 95.61	80.97 Tables 1b 88.60	84.57 , 1c 1d) 101.67	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	B9.97 Dec 98.96 1/79.59 142.13 1415.52 21.32 2.00 0.02 3.91 1.00] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)] (53)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (Ii Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f Energy lost fro	ot water us Jan in litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclus s: s declared l rage loss fa from Table factor from om water st in (55) ss calculate	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor is ctor from T e 2a Table 2b torage (kWH d for each r	Mar ch month V 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know able 2 (kW h/day) (47 month (55	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 HRS storag vn /h/litre/da	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within sam γ) 52) x (53)	Jun le 1c x (43) 80.97 onth (see 7 95.61 14.34 ne vessel	80.97 Tables 1b 88.60 13.29	84.57 . 1c 1d) 101.67 15.25	88.17	91.77 Σ(44)1 119.90 Σ(45)1 17.99	95.36 .12 = 130.88 .12 = 19.63	89.97 Dec 98.96 1∪79.59 142.13 1415.52 21.32 2.00 3.91 1.00 0.12 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f Energy lost fro Enter (50) or (54) Water storage los	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclu- itres) inclu- ss: s declared I rage loss fa factor from m water st in (55) ss calculate 3.69	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor is ctor from T e 2a Table 2b torage (kWH d for each r 3.33	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know rable 2 (kW h/day) (47 month (55 3.69	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 'HRS storage vn /h/litre/da ') x (51) x (1 5) x (41)m 3.57	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within san y) 52) x (53)	Jun le 1c x (43) 80.97 onth (see 95.61 14.34 ne vessel	80.97 Tables 1b 88.60 13.29 3.69	84.57 . 1c 1d) 101.67 15.25 3.69	88.17	91.77 Σ(44)1 119.90 Σ(45)1	95.36 .12 = 130.88 .12 =	89.97 Dec 98.96 1/79.59 142.13 142.13 21.32 2.00 3.91 1.00 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Annual average ho Hot water usage in Energy content of Distribution loss (Storage volume (li Water storage los b) Manufacturer's Hot water stor Volume factor Temperature f Energy lost fro Enter (50) or (54)	ot water us Jan In litres per 98.96 f hot water 146.76 0.15 x (45) 22.01 itres) inclus s: s declared l rage loss fa from Table factor from om water st in (55) ss calculate 3.69	Feb day for ead 95.36 used = 4.18 128.36 m 19.25 ding any so loss factor is ctor from T e 2a Table 2b torage (kWH d for each r 3.33	Mar ch month v 91.77 8 x Vd,m x 132.45 19.87 lar or WW s not know rable 2 (kW h/day) (47 month (55 3.69	Apr Vd,m = fact 88.17 nm x Tm/3 115.47 17.32 'HRS storage vn /h/litre/da ') x (51) x (1 5) x (41)m 3.57	May tor from Tab 84.57 3600 kWh/m 110.80 16.62 ge within san y) 52) x (53)	Jun le 1c x (43) 80.97 onth (see 95.61 14.34 ne vessel	80.97 Tables 1b 88.60 13.29 3.69	84.57 . 1c 1d) 101.67 15.25 3.69	88.17	91.77 Σ(44)1 119.90 Σ(45)1 17.99	95.36 .12 = 130.88 .12 = 19.63	89.97 Dec 98.96 1∪79.59 142.13 1415.52 21.32 2.00 3.91 1.00 0.12 0.12] (43)] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)

	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.2	26 22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month f	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	alculated f	or each mo	onth 0.85 x	(45)m + (4	l6)m + (57	')m + (59	9)m + (61)m				
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.	.62 128.96	5 146.8	5 156.96	169.08	(62)
Solar DHW inpu	t calculated	using Appe	endix G or A	Appendix H									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	(63)
Output from wa	ter heater f	or each mo	nth (kWh/i	month) (62	2)m + (63)n	า							
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.	.62 128.90	5 146.8	5 156.96	169.08	
										∑(64)	112 =	1732.81	(64)
Heat gains from	water heati	ing (kWh/m	nonth) 0.25	5 × [0.85 ×	(45)m + (61	l)m] + 0.8 >	< [(46)m +	(57)m +	(59)m]				
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.3	36 55.07	61.43	64.38	68.82	(65)
									_				
5. Internal gair				-		-						_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	ig Sep	Oct	Nov	Dec	
Metabolic gains	, ,				1							1	٦
	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.	.40 117.40	0 117.40	0 117.40	117.40	(66)
Lighting gains (c			-		1	1							٦
	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.9	96 12.03	15.27	17.82	19.00	(67)
Appliance gains			-	1			1	_				-	-
	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.	.96 158.39	9 169.93	3 184.50	198.19	(68)
Cooking gains (c			•		1								-
	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.	74 34.74	34.74	34.74	34.74	(69)
Pump and fan ga	ains (Table 5	ia)											-
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap												-	-
	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.	92 -93.92	-93.92	-93.92	-93.92	(71)
Water heating g					_							1	٦
	94.56	92.49	88.17	82.30	78.49	73.13	68.57	74.4	41 76.49	82.56	89.42	92.49	(72)
Total internal ga												-	-
	378.61	376.62	363.81	343.16	322.23	302.00	288.80	294.	.56 305.12	2 325.98	3 349.96	367.91	(73)
6. Solar gains													
			Access f	factor	Area	So	lar flux		g	F	F	Gains	
			Table	6d	m²	v	V/m²		specific data	specif		w	
								г	or Table 6b	ı —	ble 6c		_
SouthWest			0.7	7 X	16.68	x3	36.79	x 0.9 x [0.63	x 0.	80 =	214.36	_ (79)
SouthEast			0.7	7X	3.47	x3		x 0.9 x [0.63	x 0.	80 =	44.59	_ (77)
NorthWest			0.7	7X	10.00	x 1	1.28	x 0.9 x	0.63	x 0.	80 =	39.41	(81)
Solar gains in wa		(82)m				i	1			-	-		-
	298.36	521.30	748.04	985.13	1156.62	1171.66	1119.87	7 988.	.35 829.58	8 585.52	2 359.75	253.79	(83)
Total gaine inte	ernal and so	lar (73)m +	(83)m										_
TOTAL BAILTS - ILLE	-		4444 05	1328.29	1478.85	1473.65	1408.67	7 1282	.91 1134.7	0 911.50) 709.71	621.70	(04)
TOtal gains - Inte	676.97	897.92	1111.85	1520.25		11/5/05				0 511.5		011/0	(84)
				1528.25	1	1175.05				0 01113			(84)
7. Mean intern	al temperat	ture (heatii	ng season)		1	1	1			0 511.5			_ ` `
	al temperat	ture (heatii	ng season)		1	1	lut	Au		Oct	Nov	21.00 Dec	_ (84) _ (85)

	0.99	0.96	0.90	0.76	0.57	0.40	0.29	0.33	0.55	0.85	0.97	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	.)								-
	19.86	20.17	20.53	20.83	20.96	20.99	21.00	21.00	20.97	20.75	20.23	19.79	(87)
Temperature du	Iring heating	g periods ir	the rest of	f dwelling fr	om Table 9	9, Th2(°C)], ,
	19.85	19.86	19.86	19.87	19.87	19.87	19.87	19.87	19.87	19.87	19.86	19.86	(88)
Utilisation facto		1				1		1	1	1		1], ,
	0.99	0.95	0.87	0.71	0.51	0.33	0.22	0.25	0.47	0.81	0.96	0.99	(89)
Mean internal to	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	c)						_
	18.38	18.83	19.31	19.69	19.83	19.87	19.87	19.87	19.85	19.61	18.92	18.29	(90)
Living area fract	ion	•				•			Liv	ving area ÷	(4) =	0.36	(91)
Mean internal to	emperature	for the wh	ole dwellin	g fLA x T1 +	(1 - fLA) x T	Т2							_
	18.91	19.31	19.75	20.10	20.23	20.27	20.27	20.27	20.25	20.02	19.38	18.82	(92)
Apply adjustme	nt to the me	ean interna	l temperati	ure from Ta	ble 4e whe	ere appropr	iate				•		-
	18.91	19.31	19.75	20.10	20.23	20.27	20.27	20.27	20.25	20.02	19.38	18.82	(93)
	•	•	•			•					•		-
8. Space heating	ng requirem									-			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	_		1							1	·	-1	1
	0.98	0.95	0.87	0.72	0.53	0.36	0.24	0.28	0.50	0.81	0.96	0.99	(94)
Useful gains, ηπ		1	1						[1
	664.27	849.67	966.64	954.19	782.38	528.24	343.77	361.75	565.40	740.29	679.82	613.26	(95)
Monthly average			1					_			1		1
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo			i							1	1	1	1
.	1393.82	1372.61	1260.12	1057.32	804.72	531.13	344.13	362.45	577.83	887.98	1161.56	1386.91	(97)
Space heating re			1										1
	542.79	351.42	218.35	74.25	16.62	0.00	0.00	0.00	0.00	109.88	346.86	575.59]
									∑(98	3)15, 10		2235.75] (98)
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	30.05	(99)
9b. Energy req	uirements -	communit	ty heating s	cheme									
Fraction of spac	e heat from	secondary	/suppleme	ntary syster	m (table 11	.)				'0' if ı	none	0.00	(301)
Fraction of spac	e heat from	communit	y system							1 - (30	01) =	1.00	(302)
Fraction of com	munity heat	from boile	ers									1.00	(303a)
Fraction of total	space heat	from com	nunity boil	ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ging metho	d (Table 4c	(3)) for com	munity spa	ace heating						1.00	(305)
Factor for charg	ing method	(Table 4c(3)) for com	nunity wate	er heating							1.00	(305a)
Distribution loss	factor (Tab	le 12c) for	community	heating sy	stem							1.05	(306)
Space heating													
Annual space he	ating requi	rement						2	235.75]			(98)
Space heat from	boilers							(98	8) x (304a) x	k (305) x (30	06) =	2347.54	(307a)
Water heating													
Annual water he	eating requi	rement						1	732.81]	_		(64)
Water heat fron	n boilers							(64)	x (303a) x	(305a) x (30	06) =	1819.45	(310a)
Electricity used	for heat dis	tribution					0.01	L × [(307a)	.(307e) + (3	310a)(310	e)] =	41.67	(313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

[0.00	(331)
	326.44	(332)
[4493,43	(338)

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = 4493.43 (338)

10b. Fuel costs - community heating scheme

10b. Fuel costs - community neating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	2347.54	x	4.24	x 0.01 =	99.54	(340a)
Water heating from boilers	1819.45	х	4.24	x 0.01 =	77.14	(342a)
Electricity for lighting	326.44	х	13.19	x 0.01 =	43.06	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	339.74	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.20	(357)
SAP value					83.33]
SAP rating (section 13)					83	(358)
SAP band					В]

12b. CO₂ emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources	(space heating)						
Efficiency of boilers		89.50					(367a)
CO2 emissions from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	4655.85	x	0.216	=	1005.66	(367)
Electrical energy for communit	ty heat distribution	41.67	x	0.519	=	21.63	(372)
Total CO2 associated with com	nmunity systems					1027.29	(373)
Total CO2 associated with space	ce and water heating					1027.29	(376)
Electricity for lighting		326.44	x	0.519	=	169.42	(379)
Total CO₂, kg/year					(376)(382) =	1196.72	(383)
Dwelling CO ₂ emission rate					(383) ÷ (4) =	16.08	(384)
EI value						86.57]
EI rating (section 14)						87	(385)
EI band						В]
13b. Primary energy - comm	unity heating scheme						
		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary energy from other sou	urces (space heating)						
Efficiency of boilers		89.50					(367a)
Primary energy from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	4655.85	x	1.22	=	5680.14	(367)
Electrical energy for communit	ty heat distribution	41.67	x	3.07	=	127.93	(372)
Total primary energy associate	ed with community systems					5808.07	(373)
Total primary energy associate	ed with space and water heating					5808.07	(376)
Electricity for lighting		326.44	x	3.07	=	1002.18	(379)
Primary energy kWh/year						6810.25	(383)
Dwelling primary energy rate k	wh/m2/year					91.54	(384)



Assessor name	Miss Alicja Kreglev	vska				As	sessor numb	ber	4134	
Client						Las	st modified		13/06,	/2018
Address	A 1 01 Ingestre Ro	ad, London, I	NW5 1XE							
1. Overall dwelling dimen	sions									
			А	rea (m²)			age storey ight (m)		Vo	lume (m³)
Lowest occupied				74.40](1a) x		2.50	(2a) =		186.00 (3a
Total floor area	(1a) + (1b) + (1c) + (1d)(1	.n) =	74.40	(4)					
Dwelling volume						(3a)	+ (3b) + (3c	+ 3d)'3	n) =	186.00 (5)
2. Ventilation rate							71.			
									m³	per hour
Number of chimneys								x 40 =		0 (6;
Number of open flues							0	x 20 =		0 (6)
Number of intermittent fan	IS						3	x 10 =		30 (7;
Number of passive vents					6		0	x 10 =		0 (7)
Number of flueless gas fires	S				5		0	x 40 =		0 (70
				C	N				Air c	hanges per hour
							20	. (5)		
Infiltration due to chimneys If a pressurisation test has		intended pr			a) + (7b) + (7		30	÷ (5) =		0.16 (8)
Air permeability value, q50,							5 (10)			5.00 (1
If based on air permeability						alea				0.41 (18
Number of sides on which t			,, other wi	56 (10) - (1	0)					3 (19
Shelter factor	the dwelling is shelle	ieu					1 - [0.075 x (19	a)] = [0.78 (20
Infiltration rate incorporation	ng shelter factor						- 1	(18) x (2		0.32 (2:
Infiltration rate modified fo		d:						(10) X (2	0) =	0.52
Jan	,	⇔								
	Feb Ma	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind spee	ed from Table U2				1	-				
Monthly average wind spee		Apr 4.40	May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep 4.00	Oct 4.30	Nov	Dec (22
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4	ed from Table U2	4.40		3.80	3.80	3.70	4.00	4.30	4.50	4.70 (22
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28	ed from Table U2 200 4.90 1.25 1.23	4.40	4.30	0.95	1	-				
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4	ed from Table U2 200 4.90 1.25 1.23	4.40	4.30	0.95	3.80	3.70	4.00	4.30	4.50	4.70 (22
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	ed from Table U2 2.00 4.90 1.25 1.23 Illowing for shelter ar 0.40 0.39	4.40 1.10 nd wind facto 0.35	4.30 1.08 r) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (2.
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41	ed from Table U2 2.00 4.90 1.25 1.23 Illowing for shelter ar 0.40 0.39 ge rate for the applic	4.40 1.10 nd wind facto 0.35 able case:	4.30 1.08 r) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (22
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air changed)	ed from Table U2 2.00 4.90 1.25 1.23 Illowing for shelter ar 0.40 0.39 ge rate for the applic h: air change rate thr	4.40 1.10 and wind factor 0.35 able case: ough system	4.30 1.08 r) (21) x (2 0.34	3.80 0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	4.30	4.50	4.70 (2) 1.18 (2) 0.37 (2)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air change If mechanical ventilation	ed from Table U2 2.00 4.90 1.25 1.23 Illowing for shelter ar 0.40 0.39 ge rate for the applic n: air change rate thre covery: efficiency in S	4.40 1.10 ad wind facto 0.35 able case: ough system % allowing fo	4.30 1.08 rr) (21) x (2 0.34 r in-use fa	3.80 0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	4.30	4.50	4.70 (2. 1.18 (2. 0.37 (2. N/A (2.
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chang If mechanical ventilation If balanced with heat recommended	ed from Table U2 2.00 4.90 1.25 1.23 Illowing for shelter ar 0.40 0.39 ge rate for the applic n: air change rate thre covery: efficiency in S	4.40 1.10 ad wind facto 0.35 able case: ough system % allowing fo	4.30 1.08 rr) (21) x (2 0.34 r in-use fa	3.80 0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	4.30	4.50	4.70 (2. 1.18 (2. 0.37 (2. N/A (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chang If mechanical ventilation If balanced with heat read d) natural ventilation or	ed from Table U2 1.25 1.23 1.25 1.23 10wing for shelter ar 0.40 0.39 ge rate for the applic n: air change rate thre covery: efficiency in S whole house positive 0.58 0.58	4.40 1.10 ad wind facto 0.35 able case: ough system % allowing fo e input ventil 0.56	4.30 1.08 r) (21) x (2 0.34 r in-use fa lation from 0.56	3.80 0.95 22a)m 0.30 ctor from T	3.80 0.95 0.30	3.70 0.93 0.29	4.00	4.30 1.08 0.34	4.50 1.13 0.36	4.70 (22) 1.18 (22) 0.37 (22) N/A (22) N/A (22)



3. Heat losses and heat loss parameter								
Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m²K	A x U W/K	к-value, kJ/m².К	Ахк, kJ/K	
Window			18.60 x	1.33	= 24.66]	(2	27)
External wall			48.77 x	0.18	= 8.78		(2	29a)
Party wall			47.00 x	0.00	= 0.00		(3	32)
Total area of external elements ∑A, m ²			67.37	,			(3	31)
Fabric heat loss, W/K = $\Sigma(A \times U)$					(26)	.(30) + (32) =	33.44 (3	33)
Heat capacity Cm = $\sum (A \times \kappa)$				(28)	(30) + (32) + (3	32a)(32e) =		34)
Thermal mass parameter (TMP) in kJ/m ² K								35)
Thermal bridges: $\Sigma(L \times \Psi)$ calculated using Appe	endix K							36)
Total fabric heat loss						(33) + (36) =		37)
Jan Feb Mar	Apr	May	Jun Jul	Aug	Sep	Oct Nov	•	,
Ventilation heat loss calculated monthly 0.33 x	-							
35.76 35.56 35.37		34.29	33.50 33.50	33.36	33.81	34.29 34.64	1 34.99 (3	38)
Heat transfer coefficient, W/K (37)m + (38)m				1				
79.15 78.95 78.76	77.85	77.68	76.89 76.89	76.74	77.19	77.00 78.03	2 78.38	
		1 11122 1			Average = 2/3			39)
Heat loss parameter (HLP), W/m ² K (39)m \div (4)					0 21			,
1.06 1.06 1.06	1.05	1.04	1.03 1.03	1.03	1.94	1.04 1.05	1.05	
					Average = ∑(4	I		40)
Number of days in month (Table 1a)				$\cdot \times$		_, , _		- /
31.00 28.00 31.00	30.00	31.00	30.00 31.00	31.00	30.00	31.00 30.00) 31.00 (4	40)
		1	6					
4. Water heating energy requirement								
4. Water neuting energy requirement								
Assumed occupancy, N			Car				2.35 (4	42)
	y Vd,average	e = (25 x N) + 3	36				· · · · · · · · · · · · · · · · · · ·	42) 43)
Assumed occupancy, N	y Vd,average Apr	e = (25 x N) + 3 May	Jun Jul	Aug	Sep	Oct Nov	89.97 (4	
Assumed occupancy, N Annual average hot water usage in litres per da	Apr	Məy	Jun Jul	Aug	Sep	Oct Nov	89.97 (4	
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar	Apr	Məy	Jun Jul			Oct Nov 91.77 95.30	89.97 (4 Dec	
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont	Apr h Vd,m = fact	May tor from Tabl	Jun Jul e 1c x (43)		88.17		89.97 (4 Dec 5 98.96	
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont	Apr h Vd,m = fact 88.17	May tor fro. Tabl	Jun Jul e 1c x (43) 80.97	84.57	88.17	91.77 95.3	89.97 (4 Dec 5 98.96	43)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77	Apr h Vd,m = fact 88.17	May tor fro. Tabl	Jun Jul e 1c x (43) 80.97	84.57 b, 1c 1d)	88.17	91.77 95.3	89.97 (4 Dec 5 98.96 1079.59 (4	43)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m	Apr h Vd,m = fact 88.17	May tor from Tabl 64.: 7 3600 kWh/ma	Jun Jul e 1c x (43) 80.97 80.97 80.97 onth (see Tables 1	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ(44)112 = [89.97 (4 Dec 5 98.96 1079.59 (4 8 142.13	43)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m	Apr h Vd,m = fact 88.17	May tor from Tabl 64.: 7 3600 kWh/ma	Jun Jul e 1c x (43) 80.97 80.97 80.97 onth (see Tables 1	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ(44)112 = 119.90 130.8	89.97 (4 Dec 5 98.96 1079.59 (4 8 142.13	43) 44)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd, m 146.76 128.36 132 45	Apr h Vd,m = fact 88.17	May tor from Tabl 64.: 7 3600 kWh/ma	Jun Jul e 1c x (43) 80.97 80.97 80.97 onth (see Tables 1	b, 1c 1d)	88.17	91.77 95.30 Σ(44)112 = 119.90 130.8	89.97 (4 Dec 0 0 98.96 1079.59 (4 8 142.13 1415.52 (4	43) 44)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132 (5) Distribution loss 0.15 x (45)m	Apr h Vd,m = fact 88.17 h x nm x Tr1/s 115.47 17.32	May tor fro. Tabl 34.17 3600 kWh/mo 110.80 16.62	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	b, 1c 1d)	88.17	91.77 95.30 $\Sigma(44)112 =$ 119.90 119.90 130.8 $\Sigma(45)112 =$ 110.100	89.97 (2 Dec 0 5 98.96 1079.59 (2 8 142.13 1415.52 (2 3 21.32	43) 44) 45)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$,m 146.76 128.36 132 45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87	Apr h Vd,m = fact 88.17 h x nm x Tr1/s 115.47 17.32	May tor fro. Tabl 34.17 3600 kWh/mo 110.80 16.62	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 $\Sigma(44)112 =$ 119.90 119.90 130.8 $\Sigma(45)112 =$ 110.100	89.97 (2 Dec 0 5 98.96 1079.59 (2 8 142.13 1415.52 (2 3 21.32	43) 44) 45) 46)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132,45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) includine any solar or W	Apr h Vd,m = fact 88.17 h x nm x Tr1/s 115.47 17.32 WHRS storag	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 $\Sigma(44)112 =$ 119.90 119.90 130.8 $\Sigma(45)112 =$ 110.100	89.97 (4 Dec 0 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 2.00 (4	43) 44) 45) 46)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132 4 Distribution loss 0.15 x (45)m 22.01 19.25 1 19.87 Storage volume (litres) including any solar or W Water storage loss:	Apr h Vd,m = fact 88.17 h x nm x Tr1/s 115.47 17.32 WHRS storag	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 $\Sigma(44)112 =$ 119.90 119.90 130.8 $\Sigma(45)112 =$ 110.100	89.97 (4 Dec 0 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 2.00 (4 0.24 (4	43) 44) 45) 46) 47)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$, m 146.76 128.36 132 45 Distribution loss $0.15 \times (45)$ m 22.01 19.25 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know	Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day)	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 =	89.97 (4 Dec 0 98.96 (4 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4	43) 44) 45) 46) 47) 48)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132 4 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b	Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day)	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 =	89.97 (4 Dec 0 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5	43) 44) 45) 46) 47) 48) 49)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132 4 Distribution loss $0.15 \times (45)m$ 22.01 19.25 V 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day) 48) x (49)	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 =	89.97 (4 Dec 0 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5	43) 44) 45) 46) 47) 48) 49) 50)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$,m 146.76 128.36 132 45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 1 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55)	Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day) 48) x (49)	May tor fro. Tabl 34. 7 3600 kWh/mo 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29	84.57 b, 1c 1d)	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 =	89.97 (4 Dec 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5	43) 44) 45) 46) 47) 48) 49) 50)
Assumed occupancy, N Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = 4.18 x Vd,m 146.76 128.36 132 4 Distribution loss 0.15 x (45)m 22.01 19.25 Y 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day) 48) x (49) 55) x (41)m 3.87	May tor fro. Tabl 64. 7 3600 kWh/ma 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29 e vessel 3.87 4.00	84.57 b, 1c 1d) 101.67 15.25	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 = 17.99 19.63	89.97 (4 Dec 5 98.96 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5	 43) 44) 45) 46) 47) 48) 49) 50) 55)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$,m 146.76 128.36 132 45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 4.00	Apr h Vd,m = fact 88.17 h x n n x Tr 1/5 115.47 17.32 WHRS storage wn (kWh/day) 48) x (49) 55) x (41)m 3.87	May tor fro. Tabl 64. 7 3600 kWh/ma 110.80 16.62 ge within sam	Jun Jul e 1c x (43) 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29 e vessel 3.87 4.00	84.57 b, 1c 1d) 101.67 15.25	88.17	91.77 95.30 Σ (44)112 = 119.90 130.8 Σ (45)112 = 17.99 19.63	89.97 (4 Dec 5 98.96 1079.59 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5 4.00 (5	 43) 44) 45) 46) 47) 48) 49) 50) 55)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$,m 146.76 128.36 132 45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 4.00 If the vessel contains dedicated solar storage on	Apr h Vd,m = fact 88.17 h x n n x Tri)/5 115.47 17.32 WHRS storage vn (kWh/day) 48) x (49) 55) x (41)m 3.87 r dedicated W 3.87	May tor fro. (Table 34.) 7 3600 kWh/mo 110.80 16.62 3e within sam) 4.00 VWHRS (56)m	Jun Jul e 1c x (43) 80.97 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29 e vessel 3.87 4.00 n x [(47) - Vs] ÷ (41)	84.57 b, 1c 1d) 101.67 15.25 15.25 4.00 7), else (56)	88.17 102.88 15.43 3.87	91.77 95.30 Σ (44)112 =	89.97 (4 Dec 5 98.96 1079.59 1079.59 (4 8 142.13 1415.52 (4 3 21.32 (4 0.24 (4 0.54 (4 0.13 (5 4.00 (5	 43) 44) 45) 46) 47) 48) 49) 50) 55) 56)
Assumed occupancy, N Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 98.96 95.36 91.77 Energy content of hot water used = $4.18 \times Vd$,m 146.76 128.36 132.45 Distribution loss $0.15 \times (45)m$ 22.01 19.25 19.87 Storage volume (litres) including an solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 4.00 16 the vessel contains dedicated solar storage of 4.00 3.61 4.00	Apr h Vd,m = fact 88.17 h x n n x Tri)/5 115.47 17.32 WHRS storage vn (kWh/day) 48) x (49) 55) x (41)m 3.87 r dedicated W 3.87	May tor fro. (Table 34.) 7 3600 kWh/mo 110.80 16.62 3e within sam) 4.00 VWHRS (56)m	Jun Jul e 1c x (43) 80.97 80.97 80.97 onth (see Tables 1 95.61 88.60 14.34 13.29 e vessel 3.87 4.00 n x [(47) - Vs] ÷ (41)	84.57 b, 1c 1d) 101.67 15.25 15.25 4.00 7), else (56) 4.00	88.17 102.88 15.43 3.87 3.87	91.77 95.30 Σ (44)112 =	89.97 (4 Dec 0 1079.59 (4 11079.59 (4 1415.52 (4 2.00 (4 0.24 (4 0.54 (4 0.13 (5 4.00 (5	 43) 44) 45) 46) 47) 48) 49) 50) 55) 56)

Combi loss for e	ach month	from Table	3a, 3b or 3	с								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (61)
Total heat requi	red for wat	er heating c	alculated f	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)r	n + (59)m +	(61)m			
	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39 (62)
Solar DHW input	t calculated	using Appe	ndix G or A	ppendix H								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Output from wa	ter heater f	or each moi	nth (kWh/r	nonth) (62)m + (63)m	יי ו						,, , , , , , , , , , , , , , , , ,
·	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39
										Σ(64)1		.736.48 (64)
Heat gains from	water heat	ing (kWh/m	onth) 0.25	5 v [0 85 v /	15)m ± (61)m] ± 0.8 ×	[(46)m + (1)]	57)m ± (59)	ml	2(04)1	12	
ficat gains from	r		65.85							61.69	64.62	
	70.61	62.38	65.60	59.50	58.65	52.90	51.27	55.61	55.31	61.68	04.02	69.07 (65)
5. Internal gain	าร											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	(Table 5)			·				Ŭ				
	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	11.1.40	117.40	117.40 (66)
Lighting gains (c							117.40	117.40	117.40	117.40	117.40	117.40 (00)
Lighting gains (C	r						6.00	0.00	12.02	0.07	17.02	
. .	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19.00 (67)
Appliance gains			-									
	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.50	198.19 (68)
Cooking gains (c		Appendix L	, equation	L15 or L15	a), also see	Table 5						
	34.74	34.74	34.74	34.74	34.74	34.74	34.74	3174	34.74	34.74	34.74	34.74 (69)
Pump and fan ga	ains (Table S	5a)					C					
	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00 (70)
Losses e.g. evap	oration (Tal	ole 5)					\sim					
	-93.92	-93.92	-93.92	-93.92	-93.92	-9: .92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92 (71)
Water heating g	ains (Table	5)										
	94.90	92.82	88.51	82.64	78 53	73.47	68.91	74.75	76.82	82.90	89.75	92.83 (72)
Total internal ga	ains (66)m +	+ (67)m + (6	8)m + (69)ı	m + (70)m +	- <u>(71</u>)n. + (7	2)m						
	381.95	379.95	367.15	346.50	325 56	305.33	292.14	297.89	308.46	329.31	353.29	371.24 (73)
		11						1				
6. Solar gains				C								
			Access f		Area		ar flux		g	FF		Gains
			ab'e	6d	m²	W	//m²	-	fic data able 6b	specific d or Table		W
			$\mathbf{G}^{\mathbf{v}}$									
SouthWest			0.77		10.29				0.63 x		=	<u>115.71</u> (79)
SouthEast		Chi	0.7	7 × [2.14	x 30			0.63 x	0.70	=	24.06 (77)
NorthWest			0.7	7 X	6.17	x 1	1.28 x	0.9 x 0	0.63 x	0.70	=	21.28 (81)
Solar gains in wa	atts ∑(74)m	(82)m										
	161.05	281.39	403.78	531.77	624.34	632.46	604.50	533.50	447.80	316.06	194.18	136.99 (<mark>83</mark>)
Total gains - inte	ernal and so	lar (73)m +	(83)m									
	542.99	661.34	770.93	878.26	949.90	937.79	896.64	831.40	756.25	645.37	547.48	508.23 (84)
7. Mean intern	al tempera	ture (heatin	ig season)									
Temperature du	iring heating	g periods in	the living a	area from T	able 9, Th1	.(°C)						21.00 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation facto	r for gains f	or living are	a n1,m (se	e Table 9a)								
	0.99	0.99	0.96	0.87	0.71	0.52	0.38	0.42	0.67	0.92	0.99	1.00 (86)
Mean internal te	emp of livin	g area T1 (si	teps 3 to 7	in Table 9c)							

	20.00	20.21	20.48	20.77	20.94	20.99	21.00	21.00	20.97	20.73	20.30	19.96	(87)
Temperature du			the rest of	f dwelling f	rom Table 9	9, Th2(°C)		1				-1	
	20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04	(88)
Utilisation facto	or for gains for		velling n2,	m	1			1				-1	
	0.99	0.98	0.94	0.84	0.65	0.44	0.30	0.34	0.59	0.89	0.98	1.00	(89)
Mean internal t	emperature	in the rest of	of dwelling	g T2 (follow	v steps 3 to	7 in Table 9	e)	I	1				
	18.71	19.01	19.40	19.80	19.99	20.05	20.06	20.06	20.03	19.75	19.15	18.65	(90)
Living area fract		II			I			1		ving area ÷		0.36	(91)
Mean internal t		for the who	ole dwellin	g fLA x T1 -	+(1 - fLA) x 1	Г2				0	.,		
	19.16	19.43	19.78	20.15	20.33	20.38	20.39	20.39	20.36	20.10	19.56	19.12	(92)
Apply adjustme		I			able 4e whe		iate	-				-1	
	19.16	19.43	19.78	20.15	20.33	20.38	20.39	20.39	20.36	20.10	19.56	19.12	(93)
		I I			1	1						1	
8. Space heating	ng requirem	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or for gains, r	ղՠ								CA			
	0.99	0.98	0.94	0.84	0.67	0.47	0.32	0.37	0.62	0.90	0.98	0.99	(94)
Useful gains, ηn	nGm, W (94)m x (84)m								~			
	538.29	646.30	725.06	740.37	637.16	440.84	291.05	305.48	46.7 39	577.69	536.53	505.01	(95)
Monthly averag	e external te	emperature	from Tabl	e U1									
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	1 .40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal tempe	rature, Lm	, W [(39)m	n x [(93)m -	(96)m]		\mathcal{N}					
	1176.49	1147.35	1046.22	875.46	670.37	444.80	291 47	206.29	483.42	737.76	972.34	1169.32	(97)
Space heating re	equirement,	kWh/mont	th 0.024 x	[(97)m - (9	95)m] x (41)	m	5						
	474.82	336.71	238.94	97.27	24.71	0.00	200	0.00	0.00	110.00	212 70	494.25	7
		550.71	230.34	57.27	24.71	0.00	<i>J</i> .00	0.00	0.00	119.09	313.78	434.23	
		330.71	230.34	57.27	24.71	0.00	0.00	0.00		8)15, 10		2099.56	(98)
Space heating re	equirement			51.21	24.71		0.00	0.00			12 =		(98) (99)
	-	kWh/m²/ye	ear			Č,	0.00	0.00		8)15, 10	12 =	2099.56	
9a. Energy req	-	kWh/m²/ye	ear			Č,	0.00	0.00		8)15, 10	12 =	2099.56	
9a. Energy req Space heating	uirements -	kWh/m²/ye individual l	ear heating sys	stems inclu	uding mi .ro	-CHP	0.00	0.00		8)15, 10	12 =	2099.56 28.22] (99)
9a. Energy req Space heating Fraction of space	uirements - e heat from	kWh/m²/ye individual l secondary/	ear heating sys /supplemen	stems inclu	uding mi .ro	-CHP	0.00	0.00		8)15, 10 (98)	12 = ÷ (4)	2099.56 28.22 0.00] (99)] (201)
9a. Energy req Space heating Fraction of space Fraction of space	uirements - e heat from e heat from	kWh/m²/ye individual l secondary/ main syster	ear heating sys /supplemen m(s)	stems inclu	uding mi .ro	-CHP	0.00	0.00		8)15, 10	12 = ÷ (4)	2099.56 28.22 0.00 1.00) (99)) (201)] (202)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space	uirements - e heat from e heat from e heat from	kWh/m²/ye individual l secondary/ main systen main systen	ear heating sys ('supplemen m(s) m 2	stems inclu	uding mi .ro	-CHP	0.00	0.00	<u>Σ(</u> 3	8)15, 10 (98) 1 - (20	12 = ÷ (4))1) =	2099.56 28.22 0.00 1.00 0.00) (99)) (201)] (202)] (202)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total	uirements - te heat from te heat from te heat from I space heat	kWh/m²/ye individual l secondary/ main syster main syster from main s	ear heating sys /supplemen m(s) m 2 system 1	stems inclu	uding mi .ro	-CHP		0.00	<u>Σ(</u> 3	8)15, 10 (98) 1 - (20	12 = ÷ (4) (1) = (3)] =	2099.56 28.22 0.00 1.00 0.00 1.00] (99)] (201)] (202)] (202)] (202)] (204)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total	uirements - e heat from e heat from e heat from I space heat I space heat	kWh/m²/ye individual l secondary/ main syster main syster from main s	ear heating sys /supplemen m(s) m 2 system 1	stems inclu	uding mi .ro	-CHP		0.00	<u>Σ(</u> 3	8)15, 10 (98) 1 - (20	12 = ÷ (4) (1) = (3)] =	2099.56 28.22 0.00 1.00 0.00 1.00 0.00] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total	uirements - te heat from te heat from te heat from I space heat I space heat in system 1	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%)	ear heating sys fsupplemen m(s) m 2 system 1 system 1	stems inclu	uding mi .ro	-CHP			<u>Σ(9</u> ;	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20	12 = ÷ (4) (1) = (3)] = (3) =	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50] (99)] (201)] (202)] (202)] (202)] (204)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma	uirements - e heat from e heat from l space heat l space heat in system 1 Jan	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%)	ear heating sys (supplemen m(s) m 2 system 1 system 1 System 2 Mar	stems inclu	uding mi .ro	-CHP	Jul	Aug	<u>Σ(</u> 3	8)15, 10 (98) 1 - (20	12 = ÷ (4) (1) = (3)] =	2099.56 28.22 0.00 1.00 0.00 1.00 0.00] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total	uirements - te heat from te heat from I space heat I space heat in system 1 Jan uel (main sys	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 2 system 2 Mar /h/month	stems inclu ntary syste Apr	uding micro	-CHP) Jun	lut	Aug	Σ(94 (20 Sep	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 Oct	12 = ÷ (4) (1) = (1) = (3)] = (3) = Nov	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma	uirements - e heat from e heat from l space heat l space heat in system 1 Jan	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%)	ear heating sys (supplemen m(s) m 2 system 1 system 1 System 2 Mar	stems inclu	uding mi .ro	-CHP			∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (2()2) x [1- (20 (202) x (2(Oct 127.37	12 = ÷ (4) (1) = (1) = (3)] = (1) = (3)] = Nov (335.59)	2099.56 28.22 0.00 1.00 0.00 1.00 93.50 Dec 528.61] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for	uirements - te heat from te heat from I space heat I space heat in system 1 Jan uel (main sys	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 2 system 2 Mar /h/month	stems inclu ntary syste Apr	uding micro	-CHP) Jun	lut	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 Oct	12 = ÷ (4) (1) = (1) = (3)] = (1) = (3)] = Nov (335.59)	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating	uirements - te heat from te heat from I space heat I space heat I space heat in system 1 Jan uel (main sys 507.82	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 2 system 2 Mar /h/month	stems inclu ntary syste Apr	uding micro	-CHP) Jun	lut	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (2()2) x [1- (20 (202) x (2(Oct 127.37	12 = ÷ (4) (1) = (1) = (3)] = (1) = (3)] = Nov (335.59)	2099.56 28.22 0.00 1.00 0.00 1.00 93.50 Dec 528.61] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 507.82	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW 360.12	ear heating sys (supplemen m(s) m 2 system 1 system 2 Mar (h/month 255.55	stems inclu ntary syste Apr 104.03	uding micro trable 11 May 26.43	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 127.37 1)15, 10	12 = ÷ (4) (1) = (1) = (3)] = Nov 335.59 12 =	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52) (99)) (201)) (202)] (202)] (204)] (205)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	uirements - te heat from te heat from I space heat I space heat I space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fr.J stem 1), kW 360.12	ear heating sys (supplemen m(s) m 2 system 2 system 2 Mar /h/month	stems inclu ntary syste Apr	uding micro trable 11 May	-CHP) Jun	lut	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (2()2) x [1- (20 (202) x (2(Oct 127.37	12 = ÷ (4) (1) = (1) = (3)] = (1) = (3)] = Nov (335.59)	2099.56 28.22 0.00 1.00 0.00 1.00 93.50 Dec 528.61] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36 uel, kWh/m	kWh/m²/ye individual f secondary/ main syster main syster from main s from n from n from n from main s from n from n	ear heating sys (supplemen m(s) m 2 system 2 Mar (h/month 255.55 85.89	stems incluntary system Apr 104.03 83.83	uding mitro trable 11 May 26.43 81.26	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 127.37 1)15, 10 84.26	$12 = [] \\ (4) [] \\ (4) [] \\ (1) = [] \\ (3)] = [] \\ (3) = [] \\ $	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52 87.51) (99)) (201)) (202)] (202)] (204)] (205)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	uirements - te heat from te heat from I space heat I space heat I space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fr.J stem 1), kW 360.12	ear heating sys (supplemen m(s) m 2 system 1 system 2 Mar (h/month 255.55	stems inclu ntary syste Apr 104.03	uding micro trable 11 May 26.43	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) × [1- (20 (202) × (20 (202) × (20 Oct 127.37 1)15, 10 84.26	$12 = [] \\ (4) [] \\ (4) [] \\ (1) = [] \\ ($	2099.56 28.22 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52 87.51 87.51) (99)) (201)) (202)] (202)] (204)] (205)] (206)) (211)] (217)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36 uel, kWh/m	kWh/m²/ye individual f secondary/ main syster main syster from main s from n from n from n from main s from n from n	ear heating sys (supplemen m(s) m 2 system 2 Mar (h/month 255.55 85.89	stems incluntary system Apr 104.03 83.83	uding mitro trable 11 May 26.43 81.26	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 127.37 1)15, 10 84.26	$12 = [] \\ (4) [] \\ (4) [] \\ (1) = [] \\ ($	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52 87.51) (99)) (201)) (202)] (202)] (204)] (205)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa Water heating for Annual totals	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36 uel, kWh/m 199.20	kWh/m²/ye individual l secondary/ main syster from main syster from the syster	ear heating sys (supplemen m(s) m 2 system 2 Mar (h/month 255.55 85.89	stems incluntary system Apr 104.03 83.83	uding mitro trable 11 May 26.43 81.26	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) × [1- (20 (202) × (20 (202) × (20 Oct 127.37 1)15, 10 84.26	$12 = [] \\ (4) [] \\ (4) [] \\ (5) [] \\$	2099.56 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52 87.51 87.51 193.57 2071.79) (99)) (201)) (202)] (202)] (204)] (205)] (206)) (211)] (217)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 507.82 ter heater 87.36 uel, kWh/m 199.20	kWh/m²/ye individual l secondary/ main syster from main syster from the syster	ear heating sys (supplemen m(s) m 2 system 2 Mar (h/month 255.55 85.89	stems incluntary system Apr 104.03 83.83	uding mitro trable 11 May 26.43 81.26	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) × [1- (20 (202) × (20 (202) × (20 Oct 127.37 1)15, 10 84.26	$12 = [] \\ (4) [] \\ (4) [] \\ (5) [] \\$	2099.56 28.22 28.22 0.00 1.00 0.00 1.00 0.00 93.50 Dec 528.61 2245.52 87.51 87.51) (99)) (201)) (202)) (202)] (204)] (205)] (206)) (211)] (217)

Water heating fuel 2071.79 Electricity for pumps, fans and electric keep-hot (Table 4f) 30.00 central heating pump or water pump within warm air heating unit 30.00 boiler flue fan 45.00 Total electricity for the above, kWh/year 75.00 Electricity for lighting (Appendix L) 326.44 Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 10a. Fuel costs - individual heating systems including micro-CHP Fuel price Fuel cost £/year Space heating - main system 1 2245.52 x 3.48 x 0.01 = 72.10 Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting 326.44 x 13.19 x 0.01 = 9.89 Electricity for lighting cost 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting cost (240)(242) + (26)(54) = 323.19 120.00 Total energy cost (240)(242) + (26)(54) = 323.19 144.44 Additional standing charges 1.14 84 84 84 SAP value 84 84 84 <td< th=""><th>(230c) (230e) (231) (232) (238) (238) (238) (247) (247) (249) (250) (251) (255) (255) (255) (255)</th></td<>	(230c) (230e) (231) (232) (238) (238) (238) (247) (247) (249) (250) (251) (255) (255) (255) (255)
boiler flue fan Total electricity for the above, kWh/year Electricity for lighting (Appendix L) Total delivered energy for all uses (211)(221) + (232)(237b) = 4718.75 10a. Fuel costs - individual heating systems including micro-CHP Fuel KWh/year Space heating - main system 1 2245.52 x 3.48 x 0.01 = 78.14 Water heating 2071.79 x 3.48 x 0.01 = 72.10 Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting Additional standing charges Total energy cost 11a. SAP rating - individual heating systems including micro-CHP Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost individual heating systems including micro-CHP 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions factor KWh/year 12b. CO₂ MWh 12c. CO₂ emission factor 12d. CO₂ emission factor 	(230e) (231) (232) (238) (238) (240) (247) (247) (249) (250) (251) (255) (255) (255) (257)
boiler flue fan Total electricity for the above, kWh/year Electricity for lighting (Appendix L) Total delivered energy for all uses (211)(221) + (232)(237b) = 4718.75 10a. Fuel costs - individual heating systems including micro-CHP Fuel KWh/year Space heating - main system 1 2245.52 x 3.48 x 0.01 = 78.14 Water heating 2071.79 x 3.48 x 0.01 = 72.10 Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting Additional standing charges Total energy cost 11a. SAP rating - individual heating systems including micro-CHP Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost individual heating systems including micro-CHP 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions - individual heating systems including micro-CHP Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO₂ emissions factor KWh/year 12b. CO₂ MWh 12c. CO₂ emission factor 12d. CO₂ emission factor 	(230e) (231) (232) (238) (238) (240) (247) (247) (249) (250) (251) (255) (255) (255) (257)
Electricity for lighting (Appendix L) 326.44 Total delivered energy for all uses $(211)(221) + (231) + (232)(237b) =$ 4718.75 10a. Fuel costs - individual heating systems including micro-CHP Fuel price Fuel cost f (year Space heating - main system 1 2245.52 x 3.48 $x 0.01 =$ 78.14 Water heating 2071.79 x 3.48 $x 0.01 =$ 72.10 Pumps and fans 75.00 x 13.19 $x 0.01 =$ 9.89 Electricity for lighting 326.44 x 13.19 $x 0.01 =$ 9.89 Additional standing charges $(240)(242) + (25)(54) =$ 122.000 323.19 11a. SAP rating - individual heating systems including micro-CHP 0.42 1.14 SAP value 84.14 84.14 84.14 SAP rating (section 13) SAP band 8 8 12a. CO2 emissions - individual heating systems including micro-CHP Energy Energy Energy Emission factor 12a. CO2 emissions - individual heating systems including micro-CHP Energy Energy Emission factor Emissions <td>(232) (238) (238) (238) (247) (247) (247) (249) (250) (251) (255) (255) (255) (255)</td>	(232) (238) (238) (238) (247) (247) (247) (249) (250) (251) (255) (255) (255) (255)
Total delivered energy for all uses $(211)(221) + (231) + (232)(237b) = 4718.75$ 10a. Fuel costs - individual heating systems including micro-CHP Fuel kWh/yearFuel priceFuel cost f/yearSpace heating - main system 1 2245.52 x 3.48 x 0.01 = 78.14Water heating 2071.79 x 3.48 x 0.01 = 72.10Pumps and fans 75.00 x 13.19 x 0.01 = 9.89Electricity for lighting 326.44 x 3.48 x 0.01 = 9.89Electricity for lighting 326.44 x 3.48 x 0.01 = 9.89Colspan="2"> $120.00Total energy cost(240)(242) + (2.5)(5.4) = 323.1911a. SAP rating - individual heating systems including micro-CHPEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP band12a. CO2 emissions - individual heating systems including micro-CHPEnergy cost factor (ECF)Energy cost factorEnergy cost factorEnergy cost factorEnergy cost factorEnergy cost factorEnergy cost factor$] (240)] (240)] (247)] (249)] (250)] (251)] (255)] (255)] (256)] (257)
Total delivered energy for all uses $(211)(221) + (231) + (232)(237b) = 4718.75$ 10a. Fuel costs - individual heating systems including micro-CHP Fuel kWh/yearFuel priceFuel cost f/yearSpace heating - main system 1 2245.52 x 3.48 x 0.01 = 78.14Water heating 2071.79 x 3.48 x 0.01 = 72.10Pumps and fans 75.00 x 13.19 x 0.01 = 9.89Electricity for lighting 326.44 x 3.48 x 0.01 = 9.89Electricity for lighting 326.44 x 3.48 x 0.01 = 9.89Colspan="2"> $120.00Total energy cost(240)(242) + (2.5)(5.4) = 323.1911a. SAP rating - individual heating systems including micro-CHPEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP band12a. CO2 emissions - individual heating systems including micro-CHPEnergy cost factor (ECF)Energy cost factorEnergy cost factorEnergy cost factorEnergy cost factorEnergy cost factorEnergy cost factor$] (240)] (247)] (249)] (250)] (251)] (255)] (255)] (256)] (257)
Fuel kWh/yearFuel priceFuel cost £/yearSpace heating - main system 12245.52x3.48x 0.01 =78.14Water heating2071.79x3.48x 0.01 =72.10Pumps and fans75.00x13.19x 0.01 =9.89Electricity for lighting326.44x13.19x 0.01 =43.06Additional standing charges120.00120.00120.00Total energy cost(240)(242) + (2.5)(54) =323.1911a. SAP rating - individual heating systems including micro-CHP0.42Energy cost factor (ECF)0.42SAP value84.14SAP value84.14SAP value84SAP bandB12a. CO2 emissions - individual heating systems including micro-CHPEmergy kWh/yeacEmission factor kg CO ₂ /kWhEmission factor kg CO ₂ /kWh	(247) (249) (250) (251) (255) (255) (256) (257)
Fuel kWh/yearFuel priceFuel cost £/yearSpace heating - main system 12245.52x3.48x 0.01 =78.14Water heating2071.79x3.48x 0.01 =72.10Pumps and fans75.00x13.19x 0.01 =9.89Electricity for lighting326.44x13.19x 0.01 =43.06Additional standing charges120.00120.00120.00Total energy cost(240)(242) + (2.5)(54) =323.1911a. SAP rating - individual heating systems including micro-CHP0.42Energy cost factor (ECF)0.42SAP value84.14SAP value84.14SAP value84SAP bandB12a. CO2 emissions - individual heating systems including micro-CHPEmergy kWh/yeacEmission factor kg CO ₂ /kWhEmission factor kg CO ₂ /kWh	(247) (249) (250) (251) (255) (255) (256) (257)
kWh/year cost £/year Space heating - main system 1 2245.52 x 3.48 x 0.01 = 78.14 Water heating 2071.79 x 3.48 x 0.01 = 72.10 Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting 326.44 x 13.19 x 0.01 = 43.06 Additional standing charges (240)(242) + (2.5)(54) = 120.00	(247) (249) (250) (251) (255) (255) (256) (257)
Water heating 2071.79 x 3.48 x 0.01 = 72.10 Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting 326.44 x 13.19 x 0.01 = 43.06 Additional standing charges 120.00 120.00 120.00 120.00 120.00 Total energy cost (240)(242) + (2-5)(754) = 323.19 323.19 11a. SAP rating - individual heating systems including micro-CHP 0.42 Energy cost deflator (Table 12) 0.42 1.14 84.14 SAP value 84 84 84 SAP value 84 8 84 SAP band B B 84	(247) (249) (250) (251) (255) (255) (256) (257)
Pumps and fans 75.00 x 13.19 x 0.01 = 9.89 Electricity for lighting 326.44 x 13.19 x 0.01 = 43.06 Additional standing charges 120.00 120.00 120.00 120.00 Total energy cost (240)(242) + (25),(154) = 323.19 323.19 11a. SAP rating - individual heating systems including micro-CHP 0.42 1.14 Energy cost deflator (Table 12) 0.42 1.14 Energy cost factor (ECF) 1.14 84.14 SAP value 84 84 SAP band B 84 12a. CO2 emissions - individual heating systems including micro-CHP Emerg kWh/yee Emission factor kg CO2/kWh	(249) (250) (251) (255) (255) (256) (257)
Electricity for lighting 326.44 x 13.19 x 0.01 = 43.06 Additional standing charges 120.00 Total energy cost (240)(242) + (2.5)(754) = 323.19 11a. SAP rating - individual heating systems including micro-CHP 0.42 Energy cost factor (ECF) 0.42 SAP value 84.14 SAP value 84.14 SAP value 84 SAP band B 12a. CO2 emissions - individual heating systems including micro-CHP Energ kWh/yee) (250) (251) (255) (255) (256) (257)
Additional standing charges Total energy cost 11a. SAP rating - individual heating systems including micro-CHP Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO ₂ emissions - individual heating systems including micro-CHP Energy cost - individual heating systems including micro-CHP Energy cost actor (ECF) SAP band Energy cost factor (ECF) SAP band Energy cost factor (ECF) Energy cost factor (ECF) SAP band Energy cost factor (ECF) Energy cost factor (ECF) SAP cost factor (ECF) SAP band Energy cost factor (ECF) Energy cost factor (ECF) SAP band Energy cost factor (ECF) Energy cost factor (ECF) Energy cost factor (ECF) SAP band Energy cost factor (ECF) Ener] (251)] (255)] (256)] (257)]
Total energy cost (240)(242) + (2.5)(7.54) = 323.19 11a. SAP rating - individual heating systems including micro-CHP 0.42 Energy cost deflator (Table 12) 0.42 Energy cost factor (ECF) 1.14 SAP value 84.14 SAP rating (section 13) 84 SAP band B 12a. CO ₂ emissions - individual heating systems including micro-CHP Emerg kWh/ye. Emission factor kg CO ₂ /kWh kg CO ₂ /year] (255)] (256)] (257)]
11a. SAP rating - individual heating systems including micro-CHP Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO ₂ emissions - individual heating systems including micro-CHP Energy kWh/year Energy kWh/year Energy kWh/year Emission factor kg CO ₂ /kWh] (256)] (257)]
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO ₂ emissions - individual heating systems including micro-CHP Energy KWh/year Emission factor kg CO ₂ /kWh kg CO ₂ /year] <mark>(257)</mark>]
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO ₂ emissions - individual heating systems including micro-CHP Energy KWh/year Emission factor kg CO ₂ /kWh kg CO ₂ /year] <mark>(257)</mark>]
Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12a. CO ₂ emissions - individual heating systems including micro-CHP Energ KWh/year Emission factor kg CO ₂ /kWh Emissions kg CO ₂ /kWh Emissions kg CO ₂ /year] <mark>(257)</mark>]
SAP value 84.14 SAP rating (section 13) 84 SAP band B 12a. CO ₂ emissions - individual heating systems including micro-CHP Emerg kWh/year Emission factor kg CO ₂ /kWh Emissions kg CO ₂ /year]
SAP rating (section 13) 84 SAP band B 12a. CO ₂ emissions - individual heating systems including micro-CHP Emerge kWh/year Energe kWh/year Emission factor kg CO ₂ /kWh]] (258)]
SAP band I2a. CO2 emissions - individual heating systems including micro-CHP Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh] (200)
12a. CO2 emissions - individual heating systems including micro-CHP Energy Emission factor kWh/year kg CO2/kWh kg CO2/kWh	
Energ Emission factor Emissions kWh/year kg CO ₂ /kWh kg CO ₂ /year	1
kWh/year kg CO ₂ /kWh kg CO ₂ /year	
Space heating - main system 1 2245.52 x 0.216 = 485.03	
	(261)
Water heating 2071.79 x 0.216 = 447.51	(264)
Space and water heating (261) + (262) + (263) + (264) = 932.54	(265)
Pumps and fans 75.00 x 0.519 = 38.93	(267)
Electricity for lighting 326.44 x 0.519 = 169.42	(268)
Total CO2, kg/year (265)(271) = 1140.89 Dwelling CO2 emission rate (272) ÷ (4) = 15.33 El value 87.20 El rating (section 14) 87	(272)
Dwelling CO ₂ emission rate $(272) \div (4) = 15.33$	(273)
El value 87.20]
El rating (section 14) 87	(274)
El band B]
13a. Primary energy - individual heating systems including micro-CHP	
Energy Primary factor Primary Energy	
kWh/year kWh/year	1
Space heating - main system 1 2245.52 x 1.22 = 2739.53	(261)
Water heating 2071.79 x 1.22 = 2527.58	(264)
Space and water heating $(261) + (262) + (263) + (264) = 5267.11$	(265)
Pumps and fans 75.00 x 3.07 = 230.25	1 4 5 5 5
Electricity for lighting 326.44 x 3.07 = 1002.18	(267)
	(267) (268)
Primary energy kWh/year 6499.55 Dwelling primary energy rate kWh/m2/year 87.36	-



	Miss Alicja Kreglewsk	ka			Ass	sessor numb	er	4134		
Client					Las	st modified		13/06	/2018	
Address	A 1 02 Ingestre Road	, London, NW5 1	XE							
1. Overall dwelling dimen	ISIONS		Area (m ²)		Aven			Ve	lumo (m ³)	
			Area (m²)			age storey ight (m)		V	lume (m³)	
Lowest occupied		Γ	76.52	(1a) x		2.50	(2a) =		191.30	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1n) = [(4)	L		()	L] ()
Dwelling volume		, , , , , , ,			(3a)	+ (3b) + (3c)	+ (3d)(3	in) =	191.30	(5)
2. Ventilation rate										
								m	³ per hour	-
Number of chimneys						0	x 40 =		0	(6a)
Number of open flues						0	x 20 =		0	(6b)
Number of intermittent far	IS					3	x 10 =		30] (7a)
Number of passive vents						0	x 10 =		0] (7b)
Number of flueless gas fire	S					0	x 40 =	L	0	(7c)
								Air	changes pei hour	•
Infiltration due to chimney	s, flues, fans, PSVs		(6a) + (6b) + (7a)	+ (7b) + (7c	c) =	30	÷ (5) =		0.16	(8)
	o, maeo, mano, i o r o									
If a pressurisation test has	been carried out or is in	tended, proceed			·					
<i>If a pressurisation test has</i> Air permeability value, q50			to (17), otherwise	e continue	from (9) to				4.00	
Air permeability value, q50	, expressed in cubic me	tres per hour pe	to (17), otherwise r square metre of	e continue envelope a	from (9) to		.,		4.00] (17)] (18)
Air permeability value, q50 If based on air permeability	, expressed in cubic me v value, then (18) = [(17)	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of	e continue envelope a	from (9) to] (17)
Air permeability value, q50	, expressed in cubic me v value, then (18) = [(17)	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of	e continue envelope a	from (9) to	o (16)	0.075 x (1		0.36] (17)] (18)
Air permeability value, q50 If based on air permeability Number of sides on which	, expressed in cubic me y value, then (18) = [(17) the dwelling is sheltered	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of	e continue envelope a	from (9) to	o (16)		9)] = [0.36] (17)] (18)] (19)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor	, expressed in cubic me value, then (18) = [(17) the dwelling is sheltered ng shelter factor	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of	e continue envelope a	from (9) to	o (16)	0.075 x (1	9)] = [0.36 3 0.78] (17)] (18)] (19)] (20)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati	, expressed in cubic me value, then (18) = [(17) the dwelling is sheltered ng shelter factor	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of erwise (18) = (16)	e continue envelope a	from (9) to	o (16)	0.075 x (1	9)] = [0.36 3 0.78] (17)] (18)] (19)] (20)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati	, expressed in cubic me value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of erwise (18) = (16)	e continue envelope a	from (9) to	D (16) 1 - [0.075 x (19 (18) x (2	9)] = 20) =	0.36 3 0.78 0.28] (17)] (18)] (19)] (20)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan	, expressed in cubic me value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar	tres per hour per) ÷ 20] + (8), othe	to (17), otherwise r square metre of erwise (18) = (16) by Jun	e continue envelope a	from (9) to	D (16) 1 - [0.075 x (19 (18) x (2	9)] = 20) =	0.36 3 0.78 0.28] (17)] (18)] (19)] (20)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified fo Jan Monthly average wind spec	, expressed in cubic me y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2	tres per hour per) ÷ 20] + (8), othe d Apr Ma	to (17), otherwise r square metre of erwise (18) = (16) by Jun	e continue envelope a Jul	from (9) to area Aug	о (16) 1 - [Sep	0.075 x (19 (18) x (2 Oct	9)] = (0) = Nov	0.36 3 0.78 0.28 Dec] (17)] (18)] (19)] (20)] (21)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10	, expressed in cubic me y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2	tres per hour per) ÷ 20] + (8), othe d Apr Ma	to (17), otherwise r square metre of erwise (18) = (16) ny Jun 10 3.80	e continue envelope a Jul	from (9) to area Aug	о (16) 1 - [Sep	0.075 x (19 (18) x (2 Oct	9)] = (0) = Nov	0.36 3 0.78 0.28 Dec] (17)] (18)] (19)] (20)] (21)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	, expressed in cubic me y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	tres per hour per) ÷ 20] + (8), othe d Apr Ma 4.40 4.3 1.10 1.0	to (17), otherwisi r square metre of erwise (18) = (16) y Jun 0 3.80	e continue envelope a Jul 3.80	Aug 3.70	o (16) 1 - [Sep 4.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50	0.36 3 0.78 0.28 Dec 4.70] (17)] (18)] (19)] (20)] (21)] (22)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28	, expressed in cubic me y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	tres per hour per) ÷ 20] + (8), othe d Apr Ma 4.40 4.3 1.10 1.0	to (17), otherwise r square metre of erwise (18) = (16) y Jun 0 3.80 8 0.95 x (22a)m	e continue envelope a Jul 3.80	Aug 3.70	o (16) 1 - [Sep 4.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50	0.36 3 0.78 0.28 Dec 4.70] (17)] (18)] (19)] (20)] (21)] (22)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	, expressed in cubic mey value, then (18) = [(17)the dwelling is shelteredng shelter factoror monthly wind speed:FebMared from Table U25.004.901.251.23illowing for shelter and0.350.34	tres per hour per) ÷ 20] + (8), othe d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3	to (17), otherwise r square metre of erwise (18) = (16) y Jun 0 3.80 8 0.95 x (22a)m	e continue envelope a Jul 3.80	from (9) to area Aug 3.70 0.93	2 (16) 1 - [Sep 4.00 1.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50 1.13	0.36 3 0.78 0.28 Dec 4.70] (17)] (18)] (19)] (20)] (21)] (22)] (22a)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.35	, expressed in cubic mere y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.35 0.34 ge rate for the applicab	tres per hour per) ÷ 20] + (8), othe d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3 le case:	to (17), otherwise r square metre of erwise (18) = (16) y Jun 0 3.80 8 0.95 x (22a)m	e continue envelope a Jul 3.80	from (9) to area Aug 3.70 0.93	2 (16) 1 - [Sep 4.00 1.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50 1.13	0.36 3 0.78 0.28 Dec 4.70] (17)] (18)] (19)] (20)] (21)] (22)] (22a)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.35 Calculate effective air chan If mechanical ventilation If balanced with heat re	, expressed in cubic mere y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.35 0.34 ge rate for the applicab n: air change rate through covery: efficiency in % a	tres per hour per) \div 20] + (8), other d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3 lle case: gh system allowing for in-us	to (17), otherwise r square metre of erwise (18) = (16) y Jun 0 3.80 8 0.95 1 x (22a)m 0 0.26 5 e factor from Tab	e continue envelope a Jul 3.80 0.95 0.26	from (9) to area Aug 3.70 0.93	2 (16) 1 - [Sep 4.00 1.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50 1.13	0.36 3 0.78 0.28 Dec 4.70 1.18 0.32] (17)] (18)] (19)] (20)] (21)] (22)] (22a)] (22b)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.35 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	, expressed in cubic mere y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.35 0.34 ge rate for the applicab n: air change rate through covery: efficiency in % at whole house positive in	tres per hour per) \div 20] + (8), other d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3 lle case: gh system allowing for in-us	to (17), otherwise r square metre of erwise (18) = (16) y Jun 0 3.80 8 0.95 1 x (22a)m 0 0.26 5 e factor from Tab	e continue envelope a Jul 3.80 0.95 0.26	from (9) to area Aug 3.70 0.93	2 (16) 1 - [Sep 4.00 1.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50 1.13	0.36 3 0.78 0.28 Dec 4.70 4.70 1.18 0.32 N/A N/A] (17)] (18)] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.35 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or 0.56	, expressed in cubic mere y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.35 0.34 ge rate for the applicab n: air change rate through covery: efficiency in % at the specimic of th	tres per hour per) \div 20] + (8), other d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3 le case: gh system allowing for in-us nput ventilation 0.55 0.5	to (17), otherwise r square metre of r square metre of erwise (18) = (16) y Jun 0 3.80 18 0.95 1x (22a)m 10 0.26 10 0.26 11 6 12 0 13 0 14 0.53	e continue envelope a Jul 3.80 0.95 0.26	from (9) to area Aug 3.70 0.93	2 (16) 1 - [Sep 4.00 1.00	0.075 x (19 (18) x (2 Oct 4.30	9)] = 20) = Nov 4.50 1.13	0.36 3 0.78 0.28 Dec 4.70 4.70 0.32 N/A] (17)] (18)] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)
Air permeability value, q50 If based on air permeability Number of sides on which Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.35 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	, expressed in cubic mere y value, then (18) = [(17) the dwelling is sheltered ng shelter factor or monthly wind speed: Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.35 0.34 ge rate for the applicab n: air change rate through covery: efficiency in % at the specimic of th	tres per hour per) \div 20] + (8), other d Apr Ma 4.40 4.3 1.10 1.0 wind factor) (21) 0.30 0.3 le case: gh system allowing for in-us nput ventilation 0.55 0.5	to (17), otherwise r square metre of erwise (18) = (16) by Jun 0 3.80 18 0.95 1x (22a)m 0 0.26 ee factor from Take from loft (4 0.53 25)	e continue envelope a Jul 3.80 0.95 0.26	Aug 3.70 0.93 0.26	20 (16) 1 - [Sep 4.00 1.00 0.28	0.075 x (19 (18) x (2 Oct 4.30 1.08	9)] = 20) = Nov 4.50 1.13 0.31	0.36 3 0.78 0.28 Dec 4.70 4.70 1.18 0.32 N/A N/A] (17)] (18)] (19)] (20)] (21)] (21)] (22)] (22a)] (22a)] (22b)] (23a)] (23c)



	-											
Element		-	Gross ea, m²	Openings m ²	Net a A, n		U-value W/m²K	A x U W	•	/alue, /m².K	Ахк, kJ/K	
Window					19.9	92 x	1.24	= 24.62				(27)
External wall					12.7	70 x [0.18	= 2.29				(29a)
Party wall					64.0	09 x	0.00	= 0.00				(32)
Total area of external elem	ients ∑A, m²				32.6	52						(31)
Fabric heat loss, W/K = ∑(A	ν×U)							(26	5)(30) + (3	32) =	26.90	(33)
Heat capacity Cm = ∑(А х к)						(28)	.(30) + (32) +	+ (32a)(3	2e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²	К									250.00	(35)
Thermal bridges: $\Sigma(L \times \Psi)$ (alculated usin	ng Append	lix K								10.94	(36)
Total fabric heat loss									(33) + (3	36) =	37.84	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calcul	ated monthly	0.33 x (25	5)m x (5)									
35.49	35.34	35.19	34.49	34.35	33.74	33.74	33.63	33.98	34.35	34.62	34.90	(38)
Heat transfer coefficient, V	V/K (37)m+(38)m										
73.33	73.18	73.03	72.33	72.20	71.59	71.59	71.47	71.82	72.20	72.46	72.74]
								Average = 🛛	(39)112/	/12 =	72.33	(39)
Heat loss parameter (HLP),	. W/m²K (39)r	m ÷ (4)										
0.96	0.96	0.95	0.95	0.94	0.94	0.94	0.93	0.94	0.94	0.95	0.95]
								Average = ∑	(40)112/	/12 =	0.95	(40)
Number of days in month	(Table 1a)											
31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heating energy	roquiromont											
Assumed occupancy, N	requirement										2.39	(42)
Assumed occupancy, N											2.39] (42)
Annual average hot water	usage in litres	ner dav V	d average	$= (25 \times N) +$	36						91.05	(43)
Annual average hot water	-					Jul	Aug	Sep	Oct	Nov	91.05 Dec	(43)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	91.05 Dec	(43)
Jan Hot water usage in litres p	Feb er day for each	Mar h month V	Apr /d,m = fact	May tor from Tab	Jun le 1c x (43)		-			1	Dec] (43)]
Jan	Feb	Mar	Apr	Мау	Jun		Aug 85.58	Sep 89.23	92.87	96.51	Dec]
Jan Hot water usage in litres p 100.15	Feb er day for each 96.51	Mar h month V 92.87	Apr /d,m = fact 89.23	May tor from Tab	Jun le 1c x (43) 81.94	81.94	85.58			96.51	Dec] (43)]] (44)
Jan Hot water usage in litres p 100.15 Energy content of hot wate	Feb er day for each 96.51 er used = 4.18	Mar h month V 92.87 x Vd,m x i	Apr /d,m = fact 89.23	May for from Tab 85.58	Jun le 1c x (43) 81.94 onth (see 1	81.94 Fables 1b,	85.58 1c 1d)	89.23	92.87 ∑(44)1	96.51	Dec 100.15 1092.55]
Jan Hot water usage in litres p 100.15	Feb er day for each 96.51 er used = 4.18	Mar h month V 92.87	Apr /d,m = fact 89.23	May tor from Tab	Jun le 1c x (43) 81.94	81.94	85.58		92.87 Σ(44)1 121.34	96.51 12 = 132.45	Dec 100.15 1092.55 143.83]] (44)]
Jan Hot water usage in litres p 100.15 Energy content of hot wate	Feb er day for each 96.51 er used = 4.18 129.90	Mar h month V 92.87 x Vd,m x i	Apr /d,m = fact 89.23	May for from Tab 85.58	Jun le 1c x (43) 81.94 onth (see 1	81.94 Fables 1b,	85.58 1c 1d)	89.23	92.87 ∑(44)1	96.51 12 = 132.45	Dec 100.15 1092.55]
Jan Hot water usage in litres p 100.15 Energy content of hot wate 148.52	Feb er day for each 96.51 er used = 4.18 129.90	Mar h month V 92.87 x Vd,m x i	Apr /d,m = fact 89.23	May for from Tab 85.58	Jun le 1c x (43) 81.94 onth (see 1	81.94 Fables 1b,	85.58 1c 1d)	89.23	92.87 Σ(44)1 121.34	96.51 12 = 132.45	Dec 100.15 1092.55 143.83]] (44)]
Jan Hot water usage in litres p 100.15 Energy content of hot wate 148.52 Distribution loss 0.15 x (45 22.28	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48	Mar h month V 92.87 x Vd,m x r 134.04 20.11	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53	May for from Tab 85.58 8600 kWh/m 112.13 16.82	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1092.55 1432.51]] (44)] (45)] (46)
Jan Hot water usage in litres p 100.15 Energy content of hot wate 148.52 Distribution loss 0.15 x (45	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48	Mar h month V 92.87 x Vd,m x r 134.04 20.11	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53	May for from Tab 85.58 8600 kWh/m 112.13 16.82	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1092.55 143.83 143.51 21.58]] (44)]] (45)
Jan Hot water usage in litres p 100.15 Energy content of hot wate 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola	Mar h month V 92.87 x Vd,m x r 134.04 20.11 ar or WWH	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May for from Tab 85.58 8600 kWh/m 112.13 16.82	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1092.55 143.83 143.51 21.58]] (44)] (45)] (46)
Jan Hot water usage in litres pr 100.15 Energy content of hot wate 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is	Mar h month V 92.87 x Vd,m x r 134.04 20.11 ar or WWH not know	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May for from Tab 85.58 3600 kWh/m 112.13 16.82 se within sam	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1092.55 143.83 143.51 21.58]] (44)] (45)] (46)
Jan Hot water usage in litres p 100.15 Energy content of hot wate 148.52 Distribution loss 0.15 x (45 22.28 Storage volume (litres) incl Water storage loss:	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 Juding any sola d loss factor is factor from Ta	Mar h month V 92.87 x Vd,m x r 134.04 20.11 ar or WWH not know	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May for from Tab 85.58 3600 kWh/m 112.13 16.82 se within sam	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1092.55 143.83 1432.51 21.58 2.00] (44)] (44)] (45)] (46)] (47)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Taple 2a	Mar h month V 92.87 x Vd,m x r 134.04 20.11 ar or WWH not know	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May for from Tab 85.58 3600 kWh/m 112.13 16.82 se within sam	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 100.15 1.43.83 143.83 2.51 2.00 2.00 0.02] (44)] (44)] (45)] (45)] (46)] (47)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ole 2a m Table 2b	Mar h month V 92.87 x Vd,m x H 134.04 20.11 ar or WWH not know able 2 (kW	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May cor from Tab 85.58 3600 kWh/m 112.13 16.82 ge within sam y)	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 100.15 1.] (44)] (44)] (45)] (46)] (47)] (51)] (52)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak Temperature factor from	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ole 2a m Table 2b	Mar h month V 92.87 x Vd,m x H 134.04 20.11 ar or WWH not know able 2 (kW	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May cor from Tab 85.58 3600 kWh/m 112.13 16.82 ge within sam y)	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 1255 143.83 1432.51 21.58 2.00 0.02 3.91 1.00] (44)] (44)] (45)] (45)] (46)] (47)] (51)] (52)] (53)
Jan Hot water usage in litres p 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak Temperature factor fro Energy lost from water	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ole 2a m Table 2b storage (kWh,	Mar h month V 92.87 x Vd,m x n 134.04 20.11 ar or WWH not know able 2 (kW /day) (47)	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May cor from Tab 85.58 3600 kWh/m 112.13 16.82 ge within sam y)	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 143.83 143.83 2.55 2.00 2.00 3.91 1.00 0.12] (44)] (44)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak Temperature factor fro Energy lost from water	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ole 2a m Table 2b storage (kWh,	Mar h month V 92.87 x Vd,m x n 134.04 20.11 ar or WWH not know able 2 (kW /day) (47)	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag	May cor from Tab 85.58 3600 kWh/m 112.13 16.82 ge within sam y)	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51	81.94 Fables 1b, 89.66	85.58 1c 1d) 102.89	89.23	92.87 Σ(44)1 121.34 Σ(45)1	96.51 12 = 132.45 .12 =	Dec 100.15 143.83 143.83 2.55 2.00 2.00 3.91 1.00 0.12] (44)] (44)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (45 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak Temperature factor fro Energy lost from water Enter (50) or (54) in (55) Water storage loss calculat	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ble 2a m Table 2b storage (kWh, ted for each m 3.33	Mar h month V 92.87 x Vd,m x n 134.04 20.11 ar or WWH not know able 2 (kW /day) (47) nonth (55) 3.69	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag n h/litre/day) x (51) x (5) x (41)m 3.57	May tor from Tab 85.58 3600 kWh/m 112.13 16.82 te within sam y) 52) x (53)	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51 ne vessel	81.94 Fables 1b, 89.66 13.45	85.58 1c 1d) 102.89 15.43	89.23	92.87 Σ(44)1 121.34 Σ(45)1 18.20	96.51 .12 = 132.45 .12 = 19.87 	Dec 100.15 143.83 143.83 2.55 2.00 2.00 3.91 1.00 0.12 0.12] (44)] (44)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)
Jan Hot water usage in litres pr 100.15 Energy content of hot water 148.52 Distribution loss 0.15 x (49 22.28 Storage volume (litres) incl Water storage loss: b) Manufacturer's declared Hot water storage loss Volume factor from Tak Temperature factor fro Energy lost from water Enter (50) or (54) in (55) Water storage loss calculat 3.69	Feb er day for each 96.51 er used = 4.18 129.90 5)m 19.48 uding any sola d loss factor is factor from Ta ble 2a m Table 2b storage (kWh, ted for each m 3.33	Mar h month V 92.87 x Vd,m x n 134.04 20.11 ar or WWH not know able 2 (kW /day) (47) nonth (55) 3.69	Apr /d,m = fact 89.23 nm x Tm/3 116.86 17.53 HRS storag n h/litre/day) x (51) x (5) x (41)m 3.57	May tor from Tab 85.58 3600 kWh/m 112.13 16.82 te within sam y) 52) x (53) 3.69	Jun le 1c x (43) 81.94 onth (see T 96.76 14.51 ne vessel	81.94 Fables 1b, 89.66 13.45	85.58 1c 1d) 102.89 15.43	89.23	92.87 Σ(44)1 121.34 Σ(45)1 18.20	96.51 .12 = 132.45 .12 = 19.87 	Dec 100.15 143.83 143.83 2.55 2.00 2.00 3.91 1.00 0.12 0.12] (44)] (44)] (45)] (46)] (47)] (51)] (51)] (52)] (53)] (54)] (55)

Primary circuit lo	oss for each	month fro	m Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for ea	ach month i	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requir	red for wate	er heating o	calculated f	or each mo	onth 0.85 x	: (45)m + (4	6)m + (57)r	n + (59)m +	- (61)m				
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	(62)
Solar DHW input	calculated	using Appe	endix G or A	Appendix H									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wat	ter heater f	or each mo	onth (kWh/i	month) (62	2)m + (63)n	n							
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	
										∑(64)1	.12 = 1	749.80	(64)
Heat gains from	water heat	ing (kWh/n	nonth) 0.25	5 × [0.85 ×	(45)m + (61 	L)m] + 0.8 ×	[(46)m + (5	57)m + (59)	m]				
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38	(65)
5. Internal gain	s												
-	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)												
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	(66)
Lighting gains (ca	alculated in	Appendix	L, equation	L9 or L9a),	also see Ta	able 5					•		
	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12.30	15.61	18.22	19.43	(67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L	13a), also s	ee Table 5							
	212.01	214.21	208.67	196.87	181.97	167.97	158.61	156.41	161.96	173.76	188.66	202.66	(68)
Cooking gains (ca	alculated in	Appendix	L, equation	L15 or L15	a), also see	e Table 5							
	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	(69)
Pump and fan ga	ains (Table 5	5a)											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evapo	oration (Tab	ole 5)											
	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Water heating ga	ains (Table	5)											
	95.35	93.25	88.88	82.94	79.09	73.66	69.05	74.96	77.06	83.20	90.14	93.26	(72)
Total internal ga	ins (66)m +	- (67)m + (6	58)m + (69)ı 	m + (70)m	+ (71)m + (72)m							
	385.17	383.15	370.11	349.05	327.69	307.05	293.61	299.43	310.21	331.48	355.93	374.25	(73)
6. Solar gains													
			Access f	actor	Area	Sola	ar flux		g	FF		Gains	
			Table	6d	m²	N	//m²	-	ific data	specific o		w	
									able 6b	or Table			1
SouthWest			0.7		16.45				0.63 x			211.40] (79) 1
SouthEast			0.7	7 ×	3.47	x 3	6.79 x	0.9 x 0	0.63 x	0.80	=	44.59	(77)
Solar gains in wa													1 (22)
Tatal asian inte	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08	(83)
Total gains - inte				1000.00			100010		070.00				
	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	662.55	593.32	(84)
7. Mean intern	al tempera	ture (heati	ng season)										
Temperature du	ring heating	g periods ir	the living a	area from T	able 9, Th	L(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains fo	or living are	ea n1,m (se	e Table 9a)	1								
	0.99	0.96	0.89	0.75	0.57	0.40	0.29	0.32	0.51	0.82	0.97	0.99	(86)

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Mean internal ter	mp of living	; area T1 (s	teps 3 to 7	in Table 90	c)								
[20.25	20.50	20.75	20.92	20.99	21.00	21.00	21.00	20.99	20.89	20.53	20.19	(87)
Temperature duri	ing heating	periods in	the rest of	dwelling f	rom Table	9, Th2(°C)							
Γ	20.12	20.12	20.12	20.13	20.13	20.14	20.14	20.14	20.13	20.13	20.13	20.12	(88)
Utilisation factor	for gains fo	or rest of dv	welling n2,	m	•								-
Γ	0.99	0.95	0.87	0.71	0.52	0.35	0.23	0.26	0.45	0.78	0.96	0.99	(89)
L Mean internal ter	nperature i	in the rest	of dwelling	1			9c)	1				-1], ,
Г	19.13	19.49	19.83	20.05	20.12	20.14	20.14	20.14	20.13	20.02	19.55	19.06	(90)
Living area fractic										ving area ÷		0.35	(91)
Mean internal ter		for the who	ole dwellin	g fLA x T1 ·	+(1 - fLA) x	Т2				ing area .	(4) -	0.55] (31)
Г	19.52	19.84	20.15	20.35	20.42	20.44	20.44	20.44	20.43	20.32	19.89	19.45	(92)
Apply adjustment					-			1] (/
Γ	19.52	19.84	20.15	20.35	20.42	20.44	20.44	20.44	20.43	20.32	19.89	19.45	(93)
L	15.52	15.04	20.15	20.33	20.42	20.44	20.44	20.44	20.45	20.52	19.09	15.45] (33)
8. Space heating	; requireme	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	for gains, η	m											
[0.98	0.95	0.87	0.72	0.54	0.37	0.25	0.28	0.47	0.79	0.96	0.99	(94)
- Useful gains, ηmG	Gm, W (94)	m x (84)m											
Γ	630.15	775.06	837.88	781.70	621.46	417.03	274.59	288.45	451.73	638.96	633.53	586.22	(95)
Monthly average	external te	mperature	e from Tabl	e U1									-
Γ	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
∟ Heat loss rate for] (* */
Г	1116.21	1093.60	996.63	828.37	629.50	417.74	274.64	288.56	454.64	702.09	927.03	1109.54	(97)
L Space heating rec	I			1	1		274.04	288.50	434.04	702.03	927.05	1109.54] (57)
	-				1		0.00	0.00	0.00	46.07	211 22	290.25	7
L	361.63	214.06	118.11	33.60	5.98	0.00	0.00	0.00	0.00	46.97	211.32	389.35	
									∑(98	3)15, 10		1381.02	」(98) ☐ (98)
Space heating rec	quirement k	(Wh/m²/ye	ear							(98)	÷ (4)	18.05	(99)
9b. Energy requi	irements -	communit	y heating s	cheme									
Fraction of space	heat from	secondary/	/suppleme	ntary syste	m (table 11	1)				'0' if r	none	0.00	(301)
Fraction of space	heat from	community	y system							1 - (30	01) =	1.00	(302)
Fraction of comm												1.00	(303a)
Fraction of total s	-			ers						(302) x (303	3a) =	1.00	(304a)
Factor for control					nmunity sp	ace heating	r			(, (1.00	(305)
Factor for chargin												1.00	(305a)
Distribution loss f	-			·	-							1.05	(306)
Distribution 1055 1		c 120, 101 c	Johnnanity	neuting sy	Stem							1.05] (300)
Space heating													
Annual space hea	ting requir	ement						1	381.02	1			(98)
		ement								」 k (305) x (30)))	1450.07	(307a)
Space heat from b	JUIIEIS							(90	5) X (504a))	K (505) X (50		1450.07] (5078)
Water heating													
Water heating	ting rocui-	oment							740.90	1			(64)
Annual water hea	• •	entent							.749.80] (205a) y (20) – <u> </u>	1027 20	7
Water heat from										(305a) x (30		1837.29	(310a)
Electricity used for	or neat disti	noitudi					0.0	1 × [(307a)	.(307e) + (3	stua)(310	e)] = [32.87	(313)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	0.00	(331)
	333.80	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	3621.17	(338)

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	1450.07	x	4.24	x 0.01 =	61.48	(340a)
Water heating from boilers	1837.29	x	4.24	x 0.01 =	77.90	(342a)
Electricity for lighting	333.80	x	13.19	x 0.01 =	44.03	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	303.41	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.05	(357)
SAP value					85.37]
SAP rating (section 13)					85	(358)
SAP band					В]
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		Emission factor		Emissions (kg/year)	

	kWh/year				(kg/year)	
Emissions from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a	a) = 3673.03	x	0.216	=	793.38	(367)
Electrical energy for community heat distribution	32.87	x	0.519	=	17.06	(372)
Total CO2 associated with community systems					810.44	(373)
Total CO2 associated with space and water heating					810.44	(376)
Electricity for lighting	333.80	x	0.519	=	173.24	(379)
Total CO ₂ , kg/year				(376)(382) =	983.68	(383)
Dwelling CO₂ emission rate				(383) ÷ (4) =	12.86	(384)
El value					89.15]
El rating (section 14)					89	(385)
El band					В]

13b. Primary energy - community heating scheme

					(kWh/year)	
Primary energy from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = [3673.03	x	1.22	=	4481.10	(367)
Electrical energy for community heat distribution	32.87	x	3.07	=	100.92	(372)
Total primary energy associated with community systems					4582.02	(373)
Total primary energy associated with space and water heating					4582.02	(376)
Electricity for lighting	333.80	x	3.07	=	1024.77	(379)
Primary energy kWh/year					5606.79	(383)
Dwelling primary energy rate kWh/m2/year					73.27	(384)



Assessor name	Miss Alicja Kreglew	/ska				As	sessor numbe	r	4134		
Client						Las	st modified		13/06,	/2018	
Address	A 1 02 Ingestre Roa	ad, London, N	W5 1XE								
	-										
1. Overall dwelling dimen	isions										
			Aı	ea (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied				76.52	(1a) x		2.50 (2	2a) =		191.30	(3a)
Total floor area	(1a) + (1b) + (1	1c) + (1d)(1r	n) =	76.52	(4)			~			
Dwelling volume						(3a)	+ (3b) + (3c) -	- 3d)'3	n) =	191.30	(5)
2. Ventilation rate							71				
Number of chimneys								x 40 =	m³	f per hour	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent far	15						3	x 10 =		30	(7a)
Number of passive vents					Co		0	x 10 =		0	(7b)
Number of flueless gas fire	S				~		0	x 40 =		0	(7c)
				C	\mathbf{N}				Air c	hanges per hour	
Infiltration due to chimney	s, flues, fans, PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7	7c) =	30	÷ (5) =		0.16	(8)
If a pressurisation test has		intended, pro					o (16)				1 • •
Air permeability value, q50										5.00	(17)
If based on air permeability										0.41	(18)
Number of sides on which										3	(19)
Shelter factor		C					1 - [0	.075 x (19)] =	0.78	
Infiltration rate incorporati	in a shaltar fastar										(20)
	ing shelter factor							(18) x (2	0) =	0.32	(20) (21)
Infiltration rate modified for		d						(18) x (2	0) =	0.32	1
Infiltration rate modified fo		d [.] Apr	Мау	Jun	Jul	Aug	Sep	(18) x (2 Oct	0) = Nov	0.32 Dec	1
	or monthly wind spec Feb Ma		May	Jun	Jul	Aug	Sep				1
Jan	or monthly wind spec Feb Ma		May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep				1
Jan Monthly average wind spec	Feb May ed from Table U2	Apr				-		Oct	Nov	Dec	(21)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28	reb Ma reb Ma ed from Table U2 2.00 4.90 1.25 1.23	Apr 4.40 1.10	4.30	3.80 0.95		-		Oct	Nov	Dec	(21)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	reb Ma reb Ma ed from Table U2 2.00 4.90 1.25 1.23	Apr 4.40 1.10	4.30	3.80 0.95	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec	(21)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40	Feb Ma ed from Table U2 200 4.90 1.25 1.23 allowing for shelter and 0.39 0.39	Apr 4.40 1.10 d wind factor 0.35	4.30	3.80 0.95	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec	(21)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	Feb Ma ed from Table U2 200 4.90 1.25 1.23 allowing for shelter and 0.39 0.39	Apr 4.40 1.10 d wind factor 0.35	4.30 1.08) (21) x (2	3.80 0.95 2a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18	(21) (22) (22a)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air chan If mechanical ventilation	Feb Ma ed from Table U2 0.30 4.90 1.25 1.23 allowing for shelter and 0.39 0.39 uge rate for the applicant; n: air change rate through	Apr 4.40 1.10 d wind factor 0.35 able case: bugh system	4.30 1.08) (21) x (2 0.34	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.37	(21) (22) (22a) (22b) (23a)
Jan Monthly average wind spect 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air chan If mechanical ventilation If balanced with heat re	Feb Ma ed from Table U2 A 2,00 4.90 1.25 1.23 allowing for shelter an 0.39 0.39 0.39 age rate for the applicant: air change rate three ecovery: efficiency in 9	Apr 4.40 1.10 d wind factor 0.35 able case: bugh system 6 allowing for	4.30 1.08) (21) x (2 0.34 in-use fac	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.37	(21) (22) (22a) (22b)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	Feb Ma ed from Table U2 0.30 4.90 1.25 1.23 allowing for shelter and 0.39 0.39 uge rate for the applicant: air change rate three applicant of the applic	Apr 4.40 1.10 d wind factor 0.35 able case: bugh system % allowing for e input ventila	4.30 1.08) (21) x (2 0.34 in-use fac	3.80 0.95 2a)m 0.30 :tor from Ta loft	3.80 0.95 0.30 able 4h	3.70 0.93 0.29	4.00	Oct 4.30 1.08 0.34	Nov 4.50 1.13 0.35	Dec 4.70 1.18 0.37 N/A N/A	(21) (22) (22a) (22b) (23a) (23c)
Jan Monthly average wind spect 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or 0.58	Feb Ma ed from Table U2 200 2.00 4.90 1.25 1.23 allowing for shelter and 0.39 0.39 0.39 age rate for the applicant ecovery: efficiency in 9 r whole house positive 0.58 0.57	Apr 4.40 1.10 d wind factor 0.35 able case: bugh system & allowing for e input ventila 0.56	4.30 1.08) (21) x (2 0.34 in-use fac ition from 0.56	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.37	(21) (22) (22a) (22b) (23a)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	Feb Ma ed from Table U2 200 2.00 4.90 1.25 1.23 allowing for shelter and 0.39 0.39 0.39 age rate for the applicant ecovery: efficiency in 9 r whole house positive 0.58 0.57	Apr 4.40 1.10 d wind factor 0.35 able case: bugh system & allowing for e input ventila 0.56	4.30 1.08) (21) x (2 0.34 in-use fac ition from 0.56	3.80 0.95 2a)m 0.30 :tor from Ta loft	3.80 0.95 0.30 able 4h	3.70 0.93 0.29	4.00	Oct 4.30 1.08 0.34	Nov 4.50 1.13 0.35	Dec 4.70 1.18 0.37 N/A N/A	(21) (22) (22a) (22b) (23a) (23c)



3. Heat losses and heat loss parameter								
Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m²K	A x U W/K	к-value, kJ/m².К	Ахк, kJ/K	
Window			19.13	x 1.33	= 25.36]		(27)
External wall			13.50	x 0.18	= 2.43]		(29a)
Party wall			64.09	x 0.00	= 0.00			(32)
Total area of external elements ∑A, m ²			32.63					(31)
Fabric heat loss, W/K = $\Sigma(A \times U)$					(26)	.(30) + (32) =	27.79	(33)
Heat capacity Cm = $\sum (A \times \kappa)$				(28).	(30) + (32) + (3			(34)
Thermal mass parameter (TMP) in kJ/m ² K								(35)
Thermal bridges: $\Sigma(L \times \Psi)$ calculated using Appe	endix K							(36)
Total fabric heat loss						(33) + (36) =		(37)
Jan Feb Mar	Apr	May	Jun Jul	Aug	Sep	Oct Nov		(-)
Ventilation heat loss calculated monthly 0.33 x	-			Ū				
36.67 36.47 36.27	35.36	35.19	34.40 34.4	10 34.25	34.70	35.19 35.5	4 35.90	(38)
Heat transfer coefficient, W/K (37)m + (38)m						<u>C</u>		()
68.72 68.52 68.33	67.41	67.24	66.45 66.4	15 66.30	66.75	57.∠+ 67.5	9 67.95	
					Average = 2/3			(39)
Heat loss parameter (HLP), W/m ² K (39)m ÷ (4)								()
0.90 0.90 0.89	0.88	0.88	0.87 0.8	7 0.87	0.37	0.88 0.88	0.89	
					Average = $\Sigma(4)$	I		(40)
Number of days in month (Table 1a)					21010 <u>0</u> 0 <u>2</u> (1			(
31.00 28.00 31.00	30.00	31.00	30.00 31.0	0 1.00	30.00	31.00 30.0	0 31.00	(40)
51100 20100 51100	30.00	51.00	30.00		50.00	51.00 50.0	51.00	(10)
4. Water heating energy requirement								
				-				
Assumed occupancy, N			()				2.39	(42)
Assumed occupancy, N Annual average hot water usage in litres per da	y Vd,average	e = (25 x N) + 3	36					(42) (43)
	y Vd,average Apr	e = (25 x N) + 3 May	36 Jun Jul	Aug	Sep	Oct Nov	91.05	
Annual average hot water usage in litres per da	Apr	Məy	Jun Jul	l Aug	Sep	Oct Nov	91.05	
Annual average hot water usage in litres per da Jan Feb Mar	Apr	Məy	Jun Jul	J		Oct Nov 92.87 96.5	91.05	
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont	Apr h Vd,m = fact	Ma r) tor from Tabl	Jun Jul e 1c x (43)	J	89.23		91.05 7 Dec 1 100.15	
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont	Apr h Vd,m = fact 89.23	May tor from Tabl	Jun Jul e 1c x (43) 81.94	94 85.58	89.23	92.87 96.5	91.05 7 Dec 1 100.15	(43)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87	Apr h Vd,m = fact 89.23	May tor from Tabl	Jun Jul e 1c x (43) 81.94	04 85.58 1b, 1c 1d)	89.23	92.87 96.5	91.05 Dec 1 100.15 1092.55	(43)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,m	Apr h Vd,m = fact 89.23	May tor from Tabl 85.18	Jun Jul e 1c x (43) 81.94 81.9 onth (see Tables	04 85.58 1b, 1c 1d)	89.23	92.87 96.5 Σ(44)112 = [91.05 Dec 1 100.15 1092.55 143.83	(43)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,m	Apr h Vd,m = fact 89.23	May tor from Tabl 85.18	Jun Jul e 1c x (43) 81.94 81.9 onth (see Tables	04 85.58 1b, 1c 1d)	89.23	92.87 96.5 Σ(44)112 = 121.34 132.4	91.05 Dec 1 100.15 1092.55 143.83	(43) (44)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,m 148.52 129.90 134 f4	Apr h Vd,m = fact 89.23	May tor from Tabl 85.18	Jun Jul e 1c x (43) 81.94 81.9 onth (see Tables	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ(44)112 = 121.34 132.4	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51	(43) (44)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd,m$ 148.52 129.90 134 for Distribution loss 0.15 x (45)m	Apr h Vd,m = fact 89.23 h x nm x Trn/s 116.86 17.53	May tor from Table 3600 kWh/mo 112.13 16.82	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58	(43) (44) (45)
Annual average hot water usage in litres per da Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss 0.15 x (45)m 22.28 19.48 20.11	Apr h Vd,m = fact 89.23 h x nm x Trn/s 116.86 17.53	May tor from Table 3600 kWh/mo 112.13 16.82	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58	(43) (44) (45) (46)
Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss 0.15 x (45)m 22.28 19.48 / 20.11 Storage volume (litres) including any solar or W	Apr h Vd,m = fact 89.23 h x nm x Trh/s 116.86 17.53 WHRS storag	May tor from Table 35.18 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00	(43) (44) (45) (46)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 / 20.11 Storage volume (litres) including any solar or W Water storage loss:	Apr h Vd,m = fact 89.23 h x nm x Trh/s 116.86 17.53 WHRS storag	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24	(43) (44) (45) (46) (47)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134/4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know	Apr h Vd,m = fact 89.23 h x nm x Tr1/s 1116.86 17.53 WHRS storage vn (kWh/day)	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54	(43) (44) (45) (46) (47) (48)
Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 fd Distribution loss $0.15 \times (45)m$ 22.28 19.48 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b	Apr h Vd,m = fact 89.23 h x nm x Tr1/s 1116.86 17.53 WHRS storage vn (kWh/day)	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13	(43) (44) (45) (46) (47) (48) (49)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 f Distribution loss $0.15 \times (45)m$ 22.28 19.48 f 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Apr h Vd,m = fact 89.23 h x nm x Tr 1/3 1116.86 17.53 WHRS storage vn (kWh/day) 48) x (49)	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13	 (43) (44) (45) (46) (47) (48) (49) (50)
Annual average hot water usage in litres per dat Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55)	Apr h Vd,m = fact 89.23 h x nm x Tr 1/3 1116.86 17.53 WHRS storage vn (kWh/day) 48) x (49)	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4	94 85.58 1b, 1c 1d) 56 102.89 15 15.43	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13	 (43) (44) (45) (46) (47) (48) (49) (50)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 / 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (Apr h Vd,m = fact 89.23 h x n m x Tr h/s 1116.86 17.53 WHRS storage vn (kWh/day) 48) x (49) (55) x (41)m 3.87	May tor fro. Tak 3600 kWh/ma 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.92 onth (see Tables 96.76 89.6 14.51 13.4 e vessel 3.87 4.0	04 85.58 1b, 1c 1d) 56 102.89 15 15.43 0 4.00	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = [] 18.20 19.8 [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13	 (43) (44) (45) (46) (47) (48) (49) (50) (55)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 / 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 4.00	Apr h Vd,m = fact 89.23 h x n m x Tr h/s 1116.86 17.53 WHRS storage vn (kWh/day) 48) x (49) (55) x (41)m 3.87	May tor fro. Tak 3600 kWh/ma 112.13 16.82 ge within sam	Jun Jul e 1c x (43) 81.94 81.94 81.92 onth (see Tables 96.76 89.6 14.51 13.4 e vessel 3.87 4.0	04 85.58 1b, 1c 1d) 56 102.89 15 15.43 15 15.43 0 4.00 47), else (56)	89.23	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = [] 18.20 19.8 [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13 0.13 4.00	 (43) (44) (45) (46) (47) (48) (49) (50) (55)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = 4.18 x Vd,m 148.52 129.90 134 f Distribution loss $0.15 \times (45)m$ 22.28 19.48 f 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 $4.00If the vessel contains dedicated solar storage on$	Apr h Vd,m = fact 89.23 h x n m x Tr 1/5 1116.86 17.53 WHRS storage vn (kWh/day) (48) x (49) (55) x (41)m 3.87 r dedicated V 3.87	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam) 4.00 VWHRS (56)m	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4 e vessel 3.87 4.0 n x [(47) - Vs] ÷ (4)	04 85.58 1b, 1c 1d) 56 102.89 15 15.43 15 15.43 0 4.00 47), else (56)	89.23 104.12 15.62 3.87	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = [] 18.20 19.8 \Box [] 4.00 3.85	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13 0.13 4.00	 (43) (44) (45) (46) (47) (48) (49) (50) (55) (56)
Annual average hot water usage in litres per day Jan Feb Mar Hot water usage in litres per day for each mont 100.15 96.51 92.87 Energy content of hot water used = $4.18 \times Vd$,m 148.52 129.90 134 /4 Distribution loss $0.15 \times (45)m$ 22.28 19.48 / 20.11 Storage volume (litres) including any solar or W Water storage loss: a) If manufacturer's declared loss factor is know Temperature factor from Table 2b Energy lost from water storage (kWh/day) (Enter (50) or (54) in (55) Water storage loss calculated for each month (4.00 3.61 4.00 If the vessel contains dedicated solar storage or 4.00 3.61 4.00	Apr h Vd,m = fact 89.23 h x n m x Tr 1/5 1116.86 17.53 WHRS storage vn (kWh/day) (48) x (49) (55) x (41)m 3.87 r dedicated V 3.87	May tor fro. Tak 3600 kWh/mo 112.13 16.82 ge within sam) 4.00 VWHRS (56)m	Jun Jul e 1c x (43) 81.94 81.94 81.9 onth (see Tables 96.76 89.6 14.51 13.4 e vessel 3.87 4.0 n x [(47) - Vs] ÷ (4)	1b, 1c 1d) 56 102.89 15 15.43 0 4.00 47), else (56) 0	89.23 104.12 15.62 3.87 3.87	92.87 96.5 Σ (44)112 = [] 121.34 132.4 Σ (45)112 = [] 18.20 19.8 \Box [] 4.00 3.85	91.05 91.05 Dec 1 100.15 1092.55 15 143.83 1432.51 7 21.58 2.00 0.24 0.54 0.13 7 4.00 4.00	 (43) (44) (45) (46) (47) (48) (49) (50) (55) (56)

Combi loss for ea	ach month t	from Table	3a, 3b or 3	С								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (61)
Total heat requir	ed for wate	er heating c	alculated f	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)r	n + (59)m +	· (61)m			
	175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09 (62)
Solar DHW input	calculated	using Appe	ndix G or A	Appendix H								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Output from wat	er heater f	or each mo	nth (kWh/ı	month) (62	2)m + (63)m				•			
	175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09
		I						1		∑(64)1	·	.753.47 (64)
Heat gains from	water heat	ing (kWh/m	onth) 0.25	5 × [0.85 × ((45)m + (61)m] + 0.8 ×	[(46)m + (57)m + (59)	ml	2(,=		
	71.19	62.89	66.38	59.96	59.09	53.28	51.62	56.02	55.72	62.15	65.14	69.63 (65)
	/1.15	02.05	00.50	33.50	33.05	55.20	51.02	30.02	35.72	02.15	05.14	
5. Internal gain	s											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	(Table 5)											
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	17.9.68	119.68	119.68 (66)
Lighting gains (ca										10		
0 0 0 0 0 0 0 0 0	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12.30	15.61	18.22	19.43 (67)
Appliance gains		I					7.05	5.10	12,5	15.01	10.22	
Appliance gains	212.01	214.21	208.67	196.87	181.97	167.97	158.61	156.41	161.96	173.76	188.66	202.66 (68)
Cooking going (or							138.01	150.41	11.90	175.70	100.00	202.00 (08)
Cooking gains (ca			-									
	34.97	34.97	34.97	34.97	34.97	34.97	34.97	3197	34.97	34.97	34.97	34.97 (69)
Pump and fan ga	ins (Table 5	5a)					C				I	,
	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00 (70)
Losses e.g. evapo	oration (Tab	ole 5)										
	-95.74	-95.74	-95.74	-95.74	-95.74	-9! .74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74 (71)
Water heating ga	ains (Table	5)										
	95.69	93.58	89.22	83.28	79 /.2	74.00	69.38	75.29	77.39	83.54	90.48	93.59 (72)
Total internal ga	ins (66)m +	- (67)m + (6	8)m + (69)ı	m + (70)m ·	+ (71)n + (2)m						
	388.51	386.49	373.44	352.39	331)2	310.39	296.95	302.77	313.55	334.81	359.26	377.58 (<mark>73</mark>)
6. Solar gains				()								
			Acceps f ab'a		Area m ²		ar flux //m²	spaci	g ific data	FF specific d	lata	Gains W
			av e	ou			// III		able 6b	or Table		
SouthWest			0.7	7 x [15.80	x 3	6.79 x	0.9 x C).63 x	0.70		177.67 (79)
SouthEast			0.7		3.33).63 x			37.44 (77)
	ttc Σ(74)m	(8.)m	0.7		5.55		0.79			0.70		37.44
Solar gains in wa			F04 24	624.42	COF 70	coo 75		C10.21	F 40.05	404.00	257.65	
Tabal astronomicato	215.11	366.41	501.34	621.19	695.78	690.75	665.96	610.31	542.85	404.96	257.65	184.09 <mark>(83)</mark>
Total gains - inte				077	1077.5	10-1	0.000	0 1 1 1	0.5.5			
	603.62	752.90	874.78	973.57	1026.80	1001.14	962.90	913.08	856.40	739.78	616.91	561.67 (84)
7. Mean intern	al temperat	ture (heatir	ng season)									
Temperature du				area from T	able 9 Th1	(°C)						21.00 (85)
i emperature du	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec (65)
I Itilication fasta				•		Juit	Jui	Aug	Sch		NUV	Dec
Utilisation factor	-	-				0.42	0.20	0.22	0.52	0.94	0.07	
Moon internel !	0.99	0.97	0.91	0.78	0.60	0.42	0.30	0.33	0.53	0.84	0.97	0.99 (86)
Mean internal te												
	20.29	20.52	20.75	20.92	20.99	21.00	21.00	21.00	20.99	20.90	20.56	20.25 (87)

Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)	
20.17 20.17 20.17 20.18 20.19 20.19 20.20 20.19 20.19 20.19	8 20.18 (88)
Utilisation factor for gains for rest of dwelling n2,m	
0.99 0.96 0.89 0.74 0.55 0.37 0.25 0.28 0.47 0.80 0.97	7 0.99 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
19.24 19.56 19.88 20.10 20.17 20.19 20.20 20.19 20.08 19.6	4 19.18 <mark>(90)</mark>
Living area fraction Living area ÷ (4) =	0.35 (91)
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	
19.60 19.89 20.18 20.39 20.46 20.47 <th< td=""><td>6 19.55 <mark>(92)</mark></td></th<>	6 19.55 <mark>(92)</mark>
Apply adjustment to the mean internal temperature from Table 4e where appropriate	
19.60 19.89 20.18 20.39 20.46 20.47 20.47 20.47 20.47 20.47 20.47 20.36 19.9	6 19.55 <mark>(93)</mark>
8. Space heating requirement	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	/ Dec
Utilisation factor for gains, ηm	
0.99 0.96 0.89 0.75 0.57 0.39 0.27 0.30 0.49 6.81 0.96	5 0.99 (94)
Useful gains, ηmGm, W (94)m x (84)m	
595.02 719.77 776.45 727.66 580.89 389.63 257.36 270.08 422.5 596.28 593.5	90 556.07 <mark>(95)</mark>
Monthly average external temperature from Table U1	
4.30 4.90 6.50 8.90 11.70 14.60 16.60 16.40 14.10 10.60 7.10) 4.20 <mark>(96)</mark>
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	
<u>1051.66</u> <u>1027.28</u> <u>934.55</u> <u>774.38</u> <u>588.71</u> <u>390.24</u> <u>257.41</u> <u>2 0.17</u> <u>425.04</u> <u>656.55</u> <u>869.0</u>	04 1043.04 (97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	
339.74 206.65 117.63 33.64 5.82 0.00 0.00 0.00 44.84 198.1	
Σ(98)15, 1012 =	1308.72 (98)
Σ(98)15, 1012 =	1308.72 (98)
Space heating requirement kWh/m²/year Σ(98)15, 1012 = 9a. Energy requirements - individual heating systems including micro-C'? Space heating	1308.72 (98) 17.10 (99)
$\Sigma (98)15, 1012 = 0$ Space heating requirement kWh/m ² /year (98) ÷ (4) 9a. Energy requirements - individual heating systems including micro-C ¹ .P Space heating Fraction of space heat from secondary/supplementary system (1 able 11)	1308.72 (98) 17.10 (99) 0.00 (201)
$\sum (98)15, 1012 = $ Space heating requirement kWh/m ² /year (98) ÷ (4) 9a. Energy requirements - individual heating systems including micro-C¹.P Space heating Fraction of space heat from secondary/supplementary system (*able 11) Fraction of space heat from main system(s) 1 - (201) = 	1308.72 (98) 17.10 (99) 0.00 (201) 1.00 (202)
$\sum (98)15, 1012 = \begin{bmatrix} \\ (98)15, 1012 = \\ (98) \div (4) \end{bmatrix}$ Space heating requirements - individual heating systems including micro-C ¹ . ² Space heating Fraction of space heat from secondary/supplementary system (table 11) Fraction of space heat from main system(s) Fraction of space heat from main system 2	1308.72 (98) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202)
Space heating requirement kWh/m²/year $\sum (98)15, 1012 =$ Space heating requirements - individual heating systems including micro-C'.? (98) ÷ (4) Space heating Fraction of space heat from secondary/supplementary system (*able 11) Fraction of space heat from main system(s) 1 - (201) = Fraction of space heat from main system 2 (202) x [1- (203)] =	1308.72 (98) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204)
Space heating requirement kWh/m²/year $\sum (98) 15, 1012 = $ Space heating requirements - individual heating systems including micro-CV.P (98) ÷ (4) Space heating Fraction of space heat from secondary/supplementary system (table 11) Fraction of space heat from main system(s) 1 - (201) = Fraction of space heat from main system 2 (202) x [1- (203)] = Fraction of total space heat from main system 2 (202) x (203) =	1308.72 (98) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205)
Space heating requirement kWh/m²/year Σ (98)15, 1012 = (98) ÷ (4) (98) ÷ (4) 9a. Energy requirements - individual heating systems including micro-C' :? Space heating Fraction of space heat from secondary/supplementary system (*ao)e 11) Fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%)	1308.72 (98) 17.10 (99) 17.10 (201) 0.00 (202) 1.00 (202) 0.00 (204) 0.00 (205) 93.50 (206)
Space heating requirement kWh/m²/year $\sum(98)15, 1012 =$ Space heating requirements - individual heating systems including micro-C ⁺ .? Space heating Fraction of space heat from secondary/supplementary system (*ac) = 11) Fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 7 Efficiency of main system 1 (%) Jan Feb Mar Apr May Jun Jun Jun Jun Jun Jun	1308.72 (98) 17.10 (99) 17.10 (201) 0.00 (202) 1.00 (202) 0.00 (204) 0.00 (205) 93.50 (206)
Space heating requirement kWh/m²/year $\Sigma(98)15, 1012 =$ Space heating requirements - individual heating systems including micro-C'? Space heating Fraction of space heat from secondary/supplementary system (rable 11) Fraction of space heat from main system 2 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 5 Efficiency of main system 1 (%) Jan Feb Mar Apr May Jan Feb Mar Apr May Jun Jun Jun Jun </td <td>1308.72 (98) 17.10 (99) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) Dec 1</td>	1308.72 (98) 17.10 (99) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) Dec 1
Space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including micro-C'.?Space heating Fraction of space heat from secondary/supplementary systel 1' are 11) Fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 4 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Efficiency of main system 1 (%)JanFebMarAprMayJunJulAugSepOctNowSpace heating fuel (main system 2, 202) x [1- (203)] = [(202) x (203) = [1308.72 (98) 17.10 (99) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 87 387.49
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1308.72 (98) 17.10 (99) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) Dec 1
$ \begin{array}{c} \hline \ \ \ \ \ \ \ \ \ \ \ \ \$	1308.72 (98) 17.10 (99) 17.10 (99) 0.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 87 387.49
$\sum (98) 15, 1012 = \begin{bmatrix} \\ (98) \div (4) \end{bmatrix}$ Space heating requirement kWh/m ² /year (98) ÷ (4) \begin{bmatrix} \\ 9a. Energy requirements - individual heating systems including micro-C ¹ .? Space heating Fraction of space heat from secondary/supplementary system (backer 11) Fraction of space heat from main system (s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Space heating fuel (main system 2), Wh/month $363.36 221.01 125.81 35.98 6.22 0.00 0.00 0.00 47.96 211.8 [(211)15, 1012 = \begin{bmatrix} Water heating Efficiency of Water heater \end{bmatrix}$	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (201) 1.00 (202) 0.00 (202) 1.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 37 387.49 1399.71 (211)
Space heating requirement kWh/m ² /year Space heating requirements - individual heating systems including micro-C'.~? Space heating Fraction of space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 4 Fraction of total space heat from 5 Fraction of total space hea	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (201) 1.00 (202) 0.00 (202) 1.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 37 387.49 1399.71 (211)
Space heating requirement kWh/m ² /year Space heating requirement kWh/m ² /year $[98] \div (4)$ 9a. Energy requirements - individual heating systems including micro-C ¹ . ² Space heating Fraction of space heat from secondary/supplementary system that are 11) Fraction of space heat from main system 2 Fraction of space heat from main system 4 Fraction of total space heat from main system 4 Fraction of total space heat from main system 7 Fraction of total space heat from 7 Fraction of total space heat	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (99) 1.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 37 387.49 1399.71 (211) 0 86.77 (217)
Space heating requirement kWh/m ² /year Space heating requirement kWh/m ² /year $[98] \div (4)$ 9a. Energy requirements - individual heating systems including micro-C ¹ . ² Space heating Fraction of space heat from secondary/supplementary system (Large 11) Fraction of space heat from main system (S) Fraction of space heat from main system (S) Fraction of total space heat from main system (CO2) × [1 - (201)] = [Fraction of total space heat from main system (CO2) × [1 - (202)] = [Fraction of total space heat from main system (CO2) × [202) × [202] × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [202] × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from main system (CO2) × [203] = [Fraction of total space heat from (CO2) × [203] = [Fraction of total space heat f	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) y Dec 87 387.49 1399.71 (211) 0 86.77 (217)
$ \begin{array}{c} & & & & & & & & & & & & & & & & & & &$	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (99) 1.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) 7 387.49 1399.71 (211) 0 86.77 (217) 98 197.19
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (99) 1.00 (201) 1.00 (202) 0.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) 7 387.49 1399.71 (211) 0 86.77 (217) 98 197.19
$ \begin{array}{c} & & & & & & & \\ & & & & & & \\ & & & & $	1308.72 (98) 17.10 (99) 17.10 (99) 17.10 (99) 17.10 (201) 1.00 (202) 1.00 (202) 1.00 (204) 0.00 (205) 93.50 (206) 7 387.49 1399.71 (211) 0 86.77 (217) 28 197.19 2116.75 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f)			
central heating pump or water pump within warm air heating	unit	30.00	(230c)
boiler flue fan		45.00	(230e)
Total electricity for the above, kWh/year			75.00 (231)
Electricity for lighting (Appendix L)			333.80 (232)
Total delivered energy for all uses		(211)(221) + (231) + (232)(237b) =	<u>3925.26</u> (238)
10a. Fuel costs - individual heating systems including micro-CH	P		
	Fuel kWh/year	Fuel price	Fuel cost £/year
Space heating - main system 1	1399.71	x 3.48 x 0.01 =	48.71 (240)
Water heating	2116.75	x 3.48 x 0.01 =	73.66 (247)
Pumps and fans	75.00	x 13.19 x 0.01 =	9.89 (249)
Electricity for lighting	333.80	x 13.19 x 0.01 =	44.03 (250)
Additional standing charges			120.00 (251)
Total energy cost		(240)(242) + (24 ^r)(254) =	296.29 (255)
11a. SAP rating - individual heating systems including micro-CH	IP		
Energy cost deflator (Table 12)	_		0.42 (256)
Energy cost factor (ECF)			1.02 (257)
SAP value			85.71
SAP rating (section 13)			86 (258)
SAP band			В
12a CO ₂ emissions - individual heating systems including micro	снр 🦊		
12a. CO ₂ emissions - individual heating systems including micro		Emission factor	Emissions
12a. CO ₂ emissions - individual heating systems including micro	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO₂/year
12a. CO ₂ emissions - individual heating systems including micro Space heating - main system 1	Energy		
	Energy kWh/year	kg CO₂/kWh	kg CO ₂ /year
Space heating - main system 1	Energy kWh/year 1399.71	kg CO ₂ /kWh x 0.216 =	kg CO ₂ /year 302.34 (261) 457.22 (264)
Space heating - main system 1 Water heating	Energy kWh/year 1399.71 2116.75	kg CO ₂ /kWh x 0.216 x 0.216	kg CO ₂ /year 302.34 (261) 457.22 (264)
Space heating - main system 1 Water heating Space and water heating	Energy kWh/year 1399.71 2116.75	$kg CO_2/kWh$ x 0.216 = x 0.216 = (261) + (262) + (263) + (264) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh/year 1399.71 2116.75 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energy kWh/year 1399.71 2116.75 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year	Energy kWh/year 1399.71 2116.75 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = (265)(271) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	Energy kWh/year 1399.71 2116.75 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = (265)(271) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	Energy kWh/year 1399.71 2116.75 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = (265)(271) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	Energy kWh/ycar 1399.71 2116.75 75.00 333.80	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = (265)(271) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 89
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energy kWh/ycar 1399.71 2116.75 75.00 333.80	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = (265)(271) =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 89
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energy kWh/year 1399.71 2116.75 75.00 333.80 333.80	$kg CO_2/kWh$ $x 0.216 = $ $x 0.216 = $ $(261) + (262) + (263) + (264) = $ $x 0.519 = $ $x 0.519 = $ $(265)(271) = $ $(272) \div (4) = $	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 89 (274) B Primary Energy
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individua, keating systems including mice	Energy kWh/ycar 1399.71 2116.75 75.00 333.80 333.80	kg CO ₂ /kWh x 0.216 x 0.216 (261) + (262) + (263) + (264) = x 0.519 x 0.519 x 0.519 (265)(271) = (272) ÷ (4) =	kg CO2/year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (274) B Primary Energy kWh/year (274)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individua. Leating systems including mice Space heating - main system 1	Energy kWh/year 1399.71 2116.75 75.00 333.80 333.80	kg CO₂/kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = x 0.519 = x 0.519 = (265)(271) = (272) ÷ (4) = Primary factor x 1.22 =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (274) B
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individua. ¹ eating systems including mice Space heating - main system 1 Water heating	Energy kWh/year 1399.71 2116.75 75.00 333.80 333.80 ro-CHP Energy kWh/year 1399.71 2116.75	kg CO ₂ /kWh x 0.216 x 0.216 x 0.216 (261) + (262) + (263) + (264) = x 0.519 x 0.519 x 0.519 x 0.519 (265)(271) = (272) ÷ (4) = x 1.22 x 1.22	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (274) B
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individua. Leating systems including mice Space heating - main system 1 Water heating Space and water heating	Energy kWh/year 1399.71 2116.75 75.00 333.80 333.80 *O-CHP Energy kWh/year 1399.71 2116.75	$kg CO_2/kWh$ $x 0.216 = $ $x 0.216 = $ $(261) + (262) + (263) + (264) = $ $x 0.519 = $ $(265)(271) = $ $(272) \div (4) = $ $(272) \div (4) = $ $x 1.22 = $ $x 1.22 = $ $(261) + (262) + (263) + (264) = $	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (274) B 2582.43 1707.64 (261) 2582.43 (264) 4290.07 (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individua. Leating systems including mice Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh/year 1399.71 2116.75 75.00 333.80 75.00 Energy kWh/year 1399.71 2116.75	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) = = x 0.519 = x 0.519 = x 0.519 = x 0.519 = x 0.216 = x 0.519 = (265)(271) = (265)(271) = (272) ÷ (4) = = x 1.22 = x 1.22 = (261) + (262) + (263) + (264) = = x 3.07 =	kg CO ₂ /year 302.34 (261) 457.22 (264) 759.55 (265) 38.93 (267) 173.24 (268) 971.72 (272) 12.70 (273) 89.28 (274) B (274) B (261) 2582.43 (264) 4290.07 (265) 230.25 (267)

DER Worksheet Design - Draft



	Miss Alicja Kreglew	ska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 2 05 above hobb	y room Inge	estre Road,	London, NV	W5 1XE						
1. Overall dwelling dimen	sions		_	(2)						. (3)	
			А	area (m²)			age storey eight (m)		Vo	olume (m³)	
Lowest occupied				88.78] (1a) x		2.50	(2a) =		221.95	(3a)
Total floor area	(1a) + (1b) + (1	Lc) + (1d)(1n) =	88.78] (4)						
Dwelling volume						(3a)	+ (3b) + (3d	c) + (3d)(3	3n) =	221.95	(5)
2. Ventilation rate											
									m	³ per hour	
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent fan	IS						3	x 10 =	=	30	(7a)
Number of passive vents							0	x 10 =	= [0	(7b)
Number of flueless gas fires	S						0	x 40 =	=	0	(7c)
-									Air	changes per	
	() (- 、		۱ <i>(</i> -)		hour	
Infiltration due to chimneys If a pressurisation test has		intended n) + (6b) + (7a	a) + (7b) + (/c) =	30	÷ (5) =	-	0.14	(8)
				(17) others	les continu	a from (0) t	a(14)				
							o (16)			4.00	(17)
Air permeability value, q50	, expressed in cubic m	netres per h	our per squ	uare metre	of envelope		o (16)			4.00	(17)
Air permeability value, q50 If based on air permeability	, expressed in cubic m value, then (18) = [(1	netres per h .7) ÷ 20] + (8	our per squ	uare metre	of envelope		o (16)			0.34	(18)
Air permeability value, q50 If based on air permeability Number of sides on which t	, expressed in cubic m value, then (18) = [(1	netres per h .7) ÷ 20] + (8	our per squ	uare metre	of envelope			[0 075 v (1	9)] =	0.34 3	(18) (19)
Air permeability value, q50 If based on air permeability Number of sides on which t Shelter factor	, expressed in cubic m v value, then (18) = [(1 the dwelling is shelter	netres per h .7) ÷ 20] + (8	our per squ	uare metre	of envelope			[0.075 x (1		0.34 3 0.78	(18) (19) (20)
Air permeability value, q50 If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati	, expressed in cubic m v value, then (18) = [(1 the dwelling is shelter ng shelter factor	netres per h .7) ÷ 20] + (8 ed	our per squ	uare metre	of envelope			[0.075 x (1 (18) x (;		0.34 3	(18) (19)
Air permeability value, q50 If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified fo	, expressed in cubic m v value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed	netres per h .7) ÷ 20] + ({ ed J:	our per squ 8), otherwi	uare metre se (18) = (10	of envelope 6)	e area	1-	(18) x (1	20) =	0.34 3 0.78 0.26	(18) (19) (20)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan	, expressed in cubic m v value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar	netres per h .7) ÷ 20] + (8 ed	our per squ	uare metre	of envelope					0.34 3 0.78	(18) (19) (20)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan	, expressed in cubic m v value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar	netres per h .7) ÷ 20] + ({ ed J:	our per squ 8), otherwi	uare metre se (18) = (10	of envelope 6)	e area	1-	(18) x (1	20) =	0.34 3 0.78 0.26	(18) (19) (20) (21)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10	, expressed in cubic m value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2	hetres per h .7) ÷ 20] + (a ed d: Apr	our per squ 8), otherwi: May	uare metre se (18) = (10	of envelope 6) Jul	e area Aug	1 - Sep	(18) × (2 Oct	20) = Nov	0.34 3 0.78 0.26 Dec	(18) (19) (20)
Air permeability value, q50 If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spee	, expressed in cubic m value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2	hetres per h .7) ÷ 20] + (a ed d: Apr	our per squ 8), otherwi: May	uare metre se (18) = (10	of envelope 6) Jul	e area Aug	1 - Sep	(18) × (2 Oct	20) = Nov	0.34 3 0.78 0.26 Dec	 (18) (19) (20) (21) (22)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	, expressed in cubic m value, then (18) = [(1 the dwelling is shelter or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	hetres per h (7) ÷ 20] + (8 ed d: Apr 4.40 1.10	our per squ 8), otherwi: May 4.30	Jun 3.80 0.95	of envelope 5) Jul 3.80	Aug 3.70	1 - Sep 4.00	(18) x (1 Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70	 (18) (19) (20) (21) (22)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	, expressed in cubic m value, then (18) = [(1 the dwelling is shelter or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	hetres per h (7) ÷ 20] + (8 ed d: Apr 4.40 1.10	our per squ 8), otherwi: May 4.30	Jun 3.80 0.95	of envelope 5) Jul 3.80	Aug 3.70	1 - Sep 4.00	(18) x (1 Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70	(18) (19) (20) (21) (22) (22a)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33	, expressed in cubic mvalue, then (18) = [(1the dwelling is shelterng shelter factoror monthly wind speedFebMared from Table U25.004.901.251.23illowing for shelter an0.320.32	etres per h .7) ÷ 20] + (8 ed d: Apr 4.40 1.10 d wind facto 0.29	our per squ 8), otherwiz May 4.30 1.08 or) (21) x (2	Jun 3.80 0.95 22a)m	of envelope 5) Jul 3.80 0.95	Aug 3.70	1 - Sep 4.00	(18) x (i Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70 1.18	(18) (19) (20) (21) (22) (22a)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33	, expressed in cubic main value, then (18) = [(1) value, then (18) = [(1) the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter and 0.32 0.32 ge rate for the application	etres per h .7) ÷ 20] + (8 ed d: Apr 4.40 1.10 d wind factor 0.29 able case:	our per squ 8), otherwiz May 4.30 1.08 or) (21) x (2 0.28	Jun 3.80 0.95 22a)m	of envelope 5) Jul 3.80 0.95	Aug 3.70	1 - Sep 4.00	(18) x (i Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70 1.18	(18) (19) (20) (21) (22) (22a) (22b)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan	, expressed in cubic m value, then (18) = [(1 the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter an 0.32 0.32 ge rate for the application: air change rate throp	Apr 4.40 1.10 d wind factor 0.29 able case: bugh system	our per squ 8), otherwis May 4.30 1.08 or) (21) x (2 0.28	uare metre se (18) = (10 Jun 3.80 0.95 22a)m 0.25	of envelope 5) Jul 3.80 0.95 0.25	Aug 3.70	1 - Sep 4.00	(18) x (i Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70 1.18 0.31	(18) (19) (20) (21) (22) (22a) (22b) (23a)
Air permeability value, q50, If based on air permeability Number of sides on which t Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation	, expressed in cubic main value, then (18) = [(1) the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter an 0.32 0.32 ge rate for the application of the specific covery: efficiency in %	Apr 4.40 1.10 d wind factor 0.29 able case: ough system 6 allowing for	our per squ 8), otherwi: May 4.30 1.08 or) (21) x (2 0.28 n or in-use fa	uare metre se (18) = (10 Jun 3.80 0.95 22a)m 0.25	of envelope 5) Jul 3.80 0.95 0.25	Aug 3.70	1 - Sep 4.00	(18) x (i Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70 1.18 0.31 N/A	(18) (19) (20) (21) (22) (22a) (22b)
Air permeability value, q50, If based on air permeability Number of sides on which the Shelter factor Infiltration rate incorporation Infiltration rate modified for Jan Monthly average wind spece 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re	, expressed in cubic main value, then (18) = [(1) the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 illowing for shelter an 0.32 0.32 ge rate for the application of the specific covery: efficiency in %	Apr 4.40 1.10 d wind factor 0.29 able case: ough system 6 allowing for	our per squ 8), otherwi: May 4.30 1.08 or) (21) x (2 0.28 n or in-use fa	uare metre se (18) = (10 Jun 3.80 0.95 22a)m 0.25	of envelope 5) Jul 3.80 0.95 0.25	Aug 3.70	1 - Sep 4.00	(18) x (i Oct 4.30	20) = Nov 4.50	0.34 3 0.78 0.26 Dec 4.70 1.18 0.31 N/A	(18) (19) (20) (21) (22) (22a) (22b) (23a)
Air permeability value, q50, If based on air permeability Number of sides on which the Shelter factor Infiltration rate incorporation Infiltration rate modified for Jan Monthly average wind spect 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	, expressed in cubic main value, then (18) = [(1) the dwelling is shelter ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Illowing for shelter an 0.32 0.32 ge rate for the application n: air change rate three covery: efficiency in % whole house positive 0.55 0.55	Apr Apr 4.40 1.10 d wind facture 0.29 able case: pugh system 6 allowing for e input vent 0.54	our per squ 8), otherwis May 4.30 1.08 or) (21) x (2 0.28 n or in-use fa ilation from 0.54	uare metre se (18) = (10 Jun 3.80 0.95 22a)m 0.25 ctor from T n loft	of envelope 5) Jul 3.80 0.95 0.25 able 4h	Aug 3.70 0.93 0.24	1- Sep 4.00 1.00	(18) x (i Oct 4.30 1.08	20) = Nov 4.50 1.13 0.29	0.34 3 0.78 0.26 Dec 4.70 1.18 0.31 N/A N/A	(18) (19) (20) (21) (22) (22a) (22b) (22b) (23a) (23c)



3. Heat losses and heat loss parame	eter										
Element		Gross rea, m²	Openings m ²		area m²	U-value W/m²K	A x U W		value, /m².K	Ахк, kJ/K	
Window				23	.79 x	1.24	= 29.40)			(27)
Exposed floor				88	8.78 x	0.06	= 5.33				(28b
External wall				28	8.81 x	0.18	= 5.19				(29a)
Party wall				32	.04 x	0.00	= 0.00				(32)
Roof				16	5.11 x	0.12	= 1.93				(30)
Total area of external elements ∑A, r	n²			15	7.49						(31)
Fabric heat loss, W/K = ∑(A × U)							(2	6)(30) + (32) =	41.84	(33)
Heat capacity Cm = Σ(A x κ)						(28)	.(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ	/m²K									250.00	(35)
Thermal bridges: $\Sigma(L \times \Psi)$ calculated	using Append	dix K								15.04	(36)
Total fabric heat loss								(33) + (36) =	56.88	(37)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Ventilation heat loss calculated mon	thly 0.33 x (2	25)m x (5)									
40.64 40.48	40.33	39.61	39.48	38.85	38.85	38.74	39.09	39.48	39.75	40.03	(38)
Heat transfer coefficient, W/K (37)m	n + (38)m									•	_
97.52 97.37	97.21	96.49	96.36	95.73	95.73	95.62	95.98	96.36	96.63	96.92	7
							Average =	∑(39)112,	/12 =	96.49	(39)
Heat loss parameter (HLP), W/m ² K (39)m ÷ (4)										_
1.10 1.10	1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.09	1.09	1.09	7
							Average =]	Σ(40)112,	/12 =	1.09	(40)
Number of days in month (Table 1a)											_
31.00 28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
· · · · ·								•	•	- -	
4. Water heating energy requirement	ent										_
Assumed occupancy, N										2.61	(42)
Annual average hot water usage in li	tres per day \	/d,average	e = (25 x N) +	36						96.16	(43)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for							1	I	1		_
105.77 101.92	98.08	94.23	90.39	86.54	86.54	90.39	94.23	98.08	101.92	105.77	_
								∑(44)1	.12 =	1153.87	(44)
Energy content of hot water used = 4				· · · ·	-	· ·		1	1		-
156.86 137.19	141.56	123.42	118.42	102.19	94.69	108.66	109.96	128.15	139.88	151.91	_
								∑(45)1	.12 =	1512.90	(45)
Distribution loss 0.15 x (45)m					1		1	1	1		_
23.53 20.58	21.23	18.51	17.76	15.33	14.20	16.30	16.49	19.22	20.98	22.79	(46)
Storage volume (litres) including any	solar or WW	HRS storag	ge within san	ne vessel						2.00	(47)
Water storage loss:											
b) Manufacturer's declared loss facto											-
Hot water storage loss factor fror	n Table 2 (kW	/h/litre/da	y)							0.02	(51)
Volume factor from Table 2a										3.91	(52)
Temperature factor from Table 2	0									1.00	(53)
Energy lost from water storage (k	Wh/day) (47	') x (51) x (!	52) x (53)							0.12	(54)
Enter (50) or (54) in (55)										0.12	(55)
Water storage loss calculated for eac			· · ·		1	1	1	T	1	_	-
3.69 3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56) 3.69 3.33 3.69 3.57 3.69 3.57 3.69 3.69 3.57 3.69 3.57 3.69 (57)Primary circuit loss for each month from Table 3 23.26 23.26 21.01 22.51 23.26 22.51 23.26 23.26 22.51 23.26 22.51 23.26 (59)Combi loss for each month from Table 3a, 3b or 3c 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (61)Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m 183.80 178.85 161.53 168.51 149.50 145.37 128.27 121.64 135.61 136.04 155.10 165.96 (62)Solar DHW input calculated using Appendix G or Appendix H 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (63)Output from water heater for each month (kWh/month) (62)m + (63)m 183.80 168.51 149.50 136.04 165.96 161.53 145.37 128.27 121.64 135.61 155.10 178.85 1830.19 ∑(64)1...12 = (64)Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] 73.71 65.09 68.63 61.90 60.93 54.84 53.04 57.69 57.43 64.17 67.37 72.07 (65) 5. Internal gains Feb Mar Oct Jan Apr May Jun Jul Aug Sep Nov Dec Metabolic gains (Table 5) 130.43 130.43 130.43 130.43 130.43 130.43 130.43 130.43 130.43 130.43 130.43 130.43 (66)Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 21.11 18.75 15.25 11.55 8.63 7.29 7.87 10.23 13.74 17.44 20.35 21.70 (67)Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 177.17 236.82 239.27 233.08 219.90 203.26 187.61 174.71 180.90 194.08 210.73 226.37 (68)Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 36.04 36.04 36.04 36.04 36.04 36.04 36.04 36.04 36.04 36.04 36.04 36.04 (69)Pump and fan gains (Table 5a) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (70)Losses e.g. evaporation (Table 5) -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 -104.35 (71) Water heating gains (Table 5) 99.08 96.86 85.97 81.90 71.30 79.76 86.25 93.58 92.24 76.17 77.54 96.86 (72) Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m 419.13 417.01 402.70 379.54 355.92 333.20 318.46 324.61 336.52 359.90 386.79 407.06 (73) 6. Solar gains Access factor Solar flux FF Gains Area g Table 6d m² W/m² specific data specific data w or Table 6b or Table 6c 0.77 36.79 SouthEast 16.66 x 0.9 x 0.63 0.80 _ 214.10 (77) х x х NorthWest 0.77 7.13 11.28 x 0.9 x 0.63 0.80 28.10 (81) х х x = Solar gains in watts $\Sigma(74)$ m...(82)m 242.20 421.88 602.03 787.50 919.99 930.02 889.69 788.30 665.86 472.96 291.80 206.17 (83)Total gains - internal and solar (73)m + (83)m 1208.16 1002.38 661.33 838.89 1004.73 1167.04 1275.90 1263.22 1112.91 832.86 678.58 613.23 (84) 7. Mean internal temperature (heating season) 21.00 (85) Temperature during heating periods in the living area from Table 9, Th1(°C) Feb Dec Jan Mar Apr May Jun Jul Aug Sep Oct Nov

Utilisation factor	for gains fo	or living are	ea n1,m (se	e Table 9a)									
	0.99	0.98	0.94	0.84	0.67	0.48	0.35	0.39	0.63	0.91	0.99	1.00	(86)
Mean internal te	mp of living	g area T1 (s	teps 3 to 7	in Table 9c	:)								
	19.96	20.21	20.51	20.80	20.95	20.99	21.00	21.00	20.97	20.74	20.28	19.91	(87)
Temperature du	ring heating	g periods in	the rest of	dwelling fi	rom Table 9	9, Th2(°C)							
	20.00	20.00	20.00	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20.01	20.01	(88)
Utilisation factor	for gains fo	or rest of d	welling n2,	m									
	0.99	0.98	0.93	0.80	0.61	0.41	0.27	0.31	0.55	0.87	0.98	1.00	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						
	18.63	18.98	19.41	19.80	19.97	20.01	20.02	20.02	20.00	19.73	19.10	18.56	(90)
Living area fracti	on								Liv	ving area ÷	(4) =	0.44	(91)
Mean internal te	mperature	for the wh	ole dwellin	g fLA x T1 +	-(1 - fLA) x ⁻	Т2							
	19.22	19.52	19.89	20.24	20.40	20.44	20.45	20.45	20.43	20.17	19.62	19.16	(92)
Apply adjustmer	it to the me	an internal	l temperatu	ure from Ta	ble 4e whe	ere appropr	iate						-
	19.22	19.52	19.89	20.24	20.40	20.44	20.45	20.45	20.43	20.17	19.62	19.16	(93)
	·				•	•		•					
8. Space heatin	g requirem	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	for gains, r	յՠ											
	0.99	0.97	0.93	0.81	0.63	0.44	0.30	0.35	0.59	0.88	0.98	0.99	(94)
Useful gains, ηm	Gm, W (94)m x (84)m											_
	655.38	816.28	930.85	947.62	804.50	555.33	368.07	386.28	589.38	732.97	663.89	609.32	(95)
Monthly average	e external te	emperature	e from Tabl	e U1									_
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	r mean inte	rnal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]							
	1454.91	1423.63	1301.98	1094.21	838.46	559.54	368.55	387.22	607.07	922.52	1209.63	1449.60	(97)
Space heating re	quirement,	kWh/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m							_
	594.85	408.14	276.12	105.54	25.27	0.00	0.00	0.00	0.00	141.03	392.93	625.17	
									∑(98	3)15, 10	12 = 2	569.05	(98)
Space heating re	quirement	kWh/m²/ye	ear							(98)	÷ (4)	28.94	(99)
9b. Energy requ	uiromonts -	communit	v heating s	cheme									
Fraction of space					m (table 11)				'0' if r		0.00	(301)
				illary system		-)							1
Fraction of space										1 - (30)1) = [1.00	(302)
Fraction of com										$(202) \times (202)$	20) - [1.00	(303a)
Fraction of total			-							(302) x (303	sa) =	1.00	(304a)
Factor for contro	-	-				ace neating						1.00	(305)
Factor for chargi												1.00	(305a)
Distribution loss	factor (Tab	ie 120) for (community	neating sy	stem							1.05	(306)
:													
Space heating									F CO OF	1			(00)
Annual space he		rement							569.05] . (205) (2(CO7 F4	(98)
Space heat from	boilers							(98	3) x (304a) x	k (305) x (30	06) = 2	697.51	(307a)
M-1 1 11													
Water heating	- 41							· · ·	020.40	1			10.0
Annual water he		rement						L	830.19] (205) (5)		004 =0	(64)
Water heat from										(305a) x (30		921.70	(310a)
Electricity used f	or heat dist	ribution					0.01	. × [(307a)	.(307e) + (3	310a)(310	e)] = [46.19	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

10b. Fuel costs - community heating scheme

Electricity for lighting (Appendix L)

Total delivered energy for all uses

(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	4992.06

0.00 (331) 372.85 (332) 4992.06 (338)

(307) + (303) + (310) + (312) + (313) + (33

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	2697.51	x	4.24	x 0.01 =	114.37	(340a)
Water heating from boilers	1921.70	x	4.24	x 0.01 =	81.48	(342a)
Electricity for lighting	372.85	x	13.19	x 0.01 =	49.18	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	365.03	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.15	(357)
SAP value					84.01]
SAP rating (section 13)					84	(358)
SAP band					В	
12b. CO ₂ emissions - community heating scheme						
	Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) =	5161.13	x	0.216	=	1114.80	(367)
Electrical energy for community heat distribution	46.19	x	0.519	=	23.97	(372)
Total CO2 associated with community systems					1138.78	(373)
Total CO2 associated with space and water heating					1138.78	(376)
Electricity for lighting	372.85	x	0.519	=	193.51	(379)
Total CO ₂ , kg/year				(376)(382) =	1332.29	(383)
Dwelling CO₂ emission rate				(383) ÷ (4) =	15.01	(384)
El value					86.66	
El rating (section 14)					87	(385)
El band					В]
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	'
Primary energy from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) =	5161.13	x	1.22	=	6296.58	(367)
Electrical energy for community heat distribution	46.19	x	3.07	=	141.81	(372)
Total primary energy associated with community systems					6438.39	(373)
Total primary energy associated with space and water heating					6438.39	(376)
Electricity for lighting	372.85	x	3.07	=	1144.65	(379)
Primary energy kWh/year					7583.03	(383)
Dwelling primary energy rate kWh/m2/year					85.41	(384)
-						

TER Worksheet Design - Draft



Assessor name	Miss Alicja Kreglewsk	ka				As	sessor num	ber	4134		
Client						Las	t modified		13/06	/2018	
Address	A 2 05 above hobby	room Ingestr	e Road, I	ondon, N	W5 1XE						
1. Overall dwelling dimer	sions										
			Ar	rea (m²)			age storey ight (m)		Va	olume (m³)	
Lowest occupied				88.78](1a) x		2.50	(2a) =		221.95	(3a)
Total floor area	(1a) + (1b) + (1c)) + (1d)(1n)	=	88.78] (4)			~			
Dwelling volume						(3a)	+ (3b) + (3d	:) + (3d))	3n) =	221.95	(5)
2. Ventilation rate											
							入		m	³ per hour	
Number of chimneys								x 40 =	-	0	(6a)
Number of open flues							0	x 20 =	: [0	(6b)
Number of intermittent fai	าร						3	x 10 =	-	30	 (7a)
Number of passive vents					C		0	x 10 =	-	0	(7b)
Number of flueless gas fire	S				5		0	x 40 =	-	0	(7c)
				~					Air	changes per	r
										hour	٦
Infiltration due to chimney					a) + (7b) + (30	÷ (5) =	=	0.14	(8)
If a pressurisation test has							5 (16)				٦
Air permeability value, q50						e area				5.00	(17)
If based on air permeability			otherwis	e (18) = (10	b)					0.39	(18)
Number of sides on which Shelter factor	the dwelling is sheltered						1	[0 07F (1	0)]	3	(19)
Infiltration rate incorporati	ng chalter factor						1 -	[0.075 x (1		0.78	(20) (21)
Infiltration rate modified for								(18) x (2	20) – [0.50] (21)
Jan	Feb Ma	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spe			iviay	Juli	541	Aug	566	000	1101	Dee	
5.10	.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4						I				-	
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (a											
0.38	0.37 0.37	0.33	0.32	0.28	0.28	0.28	0.30	0.32	0.34	0.35	(22b)
Calculate effective air char	ge rate for the applicab	le case:									
If mechanical ventilatio	n: air change rate throu	gh system								N/A	(23a)
	covery: efficiency in % a	allowing for i	n-use fac	tor from T	able 4h					N/A	(23c)
If balanced with heat re											
If balanced with heat re d) natural ventilation of		nput ventilat	ion from	loft							
		nput ventilat 0.55	ion from 0.55	loft 0.54	0.54	0.54	0.54	0.55	0.56	0.56	(24d)
d) natural ventilation of	whole house positive in 0.57 0.57	0.55	0.55		0.54	0.54	0.54	0.55	0.56	0.56] (24d)



3. Heat losses	and heat lo	ss paramet	er										
Element			а	Gross irea, m ²	Openings m ²		area m²	U-value W/m²K	A x U V		value, /m².K	Ахк, kJ/K	
Window						22	2.19 x	1.33	= 29.4	2			(27)
Exposed floor						88	3.78 x	0.13	= 11.5	4			(28b
External wall						30).40 x	0.18	= 5.47	,			(29a)
Party wall						32	2.04 x	0.00	= 0.00)			(32)
Roof						16	5.11 x	0.13	= 2.09	 }			(30)
Total area of ext	ternal elem	ents ∑A, m²	:			15	7.48						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(2	6)(30) + (3	32) =	48.53	(33)
Heat capacity Cr	m = ∑(А x к))						(28)	.(30) + (32)	+ (32a)(32	2e) =	N/A	(34)
Thermal mass p	arameter (1	TMP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) c	alculated us	sing Appen	dix K								12.21	(36)
Total fabric heat	t loss									(33) + (3	36) =	60.73	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Ventilation heat	t loss calcul	ated month	ly 0.33 x (2	25)m x (5)						CA			
	41.93	41.72	41.52	40.57	40.39	39.57	39.57	39.41	39.88	10.55	40.75	41.13	(38)
Heat transfer co	efficient, V	V/K (37)m +	+ (38)m		• •							•	_
	102.66	102.45	102.25	101.30	101.12	100.30	100.30	100.15	100.62	101.12	101.48	101.86	7
		•			•				.Werage =	 Σ(39)112/	/12 =	101.30	(39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)						, T				_
	1.16	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15	7
		•					C		Average =	Σ(40)112/	/12 =	1.14	(40)
Number of days	in month (Table 1a)					~ ~						_
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	L	•								- -		•	
4. Water heati	ng energy i	requiremen	t										
Assumed occupa	ancy, N											2.61	(42)
Annual average	hot water u	usage in litro	es per day	Vd,average	e = (25 ; N) +	36						96.16	(43)
	Jan	Feb	Mar	Apr	ıvla y	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe		ach month			ole 1c x (43	3)	1	1				_
	105.77	101.92	98.08	94.2:	90.39	86.54	86.54	90.39	94.23	98.08	101.92	105.77	
										∑(44)1	.12 =	1153.87	(44)
Energy content					3600 kWh/m	nonth (see	Tables 1b,	1					_
	156.86	137.19	141.56	123.42	118.42	102.19	94.69	108.66	109.96	128.15	139.88	151.91	_
		Ch								∑(45)1	.12 =	1512.90	(45)
Distribution loss		5)m											_
	23.53	20.58	21.23	18.51	17.76	15.33	14.20	16.30	16.49	19.22	20.98	22.79	(46)
Storage volume	(litres) incl	uding any so	olar or WW	/HRS storag	ge within san	ne vessel						2.00	(47)
Water storage lo													_
a) If manufactur	er's declare	ed loss facto	or is known	(kWh/day)							0.24	(48)
Temperature	e factor from	m Table 2b										0.54	(49)
Energy lost f	rom water	storage (kW	/h/day) (48	8) x (49)								0.13	(50)
Enter (50) or (54												0.13	(55)
Water storage lo	oss calculat	ed for each	month (5	5) x (41)m	· · · · ·		1	1	-	-			_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
If the vessel con	itains dedic	ated solar s	torage or c	ledicated V	VWHRS (56)।	m x [(47) -	Vs] ÷ (47),	else (56)	1	1			_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(57)

Primary circuit lo	oss for each	month fro	om Table 3										
·	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for ea	ach month f	from Table	3a, 3b or 3	c	1			1			I		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requir	red for wate	er heating	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)n	n + (59)m +	+ (61)m				
	184.12	161.81	168.82	149.80	145.68	128.57	121.95	135.92	136.34	155.41	166.27	179.17	(62)
Solar DHW input	calculated	using App	endix G or A	Appendix H	•								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wat	ter heater f	or each mo	onth (kWh/	month) (62	2)m + (63)n	ו							
	184.12	161.81	168.82	149.80	145.68	128.57	121.95	135.92	136.34	155.41	166.27	179.17	
										∑(64)1	12 = 1	833.87	(64)
Heat gains from	water heati	ing (kWh/r	nonth) 0.2	5 × [0.85 ×	(45)m + (61	l)m] + 0.8 ×	: [(46)m + (5	57)m + (59))m]				
	73.96	65.31	68.88	62.14	61.18	55.08	53.29	57.94	57.67	64.42	67.62	72.32	(65)
5. Internal gain				-				_				_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	JCT	Nov	Dec	
Metabolic gains			I							7			
	130.43	130.43	130.43	130.43	130.43	130.43	130.43	130.43	130.13	130.43	130.43	130.43	(66)
Lighting gains (ca				1	1	1		10.00		•	<u> </u>		(67)
	21.11	18.75	15.25	11.55	8.63	7.29	7.87	10.23	13.74	17.44	20.35	21.70	(67)
Appliance gains				.			477.47		100.00	404.00	240 72		
Carlina asina (a	236.82	239.27	233.08	219.90	203.26	187.61	177.17	1 1.71	180.90	194.08	210.73	226.37	(68)
Cooking gains (ca			-	1	1		6	26.04	26.04	26.04	26.04		(60)
Duran and fam. ar	36.04	36.04	36.04	36.04	36.04	36.04	35.54	36.04	36.04	36.04	36.04	36.04	(69)
Pump and fan ga	· · · · · · · · · · · · · · · · · · ·	•						0.00		0.00			(=0)
	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evapo	· · · ·	-	404.25	101.05	10105	104.05	101.05	404.05	404.05	101.05	101.05	404.25	
Matan baating a	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	-104.35	(71)
Water heating g		-	02.50	06.24		76 50	74.62	77.07	00.00	06.50	02.04	07.20	(72)
Total internal ga	99.41	97.19	92.58	86.31	82. ⁷ .4	76.50	71.63	77.87	80.09	86.58	93.91	97.20	(72)
roldi internal ga	· · ·						221.00	227.05	220.00	262.24	200.42	440.40	(70)
	422.47	420.34	406.04	382.83	359.25	336.53	321.80	327.95	339.86	363.24	390.12	410.40	(73)
6. Solar gains				1									
			Acce is f		Area		ar flux		g	FF		Gains	
		7	rable	6d	m²	v	V/m²	•	ific data able 6b	specific d or Table		w	
o		S					c = c						()
SouthEast			0.7		15.54				0.63 x		= [174.74	(77)
NorthWest		(02)	0.7	7X	6.65	X1	1.28 x	0.9 x (0.63 x	0.70	=	22.93	(81)
Solar gains in wa			404.05	642.72	750.05	750.04	706.40	642.20	E 42 45	206.04	220.45	460.07	(00)
Tatal saina into	197.67	344.33	491.35	642.72	750.85	759.04	726.13	643.38	543.45	386.01	238.15	168.27	(83)
Total gains - inte				1 1 2 2 2 2 2				0=4.00					(0.1)
	620.14	764.67	897.39	1025.60	1110.11	1095.57	1047.93	971.32	883.30	749.25	628.28	578.66	(84)
7. Mean intern	al temperat	ture (heati	ng season)										
Temperature du	ring heating	g periods in	n the living	area from T	able 9, Th	L(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains fo	or living ar	ea n1,m (se	e Table 9a)									
	1.00	0.99	0.97	0.90	0.76	0.57	0.42	0.47	0.72	0.94	0.99	1.00	(86)

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Mean internal te	emp of livin	g area T1 (steps 3 to 7	in Table 90	:)								
	19.84	20.06	20.35	20.68	20.90	20.98	21.00	20.99	20.94	20.63	20.17	19.80	(87)
Temperature du	ring heating	g periods ir	n the rest of	dwelling f	rom Table	9 <i>,</i> Th2(°C)							
	19.96	19.96	19.96	19.97	19.97	19.98	19.98	19.98	19.97	19.97	19.97	19.96	(88)
Utilisation factor	r for gains f	or rest of d	welling n2,	n									
	0.99	0.98	0.96	0.87	0.70	0.49	0.32	0.37	0.64	0.92	0.99	1.00	(89)
Mean internal te	emperature	in the rest	of dwelling	T2 (follow	steps 3 to	7 in Table 9	e)						
	18.42	18.73	19.16	19.61	19.88	19.96	19.98	19.98	19.93	19.56	18.90	18.37	(90)
Living area fract	ion								Liv	ving area ÷	(4) =	0.44	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	+(1 - fLA) x	Т2							
	19.05	19.32	19.68	20.08	20.32	20.41	20.42	20.42	20.37	20.03	19.46	19.00	(92)
Apply adjustmer	nt to the me	ean interna	l temperatu	ire from Ta	ble 4e whe	ere appropr	iate						
	19.05	19.32	19.68	20.08	20.32	20.41	20.42	20.42	20.37	20.03	19.46	19.00	(93)
O Correction	· · · · ·												
8. Space heatir				-					_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	JCt	Nov	Dec	
Utilisation facto			0.07	0.07	0 -0	0.50			0.07			1] (2.1)
	0.99	0.98	0.95	0.87	0.72	0.52	0.36	0.41	0.67	0.92	0.98	1.00	(94)
Useful gains, ηm				005.00	000.40	574.75	202.47	400.32	502.02		640 57	575 70	
Monthly average	615.91	750.79	854.78	895.80	800.49	571.75	382.17	400.32	593.82	687.72	618.57	575.78	(95)
Monthly average		-			11.70	14.00	16.60		14.10	10.00	7 10	4.20	
Lloot loss rate fo	4.30	4.90	6.50	8.90	11.70	14.60	16.60	15.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	1513.87	1476.92	1347.77	1132.69	872.20	582.92	382.02	402.98	631.33	954.00	1254.12	1507.25	(97)
Space heating re					I		360.02	402.98	051.55	954.00	1254.12	1507.25] (97)
Space nearing re	668.08	487.95	366.79	170.56	53.35	0.00	0.00	0.00	0.00	198.11	457.59	693.01	1
	008.08	487.95	500.75	170.50	33.35	0.00	0.00	0.00		3)15, 10		8095.44	」](98)
Space heating re	quirement	$kWh/m^2/y$	oar						2(90			34.87] (99)] (99)
Space nearing re	.quirement	K • • • • • • • • • • • • • • • • • • •	cui							(50)	• (+)	54.07] (55)
9a. Energy requ	uirements -	individual	heating sys	stems inclu	ting wicro	o-CHP							
Space heating													
Fraction of space	e heat from	secondary	/supplemei	ntary synte	m (table 11	1)						0.00	(201)
Fraction of space	e heat from	main syste	em(s)							1 - (20)=	1.00	(202)
Fraction of space	e heat from	main syste	em 2									0.00	(202)
Fraction of total	space heat	from main	system 1						(20	02) x [1- (203	3)] =	1.00	(204)
Fraction of total	space heat	from main	cystem 2							(202) x (20	(3) =	0.00	(205)
Efficiency of mai	in system 1	(%,										93.50	(206)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating fu	iel (main sy	stem 1), kV	Vh/month										_
	714.53	521.88	392.28	182.42	57.06	0.00	0.00	0.00	0.00	211.88	489.40	741.19	
									∑(211	L)15, 10	12 = 3	3310.63	(211)
Water heating													
Efficiency of wat	er heater							· · · · · · · · · · · · · · · · · · ·					-
	87.95	87.58	86.83	85.16	82.41	79.80	79.80	79.80	79.80	85.46	87.38	88.07	(217)
Water heating for					1							i	-
	209.34	184.76	194.43	175.90	176.78	161.12	152.83	170.33	170.85	181.85	190.28	203.43	
										∑(219a)1	12 = 2	2171.89	(219)

Annual totals

Space heating fuel - main system 1			3310.63
Water heating fuel			2171.89
Electricity for pumps, fans and electric keep-hot (Table 4f)			
central heating pump or water pump within warm air hea	ting unit	30.00	(230c)
boiler flue fan		45.00	(230e)
Total electricity for the above, kWh/year			75.00 (231)
Electricity for lighting (Appendix L)			372.85 (232)
Total delivered energy for all uses		(211)(221) + (231) + (232)(237b)	= 5930.38 (238)
10a. Fuel costs - individual heating systems including micro	э-СНР		
	Fuel	Fuel price	Fuel
	kWh/year	ruerprice	cost £/year
Space heating - main system 1	3310.63	x 3.48 x 0.01 =	115.21 (240)
Water heating	2171.89	x 3.48 x 0.01 =	75.58 (247)
Pumps and fans	75.00	x 13.19 x 0.01 =	9.89 (249)
Electricity for lighting	372.85	x 13.19 x 01 =	49.18 (250)
Additional standing charges			120.00 (251)
Total energy cost		(240)(242, + (2^3)(254)	
11a. SAP rating - individual heating systems including micro	o-CHP		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)		· · ·	1.16 (257)
SAP value			83.80
SAP rating (section 13)	C		84 (258)
SAP band		9	В
12a. CO ₂ emissions - individual heating systems including n	nicro-CHP		
	Energy	Emission factor	Emissions
	kWh, year	kg CO₂/kWh	kg CO ₂ /year
Space heating - main system 1	3310.63	x 0.216 =	715.10 (261)
Water heating	2171.89	x 0.216 =	469.13 (264)
Space and water heating		(261) + (262) + (263) + (264)	= 1184.23 (265)
Pumps and fans	75.00	x 0.519 =	38.93 (267)
Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	372.85	x 0.519 =	193.51 (268)
Total CO ₂ , kg/year		(265)(271)	= 1416.66 (272)
Dwelling CO ₂ emission rate		(272) ÷ (4)	= 15.96 (273)
El value			85.81
El rating (section 14)			86 (274)
El band			В
13a. Primary energy - individual heating systems including			
	Energy kWh/year	Primary factor	Primary Energy kWh/year
Space heating - main system 1	3310.63	x 1.22 =	4038.97 (261)
Water heating	2171.89	x 1.22 =	2649.71 (264)
Space and water heating		(261) + (262) + (263) + (264)	
		· · · · · · · · · · · · · · · · · · ·	

Pumps and fans

Electricity for lighting

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

230.25

1144.65

8063.58

90.83

3.07

3.07

=

=

(267)

(268)

(272)

(273)

75.00

372.85

х

х

DER Worksheet Design - Draft



	Miss Alicja Kreglev	vska				As	sessor numb	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 4 01 Ingestre Ro	ad, London, N	W5 1XE								
1. Overall dwelling dimen	nsions		۸	na (m²)		A			Ve		
			Ar	ea (m²)			age storey eight (m)		VC	olume (m³)	
Lowest occupied				74.40	(1a) x		2.50	(2a) =		186.00	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1r		74.40	(10) x (4)		2.50	(20)		100.00] (30)
Dwelling volume	() () ((,(.,			(3a)	+ (3b) + (3c) + (3d)(3	n) =	186.00	(5)
]
2. Ventilation rate										-	
									m	³ per hour	_
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent fai	ns						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fire	25						0	x 40 =		0	(7c)
									Air	changes per hour	•
Infiltration due to chimney	vs flues fans PSVs		(6a) +	- (6b) + (7a) + (7h) + (7c) =	30	÷ (5) =		0.16	(8)
If a pressurisation test has		intended. pro						. (5) –		0.10] (0)
Air permeability value, g50), expressed in cubic n	netres per hou	ur per squa	re metre o	f envelope		- (- /			4.00	(17)
Air permeability value, q50 If based on air permeabilit										4.00] (17)] (18)
If based on air permeabilit	y value, then (18) = [(:	17) ÷ 20] + (8),] (18)
	y value, then (18) = [(:	17) ÷ 20] + (8),						0.075 x (19	9)] =	0.36	יינ ר
If based on air permeabilit Number of sides on which	y value, then (18) = [(: the dwelling is shelter	17) ÷ 20] + (8),								0.36 3] (18)] (19)
If based on air permeabilit Number of sides on which Shelter factor	y value, then (18) = [(: the dwelling is shelter ing shelter factor	17) ÷ 20] + (8), red						0.075 x (19 (18) x (2		0.36 3 0.78] (18)] (19)] (20)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat	y value, then (18) = [(: the dwelling is shelter ing shelter factor	17) ÷ 20] + (8), red								0.36 3 0.78] (18)] (19)] (20)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified fo	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar	17) ÷ 20] + (8), red d:	, otherwise	e (18) = (16)	e area	1 -	(18) x (2	20) =	0.36 3 0.78 0.28] (18)] (19)] (20)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified fo	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar	17) ÷ 20] + (8), red d:	, otherwise	e (18) = (16)	e area	1 -	(18) x (2	20) =	0.36 3 0.78 0.28] (18)] (19)] (20)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified fo Jan Monthly average wind spe	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar red from Table U2	17) ÷ 20] + (8), red d: Apr	, otherwise May	e (18) = (16 Jun) Jul	e area Aug	1 - Sep	(18) x (2 Oct	0) = Nov	0.36 3 0.78 0.28 Dec] (18)] (19)] (20)] (21)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified fo Jan Monthly average wind spe 5.10	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar red from Table U2	17) ÷ 20] + (8), red d: Apr	, otherwise May	e (18) = (16 Jun) Jul	e area Aug	1 - Sep	(18) x (2 Oct	0) = Nov	0.36 3 0.78 0.28 Dec] (18)] (19)] (20)] (21)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified fo Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar red from Table U2 5.00 4.90	17) ÷ 20] + (8), red d: <u>Apr</u> <u>4.40</u>	, otherwise May 4.30 1.08	e (18) = (16 Jun 3.80 0.95) Jul 3.80	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	20) = Nov 4.50	0.36 3 0.78 0.28 Dec 4.70] (18)] (19)] (20)] (21)] (22)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar red from Table U2 5.00 4.90	17) ÷ 20] + (8), red d: <u>Apr</u> <u>4.40</u>	, otherwise May 4.30 1.08	e (18) = (16 Jun 3.80 0.95) Jul 3.80	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	20) = Nov 4.50	0.36 3 0.78 0.28 Dec 4.70] (18)] (19)] (20)] (21)] (22)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34	17) ÷ 20] + (8), red d: Apr 4.40 1.10 nd wind factor 0.31	, otherwise May 4.30 1.08) (21) x (22	e (18) = (16 Jun <u>3.80</u> 0.95 ta)m) Jul 3.80 0.95	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	1.13	0.36 3 0.78 0.28 Dec 4.70 1.18] (18)] (19)] (20)] (21)] (22)] (22a)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.36	y value, then $(18) = [(13)]$ the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34 nge rate for the applic	17) ÷ 20] + (8), red d: Apr 4.40 1.10 nd wind factor 0.31 able case:	, otherwise May 4.30 1.08) (21) x (22	e (18) = (16 Jun <u>3.80</u> 0.95 ta)m) Jul 3.80 0.95	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	1.13	0.36 3 0.78 0.28 Dec 4.70 1.18] (18)] (19)] (20)] (21)] (22)] (22a)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.36 Calculate effective air char	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34 nge rate for the applic	17) ÷ 20] + (8), red d: Apr 4.40 1.10 nd wind factor 0.31 able case: ough system	, otherwise May 4.30 1.08) (21) × (22 0.30	e (18) = (16 Jun 3.80 0.95 ta)m 0.27) Jul 3.80 0.95 0.27	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	1.13	0.36 3 0.78 0.28 Dec 4.70 1.18 0.33] (18)] (19)] (20)] (21)] (22)] (22a)] (22b)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.36 Calculate effective air char If mechanical ventilatio	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34 nge rate for the applic on: air change rate thre ecovery: efficiency in S	17) ÷ 20] + (8), red d: Apr 4.40 1.10 d wind factor 0.31 able case: ough system % allowing for	, otherwise May 4.30 1.08 1) (21) x (22 0.30 in-use fac	e (18) = (16 Jun 3.80 0.95 ea)m 0.27 tor from Ta) Jul 3.80 0.95 0.27	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	1.13	0.36 3 0.78 0.28 Dec 4.70 4.70 0.33] (18)] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.36 Calculate effective air char If mechanical ventilatio If balanced with heat re	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34 nge rate for the applic on: air change rate thre ecovery: efficiency in S	17) ÷ 20] + (8), red d: Apr 4.40 1.10 d wind factor 0.31 able case: ough system % allowing for	, otherwise May 4.30 1.08 1) (21) x (22 0.30 in-use fac	e (18) = (16 Jun 3.80 0.95 ea)m 0.27 tor from Ta) Jul 3.80 0.95 0.27	Aug 3.70	1 - Sep 4.00	(18) × (2 Oct 4.30	1.13	0.36 3 0.78 0.28 Dec 4.70 4.70 0.33] (18)] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)
If based on air permeabilit Number of sides on which Shelter factor Infiltration rate incorporat Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.36 Calculate effective air char If mechanical ventilatio If balanced with heat re d) natural ventilation on	y value, then (18) = [(: the dwelling is shelter ing shelter factor or monthly wind spee Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 allowing for shelter ar 0.35 0.34 nge rate for the applic on: air change rate thre ecovery: efficiency in 9 r whole house positive 0.56 0.56	17) ÷ 20] + (8), red d: Apr 4.40 1.10 d wind factor 0.31 able case: ough system % allowing for e input ventila 0.55	, otherwise May 4.30 1.08 1) (21) x (22 0.30 in-use fact ation from 0.55	e (18) = (16 Jun 3.80 0.95 ta)m 0.27 tor from Ta loft) Jul 3.80 0.95 0.27 ble 4h	Aug 3.70 0.93 0.26	1 - Sep 4.00 1.00	(18) × (2 Oct 4.30 1.08 0.30	1.13 0.32	0.36 3 0.78 0.28 Dec 4.70 4.70 1.18 0.33 N/A N/A] (18)] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (22b)] (23a)] (23c)



3. Heat losses a	and heat los	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U W	•	/alue, /m².K	Ахк, kJ/K	
Window						30.	.15 x	1.24	= 37.26	;			(27)
External wall						37.	.21 x	0.18	= 6.70				(29a)
Party wall						47.	.00 x	0.00	= 0.00				(32)
Roof						24.	.36 x	0.12	= 2.92				(30)
Total area of ext	ernal eleme	ents ∑A, m²				91.	.72						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26	5)(30) + (1	32) =	46.88	(33)
Heat capacity Cr	n = ∑(А x к)							(28)	.(30) + (32) -	+ (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/n	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) ca	alculated us	ing Append	dix K								15.59	(36)
Total fabric heat	loss									(33) + (36) =	62.47	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	34.60	34.45	34.30	33.60	33.47	32.86	32.86	32.75	33.10	33.47	33.74	34.01	(38)
Heat transfer co	efficient, W	/K (37)m +	(38)m										
	97.07	96.92	96.77	96.07	95.94	95.33	95.33	95.21	95.56	95.94	96.20	96.48	
Heat loss param	eter (HLP)	W/m²K (30	0)m ÷ (4)						Average = 2	<u>(</u> 39)112,	/12 =	96.07	(39)
neut 1055 purun	1.30	1.30	1.30	1.29	1.29	1.28	1.28	1.28	1.28	1.29	1.29	1.30	٦
	1.50	1.50	1.50	1.25	1.25	1.20	1.20	1.20	Average = 2		·	1.29	 (40)
Number of days	in month (1	Fable 1a)							, weruge 2	_(10)112)		1.23	
,	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heating	ng energy r	equiremen	t										
Assumed occupa	ancy, N											2.35	(42)
Annual average	hot water u	sage in litre	es per day \	/d,average	= (25 x N) +	36						89.97	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	in litres pe	r day for ea	ich month	Vd,m = fact	or from Tab	le 1c x (43)						
	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96]
Energy content of	of hot wate	r used = / 1	8 v Vd m v	nm v Tm/3	8600 kWb/m	onth (see	Tables 1h	1c 1d)		∑(44)1	.12 =	1079.59	(44)
Energy content (146.76	128.36	132.45	115.47	110.80	95.61	88.60	101.67	102.88	119.90	130.88	142.13	٦
	140.70	120.50	152.45	115.47	110.00	55.01		101.07	102.00	∑(45)1	·	1415.52	 (45)
Distribution loss	0.15 x (45)	Im								ζ(43)1	.12	1413.32] (43)
	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)
Storage volume	(litres) inclu	iding any so	olar or WW	HRS storag	e within sam	ne vessel						2.00	(47)
Water storage lo	oss:												
b) Manufacturer	's declared	loss factor	is not knov	vn									
Hot water sto	orage loss fa	actor from	Table 2 (kW	/h/litre/day	()							0.02	(51)
Volume facto	or from Tabl	e 2a										3.91	(52)
Temperature	factor from	า Table 2b										1.00	(53)
Energy lost fr	om water s	torage (kW	'h/day) (47	') x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54) in (55)											0.12	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									_
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69 (57)
Primary circuit lo	ss for each	month fro	m Table 3									
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (59)
Combi loss for ea	ch month	from Table	3a, 3b or 3d	C								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (61)
Total heat requir	ed for wate	er heating c	alculated fo	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)n	n + (59)m +	- (61)m			
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08 (62)
Solar DHW input	calculated	using Appe	endix G or A	ppendix H		II		1				
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Output from wat						II	0.00	0.00	0.00	0.00	0.00	
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08
	1, 5., 1	152.70	100.10	111.00	157.75	121.05	110.00	120.02	120.50	Σ(64)1		732.81 (64)
Heat gains from	water heati	ing (kWh/m	onth) 0.25	5 x [0 85 x l	'45)m + (61)m] + 0.8 x	[(46)m + (5	57)m + (59)	ml	2(04)1	12 - 1	
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.36	55.07	61.43	64.38	68.82 (65)
	70.50	02.15	05.00	59.20	56.40	52.05	51.02	55.50	55.07	01.45	04.56	08.82 (03)
5. Internal gains	s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains ((Table 5)											
_	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40 (66)
Lighting gains (ca					also see Ta	able 5						
0 0 0 0 0 0 0	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19.00 (67)
Appliance gains (0.00	0.00	12:00	10.17	17.02	
	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.50	198.19 (68)
Cooking gains (ca							155.12	152.90	138.33	109.95	184.50	(08)
	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74 (69)
Pump and fan ga			54.74	54.74	54.74	54.74	54.74	54.74	54.74	54.74	54.74	34.74 (09)
Fullip and fall ga	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (70)
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (70)
Losses e.g. evapo												
	-93.92		-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92 (71)
Water heating ga												
	94.56	92.49	88.17	82.30	78.49	73.13	68.57	74.41	76.49	82.56	89.42	92.49 <mark>(72)</mark>
Total internal gai						· ·		[I		
	378.61	376.62	363.81	343.16	322.23	302.00	288.80	294.56	305.12	325.98	349.96	367.91 (73)
6. Solar gains												
			Access fa	actor	Area	Sola	ar flux		g	FF		Gains
			Table		m²		/m²	•	ific data	specific d		W
								or T	able 6b	or Table	6c	
SouthWest			0.77	7 x	16.68	x 30	5.79 x	0.9 x 🚺).63 x	0.80	=	214.36 (79)
SouthEast			0.77	7 X [3.47	x 36	6.79 x	0.9 x 🚺).63 x	0.80	=	44.59 (77)
NorthWest			0.77	7 X	10.00	x 1	1.28 x	0.9 x 🚺).63 x	0.80	=	39.41 (81)
Solar gains in wa	tts ∑(74)m	(82)m										
	298.36	521.30	748.04	985.13	1156.62	1171.66	1119.87	988.35	829.58	585.52	359.75	253.79 <mark>(83)</mark>
Total gains - inte	rnal and so	lar (73)m +	(83)m									
	676.97	897.92	1111.85	1328.29	1478.85	1473.65	1408.67	1282.91	1134.70	911.50	709.71	621.70 <mark>(84)</mark>
7. Mean interna	al tempera	ture (heatii	ng season)									
Temperature du	ring heating	g periods in	the living a	irea from T	able 9, Th1	.(°C)						21.00 <mark>(85)</mark>
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Utilisation facto	r for gains f	or living are	ea n1,m (se	e Table 9a)									
	0.99	0.96	0.90	0.76	0.58	0.41	0.30	0.34	0.56	0.86	0.97	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	teps 3 to 7	in Table 9c	c)								
	19.83	20.15	20.51	20.82	20.95	20.99	21.00	21.00	20.97	20.73	20.20	19.77	(87)
Temperature du	ring heating	g periods in	the rest of	dwelling fi	rom Table 9	9, Th2(°C)							
	19.84	19.84	19.84	19.85	19.85	19.86	19.86	19.86	19.85	19.85	19.85	19.84	(88)
Utilisation facto	r for gains f	or rest of d	welling n2,	m									
	0.99	0.95	0.88	0.71	0.51	0.34	0.22	0.26	0.48	0.81	0.96	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						
	18.32	18.77	19.27	19.66	19.81	19.85	19.86	19.86	19.83	19.58	18.87	18.23	(90)
Living area fract	ion								Liv	ving area ÷	(4) =	0.36	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	+(1 - fLA) x ⁻	Т2							-
	18.86	19.26	19.71	20.07	20.22	20.26	20.26	20.26	20.24	19.99	19.34	18.78	(92)
Apply adjustmer	nt to the me	ean internal	temperati	ure from Ta	ble 4e whe	ere appropr	iate						_
	18.86	19.26	19.71	20.07	20.22	20.26	20.26	20.26	20.24	19.99	19.34	18.78	(93)
	L	1			1			1					J · ·
8. Space heating	ng requirem	ient											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains, I	ηm											
	0.98	0.95	0.87	0.72	0.54	0.36	0.25	0.29	0.50	0.82	0.96	0.99	(94)
Useful gains, ηm	nGm, W (94	l)m x (84)m											
	664.36	850.48	969.79	961.89	792.31	535.96	348.65	366.89	572.68	744.02	680.26	613.29	(95)
Monthly average	e external to	emperature	e from Tabl	e U1									
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal tempe	rature, Lm	, W [(39)m	ı x [(93)m -	(96)m]							
	1413.37	1391.96	1278.21	1073.28	817.24	539.28	349.07	367.71	586.61	900.84	1177.92	1406.50	(97)
Space heating re	equirement,	, kWh/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m							
	557.26	363.88	229.47	80.20	18.55	0.00	0.00	0.00	0.00	116.68	358.31	590.14]
									∑(98	3)15, 10	12 = 2	314.49	(98)
Space heating re	equirement	kWh/m²/ye	ear							(98)	÷ (4)	31.11	(99)
													-
9b. Energy req													7
Fraction of space	e heat from	secondary,	/suppleme	ntary system	m (table 11	L)				'0' if r	none	0.00	(301)
Fraction of space	e heat from	community	y system							1 - (30	01) =	1.00	(302)
Fraction of com	munity heat	from boile	rs									1.00	(303a)
Fraction of total	space heat	from comm	nunity boile	ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ging methoo	d (Table 4c	3)) for com	nmunity spa	ace heating						1.00	(305)
Factor for charg	ing method	(Table 4c(3	s)) for comr	nunity wat	er heating							1.00	(305a)
Distribution loss	factor (Tab	le 12c) for	community	heating sy	rstem							1.05	(306)
Space heating													
Annual space he	ating requi	rement						2	314.49]			(98)
Space heat from	boilers							(98	3) x (304a) >	x (305) x (30	06) = 2	430.22	(307a)
Water heating													
Annual water he	eating requi	rement						1	732.81]			(64)
Water heat from	n boilers							(64)	x (303a) x	(305a) x (30	06) = 1	819.45	(310a)
Electricity used	for heat dist	tribution					0.01	.×[(307a)				42.50	(313)
-								•			· · · ·		- · · · ·

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	4576.11

0.00 (331) 326.44 (332) 4576.11 (338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	2430.22	x	4.24	x 0.01 =	103.04	(340a)
Water heating from boilers	1819.45	x	4.24	x 0.01 =	77.14	(342a)
Electricity for lighting	326.44	x	13.19	x 0.01 =	43.06	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) =	343.24	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.21	(357)
SAP value				~	83.16]
SAP rating (section 13)					83	(358)
SAP band					В]

12b. CO₂ emissions - community heating scheme

	Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) =	4748.23	x	0.216	=	1025.62	(367)
Electrical energy for community heat distribution	42.50	x	0.519	=	22.06	(372)
Total CO2 associated with community systems					1047.67	(373)
Total CO2 associated with space and water heating					1047.67	(376)
Electricity for lighting	326.44	x	0.519	=	169.42	(379)
Total CO ₂ , kg/year				(376)(382) =	1217.10	(383)
Dwelling CO₂ emission rate				(383) ÷ (4) =	16.36	(384)
El value					86.34]
El rating (section 14)					86	(385)
El band					В]
13b. Primary energy - community heating scheme						
	Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) =	4748.23	x	1.22	=	5792.84	(367)
Electrical energy for community heat distribution	42.50	x	3.07	=	130.46	(372)
Total primary energy associated with community systems					5923.31	(373)
Total primary energy associated with space and water heating					5923.31	(376)
Electricity for lighting	326.44	x	3.07	=	1002.18	(379)
Primary energy kWh/year					6925.49	(383)
Dwelling primary energy rate kWh/m2/year					93.08	(384)

TER Worksheet Design - Draft



Assessor name	Miss Alicja Kregl	ewska				Δο	sessor num	ber	4134		
Client							t modified		13/06	/2018	
						Lu	it mounied		15/00/	2010	
Address	A 4 01 Ingestre F	Road, London,	, NW5 1XE								
1. Overall dwelling dimen	sions										
			β	area (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied				74.40](1a) x		2.50	(2a) =		186.00	(3a)
Total floor area	(1a) + (1b) +	+ (1c) + (1d)	(1n) =	74.40	(4)						
Dwelling volume						(3a)	+ (3b) + (3c	:) + (3d)'a	8n) =	186.00	(5)
2. Ventilation rate							7.				
							$\overline{\mathbf{X}}$		m ^a	' per hour	
Number of chimneys								x 40 =		-	(6-)
											(6a)
Number of open flues							0	x 20 =			(6b)
Number of intermittent far	15						3	x 10 =			(7a)
Number of passive vents					Co		0	x 10 =			(7b)
Number of flueless gas fire	5				~		0	x 40 =			(7c)
				C	\mathbf{X}				Air c	hanges per hour	
Infiltration due to chimney	s flues fans DSVs		(62)	+(6b)+(6b)	a) + (7b) + (7c) -	30	÷ (5) =			(8)
If a pressurisation test has		is intended r						. (5) -	·	0.10	0]
Air permeability value, q50							(10)			5.00	(17)
If based on air permeability											(17)
Number of sides on which t			(8), Otherwi	36 (10) - (1	0)						(18)
Shelter factor	the dwelling is shell	tereu					1	[0.075 x (1	0)1 –		
	ng choltor factor						1 -				(20)
Infiltration rate incorporati Infiltration rate modified for		ad						(18) x (2	20) =	0.32	(21)
			Mari	lum	Jul	Aug	Sep	Oct	Nev	Dec	
Jan	Feb Mar	Apr	May	Jun		Aug		Oct	Nov	Dec	
wonting average wind spee	ad from Tchol				Jui		Jep				
	ed from Table U2	1.40	4.20		1			4.20	4.50	470	22)
5.10	ed from Table U2	0 4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
5.10 Wind factor (22)m ÷ 4	300 4.90				3.80	3.70	4.00				
5.10 Wind factor (22)m ÷ 4	300 4.90 1.25 1.23	3 1.10	1.08	0.95	1			4.30	4.50		(22) (22a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	00 4.90 1.25 1.23 allowing for shelter	3 1.10 and wind fact	1.08 tor) (21) x (2	0.95 22a)m	3.80 0.95	3.70 0.93	4.00	1.08	1.13	1.18	(22a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41	200 4.90 1.25 1.23 allowing for shelter 0.40 0.39	3 1.10 and wind fact 9 0.35	1.08	0.95	3.80	3.70	4.00			1.18	
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan	00 4.90 1.25 1.23 allowing for shelter 0.40 0.40 0.39 ige rate for the app	3 1.10 and wind fact 9 0.35 licable case:	1.08 tor) (21) x (2 0.34	0.95 22a)m	3.80 0.95	3.70 0.93	4.00	1.08	1.13	0.37	(22a) (22b)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan If mechanical ventilation	004.901.251.23allowing for shelter0.400.39oge rate for the appn: air change rate the share of	3 1.10 and wind fact 9 0.35 licable case: hrough syster	1.08 tor) (21) x (2 0.34	0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	1.08	1.13	1.18 0.37	(22a) (22b) (23a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan If mechanical ventilation If balanced with heat re	004.901.251.23allowing for shelter0.400.39uge rate for the appn: air change rate theecovery: efficiency in	3 1.10 and wind fact 9 0.35 licable case: hrough syster n % allowing f	1.08 tor) (21) x (2 0.34 n for in-use fa	0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	1.08	1.13	1.18 0.37	(22a) (22b)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	1.25 1.23 allowing for shelter 0.40 0.40 0.39 age rate for the app n: air change rate the excercise result of the position	3 1.10 and wind fact 9 0.35 licable case: hrough syster n % allowing f	1.08 tor) (21) x (2 0.34 n for in-use fa tilation fror	0.95 22a)m 0.30 Inctor from T	3.80 0.95 0.30	3.70 0.93 0.29	4.00	0.34	1.13 0.36	1.18 0.37 N/A N/A	(22a) (22b) (23a) (23c)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or 0.58	004.901.251.23allowing for shelter0.400.39age rate for the appn: air change rate the covery: efficiency incovery: efficiency inwhole house posit0.580.58	3 1.10 and wind fact 9 0.35 licable case: hrough syster n % allowing f tive input vent 3 0.56	1.08 tor) (21) x (2 0.34 n for in-use fa tilation fror 0.56	0.95 22a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	1.08	1.13	1.18 0.37 N/A N/A	(22a) (22b) (23a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.41 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	004.901.251.23allowing for shelter0.400.39age rate for the appn: air change rate the covery: efficiency incovery: efficiency inwhole house posit0.580.58	3 1.10 and wind fact 9 0.35 licable case: hrough system n % allowing factor tive input vent 3 0.56 or (24c) or (2	1.08 tor) (21) x (2 0.34 n for in-use fa tilation fror 0.56	0.95 22a)m 0.30 Inctor from T	3.80 0.95 0.30	3.70 0.93 0.29	4.00	0.34	1.13 0.36	1.18 0.37 N/A N/A 0.57	(22a) (22b) (23a) (23c)



3. Heat losses	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net a A, r		U-value W/m²K	A x U V		/alue, /m².K	Ахк, kJ/K	
Window						18.	60 x	1.33	= 24.6	6			(27)
External wall						48.	77 x	0.18	= 8.78	3			(29a)
Party wall						47.	00 x	0.00	= 0.00)			(32)
Roof						24.	36 x	0.13	= 3.17	,			(30)
Total area of ex	ternal elem	ents ∑A, m²	2			91.	73						(31)
Fabric heat loss	, W/K = ∑(A	× U)							(2	26)(30) + (2	32) =	36.60	(33)
Heat capacity C	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								8.66	(36)
Total fabric hea	t loss									(33) + (36) =	45.27	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Ventilation heat	t loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	35.76	35.56	35.37	34.46	34.29	33.50	33.50	33.36	33.81	34.20	34.64	34.99	(38)
Heat transfer co	oefficient, W	//K (37)m +	+ (38)m										
	81.03	80.83	80.64	79.73	79.56	78.77	78.77	78.63	79.0	79.56	79.91	80.26	7
									Avera ₆ =	Σ(39)112	/12 =	79.73	(39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)										_
	1.09	1.09	1.08	1.07	1.07	1.06	1.06	1.06	1.06	1.07	1.07	1.08	7
									Average =	Σ(40)112,	/12 =	1.07	(40)
Number of days	s in month (Table 1a)					C	X i					
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	L	·	•	•	• •					•	•		
4. Water heati	ing energy r	equiremen	t			$(\)$							_
Assumed occup												2.35	(42)
Annual average	hot water u	usage in litro	es per day	Vd,average	= (25 × N) +	36						89.97	(43)
	Jan	Feb	Mar	Apr	Mut	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	· · ·				te: rrorn Ťab	le 1c x (43)							_
	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96	
				C)						∑(44)1	.12 =	1079.59	(44)
Energy content		r used = 4.1			3600 kWh/m	onth (see	Tables 1b,	1c 1d)		-			_
	146.76	128.36	1.52.45	115.47	110.80	95.61	88.60	101.67	102.88	119.90	130.88	142.13	
		7								∑(45)1	.12 =	1415.52	(45)
Distribution loss	s 0.15 x (45)m											_
	22.01	1 25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)
Storage volume	(litres) inclu	uding any so	olar or WW	/HRS storag	ge within sam	ne vessel						2.00	(47)
Water storage I	OSS:												_
a) If manufactu	rer's declare	ed loss facto	or is known	(kWh/day))							0.24	(48)
Temperature	e factor fron	n Table 2b										0.54	(49)
												0.13	(50)
Energy lost f		storage (kW	/h/day) (4	8) x (49)									
	rom water s	storage (kW	/h/day) (4	3) x (49)								0.13	(55)
Energy lost f	rom water s 4) in (55)												
Energy lost f Enter (50) or (54	rom water s 4) in (55)				4.00	3.87	4.00	4.00	3.87	4.00	3.87		
Energy lost f Enter (50) or (54	rom water s 4) in (55) oss calculate 4.00	ed for each 3.61	month (5	5) x (41)m 3.87	1 1			1	3.87	4.00	3.87	0.13	(55)
Energy lost f Enter (50) or (54 Water storage l	rom water s 4) in (55) oss calculate 4.00	ed for each 3.61	month (5	5) x (41)m 3.87	1 1			1	3.87	4.00	3.87	0.13	(55)

													_
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wat	er heating o	alculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)r	n + (59)m +	- (61)m				
	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39	(62)
Solar DHW input	t calculated	using Appe	endix G or A	Appendix H									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	ter heater f	or each mo	nth (kWh/i	month) (62	2)m + (63)n	ı							
	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39	
										∑(64)1	12 = 1	736.48	(64)
Heat gains from	water heat	ing (kWh/n	nonth) 0.25	5 × [0.85 ×	(45)m + (61	.)m] + 0.8 ×	[(46)m + (5	57)m + (59)	m]				
	70.61	62.38	65.85	59.50	58.65	52.90	51.27	55.61	55.31	61.68	64.62	69.07	(65)
	-	•		•	•	•	•			•		•	-
5. Internal gain	15									_			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)									CA			
	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	(66)
Lighting gains (c	alculated in	Appendix I	, equation	L9 or L9a),	also see Ta	ible 5				7], ,
Lighting gains (c	alculated in 18.48	Appendix I 16.42	-, equation 13.35	L9 or L9a), 10.11	also see Ta 7.56	ble 5 6.38	6.89	8.96	12.03	15.27	17.82	19.00] (67)
Lighting gains (c Appliance gains	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19.00	
	18.48	16.42	13.35	10.11	7.56	6.38	6.89 155.12	8.96 152.96	12.03 158.39	15.27	17.82 184.50	19.00 198.19	
	18.48 (calculated 207.34	16.42 in Appendi 209.49	13.35 x L, equatio 204.07	10.11 on L13 or L2 192.53	7.56 13a), also se 177.96	6.38 ee Table 5 164.26] (67)
Appliance gains	18.48 (calculated 207.34	16.42 in Appendi 209.49	13.35 x L, equatio 204.07	10.11 on L13 or L2 192.53	7.56 13a), also se 177.96	6.38 ee Table 5 164.26] (67)
Appliance gains	18.48(calculated)207.34calculated in34.74	16.42 in Appendi 209.49 Appendix 34.74	13.35 x L, equatio 204.07 L, equation	10.11 on L13 or L2 192.53 L15 or L15	7.56 13a), also so 177.96 a), also see	6.38 ee Table 5 164.26 Table 5	155.12	152.96	158.39	169.93	184.50	198.19] (67)] (68)
Appliance gains Cooking gains (c	18.48(calculated)207.34calculated in34.74	16.42 in Appendi 209.49 Appendix 34.74	13.35 x L, equatio 204.07 L, equation	10.11 on L13 or L2 192.53 L15 or L15	7.56 13a), also so 177.96 a), also see	6.38 ee Table 5 164.26 Table 5	155.12	152.96	158.39	169.93	184.50	198.19] (67)] (68)
Appliance gains Cooking gains (c	18.48 (calculated 207.34 alculated in 34.74 ains (Table 9 3.00	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00	13.35 x L, equatio 204.07 L, equation 34.74	10.11 on L13 or L2 192.53 L15 or L15 34.74	7.56 13a), also so 177.96 a), also see 34.74	6.38 ee Table 5 164.26 Table 5 34.74	155.12 34.74	152.99 34.74	158.39 34.74	169.93 34.74	184.50 34.74	198.19 34.74] (67)] (68)] (69)
Appliance gains Cooking gains (c Pump and fan ga	18.48 (calculated 207.34 alculated in 34.74 ains (Table 9 3.00	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00	13.35 x L, equatio 204.07 L, equation 34.74	10.11 on L13 or L2 192.53 L15 or L15 34.74	7.56 13a), also so 177.96 a), also see 34.74	6.38 ee Table 5 164.26 Table 5 34.74	155.12 34.74	152.99 34.74	158.39 34.74	169.93 34.74	184.50 34.74	198.19 34.74] (67)] (68)] (69)
Appliance gains Cooking gains (c Pump and fan ga	18.48 (calculated 207.34 alculated in 34.74 ains (Table 5 3.00 oration (Tal -93.92	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ble 5) -93.92	13.35 x L, equation 204.07 L, equation 34.74 3.00	10.11 on L13 or L2 192.53 L15 or L15 34.74 3.00	7.56 13a), also so 177.96 a), also see 34.74 3.00	6.38 ee Table 5 164.26 Table 5 34.74 3.00	155.12 34.74	152.99 34.74 3.00	34.74 3.00	169.93 34.74 3.00	184.50 34.74 3.00	198.19 34.74 3.00] (67)] (68)] (69)] (70)
Appliance gains Cooking gains (c Pump and fan ga Losses e.g. evap	18.48 (calculated 207.34 alculated in 34.74 ains (Table 5 3.00 oration (Tal -93.92	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ble 5) -93.92	13.35 x L, equation 204.07 L, equation 34.74 3.00	10.11 on L13 or L2 192.53 L15 or L15 34.74 3.00	7.56 13a), also so 177.96 a), also see 34.74 3.00	6.38 ee Table 5 164.26 Table 5 34.74 3.00	155.12 34.74	152.99 34.74 3.00	34.74 3.00	169.93 34.74 3.00	184.50 34.74 3.00	198.19 34.74 3.00] (67)] (68)] (69)] (70)
Appliance gains Cooking gains (c Pump and fan ga Losses e.g. evap	18.48 (calculated 207.34 alculated ir 34.74 ains (Table ! 3.00 oration (Tal -93.92 ains (Table ! 94.90	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ole 5) -93.92 5) 92.82	13.35 x L, equation 204.07 L, equation 34.74 3.00 -93.92 88.51	10.11 on L13 or L2 192.53 L15 or L15 34.74 3.00 -93.92 82.64	7.56 13a), also so 177.96 a), also see 34.74 3.00 -93.92 78.63	6.38 ee Table 5 164.26 Table 5 34.74 3.00 -93.92 73.47	155.12 34.74 5.00 -93.92	152.99 34.74 3.00 -93.92	34.74 3.00 -93.92	169.93 34.74 3.00 -93.92	184.50 34.74 3.00 -93.92	198.19 34.74 3.00 -93.92] (67)] (68)] (69)] (70)] (71)
Appliance gains Cooking gains (c Pump and fan ga Losses e.g. evap Water heating g	18.48 (calculated 207.34 alculated ir 34.74 ains (Table ! 3.00 oration (Tal -93.92 ains (Table ! 94.90	16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ole 5) -93.92 5) 92.82	13.35 x L, equation 204.07 L, equation 34.74 3.00 -93.92 88.51	10.11 on L13 or L2 192.53 L15 or L15 34.74 3.00 -93.92 82.64	7.56 13a), also so 177.96 a), also see 34.74 3.00 -93.92 78.63	6.38 ee Table 5 164.26 Table 5 34.74 3.00 -93.92 73.47	155.12 34.74 5.00 -93.92	152.99 34.74 3.00 -93.92	34.74 3.00 -93.92	169.93 34.74 3.00 -93.92	184.50 34.74 3.00 -93.92	198.19 34.74 3.00 -93.92] (67)] (68)] (69)] (70)] (71)

	r	Accurs f		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific da or Table		Gains W	
SouthWest		0.7	7 X	10.29] x [36.79	x 0.9 x	0.63	x [0.70	=	115.71	(79)
SouthEast	$\mathbf{\nabla}$	0.7	7 X	2.14	x	36.79	x 0.9 x	0.63	x [0.70	=	24.06	(77)
NorthWest	·	0.7	7 X	6.17	x	11.28	x 0.9 x	0.63	x [0.70	=	21.28	(81)
Solar gains in watts ∑(74)m(82)m												
161.05	281.39	403.78	531.77	624.34	632.4	6 604.50	533	3.50 447.80)	316.06	194.18	136.99	(83)
Total gains - internal and	solar (73)m +	+ (83)m											
542.99	661.34	770.93	878.26	949.90	937.7	79 896.64	831	L.40 756.25	5	645.37	547.48	508.23	(84)
7. Mean internal tempe													7
Temperature during heat	ing periods ir	n the living a	area from T	Table 9, Th1	.(°C)							21.00	(85)
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug Sep		Oct	Nov	Dec	

 Utilisation factor for gains for living area n1,m (see Table 9a)
 0.12
 0.53
 0.39
 0.43
 0.68
 0.93
 0.99
 1.00
 (86)

Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 90	:)								
	19.96	20.17	20.45	20.75	20.93	20.99	21.00	21.00	20.96	20.71	20.27	19.92	(87)
Temperature du	uring heating	g periods ir	n the rest of	dwelling f	rom Table	9 <i>,</i> Th2(°C)							
	20.01	20.01	20.01	20.02	20.03	20.03	20.03	20.04	20.03	20.03	20.02	20.02	(88)
Utilisation facto	r for gains f	or rest of d	welling n2,	n									
	0.99	0.98	0.95	0.85	0.66	0.45	0.30	0.34	0.60	0.90	0.98	1.00	(89)
Mean internal to	emperature	in the rest	of dwelling	T2 (follow	steps 3 to	7 in Table 9	e)						
	18.64	18.94	19.34	19.75	19.96	20.03	20.03	20.04	20.00	19.71	19.10	18.59	(90)
Living area fract	ion								Liv	ving area ÷	(4) =	0.36	(91)
Mean internal to	emperature	for the wh	ole dwellin	g fLA x T1 +	+(1 - fLA) x	Т2							_
	19.11	19.38	19.74	20.11	20.31	20.37	20.38	20.38	20.34	20.06	19.51	19.06	(92)
Apply adjustme	nt to the me	an interna	l temperatu	ire from Ta	ble 4e whe	ere appropr	iate						_
	19.11	19.38	19.74	20.11	20.31	20.37	20.38	20.38	20.34	20.06	19.51	19.06	(93)
													_
8. Space heating	ng requirem												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	JCT	Nov	Dec	
Utilisation facto	r for gains,	յՠ	1							70		1	_
	0.99	0.98	0.94	0.85	0.68	0.48	0.33	0.37	0.63	0.90	0.98	0.99	(94)
Useful gains, ηm	nGm, W (94)m x (84)m	1			1							_
	538.34	646.65	726.63	745.66	646.62	449.68	297.00	311.70	175.07	580.26	536.78	505.02	(95)
Monthly average	e external t	emperatur	e from Tabl	e U1									_
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	1546	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal tempe	erature, Lm	, W [(39)m	ı x [(93)m -	(96)m]	C						
	1199.96	1170.30	1067.28	893.72	684.87	454.51	257.53	312.72	493.79	752.78	991.92	1192.92	(97)
Space heating re	equirement	kWh/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m	\sim						
	492.25	351.90	253.44	106.60	28.46	0.00	0.00	0.00	0.00	128.36	327.70	511.80]
									∑(98	3)15, 10	12 = 2	2200.50	(98)
Space heating re	equirement	kWh/m²/y	ear							(98) -	÷ (4)	29.58	(99)
9a. Energy req	uiromonto	individual	hosting sy	toms inclu	dincasico	СНР							
Space heating	unements -	marviadai	ficating sys			J-CIII							
Fraction of space	e heat from	secondary	/sunnleme	ntary syst	m (table 11	1)						0.00	(201)
Fraction of space				in it y sy to		-)				1 - (20)1) =	1.00	(202)
Fraction of space										1 (20	,_,	0.00	(202)
Fraction of total									(20	02) x [1- (203	2)1 –	1.00	(202)
Fraction of total									(20	(202) x (20		0.00	(204)
Efficiency of ma			system z							(202) X (20	/5) – [(205)
Efficiency of ma	Jan	(%) Feb	Mar	A .p.r	May	Jun	Jul	Aug	Sep	Oct	Nov	93.50 Dec	_ (206)
Space heating fu				Apr	May	Jun	Jui	Aug	зер	000	NOV	Dec	
Space heating it				114.01	20.44	0.00	0.00	0.00	0.00	127.20	250.40	E 47 20	٦
	526.47	376.36	271.06	114.01	30.44	0.00	0.00	0.00	0.00	137.28	350.48	547.38	
Motor bast									2(21)	1)15, 10	12 = 2	2353.48	(211)
Water heating	torbester												
Efficiency of wat		00.0-	00.05	0	or				70.05		0.0	0	
Mataria	87.44	86.97	86.04	84.06	81.45	79.80	79.80	79.80	79.80	84.45	86.73	87.58	(217)
Water heating f			407	400 ==	4 60 = -	450	4 4	464 == 1	401-55	4-4-	404	400.55	Г
	199.02	175.90	185.62	168.75	169.51	152.87	145.19	161.57	161.98	174.25	181.33	193.41]]
										∑(219a)1	12 = 2	2069.41	(219)

Annual totals

Space heating fuel - main system 1			2353.48	
Water heating fuel			2069.41	
Electricity for pumps, fans and electric keep-hot (Table 4f)				
central heating pump or water pump within warm air heat	ting unit	30.00	(23	30c)
boiler flue fan		45.00	(23	30e)
Total electricity for the above, kWh/year			75.00 (23	31)
Electricity for lighting (Appendix L)			326.44 (23	32)
Total delivered energy for all uses		(211)(221) + (231) + (232)(237b) =	4824.33 (23	38)
10a. Fuel costs - individual heating systems including micro	-CHP			
	Fuel	Fuel price	Fuel	
	kWh/year		cost £/year	
Space heating - main system 1	2353.48	x 3.48 x 0.01 =	81.90 (24	40)
Water heating	2069.41	x 3.48 x 0.01 =	72.02 (24	47)
Pumps and fans	75.00	x 13.19 x 0.01 =	9.89 (24	49)
Electricity for lighting	326.44	x 13.19 x 0.01 =	43.06 (25	50)
Additional standing charges			120.00 (25	51)
Total energy cost		(240)(242, + (2.5)(254) =	326.87 (25	55)
11a. SAP rating - individual heating systems including micro	D-CHP			
Energy cost deflator (Table 12)			0.42 (25	56)
Energy cost factor (ECF)				57)
SAP value			83.96	5.7
SAP rating (section 13)				58)
SAP band		2	В	,
12a. CO ₂ emissions - individual heating systems including m	nicro-CHP			
	Energy kWh, year	Emission factor kg CO₂/kWh	Emissions kg CO ₂ /year	
Cases heating main system 1				(1)
Space heating - main system 1	2253.48	x 0.216 = x 0.216 =		61)
Water heating	2009.41			64) 65)
Space and water heating Pumps and fans	75.00	(261) + (262) + (263) + (264) = x 0.519 =		65) 67)
Electricity for lighting	326.44			67) 68)
Total CO ₂ , kg/year	320.44	x 0.519 = (265)(271) =		72)
Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value		(272) ÷ (4) =		72) 73)
El value		(272) · (4) -	86.94	73)
El rating (section 14)				74)
El band			B	, -,
13a. Primary energy - individual heating systems including	micro-CHP			
	Energy kWh/year	Primary factor	Primary Energy kWh/year	
	••		••	
Space heating - main system 1	2353.48	x 1.22 =		61)
Space heating - main system 1 Water heating		x <u>1.22</u> = x <u>1.22</u> =	2871.24 (26	61) 64)
	2353.48		2871.24 (26 2524.68 (26	

Pumps and fans

Electricity for lighting

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

230.25

1002.18

6628.35

89.09

(267)

(268)

(272)

(273)

75.00

326.44

х

х

3.07

3.07

=

=

DER Worksheet Design - Draft



Assessor name	Miss Alicja	a Kreglewsł	ka				As	sessor num	ber	4134		
Client							La	st modified		13/06	/2018	
Address	A 4 02 Ing	estre Road	l, London,	NW5 1XE								
1. Overall dwelling dimen	sions				Area (m²)		Aver	ago storov		Ve	olume (m³)	
					Area (m.)			age storey ight (m)		vu	June (m.)	
Lowest occupied					76.52	(1a) x		2.50	(2a) =		191.30	(3a)
Total floor area	(1a) +	+ (1b) + (1c) + (1d)	(1n) =	76.52	(4)						
Dwelling volume						_	(3a)	+ (3b) + (3c	c) + (3d)(3n) =	191.30	(5)
2. Ventilation rate									_			
2. Ventilation rate										m	³ per hour	
Number of chimneys								0	v 40 -			
Number of chimneys Number of open flues								0	x 40 = x 20 =		0	(6a) (6b)
Number of intermittent fan	c							3	x 20 -		30	(00) (7a)
Number of passive vents	5							0	x 10 =		0	(7b)
Number of flueless gas fires	ŝ							0	x 40 =		0	(7c)
											changes per	
											hour	
Infiltration due to chimneys	, flues, fans,	PSVs		(6a	a) + (6b) + (7	a) + (7b) + (7c) =	30	÷ (5) =	=	0.16	(8)
If a pressurisation test has l								o (16)				,
Air permeability value, q50,							e area				4.00	(17)
If based on air permeability				8), otherw	rise (18) = (1	6)					0.36] (18) 1
Number of sides on which t	he dwelling i	is sheltered	d								3	(19)
Shelter factor								1 -	[0.075 x (1		0.78	(20)
Infiltration rate incorporation Infiltration rate modified for									(18) x (20) =	0.28] (21)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee				ividy	Jun	501	Aug	JCP	000	NOV	Dee	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4							•					
Wind factor (22)m ÷ 4	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
· · ·						0.95	0.93	1.00	1.08	1.13	1.18] (22a)
1.28						0.95	0.93	1.00	1.08 0.30	0.31	0.32] (22a)] (22b)
1.28 Adjusted infiltration rate (al	llowing for sl	helter and 0.34	wind fact 0.30	or) (21) x ((22a)m							
1.28Adjusted infiltration rate (al0.35	llowing for sl	helter and 0.34 ne applicab	wind fact 0.30 De case:	or) (21) x (0.30	(22a)m							
1.28 Adjusted infiltration rate (al 0.35 Calculate effective air change	llowing for sl 0.35 ge rate for th n: air change	helter and 0.34 ne applicab rate throu	wind fact 0.30 Die case: ogh systen	or) (21) x (0.30	22a)m 0.26	0.26					0.32] (22b)
1.28 Adjusted infiltration rate (a 0.35 Calculate effective air chang If mechanical ventilation	Ilowing for sl 0.35 ge rate for th n: air change covery: effici	helter and 0.34 ne applicab rate throu iency in % a	wind fact 0.30 Die case: Igh systen allowing f	or) (21) x (0.30	22a)m 0.26	0.26					0.32 N/A] (22b)] (23a)
1.28 Adjusted infiltration rate (all 0.35 Calculate effective air change If mechanical ventilation If balanced with heat read d) natural ventilation or 0.56	llowing for sl 0.35 ge rate for th n: air change covery: effici whole house 0.56	helter and 0.34 ne applicab rate throu iency in % a e positive i 0.56	wind fact 0.30 De case: gh systen allowing f nput vent 0.55	or) (21) x (0.30 n or in-use f ilation fro 0.54	22a)m 0.26 actor from T m loft 0.53	0.26					0.32 N/A] (22b)] (23a)
1.28 Adjusted infiltration rate (al 0.35 Calculate effective air chang If mechanical ventilation If balanced with heat red d) natural ventilation or	llowing for sl 0.35 ge rate for th n: air change covery: effici whole house 0.56	helter and 0.34 ne applicab rate throu iency in % a e positive i 0.56	wind fact 0.30 De case: gh systen allowing f nput vent 0.55	or) (21) x (0.30 n or in-use f ilation fro 0.54	22a)m 0.26 actor from T m loft 0.53	0.26	0.26	0.28	0.30	0.31	0.32 N/A N/A] (22b)] (23a)] (23c)



3. Heat losses a	and heat los	s paramet	er										
Element				Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U W	•	value, /m².K	Ахк, kJ/K	
Window						19.	.92 x	1.24	= 24.62	2			(27)
External wall						12.	.70 x	0.18	= 2.29				(29a)
Party wall						64.	.09 x	0.00	= 0.00				(32)
Roof						9.6	65 x	0.12	= 1.16				(30)
Total area of ext	ernal eleme	ents ∑A, m²				42.	27						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(2	5)(30) + (32) =	28.06	(33)
Heat capacity Cr	m = ∑(А x к)							(28)	.(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/n	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) ca	lculated us	sing Appen	dix K								10.11	(36)
Total fabric heat	loss									(33) + (36) =	38.17	(37)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	35.49	35.34	35.19	34.49	34.35	33.74	33.74	33.63	33.98	34.35	34.62	34.90	(38)
Heat transfer co	efficient, W	/K (37)m +	· (38)m										
	73.66	73.50	73.35	72.65	72.52	71.91	71.91	71.80	72.15	72.52	72.79	73.06	
									Average = 2	<u>5</u> (39)112	/12 =	72.65	(39)
Heat loss param	eter (HLP), '	W/m²K (39	9)m ÷ (4)										
	0.96	0.96	0.96	0.95	0.95	0.94	0.94	0.94	0.94	0.95	0.95	0.95	
									Average = 2	<u>(40)112</u>	/12 =	0.95	(40)
Number of days	in month (T	able 1a)											
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heati	ng energy r	equiremen	t						-				
Assumed occupa	ancy, N											2.39	(42)
Annual average	hot water u	sage in litre	es per day '	/d,average	= (25 x N) +	36						91.05	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ich month	Vd,m = fact	tor from Tab	le 1c x (43)						
	100.15	96.51	92.87	89.23	85.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	
										∑(44)1	.12 =	1092.55	(44)
Energy content	of hot wate	r used = 4.1	l8 x Vd,m x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1b	o, 1c 1d)					
	148.52	129.90	134.04	116.86	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	
Distribution loss	0.15 (45)									∑(45)1	.12 =	1432.51	(45)
Distribution loss			20.14	47.50	16.02	4454	10.45	45.42	45.62	10.20	40.07	24.50	
Chause a veluine e	22.28	19.48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume Water storage lo		loing any so	Diar or ww	HKS Storag	e within sam	ie vessei						2.00	(47)
b) Manufacturer		loss factor	is not know										
												0.02	7 (51)
Hot water sto Volume facto	-		Table 2 (KV	m/intre/day	ý)								(51)
												3.91	(52)
Temperature			(b/dov) (4-	/) v (F1) v (f	-2) ~ (F2)							1.00	(53)
Energy lost fr		torage (KW	11/udy) (47) X (10) X (1	J∠J X (JJ)							0.12	(54) (55)
Enter (50) or (54 Water storage lo		d for each	month /ss	(11)								0.12	7 (22)
יימובו גוטומצל ונ	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	7 (56)
	2.09	5.55	3.09	3.57	5.09	3.37	5.09	5.09	5.57	5.09	5.57	5.09	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69 (57)
Primary circuit lo	oss for each	month from	n Table 3									
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (59)
Combi loss for ea	ach month f	rom Table 3	3a, 3b or 3	с								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (61)
Total heat requir	red for wate	er heating ca	alculated f	or each mo	onth 0.85 x	(45)m + (46	6)m + (57)r	n + (59)m	+ (61)m			
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78 (62)
Solar DHW input	calculated	using Appe	ndix G or A	Appendix H								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Output from wat	ter heater fo	or each mor	nth (kWh/ı	month) (62	2)m + (63)m	1						
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78
										∑(64)1	12 =	1749.80 <mark>(64)</mark>
Heat gains from	water heati	ng (kWh/m	onth) 0.25	5 × [0.85 ×	(45)m + (61)m] + 0.8 ×	[(46)m + (57)m + (59	9)m]			
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38 <mark>(65)</mark>
5. Internal gain	c											
5. Internal Sam	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains		100	iviai	Αþ.	inay	Juli	Jui	746	Scp	011		Bee
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68 (66)
Lighting gains (ca							115.00	115.00	115.00	115.00	115.00	
	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12.30	15.61	18.22	19.43 (67)
Appliance gains (LI						7.05	5.10	12.50	15.01	10.22	
	212.01	214.21	208.67	196.87	181.97	167.97	158.61	156.41	161.96	173.76	188.66	202.66 (68)
Cooking gains (ca							100.01	100111	101.00	1.0110	100.00	
00 (34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97 (69)
Pump and fan ga	I		0.107	0.107	0.107	0.107	0.107	0.107		0.007	0.107	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (70)
Losses e.g. evapo	LI											
0	-95.74		-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74 (71)
Water heating ga												
	95.35	93.25	88.88	82.94	79.09	73.66	69.05	74.96	77.06	83.20	90.14	93.26 (72)
Total internal gai	ins (66)m +				+ (71)m + (7				I	1		、 、
-	385.17	383.15	370.11	349.05	327.69	307.05	293.61	299.43	310.21	331.48	355.93	374.25 (73)
	L 1							1	•	•	1	, · ·
6. Solar gains					-							
			Access f Table		Area m²		ar flux //m²	spe	g cific data	FF specific c	lata	Gains W
							,		Table 6b	or Table		
SouthWest			0.7	7 X	16.45	x 3	6.79 x	0.9 x	0.63 x	0.80	=	211.40 (79)
SouthEast			0.7	7 X	3.47	x 3	6.79 x	0.9 x	0.63 x	0.80	=	44.59 (77)
Solar gains in wa	tts ∑(74)m	(82)m										
	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08 (83)
Total gains - inte	rnal and so	lar (73)m +	(83)m									
	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	662.55	593.32 (84)
7 Maan intern		uro <i>(</i> hastin										
7. Mean interna						(°c)						21.00
7. Mean interna Temperature due	ring heating	g periods in	the living a				11	۸	50-	Oct	Neu	21.00 (85)
	ring heating Jan	g periods in Feb	the living a Mar	Apr	May	(°C) Jun	lut	Aug	Sep	Oct	Nov	21.00 (85) Dec

	0.99	0.96	0.89	0.75	0.57	0.41	0.29	0.32	0.52	0.82	0.97	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	.)								_
	20.24	20.50	20.74	20.92	20.98	21.00	21.00	21.00	20.99	20.89	20.53	20.19	(87)
Temperature du	iring heating	g periods ir	the rest of	f dwelling fr	om Table 9	9, Th2(°C)			1], ,
·	20.11	20.12	20.12	20.13	20.13	20.13	20.13	20.14	20.13	20.13	20.12	20.12	(88)
Utilisation facto		or rest of d] (,
	0.99	0.95	0.87	0.71	0.52	0.35	0.23	0.26	0.45	0.78	0.96	0.99	(89)
Mean internal te								0.20	0.15	0.70	0.50	0.55] (03)
	19.12	19.48	19.82	20.04	20.11	20.13	20.13	20.13	20.13	20.02	19.54	19.05	(90)
Living area fract		15.40	15.02	20.04	20.11	20.15	20.15	20.15		ving area ÷	·	0.35	(91)
Mean internal te		for the wh	ole dwellin	σ fl Δ v T1 +	.(1 - fl Λ) γ ⁻	т2				vilig alea -	(4) -	0.55] (91)
	19.51	19.83	20.14	20.35	20.42	r	20.42	20.42	20.42	20.32	19.88	10.44	(02)
Apply adjustma						20.43	20.43	20.43	20.43	20.32	19.88	19.44	(92)
Apply adjustme	r	1	-					20.42	20.42	20.22	10.00	10.44	
	19.51	19.83	20.14	20.35	20.42	20.43	20.43	20.43	20.43	20.32	19.88	19.44	(93)
8. Space heatir	ng requirem	ent											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains, I	յՠ						Ű					
	0.98	0.95	0.87	0.72	0.54	0.37	0.25	0.28	0.47	0.79	0.96	0.99	(94)
Useful gains, ηm	L			0.72	0101	0.07	0.20		0111	0.75	0.00	0.00] (0 .)
eserai Samo, ili	630.21	775.40	838.94	783.79	623.75	418.71	275.65	289.58	453.47	640.29	633.74	586.26	(95)
Monthly average					025.75	410.71	275.05	205.50	455.47	040.25	055.74	500.20] (55)
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	
Heat loss rate fo							16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	r		i				075.74	200.00	456.50		000 55	4442 74] (07)
	1120.40	1097.74	1000.49	831.74	632.10	419.45	275.71	289.69	456.50	704.87	930.55	1113.74	_ (97)
Space heating re	-	1											7
	364.70	216.61	120.19	34.52	6.21	0.00	0.00	0.00	0.00	48.05	213.70	392.45]]
									∑(98	3)15, 10		1396.43	(98)
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	18.25	(99)
9b. Energy req	uirements -	communit	ty heating s	cheme									
Fraction of space	e heat from	secondary	/suppleme	ntary syste	m (table 11)				'0' if ı	none	0.00	(301)
Fraction of space						-				1 - (30		1.00	(302)
Fraction of com										- (0		1.00	(303a)
Fraction of total				ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro			-		munity sna	ace heating				(302) × (30.	5u) =	1.00	(305)
Factor for charg												1.00	(305a)
Distribution loss	-											1.00	(306)
DISTINUTION 1055		12() 101	community	fileating sy	stem							1.05] (500)
Cuese heating													
Space heating									206.42	1			(0.0)
Annual space he		rement							396.43] (205) (20		1166.26	(98)] (207)
Space heat from	bollers							(98	3) x (304a) >	k (305) x (30	06) =	1466.26	(307a)
Water heating								·		1			14.5
Annual water he		rement							749.80]			(64)
Water heat from										(305a) x (30		1837.29] (310a)
Electricity used	for heat dist	ribution					0.01	L × [(307a)	.(307e) + (3	310a)(310	e)] =	33.04	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	0.00	(331)
	333.80	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	3637.35	(338)

10b. Fuel costs - community	heating scheme						
		Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers		1466.26	x	4.24	x 0.01 =	62.17	(340a)
Water heating from boilers		1837.29	х	4.24	x 0.01 =	77.90	(342a)
Electricity for lighting		333.80	x	13.19	x 0.01 =	44.03	(350)
Additional standing charges						120.00	(351)
Total energy cost				(340a)(342e) +	(345)(354) =	304.10	(355)
11b. SAP rating - community	heating scheme						
Energy cost deflator (Table 12)						0.42	(356)
Energy cost factor (ECF)						1.05	(357)
SAP value						85.34]
SAP rating (section 13)						85	(358)
SAP band						В]
12b. CO ₂ emissions - commu	nity heating scheme						
		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources (space heating)						
Efficiency of boilers		89.50					(367a)
CO2 emissions from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	3691.11	x	0.216	=	797.28	(367)
Electrical energy for communit	y heat distribution	33.04	x	0.519	=	17.15	(372)
Total CO2 associated with com	munity systems					814.43	(373)

Total CO2 associated with space and water heating

Electricity for lighting

Total CO₂, kg/year

Dwelling CO₂ emission rate

EI value

El rating (section 14)

EI band

13b. Primary energy - commu	nity heating scheme	, i i i i i i i i i i i i i i i i i i i					
		Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sou	rces (space heating)						
Efficiency of boilers		89.50					(367a)
Primary energy from boilers	[(307a)+(310a)] x 100 ÷ (367a) = [3691.11	x	1.22	=	4503.16	(367)
Electrical energy for community	y heat distribution	33.04	x	3.07	=	101.42	(372)
Total primary energy associated	d with community systems					4604.58	(373)
Total primary energy associated	d with space and water heating					4604.58	(376)
Electricity for lighting	[333.80	x	3.07	=	1024.77	(379)
Primary energy kWh/year						5629.35	(383)
Dwelling primary energy rate k	Wh/m2/year					73.57	(384)

333.80

0.519

814.43

173.24

987.67

12.91

89.11

89

В

(376)..(382) =

(383) ÷ (4) =

(376)

(379)

(383)

(384)

(385)

TER Worksheet Design - Draft



	Miss Alicja Kreglew	/ska				As	sessor numb	ber	4134		
Client						Las	st modified		13/06,	/2018	
Address	A 4 02 Ingestre Roa	ad, London, N	W5 1XE								
1. Overall dwelling dimen	nsions										
			Aı	ea (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied				76.52] (1a) x		2.50	(2a) =		191.30 (3a)
Total floor area	(1a) + (1b) + (1	1c) + (1d)(1n) =	76.52	(4)						
Dwelling volume						(3a)	+ (3b) + (3c	+ 3d)'3	n) =	191.30 (5)
2. Ventilation rate							11.	-			
							$\overline{\boldsymbol{X}}$		m³	ⁱ per hour	
Number of chimneys								x 40 =		0 (6a)
, Number of open flues							0	x 20 =			, 6b)
Number of intermittent far	ns					X	3	x 10 =			7a)
Number of passive vents							0	x 10 =		0 (7b)
Number of flueless gas fire	25				5		0	x 40 =		0 (7c)
-									Air c	hanges per	
										hour	
Infiltration due to chimney					a) + (7b) + (7		30	÷ (5) =		0.16 (8)
If a pressurisation test has							0 (16)				\
Air permeability value, q50						area					17)
If based on air permeabilit			otherwis	e (18) = (16)					`	18)
Number of sides on which	the dwelling is shelter	ed					1	0.075(10			19) 20)
Shelter factor Infiltration rate incorporat	ing shalter faster						1 - I	0.075 x (19)] = [0.78 (20)
Infiltration rate incorporat	ing shelter factor							(10)()	a) 🗌	0.22	24)
		4.						(18) x (2	0) =	0.32 (21)
Infiltration rate modified for	or monthly wind speed		May	lun	1.1	Aug	Son			``	21)
Infiltration rate modified fo	or monthly wind speed Feb Ma	d. Apr	Мау	Jun	Jul	Aug	Sep	(18) x (2 Oct	0) = Nov	0.32 (Dec	21)
Infiltration rate modified fo Jan Monthly average wind spe	for monthly wind speed Feb Ma sed from Table U2	Apr						Oct	Nov	Dec	
Infiltration rate modified fo Jan Monthly average wind spe 5.10	or monthly wind speed Feb Ma		May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep 4.00			Dec	21) 22)
Infiltration rate modified fo Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4	Feb Ma Feb Ma red from Table 02 3.00 4.90	Apr 4.40	4.30	3.80	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec	22)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28	red from Table U2 1.25 1.23	Apr 4.40 1.10	4.30	3.80 0.95				Oct	Nov	Dec	
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	or monthly wird speed Feb Ma eed from Table 02 500 4.90 1.25 1.23 allowing for shelter an	Apr 4.40 1.10 d wind factor)	4.30 1.08) (21) x (2	3.80 0.95 2a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec (22) 22a)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28	red from Table U2 1.25 1.25 1.23 allowing for shelter an 0.39 0.39	Apr 4.40 1.10 d wind factor) 0.35	4.30	3.80 0.95	3.80	3.70	4.00	Oct 4.30	Nov 4.50	Dec (22)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40	Feb Ma red from Table U2 200 4.90 1.25 1.23 allowing for shelter an 0.39 0.39 nge rate for the application	Apr 4.40 1.10 d wind factor) 0.35 able case:	4.30 1.08) (21) x (2	3.80 0.95 2a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 (1.18 (0.37 (22) 22a)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air char	Feb Ma red from Table U2 1.00 4.90 1.25 1.23 allowing for shelter an 0.39 0.39 nge rate for the application: air change rate through the state the state the state through the state the state the state	Apr 4.40 1.10 d wind factor) 0.35 able case: bugh system	4.30 1.08) (21) x (2 0.34	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 (1.18 (0.37 (N/A (22) 22a) 22b)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air char If mechanical ventilatio	Feb Ma eed from Table U2 200 4.90 1.25 1.23 allowing for shelter an 0.39 0.39 nge rate for the application: air change rate through the state of the second the secon	Apr 4.40 1.10 d wind factor) 0.35 able case: bugh system 6 allowing for	4.30 1.08) (21) x (2 0.34 in-use fac	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 (1.18 (0.37 (N/A (22) 22a) 22b) 23a)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air char If mechanical ventilatio If balanced with heat re	Feb Ma eed from Table U2 200 4.90 1.25 1.23 allowing for shelter an 0.39 0.39 nge rate for the application: air change rate through the state of the second the secon	Apr 4.40 1.10 d wind factor) 0.35 able case: bugh system 6 allowing for	4.30 1.08) (21) x (2 0.34 in-use fac	3.80 0.95 2a)m 0.30	3.80 0.95 0.30	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 (1.18 (0.37 (N/A (N/A (22) 22a) 22b) 23a)
Infiltration rate modified for Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.40 Calculate effective air char If mechanical ventilatio If balanced with heat re d) natural ventilation or	r whole house positive 0.58 0.57	Apr 4.40 1.10 d wind factor) 0.35 able case: bugh system 6 allowing for e input ventilation 0.56	4.30 1.08) (21) x (2 0.34 in-use factor tion from 0.56	3.80 0.95 2a)m 0.30 :tor from Ta loft	3.80 0.95 0.30 able 4h	3.70 0.93 0.29	4.00	Oct 4.30 1.08 0.34	Nov 4.50 1.13 0.35	Dec 4.70 (1.18 (0.37 (N/A (N/A (22) 22a) 22b) 23a) 23c)



3. Heat losses	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U \		/alue, /m².K	Ахк, kJ/K	
Window						19.	13 x	1.33	= 25.3	6			(27)
External wall						13.	50 x	0.18	= 2.43	3			(29a)
Party wall						64.	09 x	0.00	= 0.00)			(32)
Roof						9.6	65 x	0.13	= 1.25	5			(30)
Total area of ex	ternal eleme	ents ∑A, m²	2			42.	28						(31)
Fabric heat loss	, W/K = Σ(A	× U)							(2	26)(30) + (32) =	29.05	(33)
Heat capacity C								(28)		+ (32a)(3		N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(Γ x Ψ) ca	alculated us	sing Appen	dix K								7.06	(36)
Total fabric hea			0 11							(33) + (36) =	36.11	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ted month	ly 0.33 x (2	-	•								
	36.67	36.47	36.27	35.36	35.19	34.40	34.40	34.25	34.70	35.19	35.54	35.90	(38)
Heat transfer co] ()
	72.77	72.58	72.38	71.47	71.30	70.51	70.51	70.36	70.81	71.30	71.64	72.01	7
	,,,,,,	72.00	, 2.30	, 1	, 1.50	70.01	70.51			Σ(39)112	·	71.47] (39)
Heat loss param	neter (HLP).	W/m²K (30	9)m ÷ (4)						, werug	2(33)112)		, 1.1,	
	0.95	0.95	0.95	0.93	0.93	0.92	0.92	0.97	0.93	0.93	0.94	0.94	7
	0.55	0.55	0.55	0.55	0.55	0.52	0.52			<u>Σ(40)112</u>	·	0.93	 (40)
Number of days	in month (T	Table 1a)						X	Average -	2(40)112)	12 -	0.95] (40)
indifficer of days	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	51.00	28.00	51.00	30.00	51.00	30.00	51.00	1 51.00	30.00	51.00	50.00	51.00	_ (40)
4. Water heati	ng energy r	equiremen	t			0							
Assumed occup	ancy, N											2.39	(42)
Annual average	hot water u	isage in litre	es per day	Vd,average	= (25 × N) +	36						91.05	(43)
	Jan	Feb	Mar	Apr	Mut	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach month	Vd,m = fact	to: Iror i Tab	le 1c x (43)						
	100.15	96.51	92.87	89.23	85.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	
										∑(44)1	.12 =	1092.55	(44)
Energy content	of hot wate	r used = 4.3	18 x Vd .n x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1b,	1c 1d)					_
	148.52	129.90	154.01	116.86	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	7
			5					•		∑(45)1	.12 =	1432.51	(45)
Distribution loss	s 0.15 x (45)	m	×										
	22.28	1 48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	/HRS storag	ge within san	ne vessel		•				2.00	(47)
Water storage l													
a) If manufactu		d loss facto	or is known	(kWh/dav)								0.24	(48)
Temperature												0.54	(49)
Energy lost f			/h/dav) (48	3) x (49)								0.13	(50)
Enter (50) or (54			,,, (-,,								0.13	(55)
Water storage		ed for each	month (5)	5) x (41)m								0.20	_ (33)
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
If the vessel cor		1		1	1 1			1	5.07	1.00	5.07	4.00	
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(57)
Primary circuit I				5.07	4.00	5.07	+.00	4.00	5.07	4.00	5.07	4.00	_ (57)

							-						_
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month	from Table	3a, 3b or 3	С									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)r	n + (59)m +	- (61)m				
	175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09	(62)
Solar DHW inpu	L				1	125.14	110.52	150.15	150.50	140.00	150.05	171.05	_ (02)
Solar Brive inpu			1		1	0.00	0.00	0.00	0.00	0.00	0.00		
a f	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa					1	1				1		1	-
	175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09	
										∑(64)1	.12 = 1	.753.47	(64)
Heat gains from	water heat	ing (kWh/n	nonth) 0.2	5 × [0.85 ×	(45)m + (61	l)m] + 0.8 ×	[(46)m + (57)m + (59)	m]				
	71.19	62.89	66.38	59.96	59.09	53.28	51.62	56.02	55.72	62.15	65.14	69.63	(65)
5. Internal gair	IS												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)									CA			
	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	112.69	119.68	119.68	(66)
Lighting gains (c	alculated in	Appendix	L, equation	L9 or L9a),	also see Ta	able 5							
	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12 30	15.61	18.22	19.43	(67)
Appliance gains	(calculated		ix L. equatio		13a). also se	ee Table 5				1	1	1	
	212.01	214.21	208.67	196.87	181.97	167.97	158.61	15 5.41	161.96	173.76	188.66	202.66	(68)
Cooking going (c							158.01	1:0.4	101.90	175.70	188.00	202.00	_ (00)
Cooking gains (c				1	· · · · ·								
	34.97	34.97	34.97	34.97	34.97	34.97	34 97	34.97	34.97	34.97	34.97	34.97	(69)
Pump and fan ga	ains (Table !	5a)											_
	3.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evap	oration (Tal	ble 5)											
	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Water heating g	ains (Table	5)											
	95.69	93.58	89.22	83.28	79.4.2	74.00	69.38	75.29	77.39	83.54	90.48	93.59	(72)
Total internal ga	ins (66)m +	+ (67)m + (6	58)m + (69)	m + (70)m	+ (/1)r + (72)m		•				•	_
-	388.51	386.49	373.44	352.35	331.02	310.39	296.95	302.77	313.55	334.81	359.26	377.58	(73)
	000101	000110	0,0111	9	001.01	010.00	100.00	00117	010100	00.001	000120] (,
6. Solar gains			1	$\mathbf{\nabla}$									
			Accorst	a ctor	Area	Sol	ar flux		g	FF		Gains	
			Tobie		m²	v	//m²	•	ific data	specific o		w	
		7						or T	able 6b	or Table	6C		
SouthWest		Ch	0.7	7 x [15.80	x 3	6.79 x	0.9 x 🚺	D.63	0.70	=	177.67	(79)
SouthEast		V	0.7	7 X	3.33	x 3	6.79 x	0.9 x 🚺	D.63	0.70	=	37.44	(77)
Solar gains in wa	atts Σ(74)m	(82)m											

215.11 366.41 501.34 621.19 695.78 690.75 665.96 610.31 542.85 404.96 257.65 184.09 (83) Total gains - internal and solar (73)m + (83)m 874.78 603.62 752.90 973.57 1026.80 1001.14 962.90 913.08 856.40 739.78 616.91 561.67 (84)

7. Mean intern	al tempera	ture (heati	ng season)										
Temperature du	ring heating	g periods in	the living a	irea from T	able 9, Th1	.(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains f	or living are	ea n1,m (se	e Table 9a)									
	0.99	0.97	0.92	0.80	0.63	0.45	0.32	0.35	0.56	0.86	0.98	0.99	(86)
Mean internal to	amp of livin	g aroa T1 (g	tons 3 to 7	in Table Oc)								

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

	20.21	20.44	20.69	20.89	20.98	21.00	21.00	21.00	20.99	20.86	20.50	20.17	(87)
Temperature du		g periods in	the rest of		rom Table §			1	1				
·	20.12	20.13	20.13	20.14	20.14	20.15	20.15	20.15	20.15	20.14	20.14	20.13	(88)
Utilisation facto					-						-] (/
	0.99	0.96	0.90	0.76	0.58	0.39	0.26	0.29	0.50	0.82	0.97	0.99	(89)
Mean internal to	L	II			I								
	19.09	19.42	19.76	20.03	20.12	20.15	20.15	20.15	20.14	20.00	19.51	19.03	(90)
Living area fract		13.12	13.70	20.03	20.12	20.15	20.15	20.13		ving area ÷		0.35	(91)
Mean internal to		for the who	ole dwellin	g fl A x T1 -	⊦(1 - fl A) x ⁻	т2				ing area i		0.00	
	19.48	19.77	20.08	20.33	20.42	20.44	20.44	20.45	20.43	20.30	19.85	19.43	(92)
Apply adjustme								20.45	20.45	20.50	15.05	15.45] (32)
	19.48	19.77	20.08	20.33	20.42	20.44	20.44	20.45	20.43	20.30	19.85	19.43	(93)
	13110	15.77	20.00	20.33	20.12	20.11	20.11	20.15	20.13	20.50	13.05	13.13] (33)
8. Space heating	ng requirem	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or for gains, i	յՠ								CA			
	0.99	0.96	0.90	0.77	0.59	0.41	0.28	0.31	0.52	0.93	0.97	0.99	(94)
Useful gains, ηπ	nGm, W (94)m x (84)m								\sim			
	595.60	723.03	787.14	751.14	608.93	410.77	270.94	284.44	.44.1 12	611.14	596.15	556.39	(95)
Monthly averag	e external to	emperature	from Table	e U1									
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	1 40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal temper	rature, Lm,	, W [(39)m	x [(93)m -	(96)m]							
	1104.72	1079.52	983.02	816.60	621.57	411.93	271.04	184.61	448.58	691.57	913.59	1096.32	(97)
Space heating re	equirement,	kWh/mont	h 0.024 x	[(97)m - (9	5)m] x (41)	m	5						-
	378.79	239.56	145.74	47.13	9.41	0.00	1.00	0.00	0.00	F0.0F	228.56	401.71	1
		200100	143.74	47.15	9.41	0.00	5.00	0.00	0.00	59.85	220.50	401.71	
		200.00	143.74	47.15	9.41	0.00	0.39	0.00		39.85 8)15, 10		1510.73	(98)
Space heating re	equirement			47.13	9.41	0.00	0.00	0.00			12 =] (98) (99)
		kWh/m²/ye	ar			, C	5.60	0.00		8)15, 10	12 =	1510.73	
Space heating re 9a. Energy req		kWh/m²/ye	ar			, C	a.	0.00		8)15, 10	12 =	1510.73	
9a. Energy req Space heating	uirements -	kWh/m²/ye individual l	ar heating sys	stems inclu	iding mi2ro	-CHP	2.00	0.00		8)15, 10	12 =	1510.73	
9a. Energy req	uirements -	kWh/m²/ye individual l	ar heating sys	stems inclu	iding mi2ro	-CHP	5.53	0.00		8)15, 10	12 =	1510.73	
9a. Energy req Space heating	uirements - e heat from	kWh/m²/ye individual l secondary/	ear heating sys 'supplemen	stems inclu	iding mi2ro	-CHP	5.00	0.00		8)15, 10	12 = ÷ (4)	1510.73 19.74] (99)
9a. Energy req Space heating Fraction of space	uirements - e heat from e heat from	kWh/m²/ye individual l secondary/ main syster	ar heating sys 'supplemer m(s)	stems inclu	iding mi2ro	-CHP	5.53	0.00		3)15, 10 (98)	12 = ÷ (4)	1510.73 19.74 0.00] (99)] (201)
9a. Energy req Space heating Fraction of spac Fraction of spac	uirements - e heat from e heat from e heat from	kWh/m²/ye individual l secondary/ main syster main syster	ear heating sys (supplemen m(s) m 2	stems inclu	iding mi2ro	-CHP	5.53	0.00	Σ(ð	3)15, 10 (98)	12 = ÷ (4))1) =	1510.73 19.74 0.00 1.00) (99)) (201)] (202)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac	uirements - e heat from e heat from e heat from I space heat	kWh/m²/ye individual l secondary/ main syster main syster from main s	ar heating sys 'supplemen m(s) m 2 system 1	stems inclu	iding mi2ro	-CHP	2.03	0.00	Σ(ð	8)15, 10 (98) 1 - (20	12 = ÷ (4) 01) = 3)] =	0.00 1.00 0.00) (99)) (201)] (202)] (202)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total	uirements - e heat from e heat from e heat from I space heat I space heat	kWh/m²/ye individual l secondary/ main syster main syster from main s	ar heating sys 'supplemen m(s) m 2 system 1	stems inclu	iding mi2ro	-CHP	5.53	0.00	Σ(ð	3)15, 10 (98) 1 - (20	12 = ÷ (4) 01) = 3)] =	1510.73 19.74 0.00 1.00 0.00 1.00 1.00] (99)] (201)] (202)] (202)] (202)] (204)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total	uirements - e heat from e heat from e heat from I space heat I space heat	kWh/m²/ye individual l secondary/ main syster main syster from main s	ar heating sys 'supplemen m(s) m 2 system 1	stems inclu	iding mi2ro	-CHP	Jul	Aug	Σ(ð	3)15, 10 (98) 1 - (20	12 = ÷ (4) 01) = 3)] =	0.00 1.00 0.00 0.00 0.00 0.00] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total	uirements - e heat from e heat from l space heat l space heat in system 1 Jan	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%)	ear heating sys (supplemen m(s) m 2 system 1 system 2 Mar	stems inclu	iding mi .ro	-CHP)			Σ(98 (20	3)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20	12 = ÷ (4) (1) = (3)] = (3) =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma	uirements - e heat from e heat from l space heat l space heat in system 1 Jan	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s (%)	ear heating sys (supplemen m(s) m 2 system 1 system 2 Mar	stems inclu	iding mi .ro	-CHP)			Σ(98 (20	3)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20	12 = ÷ (4) (1) = (3)] = (3) =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma	uirements - e heat from e heat from I space heat I space heat in system 1 Jan uel (main sys	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 1 system 1 system 2 Mar (h/month	stems inclu ntary syste Apr	iding mi .ro ra (table 11 May	-CHP) Jun	Jul	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 Oct	12 = ÷ (4) (1) = (1) = (3)] = Nov 244.45	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec] (99)] (201)] (202)] (202)] (202)] (204)] (205)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma	uirements - e heat from e heat from I space heat I space heat in system 1 Jan uel (main sys	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 1 system 1 system 2 Mar (h/month	stems inclu ntary syste Apr	iding mi .ro ra (table 11 May	-CHP) Jun	Jul	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01	12 = ÷ (4) (1) = (1) = (3)] = Nov 244.45	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu	uirements - e heat from e heat from se heat from I space heat I space heat in system 1 Jan uel (main sys 405.12	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 1 system 1 system 2 Mar (h/month	stems inclu ntary syste Apr	iding mi .ro ra (table 11 May	-CHP) Jun	Jul	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01	12 = ÷ (4) (1) = (1) = (3)] = Nov 244.45	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating	uirements - e heat from e heat from se heat from I space heat I space heat in system 1 Jan uel (main sys 405.12	kWh/m²/ye individual l secondary/ main syster main syster from main s from main s from main s from main s from main s	ear heating sys (supplemen m(s) m 2 system 1 system 1 system 2 Mar (h/month	stems inclu ntary syste Apr	iding mi .ro ra (table 11 May	-CHP) Jun	Jul	Aug	∑(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01	12 = ÷ (4) (1) = (1) = (3)] = Nov 244.45	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63] (99)] (201)] (202)] (202)] (204)] (205)] (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating	uirements - e heat from e heat from se heat from I space heat I space heat in system 1 Jan uel (main system 405.12 ter heater 86.81	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fe 3 stem 1), kW 256.21	ear heating sys (supplemen m(s) m 2 system 2 Mar /h/month 155.87	stems inclu ntary syste Apr 50.41	May	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21:	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01 1)15, 10	12 = ÷ (4))1) = 3)] = 3)] = Nov 244.45 12 =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63 1615.76] (99)] (201)] (202)] (202)] (204)] (205)] (206)] (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wa	uirements - e heat from e heat from se heat from I space heat I space heat in system 1 Jan uel (main system 405.12 ter heater 86.81	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fe 3 stem 1), kW 256.21	ear heating sys (supplemen m(s) m 2 system 2 Mar /h/month 155.87	stems inclu ntary syste Apr 50.41	May	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21:	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01 1)15, 10	12 = ÷ (4))1) = 3)] = 3)] = Nov 244.45 12 =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63 1615.76] (99)] (201)] (202)] (202)] (204)] (205)] (206)] (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wa	uirements - e heat from e heat from se heat from I space heat I space heat I space heat Uspace heat I space h	kWh/m²/ye individual f secondary/ main syster main syster from main s from n from n fr	ear heating sys (supplemen m(s) m 2 system 2 Mar /h/month 155.87 84.54	stems inclu ntary syste Apr 50.41 82.21	May 10.06	-CHP .) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(212 79.80	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01 1)15, 10 82.60	12 = ÷ (4) (1) = (1) = (2) =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63 1615.76 87.01] (99)] (201)] (202)] (202)] (204)] (205)] (206)] (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wa	uirements - e heat from e heat from se heat from I space heat I space heat I space heat Uspace heat I space h	kWh/m²/ye individual f secondary/ main syster main syster from main s from n from n fr	ear heating sys (supplemen m(s) m 2 system 2 Mar /h/month 155.87 84.54	stems inclu ntary syste Apr 50.41 82.21	May 10.06	-CHP .) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(212 79.80	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01 1)15, 10 82.60	12 = ÷ (4) (1) = (1) = (2) =	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63 1615.76 87.01 196.63] (99)] (201)] (202)] (202)] (204)] (204)] (205)] (206)] (211)] (211)] (217)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	uirements - e heat from e heat from l space heat l space heat in system 1 Jan uel (main sys 405.12 ter heater 86.81 uel, kWh/m 202.49	kWh/m²/ye individual l secondary/ main syster from main syster from the syster ster 1), kW 256.21	ear heating sys (supplemen m(s) m 2 system 2 Mar /h/month 155.87 84.54	stems inclu ntary syste Apr 50.41 82.21	May 10.06	-CHP .) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(98 (20 Sep 0.00 Σ(212 79.80	8)15, 10 (98) 1 - (20)2) x [1- (20 (202) x (20 (202) x (20 Oct 64.01 1)15, 10 82.60	12 = ÷ (4) (4) (1) = (1) = (0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 429.63 1615.76 87.01 196.63] (99)] (201)] (202)] (202)] (204)] (204)] (205)] (206)] (211)] (211)] (217)

Water heating fuel					2109.74	7
Electricity for pumps, fans and electric keep-hot (Table 4f)						
central heating pump or water pump within warm air heatin	ng unit		30.00			(230c)
boiler flue fan	-		45.00			(230e)
Total electricity for the above, kWh/year				[75.00	(231)
Electricity for lighting (Appendix L)				[333.80	(232)
Total delivered energy for all uses		(211))(221) + (231) + (2	232)(237b) = [4134.30	(238)
				-		
10a. Fuel costs - individual heating systems including micro-(Fuel		Fuel price		Fuel	
	kWh/year		Fuel price		cost £/year	
Space heating - main system 1	1615.76	x	3.48	x 0.01 =	56.23	(240)
Water heating	2109.74	x	3.48	x 0.01 =	73.42	(247)
Pumps and fans	75.00	x	13.19	x 0.01 =	9.89	(249)
Electricity for lighting	333.80	x	13.19	x 0.01 =	44.03	(250)
Additional standing charges					120.00	(251)
Total energy cost			(240)(242) +	(2-5)(7.54) =	303.57	(255)
			7			
11a. SAP rating - individual heating systems including micro-	СНР					7 (
Energy cost deflator (Table 12)				l	0.42	(256)
Energy cost factor (ECF)				l	1.05	_ (257)
SAP value				[85.36	
SAP rating (section 13)					85	_ (258)
SAP band				l	В	
12a. CO ₂ emissions - individual heating systems including mi	cro-CHP					
12a. CO ₂ emissions - individual heating systems including mi	Energ kWh/yea		Emission factor kg CO2/kWh		Emissions kg CO₂/year	
12a. CO ₂ emissions - individual heating systems including mid Space heating - main system 1	Energ	x		= [(261)
	Energ / kWh/year	x x	kg CO₂/kWh	= [= [kg CO₂/year] (261)] (264)
Space heating - main system 1	Energ / kWh/ye.r 1615.76		kg CO ₂ /kWh	= [kg CO₂/year 349.00	
Space heating - main system 1 Water heating	Energ / kWh/ye.r 1615.76		kg CO₂/kWh 0.216 0.216	= [kg CO ₂ /year 349.00 455.70	(264)
Space heating - main system 1 Water heating Space and water heating	Energ / kWh/yea 1615.76 2109.74	x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (= [(263) + (264) = [kg CO ₂ /year 349.00 455.70 804.71	(264) (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 1615.76 2109.74 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [kg CO ₂ /year 349.00 455.70 804.71 38.93	(264) (265) (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 1615.76 2109.74 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [= [kg CO ₂ /year 349.00 455.70 804.71 38.93 173.24	(264) (265) (267) (268)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 1615.76 2109.74 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [kg CO ₂ /year 349.00 455.70 804.71 38.93 173.24 1016.88	(264) (265) (267) (268) (268) (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate	Energ / kWh/year 1615.76 2109.74 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [kg CO ₂ /year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29	(264) (265) (267) (268) (268) (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	Energ / kWh/year 1615.76 2109.74 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79	(264) (265) (267) (268) (272) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kWh/ye	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [kg CO ₂ /year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89	(264) (265) (267) (268) (272) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	Energ / kWh/ye 1615.76 2109.74 75.00 333.80 icro-CHP	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [(272) ÷ (4) = [[kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 B	(264) (265) (267) (268) (272) (273) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kWh/ye	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [(272) ÷ (4) = [[kg CO ₂ /year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89	(264) (265) (267) (268) (272) (273) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kWh/year 1615.76 2109.74 75.00 333.80 icro-CHP Energy	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519	= [(263) + (264) = [= [(265)(271) = [(272) ÷ (4) = [[kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 B Primary Energy	(264) (265) (267) (268) (272) (273) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m	Energ/ kWh/ye 1615.76 2109.74 75.00 333.80 333.80	x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 Primary factor	= [(263) + (264) = [= [(265)(271) = [(272) ÷ (4) = [[kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 B Primary Energy kWh/year	(264) (265) (267) (268) (272) (273) (273) (274)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m Space heating - main system 1	Energ / kWh/ye 1615.76 2109.74 75.00 333.80 333.80	x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 Primary factor 1.22	$= \begin{bmatrix} \\ (263) + (264) = \\ \\ = \\ \\ [\\ (265)(271) = \\ \\ (272) \div (4) = \\ \\ \\ \\ \end{bmatrix}$	kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 89 89 89 89 89 89 89 8	(264) (265) (267) (268) (272) (273) (273) (274)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m Space heating - main system 1 Water heating	Energ / kWh/ye 1615.76 2109.74 75.00 333.80 333.80	x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 Primary factor 1.22 1.22	$= \begin{bmatrix} \\ (263) + (264) = \\ \\ = \\ \\ [\\ (265)(271) = \\ \\ (272) \div (4) = \\ \\ \\ \\ \end{bmatrix}$	kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 89 89 89 89 89 89 89 8	(264) (265) (267) (268) (272) (273) (273) (274) (274) (274)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m Space heating - main system 1 Water heating Space and water heating	Energ / kWh/ye 1615.76 2109.74 75.00 333.80 sicro-CHP Energy kWh/year 1615.76 2109.74	x x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 0.519 Primary factor 1.22 (261) + (262) + ((261) + ((262) + ((261) + ((262) + ((261) + ((262) + ((261) + ((262) + ((262) + ((261) + ((262)	$= \begin{bmatrix} \\ (263) + (264) = \\ \\ = \\ \\ [\\ (265)(271) = \\ \\ (272) \div (4) = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 89 89 89 89 89 89 13.29 89 89 89 89 89 89 89 89 89 8	(264) (265) (267) (268) (272) (273) (273) (274) (274) (274) (261) (264) (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energ/ kWh/ye 1615.76 2109.74 75.00 333.80 icro-CHP Energy kWh/year 1615.76 2109.74	x x x x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 0.519 Primary factor 1.22 (261) + (262) + (3.07	$= \begin{bmatrix} \\ (263) + (264) = \\ \\ = \\ \\ [\\ (265)(271) = \\ \\ (272) \div (4) = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 89 89 89 89 89 89 13.29 1971.22 2573.89 4545.11 230.25	(264) (265) (267) (268) (272) (273) (273) (273) (274) (274) (261) (264) (265) (265) (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including m Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ/ kWh/ye 1615.76 2109.74 75.00 333.80 icro-CHP Energy kWh/year 1615.76 2109.74	x x x x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (0.519 0.519 0.519 Primary factor 1.22 (261) + (262) + (3.07	$= \begin{bmatrix} \\ (263) + (264) = \\ \\ = \\ \\ [\\ (265)(271) = \\ \\ (272) \div (4) = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	kg CO2/year 349.00 455.70 804.71 38.93 173.24 1016.88 13.29 88.79 89 89 89 89 89 89 89 89 89 8	(264) (265) (267) (268) (272) (273) (273) (274) (274) (274) (261) (264) (265) (265) (267) (268)

DER Worksheet Design - Draft



Assessor name	Miss Alicja Kreglews	ska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 5 01 Ingestre Roa	d, London, N	W5 1XE								
1. Overall dwelling dimen	ISIONS		Δ	ea (m²)		A 1100			Ve		
			Ar	ea (m⁻)			age storey eight (m)		vo	olume (m³)	
Lowest occupied			8	36.50	(1a) x		2.50	(2a) =		216.25	(3a)
Total floor area	(1a) + (1b) + (1	.c) + (1d)(1r		36.50	(4)			()	L] ()
Dwelling volume		, , , ,	,		. ,	(3a)	+ (3b) + (3c) + (3d)(3	n) =	216.25	(5)
											_
2. Ventilation rate						_					
									m [*]	³ per hour	-
Number of chimneys							0	x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent far	IS						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0] (7b)
Number of flueless gas fire	S						0	x 40 =		0] (7c)
									Air o	changes per hour	
Infiltration due to chimney	s, flues, fans, PSVs		(6a) -	+ (6b) + (7a) + (7b) + (7c) =	30	÷ (5) =		0.14	(8)
If a pressurisation test has		intended, pro							L] (-)
Air permeability value, q50							. ,			4.00	(17)
If based on air permeability											
										0.34	(18)
Number of sides on which t	the dwelling is sheltere	ed)					0.34] (18)] (19)
Number of sides on which t Shelter factor	the dwelling is sheltere	ed)		1 -	0.075 x (19	9)] =		, , , ,
		ed)		1 -	0.075 x (19 (18) x (2		3] (19)
Shelter factor	ng shelter factor)		1-			3 0.78] (19)] (20)
Shelter factor Infiltration rate incorporati	ng shelter factor		Мау	Jun	Jul	Aug	1 - Sep			3 0.78] (19)] (20)
Shelter factor Infiltration rate incorporati Infiltration rate modified fo	ng shelter factor or monthly wind speed Feb Mar	1:	Мау	Jun		Aug		(18) x (2	0) =	3 0.78 0.26] (19)] (20)
Shelter factor Infiltration rate incorporati Infiltration rate modified fo Jan	ng shelter factor or monthly wind speed Feb Mar	1:	May 4.30	Jun 3.80		Aug 3.70		(18) x (2	0) =	3 0.78 0.26] (19)] (20)
Shelter factor Infiltration rate incorporati Infiltration rate modified fo Jan Monthly average wind spec	ng shelter factor or monthly wind speed Feb Mar ed from Table U2	l: Apr			Jul	-	Sep	(18) x (2 Oct	0) = Nov	3 0.78 0.26 Dec] (19)] (20)] (21)
Shelter factor Infiltration rate incorporati Infiltration rate modified fo Jan Monthly average wind spec 5.10	ng shelter factor or monthly wind speed Feb Mar ed from Table U2	l: Apr			Jul	-	Sep	(18) x (2 Oct	0) = Nov	3 0.78 0.26 Dec] (19)] (20)] (21)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	l: Apr 4.40 1.10	4.30	3.80 0.95	Jul 3.80	3.70	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50	3 0.78 0.26 Dec 4.70] (19)] (20)] (21)] (22)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23	l: Apr 4.40 1.10	4.30	3.80 0.95	Jul 3.80	3.70	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50	3 0.78 0.26 Dec 4.70] (19)] (20)] (21)] (22)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Illowing for shelter and 0.33 0.32	d: Apr 4.40 1.10 d wind factor 0.29	4.30 1.08) (21) x (22	3.80 0.95 2a)m	Jul 3.80 0.95	3.70 0.93	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50 1.13	3 0.78 0.26 Dec 4.70] (19)] (20)] (21)] (22)] (22a)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Illowing for shelter and 0.33 0.32 ge rate for the applica	4.40 4.40 1.10 d wind factor 0.29 ble case:	4.30 1.08) (21) x (22	3.80 0.95 2a)m	Jul 3.80 0.95	3.70 0.93	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50 1.13	3 0.78 0.26 Dec 4.70] (19)] (20)] (21)] (22)] (22a)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Illowing for shelter and 0.33 0.32 ge rate for the applica n: air change rate thro covery: efficiency in %	d: Apr 4.40 1.10 d wind factor 0.29 able case: ugh system 6 allowing for	4.30 1.08) (21) x (22 0.28 in-use fact	3.80 0.95 2a)m 0.25 tor from Ta	Jul 3.80 0.95 0.25	3.70 0.93	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50 1.13	3 0.78 0.26 Dec 4.70 1.18] (19)] (20)] (21)] (22)] (22a)] (22b)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Illowing for shelter and 0.33 0.32 ge rate for the applica h: air change rate thro covery: efficiency in % whole house positive	4.40 4.40 1.10 d wind factor 0.29 ble case: ugh system 5 allowing for input ventila	4.30 1.08) (21) x (22 0.28 in-use fact tion from	3.80 0.95 2a)m 0.25 tor from Ta loft	Jul 3.80 0.95 0.25 able 4h	3.70 0.93 0.24	Sep 4.00 1.00	(18) x (2 Oct 4.30 1.08 0.28	0) = Nov 4.50 1.13 0.30	3 0.78 0.26 Dec 4.70 1.18 0.31 N/A N/A] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)] (23c)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or 0.56	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Ilowing for shelter and 0.33 0.32 ge rate for the applica n: air change rate thro covery: efficiency in % whole house positive 0.55 0.55	4.40 4.40 1.10 d wind factor 0.29 bble case: sugh system allowing for input ventila 0.54	4.30 1.08) (21) x (22 0.28 in-use fact tion from 0.54	3.80 0.95 2a)m 0.25 tor from Ta	Jul 3.80 0.95 0.25	3.70 0.93	Sep 4.00	(18) x (2 Oct 4.30	0) = Nov 4.50 1.13	3 0.78 0.26 Dec 4.70 1.18 0.31 N/A] (19)] (20)] (21)] (22)] (22a)] (22b)] (22b)] (23a)
Shelter factor Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	ng shelter factor or monthly wind speed Feb Mar ed from Table U2 5.00 4.90 1.25 1.23 Ilowing for shelter and 0.33 0.32 ge rate for the applica n: air change rate thro covery: efficiency in % whole house positive 0.55 0.55	4.40 4.40 1.10 d wind factor 0.29 bble case: sugh system allowing for input ventila 0.54	4.30 1.08) (21) x (22 0.28 in-use fact tion from 0.54	3.80 0.95 2a)m 0.25 tor from Ta loft	Jul 3.80 0.95 0.25 able 4h	3.70 0.93 0.24	Sep 4.00 1.00	(18) x (2 Oct 4.30 1.08 0.28	0) = Nov 4.50 1.13 0.30	3 0.78 0.26 Dec 4.70 1.18 0.31 N/A N/A] (19)] (20)] (21)] (22)] (22a)] (22a)] (22b)] (23a)] (23c)



Flowert		s paramet	ei										
Element			а	Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U W,		value, /m².K	Ахк, kJ/K	
Window						29	06 x	1.24	= 35.91				(27)
External wall						25	62 x	0.18	= 4.61				(29a)
Party wall						54	80 x	0.00	= 0.00				(32)
Roof						86	50 x	0.12	= 10.38				(30)
Total area of exte	ernal eleme	ents ∑A, m²	2			141	.18						(31)
Fabric heat loss,	W/K = ∑(A :	× U)							(26	5)(30) + (3	32) =	50.90	(33)
Heat capacity Cm	n = ∑(А x к)							(28)	.(30) + (32) +	- (32a)(32	2e) =	N/A	(34)
Thermal mass pa	rameter (T	MP) in kJ/r	m²K									250.00	(35)
Thermal bridges:	: Σ(L x Ψ) ca	lculated us	sing Appen	dix K								21.37	(36)
Total fabric heat	loss									(33) + (3	36) =	72.27	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	39.68	39.52	39.37	38.66	38.52	37.90	37.90	37.79	38.14	38.52	38.79	39.08	(38)
Heat transfer coe	efficient, W	/K (37)m +	+ (38)m										
	111.95	111.79	111.64	110.93	110.79	110.17	110.17	110.06	110.41	110.79	111.06	111.35	
									Average = ∑	(39)112/	/12 =	110.93	(39)
Heat loss parame	eter (HLP), \	W/m²K (39	9)m ÷ (4)	1							1		_
	1.29	1.29	1.29	1.28	1.28	1.27	1.27	1.27	1.28	1.28	1.28	1.29	
									Average = ∑	(40)112/	/12 =	1.28	(40)
Number of days i			1	1								- r	-
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heatin	ng energy re	equiremen	t										
Assumed occupa	incy, N											2.57	(42)
Annual average h	not water u	sage in litro	es per day '	Vd,average	= (25 x N) +	36						95.35	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fact	or from Tab	le 1c x (43)						_
	104.88	101.07	97.26	93.44	89.63	85.81	85.81	89.63	93.44	97.26	101.07	104.88	
										∑(44)1	.12 =	1144.20	(44)
Energy content o	of hot water	r used = 4.1	18 x Vd,m x	nm x Tm/3	600 kWh/m	onth (see	Tables 1b	, 1c 1d)					_
	155.54	136.04	140.38	122.38	117.43	101.33	93.90	107.75	109.04	127.08	138.71	150.63	
Distribution loss	0 1E v (4E)	m								∑(45)1	.12 =	1500.22	(45)
Distribution loss	0.15 X (45)		24.00	18.36	17.61	15.20	14.09	16.16	16.36	19.06	20.81	22.59	(46)
	23.33	20.41	1 21.06				2		10.00	20100	=0.01	==	
Storage volume (23.33 (litres) inclu	20.41 ding any se	21.06 olar or WW					•				2.00	(47)
Storage volume (Water storage lo	(litres) inclu							•				2.00	(47)
Storage volume (Water storage lo b) Manufacturer'	(litres) inclu ss:	ding any so	olar or WW	/HRS storag								2.00	(47)
Water storage lo	(litres) inclu ss: 's declared	ding any so loss factor	olar or WW is not knov	/HRS storag vn	e within sam							2.00] (47)] (51)
Water storage lo b) Manufacturer	(litres) inclu iss: 's declared prage loss fa	ding any so loss factor actor from	olar or WW is not knov	/HRS storag vn	e within sam								
Water storage lo b) Manufacturer Hot water sto	(litres) inclu iss: 's declared prage loss fa r from Tabl	ding any so loss factor actor from 7 e 2a	olar or WW is not knov	/HRS storag vn	e within sam							0.02	(51)
Water storage lo b) Manufacturer Hot water sto Volume facto	(litres) inclu ss: 's declared orage loss fa r from Tabl factor from	ding any so loss factor actor from e 2a n Table 2b	olar or WW is not knov Table 2 (kV	rHRS storag vn Vh/litre/day	e within sam							0.02] (51)] (52)
Water storage lo b) Manufacturer Hot water sto Volume facto Temperature	(litres) inclu ss: 's declared orage loss fa r from Tabl factor from om water s	ding any so loss factor actor from e 2a n Table 2b	olar or WW is not knov Table 2 (kV	rHRS storag vn Vh/litre/day	e within sam							0.02 3.91 1.00] (51)] (52)] (53)
Water storage lo b) Manufacturer Hot water sto Volume facto Temperature Energy lost fro	(litres) inclu ss: 's declared orage loss fa r from Tabl factor from om water s) in (55)	ding any so loss factor actor from e 2a n Table 2b torage (kW	olar or WW is not knov Table 2 (kV /h/day) (47	/HRS storag vn Vh/litre/day 7) x (51) x (5	e within sam							0.02 3.91 1.00 0.12) (51)) (52)) (53)) (54)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit l	oss for each	month fron	n Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month i	from Table 3	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating ca	alculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)n	n + (59)m +	- (61)m				
	182.49	160.38	167.33	148.46	144.38	127.41	120.85	134.70	135.12	154.02	164.79	177.58	(62)
Solar DHW inpu	t calculated	using Apper	ndix G or A	Appendix H									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	ter heater f	or each mor	nth (kWh/r	month) (62	2)m + (63)m	1							
	182.49	160.38	167.33	148.46	144.38	127.41	120.85	134.70	135.12	154.02	164.79	177.58	
										∑(64)1	12 = 1	.817.51	(64)
Heat gains from			-	5 × [0.85 ×	(45)m + (61)m] + 0.8 ×	[(46)m + (5	57)m + (59)	-			,	
	73.28	64.70	68.23	61.56	60.60	54.56	52.78	57.39	57.12	63.81	66.99	71.64	(65)
5. Internal gair	15												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)							Ū					
Ū	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	(66)
Lighting gains (c									_				()
0 00 (20.73	18.41	14.97	11.33	8.47	7.15	7.73	10.05	13.48	17.12	19.98	21.30	(67)
Appliance gains													(-)
	232.49	234.90	228.82	215.88	199.54	184.19	173.93	171.52	177.60	190.54	206.88	222.23	(68)
Cooking gains (c							1.0.00	1,101	111100	100101			(00)
000 000	35.87	35.87	35.87	35.87	35.87	35.87	35.87	35.87	35.87	35.87	35.87	35.87	(69)
Pump and fan g			55.67	33.07	33.07	55.67	33.07	33.07	33.07	33.07	33.07	55.67	(00)
i anip ana ian 8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap	· · · · · ·		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
200000 0.8. 0100		-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	(71)
Water heating g			102.55	102.55	102.55	102.55	102.55	102.55	102.55	102.55	102.55	102.55	(, -)
Water neuting 6	98.49	96.29	91.71	85.49	81.46	75.77	70.94	77.13	79.33	85.77	93.03	96.30	(72)
Total internal ga							70.94	//.15	79.55	85.77	95.05	90.50	(72)
	413.33	411.22	397.13	374.33	351.09	328.73	314.22	320.32	332.03	355.05	381.51	401.45	(73)
	415.55	411.22	357.13	374.33	331.09	526.75	514.22	320.32	552.05	333.05	301.31	401.45	(73)
6. Solar gains													
			Access f		Area		ar flux		g	FF		Gains	
			Table	6d	m²	W	//m²		ific data able 6b	specific d or Table		W	
SouthWest			0.77	7 x	23.26	x 3	6.79 x).63 x	0.80		298.92	(79)
NorthWest			0.7		5.80				0.63 x				(81)
Solar gains in wa	atts Σ(74)m	(82)m	0.77		5.00		1.20 X		<u>, , , , , , , , , , , , , , , , , , , </u>	0.00		22.00	(01)
eelai game mitt	321.77	555.69	780.48	1000.86	1151.90	1157.14	1109.96	995.20	856.48	619.59	386.79	274.48	(83)
Total gains - inte				1000.00	1151.50	1137.14	1105.50	555.20	050.40	015.55	500.75	274.40	(00)
	735.10	966.91	1177.61	1375.19	1502.99	1485.87	1424.18	1315.52	1188.51	974.64	768.31	675.93	(84)
	755.10	900.91	1177.01	1373.19	1502.99	1405.07	1424.10	1515.52	1100.51	374.04	708.51	075.55	(04)
7. Mean intern	al temperat	ture (heatin	g season)										
Temperature du	iring heating	g periods in	the living a	area from T	able 9, Th1	(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains fo	or living area	a n1,m (se	e Table 9a)									

	0.99	0.97	0.92	0.81	0.64	0.47	0.34	0.38	0.61	0.88	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	:)								-
	19.79	20.09	20.44	20.76	20.93	20.99	21.00	21.00	20.96	20.69	20.16	19.73	(87)
Temperature du	ring heating	g periods ir	n the rest of	f dwelling fr	rom Table 9	9, Th2(°C)	1			1		1], ,
	19.85	19.85	19.85	19.85	19.86	19.86	19.86	19.86	19.86	19.86	19.85	19.85	(88)
Utilisation facto		1	1		Į	I	1	1	1	1		1], ,
	0.99	0.96	0.90	0.77	0.58	0.39	0.25	0.29	0.52	0.84	0.97	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						
	18.27	18.70	19.19	19.61	19.80	19.85	19.86	19.86	19.83	19.54	18.81	18.19	(90)
Living area fract	ion	1			Į		1		Li	ving area ÷	(4) =	0.57	(91)
Mean internal te		for the wh	nole dwellin	g fLA x T1 +	-(1 - fLA) x T	Т2				-			
	19.14	19.49	19.90	20.26	20.44	20.50	20.51	20.51	20.47	20.19	19.58	19.06	(92)
Apply adjustmer	nt to the me	ean interna	l temperati	ure from Ta	ble 4e whe	ere appropr	iate					•	_
	19.14	19.49	19.90	20.26	20.44	20.50	20.51	20.51	20.47	20.19	19.58	19.06	(93)
		•	•	•	•	•			•		•	•	-
8. Space heatir	ng requirem	ient											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains,	ηm								1			,
	0.99	0.96	0.90	0.78	0.61	0.43	0.30	0.34	0.57	0.86	0.97	0.99	(94)
Useful gains, ηm	1Gm, W (94	l)m x (84)m		1									,
	725.18	929.01	1064.16	1078.40	919.11	641.88	429.30	449.85	676.92	833.87	744.83	669.36	(95)
Monthly average	e external t	emperatur	e from Tabl	e U1									-
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]							_
	1661.13	1631.19	1495.75	1260.43	968.68	649.87	430.47	451.95	703.72	1062.90	1386.07	1655.14	(97)
Space heating re	equirement,	, kWh/mon	nth 0.024 x	[(97)m - (9	5)m] x (41)ı	m							
	696.35	471.87	321.10	131.06	36.88	0.00	0.00	0.00	0.00	170.40	461.69	733.42]
									∑(9a	8)15, 10	.12 =	3022.77	(98)
Space heating re	equirement	kWh/m²/y	ear							(98)	÷ (4)	34.95	(99)
9b. Energy req	uirements -	communit	ty heating s	cheme									
Fraction of space					m (table 11					'0' if r	none	0.00	(301)
Fraction of space				intur y syster		-				1 - (30		1.00	(302)
Fraction of com										1 (5)		1.00	(303a)
Fraction of total	-			ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro					munity spa	ace heating				(002) // (00	, <u> </u>	1.00	(305)
Factor for charging			-									1.00	(305a)
Distribution loss	-											1.05	(306)
Distribution 1033		120,101	community	ficating sy	stem							1.05] (300)
Space heating													
Annual space he	ating requi	rement						3	022.77]			(98)
Space heat from		ement						L		」 x (305) x (30	06) =	3173.91	(307a)
opuloe neut nom	2011010							(50	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,] (007.0)
Water heating													
Annual water he	eating requi	rement						1	817.51]			(64)
Water heat from		•								」 (305a) x (30	06) =	1908.39	(310a)
Electricity used f		tribution					0.01			(3030, x (30 310a)(310		50.82	(313)
							0.01		(c) · (- / J] (2-0)

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	0.00	(331)
	366.04	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	5448.33	(338)

10b. Fuel costs - community heating scheme						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	3173.91	x	4.24	x 0.01 =	134.57	(340a)
Water heating from boilers	1908.39	x	4.24	x 0.01 =	80.92	(342a)
Electricity for lighting	366.04	x	13.19	x 0.01 =	48.28	(350)
Additional standing charges				[120.00	(351)
Total energy cost			(340a)(342e) +	(345)(354) = [383.77	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
					1.23	(357)
Energy cost factor (ECE)					1.25	
Energy cost factor (ECF)					82 90]
SAP value					82.90 83]] (358)
SAP value SAP rating (section 13)				[83]] (358)]
SAP value]] (358)]
SAP value SAP rating (section 13)				[83]] (358)]
SAP value SAP rating (section 13) SAP band	Energy kWh/year		Emission factor		83]] (358)]
SAP value SAP rating (section 13) SAP band			Emission factor		83 B Emissions] (358)]
SAP value SAP rating (section 13) SAP band 12b. CO ₂ emissions - community heating scheme			Emission factor		83 B Emissions]] (358)] (367a)
SAP value SAP rating (section 13) SAP band 12b. CO₂ emissions - community heating scheme Emissions from other sources (space heating)	kWh/year	x	Emission factor	=	83 B Emissions	
SAP value SAP rating (section 13) SAP band 12b. CO ₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers	kWh/year	x x		= [83 B Emissions (kg/year)	(367a)
SAP value SAP rating (section 13) SAP band 12b. CO₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a)	kWh/year 89.50 5678.54		0.216	L [83 B Emissions (kg/year) 1226.57	(367a)] (367)
SAP value SAP rating (section 13) SAP band 12b. CO ₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) Electrical energy for community heat distribution	kWh/year 89.50 5678.54		0.216	L [83 B Emissions (kg/year) 1226.57 26.38	(367a)] (367)] (372)
 SAP value SAP rating (section 13) SAP band 12b. CO₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) Electrical energy for community heat distribution Total CO2 associated with community systems 	kWh/year 89.50 5678.54		0.216	L [83 B Emissions (kg/year) 1226.57 26.38 1252.94	(367a)] (367)] (372)] (373)
SAP value SAP rating (section 13) SAP band 12b. CO₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating	kWh/year 89.50 5678.54 50.82	x	0.216 0.519	= [83 B Emissions (kg/year) 1226.57 26.38 1252.94 1252.94	(367a)] (367)] (372)] (373)] (376)
SAP value SAP rating (section 13) SAP band 12b. CO ₂ emissions - community heating scheme Emissions from other sources (space heating) Efficiency of boilers CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting	kWh/year 89.50 5678.54 50.82	x	0.216 0.519	= [[= [83 B Emissions (kg/year) 1226.57 26.38 1252.94 1252.94 189.97	(367a)] (367)] (372)] (373)] (376)] (379)

El rating (section 14)

EI band

	Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary energy from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
Primary energy from boilers [(307a)+(310a)] x 1	00 ÷ (367a) = 5678.54	x	1.22	=	6927.82	(367)
Electrical energy for community heat distribution	50.82	x	3.07	=	156.03	(372)
Total primary energy associated with community system	tems				7083.85	(373)
Total primary energy associated with space and wat	er heating				7083.85	(376)
Electricity for lighting	366.04	x	3.07	=	1123.74	(379)
Primary energy kWh/year					8207.59	(383)
Dwelling primary energy rate kWh/m2/year					94.89	(384)

85

В

(385)



Assessor name	Miss Alicja Kreglew	vska				As	sessor numb	er	4134	
Client						Las	st modified		13/06,	/2018
Address	A 5 01 Ingestre Roa	ad, London, N	IW5 1XE							
1. Overall dwelling dimen	isions									
			Α	rea (m²)			age storey ight (m)		Vo	lume (m³)
Lowest occupied				86.50](1a) x		2.50	(2a) =		216.25 (<mark>3</mark>
Total floor area	(1a) + (1b) + (1	1c) + (1d)(1ı	n) =	86.50] (4)			6		
Dwelling volume						(3a)	+ (3b) + (3c)	+ 3d)'3	n) =	216.25 (5)
2. Ventilation rate							71.			
									m³	per hour
Number of chimneys								x 40 =		0 (6
Number of open flues							0	x 20 =		0 (6
Number of intermittent far	าร						3	x 10 =		30 (7:
Number of passive vents							0	x 10 =		0 (7)
Number of flueless gas fire	S				5		0	x 40 =		0 (70
				C	R				Air c	hanges per hour
	e flues fame DCV/s		((a)	. (Ch)) . (7h) . (*	7-)	30	. (5)		
Infiltration due to chimney If a pressurisation test has		intended pro			a) + (7b) + (7 viso continue			÷ (5) =		0.14 (8)
Air permeability value, q50							0 (10)			5.00 (1
If based on air permeability						arca				0.39 (1
Number of sides on which			, other wit	Je (10) - (10	57					3 (19
Shelter factor							1 - [0.075 x (19	9)] =	0.78 (2)
Infiltration rate incorporati	ing shelter factor						- 1	(18) x (2		0.30 (2)
Infiltration rate modified for		d.						(10) // (1	•/	(=
Jan			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan Monthly average wind spec	Feb Ma	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind spec	Feb Ma ed from Table U2	Apr			1	-				
	Feb Ma		May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep 4.00	Oct 4.30	Nov	Dec (2.
Monthly average wind spec	Feb Ma ed from Table U2	Apr			1	-				4.70 (2
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	Feb Ma ed from Table U2 3.00 4.90 1.25 1.23	Apr 4.40	4.30	3.80 0.95	3.80	3.70	4.00	4.30	4.50	
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28	Feb Ma ed from Table U2 3.00 4.90 1.25 1.23	Apr 4.40	4.30	3.80 0.95	3.80	3.70	4.00	4.30	4.50	4.70 (2
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38	Feb Ma ed from Table U2 300 4.90 1.25 1.23 allowing for shelter and 0.38 0.37	Apr 4.40 1.10 d wind factor 0.33	4.30 1.08 ·) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38	Feb Ma ed from Table U2 200 4.90 1.25 1.23 allowing for shelter and 0.38 0.37 nge rate for the application	Apr 4.40 1.10 d wind factor 0.33 able case:	4.30 1.08 ·) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan	Feb Ma ed from Table U2 200 4.90 1.25 <tr< td=""><td>Apr 4.40 1.10 d wind factor 0.33 able case: pugh system</td><td>4.30 1.08 -) (21) × (2 0.32</td><td>3.80 0.95 2a)m 0.29</td><td>3.80 0.95 0.29</td><td>3.70 0.93</td><td>4.00</td><td>4.30</td><td>4.50</td><td>4.70 (2. 1.18 (2. 0.35 (2.</td></tr<>	Apr 4.40 1.10 d wind factor 0.33 able case: pugh system	4.30 1.08 -) (21) × (2 0.32	3.80 0.95 2a)m 0.29	3.80 0.95 0.29	3.70 0.93	4.00	4.30	4.50	4.70 (2. 1.18 (2. 0.35 (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilation	Feb May ed from Table U2 200 4.90 1.25 1.25 1.25 1.25 1.23 allowing for shelter and 0.38 0.38 0.37 nge rate for the applicant n: air change rate three ecovery: efficiency in 9	Apr 4.40 1.10 d wind factor 0.33 able case: bugh system % allowing for	4.30 1.08 (21) x (2 0.32	3.80 0.95 22a)m 0.29	3.80 0.95 0.29	3.70 0.93	4.00	4.30	4.50	4.70 (2. 1.18 (2. 0.35 (2. N/A (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilation If balanced with heat re	Feb May ed from Table U2 200 4.90 1.25 1.25 1.25 1.25 1.23 allowing for shelter and 0.38 0.38 0.37 nge rate for the applicant n: air change rate three ecovery: efficiency in 9	Apr 4.40 1.10 d wind factor 0.33 able case: bugh system % allowing for	4.30 1.08 (21) x (2 0.32	3.80 0.95 22a)m 0.29	3.80 0.95 0.29	3.70 0.93	4.00	4.30	4.50	4.70 (2. 1.18 (2. 0.35 (2. N/A (2.
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	FebMayed from Table U22004.901.251.251.23allowing for shelter and0.380.380.37oge rate for the applicantn: air change rate threeecovery: efficiency in 9r whole house positive0.570.57	Apr 4.40 1.10 d wind factor 0.33 able case: bugh system % allowing for e input ventila 0.55	4.30 1.08 1) (21) x (2 0.32 in-use factoriation from 0.55	3.80 0.95 2a)m 0.29 ctor from T	3.80 0.95 0.29 able 4h	3.70 0.93 0.28	4.00	4.30 1.08 0.32	4.50 1.13 0.34	4.70 (2) 1.18 (2) 0.35 (2) N/A (2) N/A (2)



3. Heat losses	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U \		alue, /m².K	Ахк, kJ/K	
Window						21.	.64 x	1.33	= 28.6	9			(27)
External wall						33.	.08 x	0.18	= 5.9	5			(29a)
Party wall						54.	.80 x	0.00	= 0.00)			(32)
Roof						86.	.50 x	0.13	= 11.2	5			(30)
Total area of ext	ternal elem	ents ∑A, m²	2			141	22						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(2	26)(30) + (3	32) =	45.89	(33)
Heat capacity C	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(32	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								23.52	(36)
Total fabric heat	t loss									(33) + (3	36) =	69.40	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Ventilation heat	t loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	40.95	40.74	40.54	39.60	39.42	38.60	38.60	38.45	38.92	39.47	39.78	40.15	(38)
Heat transfer co	efficient, W	//K (37)m⊣	⊦ (38)m					•		V			
	110.35	110.15	109.95	109.00	108.83	108.01	108.01	107.86	109.31	108.83	109.18	109.56	7
					· ·				Avera ₆ e =	Σ(39)112/	12 =	109.00	_] (39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)										_
	1.28	1.27	1.27	1.26	1.26	1.25	1.25	1.75	1.25	1.26	1.26	1.27	7
									Average =	Σ(40)112/	/12 =	1.26	(40)
Number of days	in month (Table 1a)					C	X					
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
		1			· ·							-	
4. Water heati	ng energy r	equiremen	t										-
Assumed occup	ancy, N											2.57	(42)
Annual average	hot water u	isage in litr	es per day '	Vd,average	= (25 × N) +	36						95.35	(43)
	Jan	Feb	Mar	Apr	ML	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	-				tor iror i Tab				1	-1	1		_
	104.88	101.07	97.26	93.44	39.63	85.81	85.81	89.63	93.44	97.26	101.07		
				U'						∑(44)1	12 =	1144.20	(44)
Energy content						onth (see	Tables 1b,	1c 1d)		_			_
	155.54	136.04	140.30	122.38	117.43	101.33	93.90	107.75	109.04	127.08	138.71	150.63	
		7								∑(45)1	12 =	1500.22	(45)
Distribution loss	5 0.15 x (45									-			_
	23.33	2 41	21.06	18.36	17.61	15.20	14.09	16.16	16.36	19.06	20.81	22.59	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	/HRS storag	e within san	ne vessel						2.00	(47)
Water storage lo	OSS:												_
a) If manufactur	er's declare	d loss facto	or is known	(kWh/day)								0.24	(48)
Temperature	e factor fron	n Table 2b										0.54	(49)
Energy lost f	rom water s	storage (kW	/h/day) (48	3) x (49)								0.13	(50)
Enter (50) or (54												0.13	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
If the vessel con	itains dedica	ated solar s	torage or d	ledicated W	/WHRS (56)r	m x [(47) -	Vs] ÷ (47),	else (56)					_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(57)
Primary circuit l	oss for each	month fro	m Table 3										

	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month	from Table	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating o	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)n	n + (59)m +	- (61)m			,	
·	182.80	160.66	167.64	148.77	144.69	127.72	121.16	135.01	135.42	154.34	165.09	177.89	(62)
						127.72	121.10	155.01	155.42	134.34	105.05	177.05	(02)
Solar DHW input	r		-		1								1 (
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	ter heater f	or each mo	onth (kWh/	month) (62	2)m + (63)n	n 							
	182.80	160.66	167.64	148.77	144.69	127.72	121.16	135.01	135.42	154.34	165.09	177.89	
										∑(64)1	12 = 1	821.19	(64)
Heat gains from	water heat	ing (kWh/n	nonth) 0.2	5 × [0.85 ×	(45)m + (61	L)m] + 0.8 ×	[(46)m + (5	57)m + (59)	m]				
	73.53	64.93	68.48	61.80	60.85	54.80	53.03	57.64	57.36	64.06	67.23	71.89	(65)
	•				•	•	•						
5. Internal gain	S												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)									CA			
	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	128.74	122.7/	128.74	128.74	(66)
Lighting gains (c	alculated in	Appendix	L, equation	L9 or L9a),	also see Ta	able 5							
0 00 1	20.73	18.41	14.97	11.33	8.47	7.15	7.73	10.05	13 48	17.12	19.98	21.30	(67)
Appliance gains					1		1.75	10.05	13.40	17.12	15.50	21.50	(07)
Appliance gains	r	1	1	1	1	1	4=0.00			100 - 1			(60)
	232.49	234.90	228.82	215.88	199.54	184.19	173.93	174.52	177.60	190.54	206.88	222.23	(68)
Cooking gains (c	alculated in	Appendix	L, equation	L15 or L15	a), also see	e Table 5		$\mathbf{\lambda}$					
	35.87	35.87	35.87	35.87	35.87	35.87	35 87	35.87	35.87	35.87	35.87	35.87	(69)
Pump and fan ga	ains (Table S	5a)					5						
	3.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evap	oration (Tal	ble 5)											
	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	-102.99	(71)
Water heating g	ains (Table	5)						1	1				• •
	98.82	96.62	92.05	85.83	21 4	76.11	71.28	77.47	79.67	86.10	93.37	96.63	(72)
Total internal ga							71.20	//.4/	75.07	80.10	33.37	90.05	(72)
i otal internal ga			· · ·							0-0.00			(- 0)
	416.66	414.55	400.46	377.6)	354.43	332.07	317.56	323.65	335.37	358.38	384.85	404.79	(73)
6. Solar gains				U.									
or oor an game			Accest	actor	Area	Sol	ar flux		a	FF		Gains	
			Tobie		m ²		//m²	spec	g ific data	specific d	ata	W	
		0					•	•	able 6b	or Table			
SouthWest			0.7	7 x	17.32	x 3	6.79 x	0.9 x 0	0.63 x	0.70		194.76	(79)
NorthWest		S	0.7		4.32	-			0.63 x			14.90	(81)
	$t = \sum (74)m$	(97)m	0.7		4.52		1.20		5.05 ×	0.70		14.50	(01)
Solar gains in wa			500 51	652.12	750	750.05	700.00	<u> </u>		400 -0	252.55	470.01	(02)
	209.65	362.07	508.54	652.13	750.55	753.97	723.22	648.45	558.05	403.70	252.02	178.84	(83)
Total gains - inte	rnal and so	lar (73)m +	· (83)m		1				1				1
	626.32	776.62	909.00	1029.80	1104.98	1086.04	1040.78	972.10	893.42	762.09	636.87	583.62	(84)
7		····· · /1											
7. Mean intern	ai tempera	ture (neati	ng season)										

Temperature du	ring heating	g periods in	the living a	area from T	able 9, Th1	L(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	for gains f	or living are	ea n1,m (se	e Table 9a)									
	1.00	0.99	0.97	0.91	0.79	0.61	0.45	0.50	0.74	0.94	0.99	1.00	(86)
Mean internal te	mp of livin	g area T1 (g	tens 3 to 7	in Table 9c)								

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

	9.71 19.93	20.24	20.59	20.85	20.97	20.99	20.99	20.91	20.56	20.06	19.66	(87)
Temperature during	heating periods ir	n the rest of	f dwelling f	rom Table 9	9, Th2(°C)		•					
1	9.86 19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.88	19.87	19.87	19.87	(88)
Utilisation factor for	gains for rest of d	welling n2,	m				•					
	0.99 0.98	0.96	0.88	0.72	0.51	0.34	0.38	0.66	0.92	0.99	1.00	(89)
Mean internal temp	erature in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)	•	•				
1	8.16 18.49	18.93	19.42	19.74	19.86	19.88	19.88	19.82	19.39	18.68	18.10	(90)
Living area fraction								Li'	ving area ÷	(4) =	0.57	(91)
Mean internal temp	erature for the wh	ole dwellin	g fLA x T1 +	-(1 - fLA) x ⁻	Т2							
1	9.04 19.31	19.67	20.09	20.37	20.49	20.51	20.51	20.44	20.06	19.46	18.99	(92)
Apply adjustment to	the mean interna	l temperati	ure from Ta	ble 4e whe	ere appropr	iate						
1	9.04 19.31	19.67	20.09	20.37	20.49	20.51	20.51	20.44	20.06	19.46	18.99	(93)
	•	•	•	•	•			•	• •			
8. Space heating re	quirement											
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for	<u> </u>				1							
	0.99 0.98	0.95	0.89	0.75	0.57	0.40	0.45	0.70	0.92	0.98	0.99	(94)
Useful gains, ηmGm,	W (94)m x (84)m		1	1	1							
	21.65 761.92	867.05	911.92	832.24	613.76	418.96	437.26	J27 22	702.83	626.62	580.39	(95)
Monthly average ext	ernal temperatur	1	1		1						·	
	4.30 4.90	6.50	8.90	11.70	14.60	16.60	11.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for me		T				•	\sim				·	
	26.38 1587.02	1448.52	1219.35	943.27	636.04	422 59	143.29	686.64	1029.01	1349.60	1620.10	(97)
Space heating requir		1	i		m	~						
74	17.52 554.46	432.62	221.34	82.61	0.00	0.00	0.00	0.00	242.67	520.55	773.54	
								∑(98	8)15, 10		3575.32	(98)
Space heating requir	ement kWh/m²/y	ear							(98) -	÷ (4)	41.33	(99)
9a. Energy requirer	nents - individual	1										
Space heating		heating sys	stems inclu	iding micro	-CHP							
		heating sys	stems inclu	iding micro	-СНР							
Fraction of space he	at from secondary			SY							0.00	(201)
Fraction of space here Fraction of space here		/suppleme		SY					1 - (20)1) =	0.00	(201) (202)
Fraction of space he	at from main syste	/suppleme em(s)		SY					1 - (20	01) =	1.00	(202)
Fraction of space here Fraction of space here	at from main syste	y/suppleme em(s) em 2		SY				(20			1.00	(202) (202)
Fraction of space he Fraction of space he Fraction of total space	at from main syste at from main syste ce heat from main	r/suppleme em(s) em 2 systen, 1		SY				(20	02) x [1- (20	3)] =	1.00 0.00 1.00	(202) (202) (204)
Fraction of space here Fraction of space here Fraction of total space Fraction of total space	at from main syste at from main syste ce heat from main ce heat from main	r/suppleme em(s) em 2 systen, 1		SY				(20		3)] =	1.00 0.00 1.00 0.00	(202) (202) (204) (205)
Fraction of space here Fraction of space here Fraction of total space Fraction of total space Efficiency of main sy	at from main syste at from main syste ce heat from main ce heat from main stem 1 (%)	r/suppleme em(s) em 2 systen, 1	ntary sy te	table 11	.)	Jul	Aug)2) x [1- (20) (202) x (20	3)] =	1.00 0.00 1.00	(202) (202) (204)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy	at from main syste at from main syste ce heat from main ce heat from main stem 1 (%) Jan Fro	em(s) em 2 system 1 system 2 Mar		SY		Jul	Aug	(20 Sep	02) x [1- (20	3)] =)3) =	1.00 0.00 1.00 0.00 93.50	(202) (202) (204) (205)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r	at from main syste at from main syste ce heat from main se heat from main stem 1 (%) Jan Fr.s nain system 1, kV	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month	ntary sy te	May	.) Jun		-	Sep	02) x [1- (203 (202) x (20 Oct	3)] =)3) = Nov	1.00 0.00 1.00 0.00 93.50 Dec	(202) (202) (204) (205)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r	at from main syste at from main syste ce heat from main ce heat from main stem 1 (%) Jan Fro	em(s) em 2 system 1 system 2 Mar	ntary sy te	table 11	.)	Jul 0.00	Aug 0.00	Sep	02) x [1- (203 (202) x (20 Oct 259.55	3)] =)3) = Nov 556.73	1.00 0.00 1.00 93.50 Dec 827.32	(202) (202) (204) (205) (206)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 75	at from main syste at from main syste ce heat from main se heat from main stem 1 (%) Jan Fr.s nain system 1, kV	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month	ntary sy te	May	.) Jun		-	Sep	02) x [1- (203 (202) x (20 Oct	3)] =)3) = Nov 556.73	1.00 0.00 1.00 0.00 93.50 Dec	(202) (202) (204) (205)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating	at from main syste at from main syste ce heat from main stem 1 (%) Jan Fr.s nain system 1,, kV 29.49 593.01	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month	ntary sy te	May	.) Jun		-	Sep	02) x [1- (203 (202) x (20 Oct 259.55	3)] =)3) = Nov 556.73	1.00 0.00 1.00 93.50 Dec 827.32	(202) (202) (204) (205) (206)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h	at from main syste at from main syste ce heat from main stem 1 (%) Jan Fro nain system 1), kV 09.49 593.01	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month 462.69	Apr 236.73	May 88.35	.) Jun 0.00	0.00	0.00	Sep 0.00 Σ(21:	02) x [1- (203 (202) x (20 Oct 259.55 1)15, 10	3)] =)3) = Nov 556.73 12 =	1.00 0.00 1.00 93.50 Dec 827.32 3823.87	(202) (202) (204) (205) (206)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h	at from main syste at from main syste ce heat from main stem 1 (%) Jan Fr.3 nain system 1), kV 29.49 593.01 eater 8.18 87.85	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month	ntary syste	May	.) Jun		-	Sep	02) x [1- (203 (202) x (20 Oct 259.55	3)] =)3) = Nov 556.73	1.00 0.00 1.00 93.50 Dec 827.32	(202) (202) (204) (205) (206)
Fraction of space here Fraction of space here Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h 8 Water heating fuel, l	at from main syste at from main syste at from main syste at from main se heat from main stem 1 (%) Jan Fro nain system 1), kV 29.49 593.01 eater 8.18 87.85 sWh/month	/supplemen em(s) em 2 system 1 system 2 Mar Vh/month 462.69	Apr 236.73	May 88.35	.) Jun 0.00	0.00	0.00	Sep 0.00 Σ(21:	02) x [1- (203 (202) x (20 Oct 259.55 1)15, 10	3)] =)3) = Nov 556.73 12 =	1.00 0.00 1.00 93.50 Dec 827.32 3823.87	(202) (202) (204) (205) (206)
Fraction of space here Fraction of space here Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h 8 Water heating fuel, l	at from main syste at from main syste ce heat from main stem 1 (%) Jan Fro nain system 1), kV 09.49 593.01 eater 8.18 87.85 cWh/month	/supplemener em(s) em 2 system 2 Mar Vh/month 462.69	Apr 236.73 85.87	May 88.35 83.38) Jun 0.00 79.80	0.00 79.80	0.00	Sep 0.00 Σ(21: 79.80)2) x [1- (203 (202) x (20 Oct 259.55 1)15, 10 86.02 179.43	3)] =)3) = Nov 556.73 12 = 87.67 188.31	1.00 0.00 1.00 0.00 93.50 Dec 827.32 3823.87 888.29 201.49	(202) (202) (204) (205) (206)
Fraction of space here Fraction of space here Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h 8 Water heating fuel, l	at from main syste at from main syste at from main syste at from main se heat from main stem 1 (%) Jan Fro nain system 1), kV 29.49 593.01 eater 8.18 87.85 sWh/month	/supplemener em(s) em 2 system 2 Mar Vh/month 462.69	Apr 236.73 85.87	May 88.35 83.38) Jun 0.00 79.80	0.00 79.80	0.00	Sep 0.00 Σ(21: 79.80	02) x [1- (203 (202) x (20 Oct 259.55 1)15, 10 86.02	3)] =)3) = Nov 556.73 12 = 87.67 188.31	1.00 0.00 1.00 93.50 Dec 827.32 3823.87 88.29	(202) (202) (204) (205) (206) (211)
Fraction of space her Fraction of space her Fraction of total space Fraction of total space Efficiency of main sy Space heating fuel (r 79 Water heating Efficiency of water h 8 Water heating fuel, l	eater 81 from main system 91 from main system 92 heat from main 93 heat from main 94 from main 95 heat from main 96 heat from main 97 heat from main 98 heat from main 99 heat from main 90 heat from main 91 heat from main 92 heat from main 93 heat from main 94 heat from main	/supplemener em(s) em 2 system 2 Mar Vh/month 462.69	Apr 236.73 85.87	May 88.35 83.38) Jun 0.00 79.80	0.00 79.80	0.00	Sep 0.00 Σ(21: 79.80)2) x [1- (203 (202) x (20 Oct 259.55 1)15, 10 86.02 179.43	3)] =)3) = Nov 556.73 12 = 87.67 188.31 12 =	1.00 0.00 1.00 0.00 93.50 Dec 827.32 3823.87 888.29 201.49	(202) (202) (204) (205) (206) (211)

Water heating fuel	2149.1	2
Electricity for pumps, fans and electric keep-hot (Table 4f)		
central heating pump or water pump within warm air heating unit	30.00	(230c)
boiler flue fan	45.00	(230e)
Total electricity for the above, kWh/year	75.00	
Electricity for lighting (Appendix L)	366.0	
Total delivered energy for all uses	(211)(221) + (231) + (232)(237b) = 6414.0	
10a. Fuel costs - individual heating systems including micro-CHP		
	uel Fuel price Fuel /year cost £/y	
Space heating - main system 1 382	x 0.01 = 133.0	7 (240)
Water heating 214	9.12 x 3.48 x 0.01 = 74.79	(247)
Pumps and fans 75	x 13.19 x 0.01 = 9.89	(249)
Electricity for lighting 36	6.04 x 13.19 x 0.01 = 48.28	3 (250)
Additional standing charges	120.0	0 (251)
Total energy cost	(240)(242) + (2-5)(754) = 386.0	3 (255)
11a. SAP rating - individual heating systems including micro-CHP		
Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF)	1.23	(257)
SAP value	82.80)
SAP rating (section 13)	83	(258)
SAP band	В	
12a. CO₂ emissions - individual heating systems including micro-CHP		
	erg Emission factor Emissio	ons
	/year kg CO ₂ /kWh kg CO ₂ /y	-
Space heating - main system 1 382	3.87 x 0.216 = 825.9	6 (261)
	9.12 x 0.216 = 464.2	1 (264)
Water heating Space and water heating	19.12 x 0.216 = 464.2	.7 (265)
Water heating Space and water heating Pumps and fans	$\begin{array}{c} 19.12 \\ (261) + (262) + (263) + (264) = \\ 1290.1 \\ \end{array}$.7 (265)
Water heating Space and water heating Pumps and fans Electricity for lighting	$\begin{array}{c} 19.12 \\ 0.216 \\ (261) + (262) + (263) + (264) = \\ 1290.1 \\ 0.00 \\ x \\ 0.519 \\ 0$.7 (265) 3 (267) 7 (268)
Water heating Space and water heating Pumps and fans Electricity for lighting	y9.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.1 0.00 x 0.519 = 38.92 6.04 x 0.519 = 189.9	.7 (265) 3 (267) 7 (268) 17 (272)
Water heating Space and water heating Pumps and fans Electricity for lighting	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	7 (265) 3 (267) 7 (268) 17 (272) 5 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	7 (265) 3 (267) 7 (268) 17 (272) 5 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$.7 (265) .3 (267) .7 (268) .7 (272) .5 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$.7 (265) .3 (267) .7 (268) .7 (272) .5 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP	99.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.00 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B B 84.52	.7 (265) .267) (267) .268) (272) .27 (272) .27 (273) .27 (274)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP Energy	99.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 0.00 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B B 84.52 Wh/year Primary factor Primary E	.7 (265) 3 (267) 7 (268) 17 (272) 5 (273) 2 (274) . (274) . (274) . (274) . (274)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP En kWh Space heating - main system 1 382	9.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.1 6.00 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 85 B 84.52 85 8387 x 1.22 $=$ 4665.1	(265) (267) (268) (268) (272) (273) (273) (274) (274) (274) (274)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP En kWh Space heating - main system 1 Water heating 214	9.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.00 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B 84.52 85 83.87 x 1.22 = 4665.3 9.12 x 1.22 = 2621.5	.7 (265) .267) (267) 7 (268) 17 (272) .2 (273) .2 (274) .2 (261) .3 (264)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP En kWh Space heating - main system 1 Water heating Space and water heating	9.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.04 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 85 85 85 85 85 85 81 1.22 $=$ 4665.3 9.12 x 1.22 $=$ 2621.6 $(261) + (262) + (263) + (264) =$ 7287.0	(265) (267) (268) (268) (272) (273) (273) (274) (274) (274) (274) (274) (265) (265)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP Enkwh Space heating - main system 1 Water heating Space and water heating Pumps and fans 75	99.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.04 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B B 84.52 85 85 85 B 84.52 85 87 1.22 $=$ 4665.3 9.12 x 1.22 $=$ 2621.6 $(261) + (262) + (263) + (264) =$ 7287.0 7287.0 6.00 x 3.07 $=$ 230.2	(265) (267) (268) (268) (272) (272) (273) (273) (273) (274) (274) (274) (274) (274) (274) (274) (274) (275) (274) (275) (275) (276) (273) (272) (273) (273) (273) (273) (273) (273) (274) (274) (274) (275) (275) (275) (275) (276) (277) (2
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO2, kg/year Dwelling CO2 emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP Enk KWh Space heating - main system 1 Water heating Space and water heating Pumps and fans Pumps and fans Total CO2, for lighting	9.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.04 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B 84.52 85 89.12 x 1.22 2621.5 $(261) + (262) + (263) + (264) =$ 7287.6 7287.6 6.04 x 3.07 $=$ 1123.7	.7 (265) .7 (267) 7 (268) .7 (272) .6 (273) .2 (274) .2 (261) .3 (264) .5 (265) .5 (267) .4 (268)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including micro-CHP En kWh Space heating - main system 1 Water heating Space and water heating Pumps and fans 75	99.12 x 0.216 = 464.2 $(261) + (262) + (263) + (264) =$ 1290.3 6.04 x 0.519 = 38.93 6.04 x 0.519 = 189.9 $(265)(271) =$ 1519.0 $(272) \div (4) =$ 17.56 84.52 85 85 B B 84.52 85 85 85 B 84.52 85 87 1.22 $=$ 4665.3 9.12 x 1.22 $=$ 2621.6 $(261) + (262) + (263) + (264) =$ 7287.0 7287.0 6.00 x 3.07 $=$ 230.2	.7 (265) .7 (267) .7 (268) .7 (272) .2 (273) .2 (274) .2 (261) .3 (264) .5 (265) .5 (267) .4 (268) .4 (272)



Assessor name	Miss Alicja	Kreglewsk	ka				As	sessor numl	ber	4134		
Client							La	st modified		13/06	5/2018	
Address	A 5 04 Inge	estre Road	, London,	NW5 1XE								
1. Overall dwelling dimen	sions			_	())							
				А	area (m²)			age storey ight (m)		Vo	olume (m³)	
Lowest occupied					72.67	(1a) x		2.50	(2a) =		181.68	(3a)
Total floor area	(1a) +	(1b) + (1c) + (1d)(1n) =	72.67	(4)						
Dwelling volume							(3a)	+ (3b) + (3c) + (3d)(3	in) =	181.68	(5)
2. Ventilation rate												
										m	³ per hour	
Number of chimneys								0	x 40 =		0	(6a)
Number of open flues								0	x 20 =		0	(6b)
Number of intermittent fan	S							2	x 10 =		20	(7a)
Number of passive vents								0	x 10 =		0	(7b)
Number of flueless gas fires	5							0	x 40 =		0	(7c)
										Air	changes per	
La file at an all a standard and	()					-) - (71-) - (20	. (5)		hour	
Infiltration due to chimneys If a pressurisation test has I			tondod r		(+ (6b) + (7a))		· ·	20	÷ (5) =		0.11	(8)
Air permeability value, q50,								0 (10)			4.00	(17)
If based on air permeability											0.31	(17)
Number of sides on which t					30 (10) (11						3	(19)
Shelter factor			-					1 -	[0.075 x (19	9)] =	0.78	(20)
Infiltration rate incorporation	ng shelter fac	ctor							(18) x (2		0.24	
Infiltration rate modified fo									(- /)	- /		(21)
												(21)
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(21)
Jan Monthly average wind spee	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(21)
	Feb	Mar	Apr 4.40	May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep	Oct 4.30	Nov 4.50	Dec	(21)
Monthly average wind spee	Feb ed from Table	Mar e U2					-					1
Monthly average wind spee	Feb ed from Table	Mar e U2					-					1
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4	Feb ed from Table 5.00 1.25	Mar e U2 4.90 1.23	4.40	4.30	0.95	3.80	3.70	4.00	4.30	4.50	4.70] (22)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28	Feb ed from Table 5.00 1.25	Mar e U2 4.90 1.23	4.40	4.30	0.95	3.80	3.70	4.00	4.30	4.50	4.70] (22)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30	Mar e U2 4.90 1.23 helter and 0.29	4.40 1.10 wind fact 0.26	4.30 1.08 or) (21) x (2	3.80 0.95 22a)m	3.80	3.70 0.93	4.00	4.30	4.50	4.70] (22)] (22a)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.31	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30 ge rate for th	Mar e U2 4.90 1.23 helter and 0.29 he applicab	4.40 1.10 wind fact 0.26 lle case:	4.30 1.08 or) (21) x (2 0.26	3.80 0.95 22a)m	3.80	3.70 0.93	4.00	4.30	4.50	4.70] (22)] (22a)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.31 Calculate effective air changed	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30 ge rate for th n: air change	Mar e U2 4.90 1.23 helter and 0.29 he applicab rate throug	4.40 1.10 wind fact 0.26 lle case: gh systen	4.30 1.08 or) (21) x (2 0.26	3.80 0.95 22a)m 0.23	3.80 0.95 0.23	3.70 0.93	4.00	4.30	4.50	4.70 1.18 0.28] (22)] (22a)] (22b)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.31 Calculate effective air chang If mechanical ventilation	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30 ge rate for th h: air change covery: efficient	Mar e U2 4.90 1.23 helter and 0.29 he applicab rate through ency in % a	4.40 1.10 wind fact 0.26 le case: gh systen allowing f	4.30 1.08 or) (21) x (2 0.26 n or in-use fa	3.80 0.95 22a)m 0.23	3.80 0.95 0.23	3.70 0.93	4.00	4.30	4.50	4.70 1.18 0.28 N/A] (22)] (22a)] (22b)] (23a)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.31 Calculate effective air chang If mechanical ventilation If balanced with heat read d) natural ventilation or 0.55	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30 ge rate for th h: air change covery: efficie whole house 0.55	Mar 2 U2 4.90 1.23 helter and 0.29 he applicab rate through ency in % a 2 positive in 0.54	4.40 1.10 wind fact 0.26 le case: gh system allowing f nput vent 0.53	4.30 1.08 or) (21) x (2 0.26 or in-use fa ilation from 0.53	3.80 0.95 22a)m 0.23	3.80 0.95 0.23	3.70 0.93	4.00	4.30	4.50	4.70 1.18 0.28 N/A] (22)] (22a)] (22b)] (23a)
Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.31 Calculate effective air change If mechanical ventilation If balanced with heat read d) natural ventilation or	Feb ed from Table 5.00 1.25 Ilowing for sh 0.30 ge rate for th h: air change covery: efficie whole house 0.55	Mar 2 U2 4.90 1.23 helter and 0.29 he applicab rate through ency in % a 2 positive in 0.54	4.40 1.10 wind fact 0.26 le case: gh system allowing f nput vent 0.53	4.30 1.08 or) (21) x (2 0.26 or in-use fa ilation from 0.53	3.80 0.95 22a)m 0.23 	3.80 0.95 0.23	3.70 0.93 0.22	4.00	4.30	4.50 1.13 0.27	 4.70 1.18 0.28 N/A N/A] (22)] (22a)] (22b)] (22b)] (23a)] (23c)



3. Heat losses a	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U W/		/alue, /m².K	Ахк, kJ/K	
Window						25.	07 x	1.24	= 30.98				(27)
External wall						30.	28 x	0.18	= 5.45				(29a)
Party wall						38.	70 x	0.00	= 0.00				(32)
Roof						72.	67 x	0.12	= 8.72				(30)
Total area of ext	ernal eleme	ents ∑A, m²				128	.02						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26))(30) + (3	32) =	45.15	(33)
Heat capacity Cr	n = ∑(А x к)							(28)	.(30) + (32) +	(32a)(3	2e) =	N/A	(34)
Thermal mass pa	arameter (T	MP) in kJ/n	n²K									250.00	(35)
Thermal bridges	: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								17.76	(36)
Total fabric heat	loss									(33) + (3	36) =	62.91	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	32.79	32.68	32.57	32.07	31.98	31.54	31.54	31.46	31.71	31.98	32.17	32.37	(38)
Heat transfer co	efficient, W	//K (37)m +	- (38)m										
	95.70	95.59	95.48	94.98	94.88	94.44	94.44	94.36	94.61	94.88	95.07	95.27	
									Average = ∑	39)112/	/12 =	94.98	(39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)										
	1.32	1.32	1.31	1.31	1.31	1.30	1.30	1.30	1.30	1.31	1.31	1.31]
									Average = \sum	40)112/	/12 =	1.31	(40)
Number of days	in month (1	Fable 1a)											_
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heatin	ng energy r	equiremen	t										
Assumed occupa	ancy, N											2.31	(42)
Annual average	hot water u	isage in litre	es per day '	Vd,average	= (25 x N) +	36						89.04	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	in litres pe	r day for ea	ich month	Vd,m = fact	tor from Tab	le 1c x (43)						_
	97.95	94.39	90.82	87.26	83.70	80.14	80.14	83.70	87.26	90.82	94.39	97.95	
										∑(44)1	.12 =	1068.51	(44)
Energy content of	of hot wate	r used = 4.1	.8 x Vd,m x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1b	o, 1c 1d)					_
	145.25	127.04	131.09	114.29	109.66	94.63	87.69	100.63	101.83	118.67	129.54	140.67	
Distribution loss	0.15 x (45))m								∑(45)1	.12 =	1400.99	(45)
	21.79	19.06	19.66	17.14	16.45	14.19	13.15	15.09	15.27	17.80	19.43	21.10	(46)
Storage volume					e within sam				-			2.00	(47)
Water storage lo		· ·											_ • •
b) Manufacturer	's declared	loss factor	is not knov	vn									
Hot water sto	orage loss fa	actor from	Table 2 (kV	Vh/litre/day	y)							0.02	(51)
Volume facto	or from Tab	le 2a										3.91	(52)
Temperature	factor fron	n Table 2b										1.00	(53)
Energy lost fr	rom water s	torage (kW	'h/day) (47	7) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54) in (55)											0.12	(55)
Water storage lo	oss calculate	ed for each	month (55	5) x (41)m									_
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit l				5.57	3.05	5.57	5.05	5.05	5.57	5.05	5.57	5.05	
· · · · · · · · · · · · · · · · · · ·	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e					25.20	22.51	25.20	25.20	22.51	25.20	22.51	23.20	_ (55)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total boat roqui					1 1		1	1		0.00	0.00	0.00	
Total heat requi		-		1				1					
	172.20	151.38	158.04	140.37	136.61	120.71	114.64	127.57	127.91	145.62	155.62	167.62	(62)
Solar DHW inpu		<u> </u>			1 1		1	1				1	۰
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	ater heater f	or each mo	nth (kWh/	month) (62	2)m + (63)m			_					-
	172.20	151.38	158.04	140.37	136.61	120.71	114.64	127.57	127.91	145.62	155.62	167.62	
										∑(64)1	.12 =	1718.28	(64)
Heat gains from	water heat	ing (kWh/m	nonth) 0.2	5 × [0.85 ×	(45)m + (61))m] + 0.8 >	< [(46)m +	(57)m + (59)m]				_
	69.85	61.71	65.15	58.86	58.02	52.33	50.72	55.02	54.72	61.02	63.93	68.33	(65)
5. Internal gai	26												
J. Internal gan		Feb	Mar	Apr	May	lun	I.I.	Aug	For	Oct	Nov	Dec	
Matabalia gaina	Jan	rep	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains		445.46	445.46	445.46	445.46	445.46	145.46	145.46	445.46	445.46	115.10	445.46	
	115.46	115.46	115.46	115.46	115.46	115.46	115.46	115.46	115.46	115.46	115.46	115.46	(66)
Lighting gains (o			-						1		1	1	٦
	18.14	16.11	13.10	9.92	7.41	6.26	6.76	8.79	11.80	14.98	17.49	18.64	(67)
Appliance gains	(calculated		-	1	13a), also se	e Table 5		_	_		1	1	-
	203.45	205.56	200.24	188.91	174.62	161.18	152.20	150.09	155.41	166.74	181.03	194.47	(68)
Cooking gains (o	calculated in	Appendix I	., equation	L15 or L15	a), also see	Table 5							_
	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.55	(69)
Pump and fan g	ains (Table !	5a)											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap	oration (Tal	ole 5)											
	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	-92.37	(71)
Water heating g	gains (Table	5)											
	93.89	91.83	87.56	81.76	77.99	72.68	68.17	73.95	76.00	82.01	88.80	91.84	(72)
Total internal ga	ains (66)m +	+ (67)m + (6	8)m + (69)	m + (70)m	+ (71)m + (7	72)m							
	373.11	371.14	358.54	338.22	317.65	297.75	284.77	290.47	300.85	321.37	344.96	362.59	(73)
													_
6. Solar gains						_							
			Access f Table		Area m²		lar flux V/m²		g cific data	FF specific c	lata	Gains W	
			Table	ou		v	v/111	•	able 6b	or Table		vv	
SouthEast			0.7	7 X	13.39	x	36.79	(0.9 x	0.63 x	0.80		172.08	(77)
NorthWest			0.7		6.14				0.63 x		= [24.20	(81)
NorthEast			0.7		3.44				0.63 x			13.56	(75)
SouthWest			0.7		2.10				0.63 x			26.99	(79)
Solar gains in w	atte 5(71)m	(97)m	0.7		2.10		50.79		0.03	0.80	= [20.99	_ (75)
	236.82	415.93	602.40	802.23	949.52	965.07	921.10	807.79	671.06	468.67	285.93	201.19	(83)
Total gains int		II		802.23	949.52	905.07	921.10	807.79	071.00	408.07	285.93	201.19	_ (83)
Total gains - inte				4440	4267 1-	4000.00	4205.0-	4000.05	074.04	700.00	c20.00	F 60 -0	
	609.93	787.06	960.93	1140.45	1267.17	1262.82	1205.87	1098.25	971.91	790.03	630.89	563.78	(84)
7. Mean interr	nal t <u>empera</u>	ture <u>(heatir</u>	ng s <u>eason)</u>										
Temperature du	-			area from T	able 9. Th1	(°C)						21.00	(85)
					-,=								1 1 1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for	or living are	a n1,m (see	e Table 9a)									
0.99	0.98	0.93	0.82	0.65	0.47	0.34	0.39	0.63	0.90	0.98	0.99	(86)
Mean internal temp of livin	g area T1 (s	-			1				1	1	1	1
19.75	20.03	20.39	20.73	20.92	20.99	21.00	21.00	20.95	20.65	20.12	19.69	(87)
Temperature during heating					1	1	1		1	1	1	1
19.83	19.83	19.83	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.83	19.83	(88)
Utilisation factor for gains for							1		1		1	1
0.99	0.97	0.91	0.78	0.58	0.39	0.25	0.29	0.54	0.86	0.97	0.99	(89)
Mean internal temperature		of dwelling		steps 3 to	1	1			I	1	1	1
18.21	18.61	19.10	19.56	19.77	19.83	19.84	19.84	19.81	19.47	18.74	18.12] (90)
Living area fraction								Liv	ving area ÷	(4) =	0.39	(91)
Mean internal temperature	for the who		; fLA x T1 +(1 - fLA) x						1	1	1
18.82	19.17	19.61	20.02	20.23	20.29	20.30	20.30	20.26	19.94	19.28	18.74	(92)
Apply adjustment to the me						1	1			1	i	1
18.82	19.17	19.61	20.02	20.23	20.29	20.30	20.30	20.26	19.94	19.28	18.74	(93)
8. Space heating requirem	ent											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, I	յՠ											
0.99	0.96	0.91	0.79	0.61	0.42	0.29	0.33	0.57	0.86	0.97	0.99	(94)
Useful gains, ηmGm, W (94)m x (84)m											
601.52	757.92	872.98	897.35	767.58	530.82	348.18	365.89	558.49	681.99	612.00	558.05	(95)
Monthly average external to	emperature	from Table	e U1									
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean inte	rnal tempe	rature, Lm,	W [(39)m	x [(93)m -	(96)m]							
1389.12	1363.88	1251.59	1056.36	809.08	537.12	349.05	367.55	582.55	885.91	1158.11	1385.37	(97)
Space heating requirement,	kWh/mont	h 0.024 x [(97)m - (95)m] x (41)	m							
585.97	407.20	281.69	114.49	30.88	0.00	0.00	0.00	0.00	151.71	393.20	615.52]
								∑(98	8)15, 10	.12 = 2	580.66	(98)
Space heating requirement	kWh/m²/ye	ar							(98)	÷ (4)	35.51	(99)
Oh Franziscomanta		, hooting of	home									
9b. Energy requirements -				/+= = 11	• •				101 :6		0.00	(201)
Fraction of space heat from			tary system	i (table 11	L)				'0' if i		0.00	(301)
Fraction of space heat from		•							1 - (3	01) = [1.00	(302)
Fraction of community heat									(202) (20	2-)	1.00	(303a)
Fraction of total space heat		-			h + ¹				(302) x (30	3a) =	1.00	(304a)
Factor for control and charg					ace neating						1.00	(305)
Factor for charging method				-							1.00	(305a)
Distribution loss factor (Tab	le 12c) for c	community	heating sys	tem							1.05	(306)
Space heating												
Annual space heating requi	rement						2	580.66]			(98)
Space heat from boilers									」 x (305) x (3	06) = 🖂	2709.69	(307a)
							(50	, , , , , , , , , , , , , , , , , , ,	. (505) × (5] (3074)
Water heating												
Annual water heating requi	rement						1	718.28]			(64)
Water heat from boilers							(64)	x (303a) x	(305a) x (3	06) = 1	804.19	(310a)

Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(310e)] =	45.14 (313)
Electricity for pumps, fans and electric keep-hot (Table 4f)			
Total electricity for the above, kWh/year			0.00 (331)
Electricity for lighting (Appendix L)			320.31 (332)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	
10b. Fuel costs - community heating scheme	Fuel	Fuel price	Fuel
	kWh/year		cost £/year
Space heating from boilers	2709.69	x 4.24 x 0.01 =	114.89 (340a
Water heating from boilers	1804.19	x 4.24 x 0.01 =	76.50 (342a
Electricity for lighting	320.31	x 13.19 x 0.01 =	42.25 (350)
Additional standing charges			120.00 (351)
Total energy cost		(340a)(342e) + (345)(354) =	353.64 (355)
11b. SAP rating - community heating scheme			
Energy cost deflator (Table 12)			0.42 (356)
Energy cost factor (ECF)			1.26 (357)
SAP value			82.39
SAP rating (section 13)			82 (358)
SAP band			В
12b. CO ₂ emissions - community heating scheme			
	Energy	Emission factor	Emissions
	kWh/year		(kg/year)
Emissions from other sources (space heating)			
Efficiency of boilers	89.50		(367;
CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) =			
$(30/a)+(310a)] \times 100 \div (30/a) =$	5043.45	x 0.216 =	1089.38 (367)
Electrical energy for community heat distribution $(307a) + (310a) = (307a) + (310a) + (310a) = (307a) + (310a) + (310a) = (307a) + (310a) + (310a) + (310a) = (307a) + (310a) + (310a$	45.14	x 0.216 = x 0.519 =	1089.38 (367) 23.43 (372)
Electrical energy for community heat distribution			23.43 (372)
Electrical energy for community heat distribution Total CO2 associated with community systems			23.43 (372) 1112.81 (373)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating	45.14	x 0.519 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting	45.14	x 0.519 = x 0.519 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year	45.14	x 0.519 = x 0.519 = (376)(382) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate	45.14	x 0.519 = x 0.519 = (376)(382) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	45.14	x 0.519 = x 0.519 = (376)(382) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (372)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	45.14	x 0.519 = x 0.519 = (376)(382) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	45.14 320.31 Energy	x 0.519 = x 0.519 = (376)(382) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B Primary energy
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme	45.14	x 0.519 = x 0.519 = $(376)(382) =$ $(383) \div (4) =$	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (385)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating)	45.14 320.31 Energy kWh/year	x 0.519 = x 0.519 = $(376)(382) =$ $(383) \div (4) =$	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B Primary energy (kWh/year) (kWh/year)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers	45.14 320.31 Energy kWh/year 89.50	x 0.519 = x 0.519 = (376)(382) = (383) ÷ (4) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B B Primary energy (kWh/year) (367a)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) =	45.14 320.31 Energy kWh/year 89.50 5043.45	x 0.519 = x 0.519 = (376)(382) = (383) ÷ (4) = Primary factor x 1.22 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367) (kWh/year) (367) (367) (367)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution	45.14 320.31 Energy kWh/year 89.50	x 0.519 = x 0.519 = (376)(382) = (383) ÷ (4) =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367) (kWh/year) (367) (138.58 (372)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution Total primary energy associated with community systems	45.14 320.31 Energy kWh/year 89.50 5043.45	x 0.519 = x 0.519 = (376)(382) = (383) ÷ (4) = Primary factor x 1.22 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367a) (kWh/year) (367a) 6153.00 (367) 138.58 (372) 6291.58 (373)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution Total primary energy associated with community systems Total primary energy associated with space and water heating	45.14 320.31 Energy kWh/year 89.50 5043.45 45.14	x 0.519 = x 0.519 = (376).(382) = (383) \div (4) = y (383) \div (4) = x 1.22 = x 3.07 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367a) (kWh/year) (367a) (138.58 (372) 6291.58 (376)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution Total primary energy associated with community systems Total primary energy associated with space and water heating Electricity for lighting	45.14 320.31 Energy kWh/year 89.50 5043.45	x 0.519 = x 0.519 = (376)(382) = (383) ÷ (4) = Primary factor x 1.22 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367a) (kWh/year) (367a) 6153.00 (367) 138.58 (372) 6291.58 (373) 6291.58 (376) 983.36 (379)
Electrical energy for community heat distribution Total CO2 associated with community systems Total CO2 associated with space and water heating Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13b. Primary energy - community heating scheme Primary energy from other sources (space heating) Efficiency of boilers Primary energy from boilers [(307a)+(310a)] x 100 ÷ (367a) = Electrical energy for community heat distribution Total primary energy associated with community systems Total primary energy associated with space and water heating	45.14 320.31 Energy kWh/year 89.50 5043.45 45.14	x 0.519 = x 0.519 = (376).(382) = (383) \div (4) = y (383) \div (4) = x 1.22 = x 3.07 =	23.43 (372) 1112.81 (373) 1112.81 (376) 166.24 (379) 1279.05 (383) 17.60 (384) 85.43 (385) B (367a) (kWh/year) (367a) (138.58 (372) 6291.58 (376)



Assessor name	Miss Alicja Kreglev	vska				As	sessor num	ber	4134		
Client						La	st modified		13/06	/2018	
Address	A 5 04 Ingestre Ro	ad, London.	NW5 1XE								
1. Overall dwelling dimens	ions										
			А	area (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied				72.67](1a) x		2.50] (2a) =		181.68	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1n) =	72.67	(4)						
Dwelling volume						(3a)	+ (3b) + (3	c) + (3d)'á	8n) =	181.68	(5)
2. Ventilation rate											
							く		m	³ per hour	
Number of chimneys								x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent fans	5						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fires					5		0	x 40 =		0	(7c)
-				~					Air	hanges pe	r
)			1		hour	-
Infiltration due to chimneys,					a) + (7b) + (30] ÷ (5) =		0.17	(8)
If a pressurisation test has b							0 (16)				
Air permeability value, q50,						e area				5.00	(17)
If based on air permeability			s), otherwi	se (18) = (1	6)					0.42	(18)
Number of sides on which th Shelter factor	he dwelling is shelte	rea					1	[0.075 x (1		3	(19)
Infiltration rate incorporatin	a chalter factor						1 -				(20)
Infiltration rate modified for	-	d						(18) x (2	20) =	0.32	(21)
Jan	Feb Ma	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed		Арі	Ividy	Jun	301	Aug	Зер	000	NOV	Dec	
5.10	3.00 4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	300 4.90	4.40	4.30	5.80	5.80	5.70	4.00	4.30	4.50	4.70	_ (22)
1.28	1.25 1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (all					0.00	0.55	1.00	1.00	1.15	1.10	
0.41	0.40 0.39	0.35	0.35	0.31	0.31	0.30	0.32	0.35	0.36	0.38	(22b)
Calculate effective air chang			0.00	0.51	0.01	1 0.00	5.52	5.55	5.50	0.50	
If mechanical ventilation										N/A	(23a)
If balanced with heat rec	-			ctor from T	able 4h					N/A	(23c)
d) natural ventilation or v		-							L		
0.58	0.58 0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	(24d)
Effective air change rate - er				0.00			0.00	0.00	0.07	1 0.07	_ (= .0)
0.58	0.58 0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	(25)
0.50	0.00	0.00		0.00	0.00		5.00	5.00	5.57	0.07	



3. Heat losses	and heat los	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net a A, r		U-value W/m²K	A x U \		/alue, /m².K	Ахк, kJ/K	
Window						18.3	L7 X	1.33	= 24.0	9			(27)
External wall						37.2	18 x	0.18	= 6.69	Э			(29a)
Party wall						38.	70 x	0.00	= 0.00)			(32)
Roof						72.6	67 x	0.13	= 9.4	5			(30)
Total area of ex	ternal eleme	ents ∑A, m²	2			128.	02						(31)
Fabric heat loss	, W/K = ∑(A	× U)							(2	26)(30) + (32) =	40.23	(33)
Heat capacity C	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: ∑(L x Ψ) ca	alculated us	sing Appen	dix K								18.48	(36)
Total fabric hea	t loss									(33) + (36) =	58.71	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-
Ventilation hear	t loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	35.02	34.82	34.63	33.73	33.56	32.78	32.78	32.63	33.08	3.5F	33.90	34.26	(38)
Heat transfer co	oefficient, W	//K (37)m ⊦	⊦ (38)m		••	· · ·		•		JO I		-	-
	93.73	93.54	93.34	92.44	92.27	91.49	91.49	91.34	91.75	92.27	92.61	92.97	7
		•			• •	•			Avera _b e =	Σ(39)112	/12 =	92.44	(39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)										-
	1.29	1.29	1.28	1.27	1.27	1.26	1.26	1.76	1.26	1.27	1.27	1.28	7
								X	Average =	Σ(40)112,	/12 =	1.27	(40)
Number of days	s in month (1	Table 1a)					C	X İ					_
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
		·	•	•	• •					·	•	·	
4. Water heati	ing energy r	equiremen	t			-()							_
Assumed occup												2.31	(42)
Annual average	hot water u	isage in litr	es per day	Vd,average	= (25 × N) +	36						89.04	(43)
	Jan	Feb	Mar	Apr	Mut	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	-	-				le 1c x (43)		1	1				_
	97.95	94.39	90.82	87.26	83.70	80.14	80.14	83.70	87.26	90.82	94.39	97.95	
				U'						∑(44)1	.12 =	1068.51	(44)
Energy content	of hot wate	r used = 4.2			3600 kWh/m	onth (see 1	ables 1b,	1c 1d)					_
	145.25	127.04	151.0.	114.29	109.66	94.63	87.69	100.63	101.83	118.67	129.54	140.67	
		7								∑(45)1	.12 =	1400.99	(45)
Distribution los	s 0.15 x (45)												_
	21.79	1 06	19.66	17.14	16.45	14.19	13.15	15.09	15.27	17.80	19.43	21.10	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	/HRS storag	ge within sam	ne vessel						2.00	(47)
Water storage I	OSS:												_
a) If manufactu	rer's declare	d loss facto	or is known	(kWh/day))							0.24	(48)
Temperature	e factor fron	n Table 2b										0.54	(49)
Energy lost f	rom water s	storage (kW	/h/day) (48	3) x (49)								0.13	(50)
Enter (50) or (54	4) in (55)											0.13	(55)
Water storage I	oss calculate	ed for each	month (5	5) x (41)m									
				, , ,									
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
If the vessel cor	4.00	3.61	4.00	3.87	I I			1	3.87	4.00	3.87	4.00	(56)
-	4.00	3.61	4.00	3.87	I I			1	3.87 3.87	4.00	3.87	4.00	(56) (57)

													_
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	each month	from Table	3a, 3b or 3	С									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requ	ired for wat	er heating o	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)r	n + (59)m +	(61)m				_
	172.51	151.66	158.35	140.67	136.92	121.01	114.95	127.89	128.21	145.93	155.92	167.93	(62)
Solar DHW inpu	ut calculated	using Appe	endix G or A	Appendix H									_
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa	ater heater f	or each mo	onth (kWh/i	month) (62	2)m + (63)m	1							
	172.51	151.66	158.35	140.67	136.92	121.01	114.95	127.89	128.21	145.93	155.92	167.93]
										∑(64)1	12 = 1	721.95	(64)
Heat gains from	n water heat	ing (kWh/n	nonth) 0.2	5 × [0.85 ×	(45)m + (61	.)m] + 0.8 ×	[(46)m + (5	57)m + (59)	m]				
	70.10	61.94	65.40	59.11	58.27	52.57	50.96	55.27	54.96	61.27	64.18	68.58	(65)
5. Internal gai	ns												
	lan	E . I.		-									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains		FeD	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains		Feb 115.46	Mar 115.46	Apr 115.46	May 115.46	Jun 115.46	Jul 115.46	Aug 115.46	Sep 115.46	Oct	Nov 115.46	Dec 115.46] <mark>(66)</mark>
Metabolic gains	s (Table 5)	115.46	115.46	115.46	115.46	115.46				6	-] (66)
C C	s (Table 5)	115.46	115.46	115.46	115.46	115.46				6	-] (66)] (67)
C C	s (Table 5) 115.46 calculated in 18.14	115.46 Appendix 1 16.11	115.46 L, equation 13.10	115.46 L9 or L9a), 9.92	115.46 also see Ta 7.41	115.46 able 5 6.26	115.46	115.46	115.46	11-46	115.46	115.46	, , , ,
Lighting gains (s (Table 5) 115.46 calculated in 18.14	115.46 Appendix 1 16.11	115.46 L, equation 13.10	115.46 L9 or L9a), 9.92	115.46 also see Ta 7.41	115.46 able 5 6.26	115.46	115.46	115.46	11-46	115.46	115.46	, , , ,
Lighting gains (s (Table 5) 115.46 calculated in 18.14 s (calculated 203.45	115.46 Appendix 1 16.11 in Appendi 205.56	115.46 L, equation 13.10 x L, equation 200.24	115.46 L9 or L9a), 9.92 on L13 or L1 188.91	115.46 also see Ta 7.41 13a), also se 174.62	115.46 able 5 6.26 ee Table 5 161.18	115.46 6.76	8.79	115.46 11.80	11- <i>46</i> 14.98	115.46	115.46 18.64] (67)
Lighting gains (Appliance gains	s (Table 5) 115.46 calculated in 18.14 s (calculated 203.45	115.46 Appendix 1 16.11 in Appendi 205.56	115.46 L, equation 13.10 x L, equation 200.24	115.46 L9 or L9a), 9.92 on L13 or L1 188.91	115.46 also see Ta 7.41 13a), also se 174.62	115.46 able 5 6.26 ee Table 5 161.18	115.46 6.76	8.79	115.46 11.80	11- <i>46</i> 14.98	115.46	115.46 18.64] (67)
Lighting gains (Appliance gains	s (Table 5) 115.46 calculated in 18.14 calculated 203.45 calculated ir 34.55	115.46 Appendix 1 16.11 in Appendi 205.56 Appendix 34.55	115.46 L, equation 13.10 x L, equation 200.24 L, equation	115.46 L9 or L9a), 9.92 on L13 or L2 188.91 L15 or L15	115.46 also see Ta 7.41 13a), also se 174.62 a), also see	115.46 able 5 6.26 ee Table 5 161.18 Table 5	115.46 6.76 152.20	115.46 8.79 150.09	115.46 11.80 155.41	11-46 14.98 166.74	115.46 17.49 181.03	115.46 18.64 194.47] (67)] (68)
Lighting gains (Appliance gains Cooking gains (s (Table 5) 115.46 calculated in 18.14 calculated 203.45 calculated ir 34.55	115.46 Appendix 1 16.11 in Appendi 205.56 Appendix 34.55	115.46 L, equation 13.10 x L, equation 200.24 L, equation	115.46 L9 or L9a), 9.92 on L13 or L2 188.91 L15 or L15	115.46 also see Ta 7.41 13a), also se 174.62 a), also see	115.46 able 5 6.26 ee Table 5 161.18 Table 5	115.46 6.76 152.20	115.46 8.79 150.09	115.46 11.80 155.41	11-46 14.98 166.74	115.46 17.49 181.03	115.46 18.64 194.47] (67)] (68)
Lighting gains (Appliance gains Cooking gains (s (Table 5) 115.46 calculated in 18.14 s (calculated 203.45 calculated ir 34.55 gains (Table 9 3.00	115.46 Appendix I 16.11 in Appendi 205.56 Appendix 34.55 5a) 3.00	115.46 L, equation x L, equation 200.24 L, equation 34.55	115.46 L9 or L9a), 9.92 on L13 or L2 188.91 L15 or L15 34.55	115.46 also see Ta 7.41 13a), also se 174.62 a), also see 34.55	115.46 able 5 6.26 ee Table 5 161.18 Table 5 34.55	115.46 6.76 152.20 34.55	115.46 8.79 150.0°	115.46 1180 155.41 34.55	11-46 14.98 166.74 34.55	115.46 17.49 181.03 34.55	115.46 18.64 194.47 34.55] (67)] (68)] (69)
Lighting gains (Appliance gains Cooking gains (Pump and fan g	s (Table 5) 115.46 calculated in 18.14 s (calculated 203.45 calculated ir 34.55 gains (Table 9 3.00	115.46 Appendix I 16.11 in Appendi 205.56 Appendix 34.55 5a) 3.00	115.46 L, equation x L, equation 200.24 L, equation 34.55	115.46 L9 or L9a), 9.92 on L13 or L2 188.91 L15 or L15 34.55	115.46 also see Ta 7.41 13a), also se 174.62 a), also see 34.55	115.46 able 5 6.26 ee Table 5 161.18 Table 5 34.55	115.46 6.76 152.20 34.55	115.46 8.79 150.0°	115.46 1180 155.41 34.55	11-46 14.98 166.74 34.55	115.46 17.49 181.03 34.55	115.46 18.64 194.47 34.55] (67)] (68)] (69)
Lighting gains (Appliance gains Cooking gains (Pump and fan g	s (Table 5) 115.46 calculated in 18.14 s (calculated 203.45 calculated in 34.55 gains (Table 9 3.00 poration (Tal -92.37	115.46 Appendix I 16.11 in Appendi 205.56 Appendix 34.55 5a) 3.00 ble 5) -92.37	115.46 L, equation 13.10 x L, equation 200.24 L, equation 34.55 3.00	115.46 L9 or L9a), 9.92 on L13 or L2 188.91 L15 or L15 34.55 3.00	115.46 also see Ta 7.41 13a), also see 174.62 a), also see 34.55 3.00	115.46 able 5 6.26 ee Table 5 161.18 Table 5 34.55 3.00	115.46 6.76 152.20 34.55	115.46 8.79 150.00 34.55 3.00	115.46 1180 155.41 34.55 3.00	11-46 14.98 166.74 34.55 3.00	115.46 17.49 181.03 34.55 3.00	115.46 18.64 194.47 34.55 3.00] (67)] (68)] (69)] (70)

 Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)r + (72)m

 376.45
 374.47
 361.87
 341.5t
 320.99
 301.09
 288.10
 293.80
 304.18

6. Solar gains			Accurs f		Area m²		Solar flux W/m ²		g specific da or Table 6		FF specific o or Table		Gains W	
SouthEast			0.7	7 x [9.71] x [36.79	x 0.9 x	0.63	×	0.70	=	109.19	(77)
NorthWest		V.	0.7	7 x	4.44	x	11.28	x 0.9 x	0.63	×	0.70	=	15.31	(81)
NorthEast		Ť	0.7	7 X	2.50	x	11.28	x 0.9 x	0.63	×	0.70	=	8.62	(75)
SouthWest			0.7	7 X	1.52	x	36.79	x 0.9 x	0.63	×	0.70	=	17.09	(79)
Solar gains in wa	tts ∑(74)m	ı(82)m												
	150.21	263.81	382.07	508.79	602.19	612.0	584.1	5 512	2.31 425	5.61	297.26	181.36	127.61	(83)
Total gains - inte	rnal and so	lar (73)m +	(83)m											
	526.66	638.28	743.94	850.35	923.18	913.1	.3 872.2	7 806	5.11 729	9.80	621.96	529.65	493.54	(84)
7. Mean interna	al tempera	ture (heatir	ng season)											
Temperature du	ring heating	g periods in	the living a	area from T	able 9, Th1	.(°C)							21.00	(85)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Α	ug Se	ep	Oct	Nov	Dec	
Utilisation factor	for gains f	or living are	a n1,m (se	e Table 9a)										

324.70

348.29

365.93 (73)

	1.00	0.99	0.97	0.91	0.79	0.61	0.45	0.51	0.76	0.95	0.99	1.00	(86)
Mean internal t	emp of livin	g area T1 (s	teps 3 to 7	in Table 90	:)								
	19.69	19.90	20.20	20.57	20.84	20.96	20.99	20.99	20.90	20.53	20.04	19.65	(87)
Temperature du	uring heatin	g periods in	the rest o	f dwelling f	rom Table 9	9, Th2(°C)			1			1	_ · ·
	19.85	19.85	19.85	19.86	19.86	19.87	19.87	19.87	19.87	19.86	19.86	19.86	(88)
Utilisation facto	or for gains f	or rest of d	welling n2,	m			1	I	1	1	1	1], ,
	0.99	0.99	0.96	0.89	0.73	0.52	0.34	0.39	0.67	0.93	0.99	1.00	(89)
Mean internal t								0.00	0.07	0.00	0.000	1.00] (00)
	18.12	18.43	18.87	19.38	19.72	19.85	19.87	19.87	19.80	19.35	18.64	18.07	(90)
Living area fract		10.45	10.07	19.50	15.72	19.05	15.07	15.67		ving area ÷	·	0.39	(91)
Mean internal t		for tho wh	olo dwollin	α fl Λ v T1 μ		- 2			LI LI	vilig alea -	(4) -	0.39] (31)
inean internart	18.74	19.01	19.39	19.85	20.16	20.29	20.31	20.31	20.23	19.81	19.19	18.69	(92)
Apply adjustma				!				20.31	20.23	19.81	19.19	18.09] (92)
Apply adjustme			-	T				20.24	20.22	10.01	10.10	10.00	
	18.74	19.01	19.39	19.85	20.16	20.29	20.31	20.31	20.23	19.81	19.19	18.69	93) (93)
8. Space heati	ng requiren	ient								C.			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Let	Nov	Dec	
Utilisation facto				•				. 6		5			
	0.99	0.98	0.96	0.89	0.75	0.55	0.39	0.44	0.70	0.92	0.98	0.99	(94)
Useful gains, ηn	L			0.05	0.75	0.55	0.55	0.44	0.0	0.52	0.50	0.55] (34)
Oserui gains, iji	522.41	626.38	710.70	753.51	690.26	503.66	337.11	35 2.72	512.11	574.81	520.82	490.50	
Monthly avorage				1	090.20	505.00	557.11	5.2.7.	513.11	574.01	520.82	490.50	95)
Monthly averag		-		1		11.00				10.00	- 10] (0.0)
	4.30	4.90	6.50	8.90	11.70	14.60	16 60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo		-								1	1	·	1
	1353.52	1319.53	1203.67	1012.19	780.59	520.49	355.63	357.16	562.86	850.20	1119.70	1347.52	(97)
Space heating r	-)		I	T	1	T	-
	618.35	465.79	366.77	186.25	67.20	0.00	0.00	0.00	0.00	204.88	431.19	637.62	
						•			∑(9)	8)15, 10		2978.05	(98)
Space heating r	equirement	kWh/m²/ye	ear		C					(98)	÷ (4)	40.98	(99)
9a. Energy req	uirements .	individual	heating sy	stems is co	diny micro	-СНР							
	unements	maividuar	neating sy			-enr							
Space heating			1	C)								0.00	
Fraction of space				ntary-syste	m (table 11)						0.00] (201)
Fraction of space										1 - (20)1) = [1.00] (202)
Fraction of space												0.00	(202)
Fraction of tota			-						(20	02) x [1- (20		1.00] (204) _
Fraction of tota			system 2							(202) x (20	03) =	0.00] (205) _
Efficiency of ma	in system 1	(%)										93.50	(206)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating for	uel (main sy	stem 1), kW	/h/month										_
	661.33	498.18	392.26	199.20	71.87	0.00	0.00	0.00	0.00	219.13	461.17	681.94	
									∑(21	1)15, 10	.12 = 🔤	3185.08	(211)
Mater heating													
Water heating													
Efficiency of wa	ter heater												
-	ter heater 87.93	87.61	86.98	85.56	83.03	79.80	79.80	79.80	79.80	85.72	87.39	88.04] (217)
-	87.93		86.98	85.56	83.03	79.80	79.80	79.80	79.80	85.72	87.39	88.04] (217)
Efficiency of wa	87.93		86.98 182.05	85.56	83.03	79.80	79.80	79.80	79.80	85.72	87.39	88.04] (217)]
Efficiency of wa	87.93 Tuel, kWh/m	onth									178.42] (217)]] (219)

Annual totals

Space heating fuel - main system 1

Water heating fuel		2036.67	
Electricity for pumps, fans and electric keep-hot (Table 4f)			
central heating pump or water pump within warm air heating unit	30.00		(230c)
boiler flue fan	45.00		(230e)
Total electricity for the above, kWh/year		75.00	(231)
Electricity for lighting (Appendix L)		320.31	(232)
Total delivered energy for all uses	(211)(221) + (231) + (232)(237b) =	5617.07	(238)

10a. Fuel costs - individual heating systems including micro-CHP

kWh/year cost s	
	uel
Space heating - main system 1 3185.08 x 3.48 x 0.01 = 110	£/year
	0.84 (240)
Water heating 2036.67 x 3.48 x 0.01 = 70).88 (247)
Pumps and fans 75.00 x 13.19 x0.01 = 9.	.89 (249)
Electricity for lighting 320.31 x 13.19 x 0.0 = 42	2.25 (250)
Additional standing charges	0.00 (251)
Total energy cost (240). (242) + (245)(254) = 352	3.86 (255)
11a. SAP rating - individual heating systems including micro-CHP	
	.42 (256)
Energy cost factor (ECF)	.26 (257)
SAP value 82	2.38
SAP rating (section 13)	32 (258)
SAP band	В
125 CO emissions individual besting systems including misro CUD	
12a. CO ₂ emissions - individual heating systems including micro-CHP	
Energy Emission factor Emis	ssions 92/year
Energy Emission factor Emis kWh/year kg CO₂/kWh kg CO	2/year
Energy kWh/yearEmission factor kg CO2/kWhEmission factor kg CO2/kWhSpace heating - main system 13185.08x0.216=68	9 <mark>2/year</mark> 7.98 (261)
Energy kWh/yearEmission factor kg CO2/kWhEmission factor kg CO2/kWhEmission factor 	9.92/year (261) 9.92 (264)
Energy $kWh/year$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Space heating3185.08x 0.216 = 682 Water heating2036.67x 0.216 = 432 Space and water heating(261) + (262) + (263) + (264) =1122	2/year 7.98 (261) 9.92 (264) 17.90 (265)
Energy $kWh/year$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Space heating3185.08x 0.216 = 682 Water heating2036.67x 0.216 = 432 Space and water heating(261) + (262) + (263) + (264) =1122	9.92/year (261) 9.92 (264)
Energy $kWh/year$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Emission factor $kg CO_2/kWh$ Space heating3185.08x 0.216 = 682 Water heating2036.67x 0.216 = 432 Space and water heating(261) + (262) + (263) + (264) =1122	92/year 7.98 (261) 9.92 (264) 17.90 (265) 8.93 (267)
Energy $kWh/year$ Emission factor $kg CO_2/kWh$ Emission factor $kg C$	year 7.98 (261) 9.92 (264) 7.90 (265) 8.93 (267) 6.24 (268)
Energy kWh/yearEmission factor kg CO2/kWhEmission kg CO kg CO2/kWhEmission kg CO kg CO2/kWhSpace heating - main system 1 3185.08 x 0.216 = 687 Water heating 2036.67 x 0.216 = 439 Space and water heating $(261) + (262) + (263) + (264) =$ 112 Pumps and fans 75.00 x 0.519 = 388 Electricity for lighting 320.31 x 0.519 = 160 Total CO2, kg/year $(265)(271) =$ 1338 $(272) \div (4) =$ 188	2/year 7.98 (261) 9.92 (264) 27.90 (265) 3.93 (267) 6.24 (268) 3.07 (272)
Energy kWh/yearEmission factor kg CO2/kWhEmission factor kg CO2/kWhEmission factor kg CO2/kWhSpace heating 3185.08 x 0.216 = 68 Water heating 2036.67 x 0.216 = 439 Space and water heating $(261) + (262) + (263) + (264) =$ 112 Pumps and fans 75.00 x 0.519 = 38 Electricity for lighting 320.31 x 0.519 = 166 Total CO2, kg/year $(265)(271) =$ 133 Dwelling CO2 emission rate $(272) \div (4) =$ 188 El value 84	year 7.98 (261) 9.92 (264) 17.90 (265) 9.93 (267) 6.24 (268) 13.07 (272) 3.34 (273)

13a. Primary energy - individual heating systems including micro-CHP

	Energy kWh/year		Primary factor		Primary Energy kWh/year	
Space heating - main system 1	3185.08] x	1.22] =	3885.80	(261)
Water heating	2036.67] x	1.22	=	2484.74	(264)
Space and water heating			(261) + (262) +	- (263) + (264) =	6370.55	(265)
Pumps and fans	75.00] x	3.07] =	230.25	(267)
Electricity for lighting	320.31] x	3.07	=	983.36	(268)
Primary energy kWh/year					7584.16	(272)

3185.08

ASE CASE - CASHEATING



Assessor name	Miss Alicja	a Kreglewsk	ka				As	sessor num	ber	4134		
Client							La	st modified		13/06	6/2018	
Address	A G 01 Ing	gestre Road	l, London,	, NW5 1XE								
1. Overall dwelling dimen	sions											
				А	rea (m²)			age storey eight (m)		Vo	olume (m³)	
Lowest occupied					74.40](1a) x		3.00	(2a) =		223.20	(3a)
Total floor area	(1a) -	+ (1b) + (1c)) + (1d)((1n) =	74.40] (4)						
Dwelling volume							(3a)	+ (3b) + (3d	c) + (3d)(3n) = 📃	223.20] (5)
2. Ventilation rate												
										m	³ per hour	
Number of chimneys								0	x 40 =	-	0	(6a)
Number of open flues								0	x 20 =	-	0	(6b)
Number of intermittent far	IS							3	x 10 =	:	30	(7a)
Number of passive vents								0	x 10 =	-	0	(7b)
Number of flueless gas fire	S							0	x 40 =	-	0	(7c)
										Air	changes per hour	•
Infiltration due to chimney	s, flues, fans	, PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7c) =	30	÷ (5) :	=	0.13	(8)
If a pressurisation test has			tended, p					o (16)]
Air permeability value, q50	, expressed i	in cubic me	tres per h	iour per squ	uare metre	of envelop	e area				4.00	(17)
If based on air permeability	value, then	(18) = [(17)) ÷ 20] + (8), otherwi	se (18) = (16	6)					0.33	(18)
Number of sides on which	the dwelling	is sheltered	b								3	(19)
Shelter factor								1 -	[0.075 x (1	9)] =	0.78	-
												(20)
Infiltration rate incorporati	ng shelter fa	ictor							(18) x (20) =	0.26] (20)] (21)
Infiltration rate incorporati Infiltration rate modified for									(18) x (20) =	0.26	יינ ר
			Apr	Мау	Jun	Jul	Aug	Sep	(18) × () Oct	20) = Nov	0.26 Dec	יינ ר
Infiltration rate modified for	or monthly w Feb	vind speed: Mar	Apr	May	Jun	Jul	Aug	Sep				יינ ר
Infiltration rate modified fo	or monthly w Feb	vind speed: Mar	Apr 4.40	May	Jun 3.80	Jul 3.80	Aug 3.70	Sep				יינ ר
Infiltration rate modified for Jan Monthly average wind spec	or monthly w Feb ed from Tabl	vind speed: Mar le U2		·			-		Oct	Nov	Dec] (21)
Infiltration rate modified for Jan Monthly average wind spec 5.10	or monthly w Feb ed from Tabl	vind speed: Mar le U2		·			-		Oct	Nov	Dec] (21)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4	er monthly w Feb ed from Tabl 5.00 1.25	vind speed: Mar le U2 4.90 1.23	4.40	4.30	0.95	3.80	3.70	4.00	Oct 4.30	Nov	Dec] (21)] (22)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28	er monthly w Feb ed from Tabl 5.00 1.25	vind speed: Mar le U2 4.90 1.23	4.40	4.30	0.95	3.80	3.70	4.00	Oct 4.30	Nov	Dec] (21)] (22)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	Feb ed from Tabl 5.00 1.25 Illowing for s	Vind speed: Mar le U2 4.90 1.23 shelter and 0.32	4.40 1.10 wind fact 0.29	4.30 1.08 or) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18] (21)] (22)] (22a)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33	Feb ed from Tabl 5.00 1.25 Illowing for s 0.32 ge rate for th	Vind speed: Mar le U2 4.90 1.23 shelter and 0.32 he applicab	4.40 1.10 wind fact 0.29 lle case:	4.30 1.08 cor) (21) x (2 0.28	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18] (21)] (22)] (22a)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re	er monthly w Feb ed from Tabl 5.00 1.25 Illowing for s 0.32 ge rate for the n: air change covery: effic	vind speed: Mar le U2 4.90 1.23 shelter and 0.32 he applicab e rate throug	4.40 1.10 wind fact 0.29 le case: gh system allowing f	4.30 1.08 for) (21) x (2 0.28 n for in-use fa	3.80 0.95 22a)m 0.25	3.80 0.95 0.25	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.30] (21)] (22)] (22a)] (22b)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation	er monthly w Feb ed from Tabl 5.00 1.25 Illowing for s 0.32 ge rate for the n: air change covery: effic	vind speed: Mar le U2 4.90 1.23 shelter and 0.32 he applicab e rate throug	4.40 1.10 wind fact 0.29 le case: gh system allowing f	4.30 1.08 for) (21) x (2 0.28 n for in-use fa	3.80 0.95 22a)m 0.25	3.80 0.95 0.25	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.30] (21)] (22)] (22a)] (22b)] (22b)
Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or 0.55	r monthly w Feb ed from Tabl 5.00 1.25 Illowing for s 0.32 ge rate for the n: air change covery: effic whole hous 0.55	vind speed: Mar le U2 4.90 1.23 shelter and 0.32 he applicab e rate throug ciency in % a se positive in 0.55	4.40 1.10 wind fact 0.29 le case: gh system allowing for nput vent 0.54	4.30 1.08 or) (21) x (2 0.28 n for in-use fa illation from 0.54	3.80 0.95 22a)m 0.25	3.80 0.95 0.25	3.70 0.93	4.00	Oct 4.30 1.08	Nov 4.50	Dec 4.70 1.18 0.30] (21)] (22)] (22a)] (22b)] (22b)] (23a)
Infiltration rate modified for Jan Monthly average wind spect 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.33 Calculate effective air chan If mechanical ventilation If balanced with heat re d) natural ventilation or	r monthly w Feb ed from Tabl 5.00 1.25 Illowing for s 0.32 ge rate for the n: air change covery: effic whole hous 0.55	vind speed: Mar le U2 4.90 1.23 shelter and 0.32 he applicab e rate throug ciency in % a se positive in 0.55	4.40 1.10 wind fact 0.29 le case: gh system allowing for nput vent 0.54	4.30 1.08 or) (21) x (2 0.28 n for in-use fa illation from 0.54	3.80 0.95 22a)m 0.25 ctor from T n loft	3.80 0.95 0.25	3.70 0.93 0.24	4.00	Oct 4.30 1.08 0.28	Nov 4.50 1.13 0.29	Dec 4.70 1.18 0.30 N/A N/A] (21)] (22)] (22a)] (22a)] (22b)] (23a)] (23c)



3. Heat losses	and heat lo	ss paramet	er.										
Element				Gross rea, m²	Openings m ²		area m²	U-value W/m²K	A x U W	•	/alue, /m².K	Ахк, kJ/K	
Window						30	.15 x	1.24	= 37.26	5			(27)
Exposed floor						74	.40 x	0.12	= 8.93				(28t
External wall						59	.58 x	0.18	= 10.72	2			(2 9a
Party wall						62	.62 x	0.00	= 0.00				(32)
Total area of ext	ternal elem	ents ∑A, m ²	2			164	1.13						(31)
Fabric heat loss,	, W/K = Σ(A	× U)							(2	6)(30) + (1	32) =	56.91	(33)
Heat capacity C								(28)	.(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	·MP) in kJ/r	m²K									250.00	(35)
Thermal bridges	s: Σ(Γ x Ψ) c	alculated u	sing Appen	dix K								23.35	(36)
Total fabric heat			0 11							(33) + (1	36) =	80.26	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_ • •
Ventilation heat	t loss calcula	ated month	ıly 0.33 x (2		•			, C					
	40.85	40.69	40.54	39.82	39.69	39.06	39.06	38.94	39.30	39.69	39.96	40.24	(38)
Heat transfer co													
	121.11	120.96	120.80	120.08	119.95	119.32	119.32	119.21	119.56	119.95	120.22	120.51	٦
		120.00	110.00	120.00	110.00	110.01			Average = 2		·	120.08	 (39)
Heat loss param	eter (HLP).	W/m²K (39	9)m ÷ (4)						/	_(00/1)		110:00	
	1.63	1.63	1.62	1.61	1.61	1.60	1.60	1.60	1.61	1.61	1.62	1.62	7
	1.05	1.05	1.02	1.01	1.01	1.00	1.00		Average = 2		·	1.61	 (40)
Number of days	in month (⁻	Table 1a)							Average - 2	2(40)112/	12 -	1.01	_ (40)
Number of days	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	51.00	28.00	51.00	30.00	51.00	30.00	31.00	51.00	30.00	51.00	50.00	51.00	(40)
4. Water heati	ng energy r	equiremen	it										
Assumed occup	ancy, N											2.35	(42)
Annual average	hot water ι	ısage in litr	es per day	Vd,average	= (25 x N) +	36						89.97	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Hot water usage	e in litres pe	r day for ea	ach month	Vd,m = fact	tor from Tab	le 1c x (43)						
	98.96	95.36	91.77	88.17	84.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96	٦
		•							•	<u>Σ</u> (44)1	.12 =	1079.59	(44)
Energy content	of hot wate	r used = 4.:	18 x Vd,m x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1b	, 1c 1d)					
	146.76	128.36	132.45	115.47	110.80	95.61	88.60	101.67	102.88	119.90	130.88	142.13	٦
								-	1	∑(45)1	·	1415.52	 (45)
Distribution loss	s 0.15 x (45)m								2(-)			
	22.01	19.25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)
Storage volume							13.25	13.23	13.45	17.55	13:05	2.00	(47)
Water storage le		ang any s				ine vesser					L	2.00	_ (+,)
b) Manufacture		loss factor	is not know	wp.									
												0.02	☐ (E1)
Hot water st	-		Table 2 (KV	vn/iitre/da	Y)							0.02	(51)
Volume facto												3.91	(52)
Temperature			//-/									1.00	(53)
Energy lost f		storage (kW	/h/day) (4,	/) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54				-) ()								0.12	(55)
Water storage lo	r	1		1	, , , , , , , , , , , , , , , , , , ,			1	1	1			
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
If the vessel con	tains dedic:	ated solar s	torage or d	ledicated W	VWHRS (56)r	n x [(47) -	$V_{s}] \div (47)$	else (56)					

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69 (57)
Primary circuit lo	oss for each	month fro	m Table 3									
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (59)
Combi loss for ea	ach month	from Table	3a, 3b or 3c	:								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (61)
Total heat requi	red for wate	er heating c	alculated fo	or each mo	nth 0.85 x							, 、 ,
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08 (62)
Solar DHW input					157.75	121.05	115.55	120.02	120.50	140.05	130.50	105.00 (02)
	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Outrout from way		0.00	0.00		ļ	ļ Į	0.00	0.00	0.00	0.00	0.00	0.00 (63)
Output from wat	r					г т						
	173.71	152.70	159.40	141.55	137.75	121.69	115.55	128.62	128.96	146.85	156.96	169.08
										∑(64)1	12 = 1	732.81 (64)
Heat gains from	water heat	ing (kWh/m	nonth) 0.25	× [0.85 × ((45)m + (61	.)m] + 0.8 ×	[(46)m + (5	57)m + (59)	[m]			
	70.36	62.15	65.60	59.26	58.40	52.65	51.02	55.36	55.07	61.43	64.38	68.82 <mark>(65)</mark>
5. Internal gain	~											
5. Internal gain		5 . k	N4	A				A	6	0.1		Dea
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	, ,											
	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40 <mark>(66)</mark>
Lighting gains (ca	alculated in	Appendix I	, equation I	L9 or L9a),	also see Ta	ible 5						
	18.48	16.42	13.35	10.11	7.56	6.38	6.89	8.96	12.03	15.27	17.82	19.00 (67)
Appliance gains	(calculated	in Appendi	x L, equatio	n L13 or L1	L3a), also se	ee Table 5						
	207.34	209.49	204.07	192.53	177.96	164.26	155.12	152.96	158.39	169.93	184.50	198.19 <mark>(68)</mark>
Cooking gains (c	alculated in	Appendix I	., equation	L15 or L15	a), also see	Table 5						
	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74	34.74 <mark>(69)</mark>
Pump and fan ga	ains (Table S	5a)										
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (70)
Losses e.g. evap	oration (Tal	ole 5)										
	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92	-93.92 (71)
Water heating g				50.51	50.51	55.52	50.52	50151	50152	50.52	50.01	
	94.56	92.49	88.17	82.30	78.49	73.13	68.57	74.41	76.49	82.56	89.42	92.49 (72)
Total internal ga			I				08.57	/4.41	70.49	82.50	89.42	52.45 (72)
Total internal ga						I I I I	200.00	204.50	205.42	225.00	242.00	267.04 (72)
	378.61	376.62	363.81	343.16	322.23	302.00	288.80	294.56	305.12	325.98	349.96	367.91 (73)
6. Solar gains												
Ū			Access fa	actor	Area	Sola	ar flux		g	FF		Gains
			Table		m²		//m²	•	ific data	specific d		W
								or T	able 6b	or Table	6c	
SouthWest			0.77	x	16.68	x 36	6.79 x	0.9 x 🚺	D.63 x	0.80	=	214.36 (79)
SouthEast			0.77	×	3.47	x 30	6.79 x	0.9 x 🚺	0.63 x	0.80	=	44.59 (77)
NorthWest			0.77	x	10.00	x 1	1.28 x	0.9 x 0	D.63 x	0.80	=	39.41 (81)
Solar gains in wa	ntts ∑(74)m	(82)m										
-	298.36	521.30	748.04	985.13	1156.62	1171.66	1119.87	988.35	829.58	585.52	359.75	253.79 <mark>(83)</mark>
Total gains - inte			I									(00)
	676.97	897.92	1111.85	1328.29	1478.85	1473.65	1408.67	1282.91	1134.70	911.50	709.71	621.70 (84)
	070.97	51.32	1111.00	1320.23	14/0.03	14/3.03	1400.07	1202.91	1134.70	911.30	109.11	021.70 (04)
7. Mean intern	al tempera	ture (heatii	ng season)									
Temperature du	ring heating	g periods in	the living a	rea from T	able 9, Th1	.(°C)						21.00 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				•	•			5	•			

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Utilisation factor	r for gains fo	or living are	ea n1,m (se	e Table 9a)									
	0.99	0.97	0.93	0.83	0.67	0.50	0.37	0.42	0.65	0.90	0.98	0.99	(86)
Mean internal te	emp of living	g area T1 (s	steps 3 to 7	in Table 9c	:)								
	19.43	19.75	20.16	20.59	20.86	20.97	20.99	20.99	20.90	20.50	19.86	19.36	(87)
Temperature du	ring heating	g periods in	the rest of	f dwelling fi	rom Table	9 <i>,</i> Th2(°C)							
	19.59	19.59	19.60	19.60	19.60	19.61	19.61	19.61	19.61	19.60	19.60	19.60	(88)
Utilisation factor	r for gains fo	or rest of d	welling n2,	m									
	0.99	0.96	0.91	0.78	0.59	0.40	0.25	0.30	0.55	0.86	0.97	0.99	(89)
Mean internal te	emperature	in the rest	of dwelling	g T2 (follow	steps 3 to	7 in Table 9	e)						
	17.58	18.04	18.62	19.18	19.49	19.59	19.61	19.61	19.55	19.09	18.21	17.49	(90)
Living area fracti	ion								Liv	ving area ÷	(4) =	0.36	(91)
Mean internal te	emperature	for the wh	ole dwellin	g fLA x T1 +	-(1 - fLA) x	Т2							-
	18.24	18.65	19.17	19.68	19.97	20.08	20.10	20.10	20.03	19.59	18.80	18.15	(92)
Apply adjustmer	nt to the me	ean internal	l temperati	ure from Ta	ble 4e whe	ere appropr	iate						<u> </u>
	18.24	18.65	19.17	19.68	19.97	20.08	20.10	20.10	20.03	19.59	18.80	18.15	(93)
		· · · · · ·	1	1	1	4		1]
8. Space heatin	ıg requirem	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains, r	յՠ											
	0.98	0.95	0.90	0.78	0.62	0.43	0.29	0.34	0.58	0.86	0.96	0.99	(94)
Useful gains, ηm	iGm, W (94)m x (84)m											
	664.72	857.31	999.08	1041.80	911.13	638.18	415.05	436.25	661.26	780.04	683.79	613.20	(95)
Monthly average	e external te	emperature	e from Tabl	e U1									
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	r mean inte	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]							
	1687.94	1663.10	1530.42	1294.76	992.48	653.94	417.66	440.81	708.93	1078.80	1406.65	1681.57	(97)
Space heating re	quirement,	kWh/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m							_
	761.27	541.49	395.31	182.13	60.52	0.00	0.00	0.00	0.00	222.28	520.46	794.87]
								•	Σ(98	8)15, 10	.12 = 3	478.34	(98)
Space heating re	quirement	kWh/m²/ye	ear							(98)	÷ (4)	46.75	(99)
													-
9b. Energy requ	uirements -	communit	y heating s	cheme									_
Fraction of space	e heat from	secondary,	/suppleme	ntary system	m (table 11	1)				'0' if r	none	0.00	(301)
Fraction of space	e heat from	community	y system							1 - (30	01) =	1.00	(302)
Fraction of com	nunity heat	from boile	ers									1.00	(303a)
Fraction of total	space heat	from comm	nunity boil	ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ing methoo	d (Table 4c	(3)) for com	munity sp	ace heating						1.00	(305)
Factor for chargi	ing method	(Table 4c(3	3)) for com	nunity wat	er heating							1.00	(305a)
Distribution loss	factor (Tab	le 12c) for	community	heating sy	stem							1.05	(306)
Space heating													
Annual space he	ating requi	rement						3	478.34]			(98)
Space heat from	boilers							(98	3) x (304a) x	x (305) x (30	06) = 3	652.25	(307a)
Water heating													
Annual water he	ating requi	rement						1	732.81]			(64)
Water heat from	n boilers							(64)	x (303a) x	_ (305a) x (30	06) = 1	.819.45	(310a)
Electricity used f		ribution					0.01			310a)(310		54.72	(313)
,									. , (-	, (_ • · · ·

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	326.44	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	5798.15	(338)

0.00

(331)

10b. Fuel costs - community heating scheme

,, _,, _						
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	3652.25	х	4.24	x 0.01 =	154.86	(340a)
Water heating from boilers	1819.45	x	4.24	x 0.01 =	77.14	(342a)
Electricity for lighting	326.44	х	13.19	x 0.01 =	43.06	(350)
Additional standing charges					120.00	(351)
Total energy cost			(340a)(342e) + ((345)(354) =	395.06	(355)
11b. SAP rating - community heating scheme						
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)					1.39	(357)
SAP value					80.61]
SAP rating (section 13)					81	(358)
SAP band					В]

SAP band

12b. CO₂ emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources (space	ce heating)						
Efficiency of boilers	[89.50					(367a)
CO2 emissions from boilers [(3	307a)+(310a)] x 100 ÷ (367a) = [6113.63	x	0.216	=	1320.55	(367)
Electrical energy for community he	at distribution	54.72	x	0.519	=	28.40	(372)
Total CO2 associated with commun	nity systems					1348.94	(373)
Total CO2 associated with space ar	nd water heating					1348.94	(376)
Electricity for lighting	[326.44	x	0.519	=	169.42	(379)
Total CO₂, kg/year					(376)(382) =	1518.37	(383)
Dwelling CO ₂ emission rate					(383) ÷ (4) =	20.41	(384)
El value						82.96]
El rating (section 14)						83	(385)
El band						В]
13b. Primary energy - community	r heating scheme						
		Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sources	(space heating)						
Efficiency of boilers		89.50					(367a)
Primary energy from boilers [(3	307a)+(310a)] x 100 ÷ (367a) = [6113.63	x	1.22	=	7458.63	(367)
Electrical energy for community he	at distribution	54.72	x	3.07	=	167.98	(372)
Total primary energy associated wi	th community systems					7626.62	(373)
Total primary energy associated wi	th space and water heating					7626.62	(376)
Electricity for lighting	[326.44	x	3.07	=	1002.18	(379)
Primary energy kWh/year						8628.80	(383)



	Miss Alicja Kreglew	/ska				As	sessor numb	er	4134		
Client						Las	t modified		13/06,	/2018	
Address	A G 01 Ingestre Roa	ad, London, N	NW5 1XE								
1. Overall dwelling dimer	nsions										
			A	rea (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied				74.40] (1a) x		3.00	(2a) =		223.20	(3a)
Total floor area	(1a) + (1b) + (1	Lc) + (1d)(1	n) =	74.40] (4)			-			
Dwelling volume						(3a)	+ (3b) + (3c)	+ 3d)'3	n) =	223.20	(5)
2. Ventilation rate							11	-			
							~ ~		m³	³ per hour	
Number of chimneys								x 40 =		0	(6a)
Number of open flues							0	x 20 =		0	(6b)
Number of intermittent far	ns						3	x 10 =		30	(7a)
Number of passive vents							0	x 10 =		0	(7b)
Number of flueless gas fire	!S				5		0	x 40 =		0	(7c)
-					\sim				Air c	hanges per	
										hour	
Infiltration due to chimney					a) + (7b) + (7		30	÷ (5) =		0.13	(8)
If a pressurisation test has							0 (16)				(. _)
Air permeability value, q50						area					(17)
If based on air permeability			,, othe rwis	se (18) = (16	5)						(18)
Number of sides on which	the dwelling is shelter	ed						0 075 (40			(19)
Shelter factor		U.					1-[0.075 x (19			
Infiltration rate incorporati	ing shelter factor								\sim		(20)
Infiltration rate modified for	ar monthly wind an a	٩.						(18) x (2	0) =	0.30	(20)
Infiltration rate modified for			B.4 a.v	1	11	A.u.a.	for				
Jan	Feb Mə	d [,] Apr	May	Jun	Jul	Aug	Sep	(18) x (2 Oct	0) = Nov	0.30 Dec	
Jan Monthly average wind spe	Feb Ma ed from Table U2	Apr				-		Oct	Nov	Dec	(21)
Jan Monthly average wind spe 5.10	Feb Mə		May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep 4.00			Dec	
Jan Monthly average wind sper 5.10 Wind factor (22)m ÷ 4	Feb Ma ed from Table U2 00 00	Apr 4.40	4.30	3.80	3.80	3.70	4.00	Oct	Nov 4.50	Dec 4.70	(21)
Jan Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4 1.28	Feb Ma ed from Table U2 3.00 4.90 1.25 1.23	Apr 4.40	4.30	3.80 0.95		-		Oct	Nov	Dec 4.70	(21)
Jan Monthly average wind sper 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a	Feb Ma ed from Table U2 200 4.90 1.25 1.23 allowing for shelter an	Apr 4.40 1.10 d wind factor	4.30 1.08 r) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70	(21) (22) (22a)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38	Feb Ma ed from Table U2 300 5.00 4.90 1.25 1.23 allowing for shelter an 0.37	Apr 4.40 1.10 d wind factor 0.33	4.30	3.80 0.95	3.80	3.70	4.00	Oct	Nov 4.50	Dec 4.70	(21)
Jan Monthly average wind spe 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan	Feb Ma ed from Table U2 200 4.90 1.25 1.23 allowing for shelter and 0.37 0.36 nge rate for the application	Apr 4.40 1.10 d wind factor 0.33 able case:	4.30 1.08 r) (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 1.18 0.35	(21) (22) (22a) (22b)
Jan Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38	Feb Ma ed from Table U2 200 4.90 1.25 1.25 1.25 1.25 0.37 0.36 nge rate for the application: air change rate through the second secon	Apr 4.40 1.10 d wind factor 0.33 able case: pugh system	4.30 1.08 r) (21) x (2 0.32	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 1.18 0.35	(21) (22) (22a)
Jan Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio	Feb Ma ed from Table U2	Apr 4.40 1.10 d wind factor 0.33 able case: ough system 6 allowing for	4.30 1.08 r) (21) x (2 0.32	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 1.18 0.35	(21) (22) (22a) (22b) (23a)
Jan Monthly average wind sper 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio If balanced with heat re	Feb Ma ed from Table U2	Apr 4.40 1.10 d wind factor 0.33 able case: ough system 6 allowing for	4.30 1.08 r) (21) x (2 0.32	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	Oct 4.30	Nov 4.50 1.13	Dec 4.70 1.18 0.35 N/A N/A	(21) (22) (22a) (22b) (23a)
Jan Monthly average wind sper 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio If balanced with heat re d) natural ventilation on	FebMaed from Table U2.00.001.251.251.23allowing for shelter an0.370.36nge rate for the applicationn: air change rate threeecovery: efficiency in %r whole house positive0.570.57	Apr 4.40 1.10 d wind factor 0.33 able case: bugh system 6 allowing for e input ventila 0.55	4.30 1.08 r) (21) x (2 0.32 r in-use fa ation from 0.55	3.80 0.95 22a)m 0.28 ctor from T n loft	3.80 0.95 0.28 able 4h	3.70 0.93 0.28	4.00	Oct 4.30 1.08 0.32	Nov 4.50 1.13 0.34	Dec 4.70 1.18 0.35 N/A N/A	(21) (22) (22a) (22b) (23a) (23c)



3. Heat losses	and heat lo	ss paramet	:er										
Element			а	Gross rea, m²	Openings m ²	Net a A, i		U-value W/m²K	A x U V		/alue, /m².K	Ахк, kJ/K	
Window						18.	60 x	1.33	= 24.6	6			(27)
Exposed floor						74.	40 x	0.13	= 9.67	7			(28b
External wall						71.	14 x	0.18	= 12.8	1			(29a)
Party wall						62.	62 x	0.00	= 0.00)			(32)
Total area of ex	ternal elem	ents ∑A, m²	2			164	.14						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(2	26)(30) + (3	32) =	47.14	(33)
Heat capacity C	m = ∑(А x к)							(28)	(30) + (32)	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	m²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								16.43	(36)
Total fabric hea	t loss									(33) + (3	36) =	63.57	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ted month	ily 0.33 x (2	25)m x (5)									
	42.14	41.94	41.73	40.78	40.61	39.78	39.78	39.62	40.10	40.61	40.96	41.34	(38)
Heat transfer co	befficient, W	/ //K (37)m⊣	+ (38)m					•					
	105.71	105.50	105.30	104.35	104.17	103.34	103.34	103.19	107.67	104.17	104.53	104.91	7
									Avera _b e =	Σ(39)112/	/12 =	104.35	(39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)										_
	1.42	1.42	1.42	1.40	1.40	1.39	1.39	1.30	1.39	1.40	1.40	1.41	7
									Average =	Σ(40)112/	/12 =	1.40	(40)
Number of days	; in month (Fable 1a)					C	X i					
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	·	•	•		· ·					•	•		
4. Water heati	ng energy r	equiremen	t										-
Assumed occup	ancy, N											2.35	(42)
Annual average	hot water u	isage in litr		Vd,average	= (25 × N) +	36						89.97	(43)
	Jan	Feb	Mar	Apr	Mui	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	-	-									1		-
	98.96	95.36	91.77	88.17	34.57	80.97	80.97	84.57	88.17	91.77	95.36	98.96	
				U'						∑(44)1	.12 =	1079.59	(44)
Energy content						onth (see	Tables 1b,	1c 1d)		-			_
	146.76	128.36	1.52.4.5	115.47	110.80	95.61	88.60	101.67	102.88	119.90	130.88	142.13	
		7								∑(45)1	.12 =	1415.52	(45)
Distribution loss	s 0.15 x (45									-			_
	22.01	1 25	19.87	17.32	16.62	14.34	13.29	15.25	15.43	17.99	19.63	21.32	(46)
Storage volume	(litres) inclu	uding any s	olar or WW	/HRS storag	e within san	ne vessel						2.00	(47)
Marken at a second l													
Water storage l	oss:												_
a) If manufactur		d loss facto	or is known	(kWh/day)								0.24	(48)
-	rer's declare		or is known	(kWh/day)								0.24	(48) (49)
a) If manufactur	rer's declare e factor fron	n Table 2b											
a) If manufactur Temperature	rer's declare e factor fron rom water s	n Table 2b										0.54	(49)
a) If manufactur Temperature Energy lost f	rer's declare e factor fron rom water s 4) in (55)	n Table 2b torage (kW	/h/day) (48	3) x (49)								0.54 0.13	(49) (50)
a) If manufactur Temperature Energy lost f Enter (50) or (54	rer's declare e factor fron rom water s 4) in (55)	n Table 2b torage (kW	/h/day) (48	3) x (49)	4.00	3.87	4.00	4.00	3.87	4.00	3.87	0.54 0.13	(49) (50)
a) If manufactur Temperature Energy lost f Enter (50) or (54	rer's declare e factor from rom water s 4) in (55) oss calculate 4.00	n Table 2b storage (kW ed for each 3.61	/h/day) (48 month (59 4.00	3) x (49) 5) x (41)m 3.87	4.00			1	3.87	4.00	3.87	0.54 0.13 0.13	(49) (50) (55)
a) If manufactur Temperature Energy lost f Enter (50) or (54 Water storage le	rer's declare e factor from rom water s 4) in (55) oss calculate 4.00	n Table 2b storage (kW ed for each 3.61	/h/day) (48 month (59 4.00	3) x (49) 5) x (41)m 3.87	4.00			1	3.87	4.00	3.87	0.54 0.13 0.13	(49) (50) (55)

	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26 (5
Combi loss for e	ach month	from Table	3a, 3b or 3	c								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (6
Total heat requi	red for wat	er heating o	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)n	n + (59)m +	- (61)m			
	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39 (6
Solar DHW input	t calculated	using Appe	endix G or <i>I</i>	Appendix H		-						
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (6
Output from wa	ter heater f	for each mo	onth (kWh/	month) (62	2)m + (63)n	ı						
	174.02	152.98	159.71	141.86	138.06	121.99	115.86	128.93	129.26	147.16	157.26	169.39
										∑(64)1	.12 = 1	736.48 (6
Heat gains from	water heat	ing (kWh/n	nonth) 0.2	5 × [0.85 ×	(45)m + (61	.)m] + 0.8 ×	: [(46)m + (5	57)m + (59)	m]			
	70.61	62.38	65.85	59.50	58.65	52.90	51.27	55.61	55.31	61.68	64.62	69.07 (6
		•	•	•	•		•			•	•	
5. Internal gain	IS											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	(Table 5)											
Metabolic gains	(Table 5) 117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40	117.40 (6
Metabolic gains Lighting gains (c	117.40	1					117.40	117.40	117.40	117.40	117.40	117.40 (6
Ū	117.40	1					6.89	117.40 8.96	117.40	117.40	117.40	117.40 (6 19.00 (6
Ū	117.40 alculated in 18.48	Appendix 16.42	L, equation 13.35	L9 or L9a), 10.11	also see Ta 7.56	ble 5 6.38				7		· · · · · ·
Lighting gains (c	117.40 alculated in 18.48	Appendix 16.42	L, equation 13.35	L9 or L9a), 10.11	also see Ta 7.56	ble 5 6.38				7		· · · · · ·
Lighting gains (c	117.40 alculated in 18.48 (calculated 207.34	Appendix 16.42 in Appendi 209.49	L, equation 13.35 x L, equatio 204.07	L9 or L9a), 10.11 on L13 or L2 192.53	also see Ta 7.56 13a), also so 177.96	oble 5 6.38 ee Table 5 164.26	6.89	8.96	12.03	15.27	17.82	19.00 (6
Lighting gains (c Appliance gains	117.40 alculated in 18.48 (calculated 207.34	Appendix 16.42 in Appendi 209.49	L, equation 13.35 x L, equatio 204.07	L9 or L9a), 10.11 on L13 or L2 192.53	also see Ta 7.56 13a), also so 177.96	able 5 6.38 ee Table 5 164.26	6.89	8.96	12.03	15.27	17.82	19.00 (6
Lighting gains (c Appliance gains	117.40 alculated in 18.48 (calculated 207.34 alculated in 34.74	Appendix 16.42 in Appendi 209.49 Appendix 34.74	L, equation 13.35 x L, equation 204.07 L, equation	L9 or L9a), 10.11 on L13 or L2 192.53 L15 or L15	also see Ta 7.56 13a), also se 177.96 a), also see	ble 5 6.38 ee Table 5 164.26 Table 5	6.89 155.12	8.96 152.99	1203	15.27 169.93	17.82	19.00 (¢
Lighting gains (c Appliance gains Cooking gains (c	117.40 alculated in 18.48 (calculated 207.34 alculated in 34.74	Appendix 16.42 in Appendi 209.49 Appendix 34.74	L, equation 13.35 x L, equation 204.07 L, equation	L9 or L9a), 10.11 on L13 or L2 192.53 L15 or L15	also see Ta 7.56 13a), also se 177.96 a), also see	ble 5 6.38 ee Table 5 164.26 Table 5	6.89 155.12	8.96 152.99	1203	15.27 169.93	17.82	19.00 (¢
Lighting gains (c Appliance gains Cooking gains (c	117.40 alculated in 18.48 (calculated 207.34 alculated ir 34.74 ains (Table 1 3.00	Appendix 16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00	L, equation 13.35 x L, equation 204.07 L, equation 34.74	L9 or L9a), 10.11 on L13 or L2 192.53 L15 or L15 34.74	also see Ta 7.56 13a), also se 177.96 a), also see 34.74	ble 5 6.38 ee Table 5 164.26 Table 5 34.74	6.89 155.12 34.74	8.96 152.99 34.74	12 03 158.39 34.74	15.27 169.93 34.74	17.82 184.50 34.74	19.00 (6 198.19 (6 34.74 (6
Lighting gains (c Appliance gains Cooking gains (c Pump and fan ga	117.40 alculated in 18.48 (calculated 207.34 alculated ir 34.74 ains (Table 1 3.00	Appendix 16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00	L, equation 13.35 x L, equation 204.07 L, equation 34.74	L9 or L9a), 10.11 on L13 or L2 192.53 L15 or L15 34.74	also see Ta 7.56 13a), also se 177.96 a), also see 34.74	ble 5 6.38 ee Table 5 164.26 Table 5 34.74	6.89 155.12 34.74	8.96 152.99 34.74	12 03 158.39 34.74	15.27 169.93 34.74	17.82 184.50 34.74	19.00 (6 198.19 (6 34.74 (6
Lighting gains (c Appliance gains Cooking gains (c Pump and fan ga	117.40 alculated in 18.48 (calculated 207.34 alculated ir 34.74 ains (Table 1) 3.00 oration (Tai -93.92	Appendix 16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ble 5) -93.92	L, equation 13.35 x L, equatio 204.07 L, equation 34.74 3.00	L9 or L9a), 10.11 on L13 or L1 192.53 L15 or L15 34.74 3.00	also see Ta 7.56 13a), also se 177.96 a), also see 34.74 3.00	able 5 6.38 ee Table 5 164.26 Table 5 34.74 3.00	6.89 155.12 34.74	8.96 152.97 34.74 3.00	12 03 158.39 34.74 3.00	15.27 169.93 34.74 3.00	17.82 184.50 34.74 3.00	19.00 (6 198.19 (6 34.74 (6 3.00 (7
Lighting gains (c Appliance gains Cooking gains (c Pump and fan ga Losses e.g. evap	117.40 alculated in 18.48 (calculated 207.34 alculated ir 34.74 ains (Table 1) 3.00 oration (Tai -93.92	Appendix 16.42 in Appendi 209.49 Appendix 34.74 5a) 3.00 ble 5) -93.92	L, equation 13.35 x L, equatio 204.07 L, equation 34.74 3.00	L9 or L9a), 10.11 on L13 or L1 192.53 L15 or L15 34.74 3.00	also see Ta 7.56 13a), also se 177.96 a), also see 34.74 3.00	able 5 6.38 ee Table 5 164.26 Table 5 34.74 3.00	6.89 155.12 34.74	8.96 152.97 34.74 3.00	12 03 158.39 34.74 3.00	15.27 169.93 34.74 3.00	17.82 184.50 34.74 3.00	19.00 (6 198.19 (6 34.74 (6 3.00 (7
Lighting gains (c Appliance gains Cooking gains (c Pump and fan ga Losses e.g. evap	117.40 alculated in 18.48 (calculated 207.34 alculated ir 34.74 ains (Table 1) 0 oration (Tail -93.92 ains (Table 2)	Appendix 16.42 in Appendix 209.49 Appendix 34.74 5a) 3.00 ble 5) -93.92 5) 92.82	L, equation 13.35 x L, equation 204.07 L, equation 34.74 3.00 -93.92 88.51	L9 or L9a), 10.11 on L13 or L1 192.53 L15 or L15 34.74 3.00 -93.92 82.64	also see Ta 7.56 13a), also see 177.96 a), also see 34.74 3.00 -93.92 78.63	able 5 6.38 ee Table 5 164.26 Table 5 34.74 3.00 -93.92 73.47	6.89 155.12 34.74 5.00 -93.92	8.96 152.97 34.74 3.00 -93.92	12 03 158.39 34.74 3.00 -93.92	15.27 169.93 34.74 3.00 -93.92	17.82 184.50 34.74 3.00 -93.92	19.00 (6 198.19 (6 34.74 (6 3.00 (7 -93.92 (7

381.95 379.95 367.15

		P	Access f		Area m²		blar flux W/m²		g specific data or Table 6b		FF specific da or Table		Gains W	
outhWest		0	0.7	7 x	10.29	x	36.79 x	0.9 x	0.63	x [0.70	=	115.71	(79)
outhEast		V	0.7	7 x	2.14	x	36.79 x	0.9 x	0.63	х [0.70	=	24.06	(77)
lorthWest			0.7	7 X	6.17	x	11.28 x	0.9 x	0.63	x [0.70	=	21.28	(81)
olar gains in w	atts ∑(74)m	(82)m												
	161.05	281.39	403.78	531.77	624.34	632.46	604.50	533.5	50 447.80)	316.06	194.18	136.99	(83)
otal gains - int	ernal and so	lar (73)m +	(83)m											
	542.99	661.34	770.93	878.26	949.90	937.79	896.64	831.4	40 756.25	;	645.37	547.48	508.23	(84)
7. Mean inter						(°C)							21.00	
emperature d	0	51	0			. ,					_		21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep		Oct	Nov	Dec	

1

Utilisation factor for gains for living area n1,m (see Table 9a) 0.82 0.65 0.49 0.55 0.79 0.95 1.00 (86) 1.00 0.99 0.97 0.93 0.99

Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 152.87 145.19 161.57 161.98 170.64 179.33 191.89	Mean internal to	emp of livin	g area T1 (s	steps 3 to 7	in Table 90	c)								
$ \begin{array}{ 2,75 & 12,75 & 12,75 & 12,75 & 12,76 & 12,77 & 12,77 & 12,77 & 12,77 & 12,77 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,76 & 12,77 $		19.53	19.74	20.06	20.46	20.77	20.94	20.99	20.98	20.86	20.44	19.90	19.49	(87)
Utilisation factor for gains for rest of dwelling n2,m 0.99 0.96 0.90 0.96 0.90 0.96 0.96 0.976 0.55 0.36 0.41 0.70 0.93 0.96 0.96 Mean internal requestrue in the rest of dwelling 71 (fallow steps 3 to 7) 19.77 19.77 19.76 19.17 19.77 19.86 19.14 18.88 17.77 (90) Mean internal requestrue for the whole dwelling fLA x11 + (1 - fLA) x12 Utiling area fraction Utiling area fraction Utiling area fraction Utiling area fraction 18.92 18.88 19.39 20.16 20.20 20.20 20.09 19.60 18.92 18.88 (93) Apply adjustment to the mean internal temperature from Table 4 where appropriate 18.43 18.71 19.12 19.62 19.99 20.16 20.20 20.09 19.60 18.92 18.88 (93) 5. Space heating requirement Ian Fe Mar Apr May Jun Jul Aug Space heating requirement (90) (94) Utilia.00 7.00 20	Temperature du	uring heatin	g periods in	the rest of	f dwelling f	rom Table 9	9, Th2(°C)							
0.99 0.99 0.96 0.90 0.76 0.55 0.36 0.41 0.70 0.93 0.99 1.00 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 92) Using area fraction 1.0.20 2.0.20 2.0.20 2.0.20 2.0.20 2.0.20 2.0.20 1.0.20 1.0.22 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.24 1.0.3.8 1.0.22 1.0.3.8 1.0.22 1.0.24 0.0.25 0.0.99 0.0.8 0.96 0.28 0.77 0.5.8 0.41 0.46 0.72 0.0.95 0.99 9.91 <td< td=""><td></td><td>19.75</td><td>19.75</td><td>19.75</td><td>19.76</td><td>19.76</td><td>19.77</td><td>19.77</td><td>19.77</td><td>19.77</td><td>19.76</td><td>19.76</td><td>19.76</td><td>(88)</td></td<>		19.75	19.75	19.75	19.76	19.76	19.77	19.77	19.77	19.77	19.76	19.76	19.76	(88)
Mean internal temperature in the res of dwelling T2 (follow steps 3 to 7 in Table 9c) 17.82 18.14 18.60 19.15 19.57 19.77 19.77 19.76 19.14 18.38 17.77 (90) Laving area fraction Living area + (4) = 0.36 (91) Mean internal temperature for the whole dwelling (LA x T1 + (1 - (LA) x T2 Living area + (4) = 0.36 (91) Mean internal temperature for the whole dwelling (LA x T1 + (1 - (LA) x T2 18.43 18.71 19.12 19.62 19.99 20.16 20.20 20.20 20.09 19.60 18.92 18.38 (91) Apply adjustment to the mean internal temperature from Table 4e where appropriate 18.7 19.52 18.38 (93) 8. Space heating requirement: Jan Feb Mar Apr May Jun Jul Aug Sep Par Nov Dec Utilisation factor for gains, gm 0.96 0.89 0.77 0.58 0.41 0.46 0.71 0.420 (94) Monthly average external temperature, from Table U1 538.32 648.70 737.40 785.92 732.14 546.05 367.21 383.66 <td>Utilisation facto</td> <td>or for gains f</td> <td>or rest of d</td> <td>welling n2,</td> <td>m</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td>	Utilisation facto	or for gains f	or rest of d	welling n2,	m									_
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17.82 18.14 18.60 19.15 19.75 19.77 19.77 19.66 19.14 18.38 17.77 (9)1 Wing area fraction Living area f (4) = 0.36 (9)1 Mean internal temperature for whole dwelling fLA X T1 +(1 : fLA) X T2 20.02 20.09 19.60 18.892 18.83 (92) Apply adjustment to the mean internal temperature from Table 4e where appropriate 38.71 19.12 19.62 19.99 20.16 20.20 20.20 20.09 19.60 18.892 18.38 (92) Apply adjustment to the mean internal temperature from Table 4e where appropriate U 38.92 18.87 18.87 19.38 (94) Usidiation factor for gains, mm G99 0.98 0.90 0.89 0.97 0.58 0.41 0.40 0.74 93 0.98 0.99 (94) Usidiation factor for gains, mm (94)m x (84)m 737.40 785.92 732.14 546.05 367.21 383.66 42.95 588.10 598.10 598.10 598.10 598.10 598.10 598.10 598.10 598.10 598.10 598.10 <td>Mean internal to</td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Mean internal to					1								
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18.43 18.71 19.12 19.62 19.99 20.16 20.20 20.09 19.60 18.92 18.38 (93) S. Space heating requirement Jan Feb Mar Apr May Jun Jul Aug Sep 67 Nov Dec Usidization factor for gains, nm 0.99 0.98 0.96 0.89 0.77 0.58 0.41 0.46 0.77 0.93 0.98 0.99 (94) Useful gains, nmm, W (34)m x (83)m 18.70 177.40 785.92 732.14 546.05 367.21 383.66 42.87 598.65 538.10 504.86 (95) Monthly average external temperature, Lm, W (39)m x (193)m x (193)m 1460 16.60 16.40 14.10 10.60 7.10 4.20 (96) Heat loss rate for mean internal temperature, Lm, W (139)m x (193)m x (193)m x (193)m 11.70 14.60 16.60 10.40 14.10 10.60 7.10 4.20 (96) Space heating requirement, kWh/month 0.024 x (197)m - (95)m) x (41)m 11.10 11.10 11.10 11.10 1	A	L				1			20.20	20.09	19.60	18.92	18.38	_ (92)
Space heating requirement Jain Feb Mar Apr May Jun Jul Aug Sep Pat Nov Dec Utilisation factor for gains, nm 0.99 0.98 0.96 0.89 0.77 0.58 0.41 0.46 0.78 0.93 0.98 0.99 (94) Useful gains, nmGm, W (94)m x (84)m 538.32 648.70 737.40 785.92 732.14 546.05 367.21 383.86 442.87 598.65 538.10 504.86 (95) Monthly average external temperature from Table U1 4.30 4.90 6.50 8.90 11.70 14.60 16.60 10.40 14.10 10.60 7.10 4.20 (96) Heat loss rate for mean internal temperature, In, W (193)m x (193)m (193)m (193)m (201)m 11.70 14.60 16.60 10.40 143.74 (97) Space heating requirement, KWh/month 0.024 x (187)m (193)m (193)m x (193)m (201)m 11.75 125.53 1487.48 (97) Space heating requirement, KWh/m ⁷ /year 20.90 0.00 0.00	Apply adjustme	-		-		1					1		1	-
Jan Feb Mar Apr May Jun Jul Aug Sep Fe Nov Dec Utilisation factor for gains, mm 0.99 0.88 0.96 0.89 0.77 0.58 0.41 0.46 0.72 0.93 0.98 0.99 (94) Useful gains, mmGm, W (94)m x (84)m 538.32 648.70 737.40 785.92 732.14 546.05 367.21 383.66 127.87 598.65 538.10 504.86 (95) Monthly average external temperature from Table U1 4.30 4.90 6.50 8.90 11.70 14.60 16.60 94.00 14.10 10.60 7.10 4.20 (96) Heat loss rate for mean internal temperature, Lm, W [(39)m × [(93)m · (95)m] x(41)m 710.58 543.00 40.01 239.00 97.48 39.607 391.73 620.68 937.48 123.53 1487.48 (97) Space heating requirement, KWh/month 710.58 543.00 40.01 29.00 97.43 0.00 0.00 <t< td=""><td></td><td>18.43</td><td>18.71</td><td>19.12</td><td>19.62</td><td>19.99</td><td>20.16</td><td>20.20</td><td>20.20</td><td>20.09</td><td>19.60</td><td>18.92</td><td>18.38</td><td>(93)</td></t<>		18.43	18.71	19.12	19.62	19.99	20.16	20.20	20.20	20.09	19.60	18.92	18.38	(93)
Jan Feb Mar Apr May Jun Jul Aug Sep Fe Nov Dec Utilisation factor for gains, mm 0.99 0.88 0.96 0.89 0.77 0.58 0.41 0.46 0.72 0.93 0.98 0.99 (94) Useful gains, mmGm, W (94)m x (84)m 538.32 648.70 737.40 785.92 732.14 546.05 367.21 383.66 127.87 598.65 538.10 504.86 (95) Monthly average external temperature from Table U1 4.30 4.90 6.50 8.90 11.70 14.60 16.60 94.00 14.10 10.60 7.10 4.20 (96) Heat loss rate for mean internal temperature, Lm, W [(39)m × [(93)m · (95)m] x(41)m 710.58 543.00 40.01 239.00 97.48 39.607 391.73 620.68 937.48 123.53 1487.48 (97) Space heating requirement, KWh/month 710.58 543.00 40.01 29.00 97.43 0.00 0.00 <t< td=""><td>8. Space heating</td><td>ng requirem</td><td>hent</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	8. Space heating	ng requirem	hent											
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					795.02	722.14	E46.0E	267.21	202.66	547.07		E 29 10	E04.96	(OE)
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Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m] 1493.40 1456.74 1328.94 1118.28 863.09 574.85 33.607 391.73 620.68 937.48 1235.39 1487.48 (97) Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m 710.58 543.00 440.11 239.30 97.43 0.00 0.00 0.00 252.09 502.05 731.07 Space heating requirement, kWh/m [*] /year (98) ÷ (4) 47.25 (99) 93. 574.85 33.607 391.73 620.68 937.48 1235.39 1487.48 (97) Space heating requirement, kWh/m [*] /year 40.11 239.30 97.43 0.00 0.00 0.00 0.00 252.09 502.05 731.07 Space heating requirement kWh/m [*] /year 98) ÷ (4) 47.25 (99) 93. 500.00 (201) 1.00 (202) Fraction of space heat from main system 2 0.00 1.1 (202) x [1- (203]] = 1.00 (204) Fraction of total space heat from main system 1 (202) x [1- (203]] = 0.00 (205) 93.50 (206) Ja	wontiny averag			1	1	44.70	11.50	10.00		1110	10.00	7.40	1.20	
1493.40 1456.74 1328.94 1118.28 863.09 574.85 37.077 391.73 620.68 937.48 1235.39 1487.48 (97) Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m 710.58 543.00 440.11 239.30 97.43 0.00 0.00 0.00 252.09 502.05 731.07 Space heating requirement, kWh/m2/year (98) (40.11 239.30 97.43 0.00 0.00 0.00 252.09 502.05 731.07 Space heating requirement, kWh/m2/year (98) (40.11 239.30 97.43 0.00 0.00 0.00 252.09 502.05 731.07 Space heating requirement, kWh/m2/year (98) (40.11 239.30 97.43 0.00 0.00 0.00 202.05 731.07 Space heating requirements - individual heating systems inclu firs, sitc.o-CHP 0.00 (201) 1 - (201) = 1.00 (202) Fraction of space heat from main system 1 (30.20 1 - (202) x [1 - (203)] = 1.00 (202) (202) x (202) x [20.00 (202) (202) x (20.20) = 0.00 (202) (202) x								16.60	1. 40	14.10	10.60	7.10	4.20	_ (96)
Space heating requirement, kWh/month 0.024 x [[97]m - (95]m] x (41]m 710.58 543.00 440.11 239.30 97.43 000 0.00 0.00 252.09 502.05 731.07 ∑(98)15, 1012 = 3515.63 (98) (98) ÷ (4) 47.25 (99) 9a. Energy requirements - individual heating systems inclu line, score-CHP Space heating Fraction of space heat from main system? Fraction of total space heat from	Heat loss rate fo			1				Co						٦
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						1		372.07	391.73	620.68	937.48	1235.39	1487.48	_ (97)
$ \begin{array}{c} & & & & & & & & \\ & & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & \\ & & & & & & $	Space heating re	-				1							_	_
Space heating requirement kWh/m²/year (98) \div (4) 47.25 (99) 9a. Energy requirements - individual heating systems inclu (inc, +\ick-o-CHP) Space heating Fraction of space heat from secondary/supplementary system (table 11) Fraction of space heat from main system 2 Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 2 Fraction of total space heat from main system 3 (202) x (202) x (203) = Jan Feb Mar Apr May Jun Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month T59.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 <td></td> <td>710.58</td> <td>543.00</td> <td>440.11</td> <td>239.30</td> <td>97.43</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>252.09</td> <td>502.05</td> <td>731.07</td> <td></td>		710.58	543.00	440.11	239.30	97.43	0.00	0.00	0.00	0.00	252.09	502.05	731.07	
9a. Energy requirements - individual heating systems inclu first wice-CHP Space heating Fraction of space heat from secondary/supplementary system (table 11) Fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 (202) × [1-(203]] Fraction of total space heat from main system 1 (202) × [203] Go.00 (202) × [203] Ifficiency of main system 1 (%) Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month [211] T59.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 _(211)15, 1012 = 3760.03 (211) Water heating 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27										∑(9)	8)15, 10	12 =	3515.63	(98)
Space heating Fraction of space heat from main system(s) 0.00 (201) Fraction of space heat from main system(s) $1 - (201) = 1.00$ (202) Fraction of space heat from main system 2 0.00 (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times (203) = 0.00$ (205) Efficiency of main system 1, kWh/month $[211)15, 1012 = 3760.03$ (211) Water heating $[81.17 \ 87.91 \ 87.38 \ 86.20 \ 83.90 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 86.24 \ 87.70 \ 88.27 \ (217)$ Water heating fuel, kWh/month $[17.36 \ 174.02 \ 182.78 \ 164.57 \ 164.55 \ 152.87 \ 145.19 \ 161.57 \ 161.98 \ 170.64 \ 179.33 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 1$	Space heating re	equirement	kWh/m²/ye	ear			•				(98)	÷ (4)	47.25	(99)
Space heating Fraction of space heat from main system(s) 0.00 (201) Fraction of space heat from main system(s) $1 - (201) = 1.00$ (202) Fraction of space heat from main system 2 0.00 (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] = 1.00$ (202) Fraction of total space heat from main system 2 $(202) \times (203) = 0.00$ (205) Efficiency of main system 1, kWh/month $[211)15, 1012 = 3760.03$ (211) Water heating $[81.17 \ 87.91 \ 87.38 \ 86.20 \ 83.90 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 79.80 \ 86.24 \ 87.70 \ 88.27 \ (217)$ Water heating fuel, kWh/month $[17.36 \ 174.02 \ 182.78 \ 164.57 \ 164.55 \ 152.87 \ 145.19 \ 161.57 \ 161.98 \ 170.64 \ 179.33 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 191.89 \ 1$		uiromonto	individual	booting sy	stoms inclu		СНР							
Fraction of space heat from secondary/supplementary system (table 11) 		unements -	mulviuuai	neating sys	stems mere		-CHP							
Fraction of space heat from main system 2 $1 - (201) = 1.00$ (202) Fraction of space heat from main system 2 0.00 (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] = 1.00$ (204) Fraction of total space heat from main system 2 $(202) \times [1 - (203)] = 0.00$ (205) Fraction of total space heat from main system 1 $(202) \times [202) \times (203) = 0.00$ (205) Efficiency of main system 1 (%) 93.50 (206) Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 0.00 269.62 536.95 781.89 Space heating fuel (main system 1), kWh/month $(202) \times [1 - (203)] = 3760.03$ (211) Water heating B8.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month Interval				/	X									
Fraction of space heat from main system 1 0.00 (202) Fraction of total space heat from main system 1 $(202) \times [1 - (203)] =$ 1.00 (204) Fraction of total space heat from main system 2 $(202) \times (203) =$ 0.00 (205) Efficiency of main system 1 (% 93.50 (206) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Space heating fuel (main system 1), kWh/month V <t< td=""><td></td><td></td><td></td><td></td><td>ntary syste</td><td>m (table 11</td><td>.)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>					ntary syste	m (table 11	.)							
Fraction of total space heat from main system 1 $(202) \times [1 - (203)] =$ 1.00 (204) Fraction of total space heat from main system 2 $(202) \times (203) =$ 0.00 (205) Efficiency of main system 1 (%) 93.50 (206) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Space heating fuel (main system 1), kWh/month (211) (211) (211) (211) (211) Water heating 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89											1 - (20)1) = [
Fraction of total space heat from main rystem 2 (202) \times (203) = 0.00 (205) Efficiency of main system 1 (% 93.50 (206) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Vater heating 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Vater heating \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} (211) Water heater \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} (211) Water heating fuel, kWh/month \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} \mathbb{K} (211) Water heating fuel, kWh/month \mathbb{K} <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td><td></td></td<>													0.00	
Efficiency of main system 1 (% Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Vater heating 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Space heating fuel (main system 1), kWh/month Vater heating 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 Space state Water heating Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89		·								(20				
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 ∑(211)15, 1012 = 3760.03 (211) Water heating 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89				cystem 2							(202) x (20	03) =	0.00	(205)
Space heating fuel (main system 1), kWh/month 759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 0.00 269.62 536.95 781.89 Σ(211)15, 1012 = 3760.03 (211) Water heating Efficiency of water heater Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89	Efficiency of ma	in system 1	(%,										93.50	(206)
759.98 580.75 470.70 255.94 104.20 0.00 0.00 0.00 269.62 536.95 781.89 ∑(211)15, 1012 = 3760.03 (211) Water heating Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Σ(211)15, 1012 = 3760.03 (211) Water heating Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 152.87 145.19 161.57 161.98 170.64 179.33 191.89	Space heating fu	uel (main sy	stem 1), kW	Vh/month										
Water heating Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 152.87 145.19 161.57 161.98 170.64 179.33 191.89		759.98	580.75	470.70	255.94	104.20	0.00	0.00	0.00	0.00	269.62	536.95	781.89	
Efficiency of water heater 88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89										∑(21)	1)15, 10	12 =	3760.03	(211)
88.17 87.91 87.38 86.20 83.90 79.80 79.80 79.80 86.24 87.70 88.27 (217) Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 152.87 145.19 161.57 161.98 170.64 179.33 191.89	Water heating													
Water heating fuel, kWh/month 197.36 174.02 182.78 164.57 152.87 145.19 161.57 161.98 170.64 179.33 191.89	Efficiency of wa	ter heater												
197.36 174.02 182.78 164.57 164.55 152.87 145.19 161.57 161.98 170.64 179.33 191.89		88.17	87.91	87.38	86.20	83.90	79.80	79.80	79.80	79.80	86.24	87.70	88.27	(217)
	Water heating f	uel, kWh/m	onth											
		197.36	174.02	182.78	164.57	164.55	152.87	145.19	161.57	161.98	170.64	179.33	191.89	
(219a)112 = (2046.74) (219)											∑(219a)1	12 =	2046.74	(219)

Annual totals

Space heating fuel - main system 1			3760.03
Water heating fuel			2046.74
Electricity for pumps, fans and electric keep-hot (Table 4f)			
central heating pump or water pump within warm air heating	g unit	30.00	(230c)
boiler flue fan		45.00	(230e)
Total electricity for the above, kWh/year			75.00 (231)
Electricity for lighting (Appendix L)			326.44 (232)
Total delivered energy for all uses		(211)(221) + (231) + (232)(237b	
			,
10a. Fuel costs - individual heating systems including micro-Cl	HP		
	Fuel	Fuel price	Fuel
	kWh/year		cost £/year
Space heating - main system 1	3760.03	x 3.48 x 0.01 =	130.85 (240)
Water heating	2046.74	x 3.48 x 0.01 =	71.23 (247)
Pumps and fans	75.00	x 13.19 x 0.01 =	9.89 (249)
Electricity for lighting	326.44	x 13.19 x 0.01 =	43.06 (250)
Additional standing charges			120.00 (251)
Total energy cost		(240)(242, + (2**)(254) = 375.03 (255)
11a. SAP rating - individual heating systems including micro-C	нр		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)			1.32 (257)
SAP value			81.60
		X '	
SAP rating (section 13)	C	2	82 (258)
SAP band			B
12a. CO ₂ emissions - individual heating systems including mice	ro-CHP		
12a. CO ₂ emissions - individual heating systems including mice	Energy	Emission factor	Emissions
12a. CO ₂ emissions - individual heating systems including mice		Emission factor kg CO2/kWh	Emissions kg CO ₂ /year
12a. CO₂ emissions - individual heating systems including mice Space heating - main system 1	Energy		
	Energy kWh, year	kg CO₂/kWh	kg CO₂/year
Space heating - main system 1	Energy kWhyear 3760.03	kg CO ₂ /kWh x 0.216 =	kg CO ₂ /year 812.17 (261) 442.10 (264)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWhyear 3760.03	kg CO2/kWh x 0.216 = x 0.216 =	kg CO ₂ /year 812.17 (261) 442.10 (264)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh, year 3760.03 2046.74	$kg CO_2/kWh$ x 0.216 = x 0.216 = (261) + (262) + (263) + (264)	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh, year 3760.03 2046.74 75.00	$kg CO_2/kWh$ x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 =	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265) 38.93 (267) 169.42 (268)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh, year 3760.03 2046.74 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 =	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265) 38.93 (267) 169.42 (268)) = 1462.61 (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year	Energy kWh, year 3760.03 2046.74 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271)	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265) 38.93 (267) 169.42 (268)) = 1462.61 (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energy kWh, year 3760.03 2046.74 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271)	$kg CO_2/year$ $812.17 (261)$ $442.10 (264)$ $1254.26 (265)$ $38.93 (267)$ $169.42 (268)$ $1462.61 (272)$ $19.66 (273)$
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	Energy kWh, year 3760.03 2046.74 75.00	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271)	$kg CO_2/year$ $812.17 (261)$ $442.10 (264)$ $1254.26 (265)$ $38.93 (267)$ $169.42 (268)$ $169.42 (268)$ $1462.61 (272)$ $19.66 (273)$ 83.59
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energy kWhyear 3760.03 2046.74 75.00 326.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271)	$kg CO_2/year$ $812.17 (261)$ $442.10 (264)$ $1254.26 (265)$ $38.93 (267)$ $169.42 (268)$ $169.42 (268)$ $1 = 1462.61 (272)$ $19.66 (273)$ 83.59 $84 (274)$
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	Energy kWh, year 3760.03 2046.74 75.00 326.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271) (272) ÷ (4)	$kg CO_2/year$ $812.17 (261)$ $442.10 (264)$ $1254.26 (265)$ $38.93 (267)$ $169.42 (268)$ $169.42 (268)$ $1462.61 (272)$ $19.66 (273)$ 83.59 $84 (274)$ B
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energy kWhyear 3760.03 2046.74 75.00 326.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271)	$kg CO_2/year$ $812.17 (261)$ $442.10 (264)$ $1254.26 (265)$ $38.93 (267)$ $169.42 (268)$ $169.42 (268)$ $1 = 1462.61 (272)$ $19.66 (273)$ 83.59 $84 (274)$
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energy kWh, year 3760.03 2046.74 75.00 326.44 326.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271) (272) ÷ (4)	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265) 38.93 (267) 169.42 (268)) = 1462.61 (272)) = 19.66 (273) 83.59 84 (274) B Primary Energy
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including mi	Energy kWh,year 3760.03 2046.74 75.00 326.44 326.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = (265)(271) (272) ÷ (4) Primary factor	kg CO ₂ /year 812.17 (261) 442.10 (264)) = 1254.26 (265) 38.93 (267) 169.42 (268)) = 1462.61 (272)) = 19.66 (273) 83.59 84 (274) B Primary Energy kWh/year
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including mil	Energy kWhyear 3760.03 2046.74 75.00 326.44 x26.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = x 0.519 = x 0.519 = (265)(271) (272) ÷ (4) Primary factor x 1.22 =	kg CO ₂ /year 812.17 (261) 442.10 (264) 1254.26 (265) 38.93 (267) 169.42 (268) $) =$ 1462.61 (272) $) =$ 19.66 (273) 83.59 (274) B B Primary Energy kWh/year 4587.24 (261) 2497.03 (264)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including main Space heating - main system 1 Water heating	Energy kWhyear 3760.03 2046.74 75.00 326.44 x26.44	kg CO ₂ /kWh x 0.216 = x 0.216 = (261) + (262) + (263) + (264) x 0.519 = (265)(271) (272) ÷ (4) Primary factor x 1.22 = x 1.22 =	kg CO ₂ /year 812.17 (261) 442.10 (264) 1254.26 (265) 38.93 (267) 169.42 (268) $) =$ 1462.61 (272) $) =$ 19.66 (273) 83.59 (274) B B Primary Energy kWh/year 4587.24 (261) 2497.03 (264)

Electricity for lighting

Primary energy kWh/year

Dwelling primary energy rate kWh/m2/year

1002.18

8316.70

111.78

(268)

(272)

(273)

326.44

х

3.07

=



Assessor name	Miss Alicja H	Kreglewska					As	sessor num	ber	4134		
Client							La	at modified		13/06	/2018	
Address	A G 02 Inge	stre Road,	London,	NW5 1XE								
1. Overall dwelling dimens	sions			•	ree (m²)		A utor			Va		
				А	rea (m²)			age storey ight (m)		vc	olume (m³)	
Lowest occupied					76.52	(1a) x		3.00	(2a) =		229.56	(3a)
Total floor area	(1a) + ((1b) + (1c) +	⊦ (1d)(1n) =	76.52] (4)], ,
Dwelling volume							(3a)	+ (3b) + (3d	c) + (3d)(3	in) =	229.56	(5)
									_			-
2. Ventilation rate											3	
											³ per hour	1
Number of chimneys								0	x 40 =		0] (6a)
Number of open flues								0	x 20 =		0] (6b)
Number of intermittent fan	S							3	x 10 =		30] (7a)
Number of passive vents								0	x 10 =		0] (7b) 1
Number of flueless gas fires	;							0	x 40 =		0] (7c)
										Air	changes pei hour	
Infiltration due to chimneys	, flues, fans, P	PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7c) =	30	÷ (5) =	:	0.13	(8)
, If a pressurisation test has b			ended, pl					o (16)	()] , ,
Air permeability value, q50,	expressed in	cubic metr	es per h	our per squ	are metre	of envelope	e area				4.00	(17)
If based on air permeability	value, then (1	18) = [(17) ÷	+ 20] + (8	8), otherwi	se (18) = (10	6)					0.33	(18)
Number of sides on which t	he dwelling is	sheltered									3	(19)
Shelter factor								1 -	[0.075 x (1	9)] =	0.78	(20)
Infiltration rate incorporatir	ng shelter fact	or							(18) x (2	20) =	0.26	(21)
Infiltration rate modified for	r monthly win	d speed:										-
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind spee	d from Table	U2										
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
5.10 Wind factor (22)m ÷ 4	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70] (22)
	5.00	4.90	4.40	4.30	3.80	3.80	3.70 0.93	4.00	4.30	4.50	4.70] (22)] (22a)
Wind factor (22)m ÷ 4	1.25	1.23	1.10	1.08	0.95	1	1					1
Wind factor (22)m ÷ 4	1.25	1.23	1.10	1.08	0.95	1	1					1
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al	1.25 llowing for she	1.23 elter and w 0.31	1.10 ind facto 0.28	1.08 or) (21) x (2	0.95 2a)m	0.95	0.93	1.00	1.08	1.13	1.18] (22a)
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.33	1.25 Ilowing for she 0.32 ge rate for the	1.23 elter and w 0.31 e applicable	1.10 ind facto 0.28 case:	1.08 or) (21) x (2 0.28	0.95 2a)m	0.95	0.93	1.00	1.08	1.13	1.18] (22a)
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.33 Calculate effective air change	1.25 Ilowing for she 0.32 ge rate for the h: air change ra	1.23 elter and w 0.31 e applicable ate through	1.10 ind facto 0.28 case: n system	1.08 or) (21) x (2 0.28	0.95 2a)m 0.24	0.95	0.93	1.00	1.08	1.13	0.30] (22a)] (22b)
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.33 Calculate effective air change If mechanical ventilation	1.25 Ilowing for she 0.32 ge rate for the a: air change rate covery: efficient	1.23 elter and w 0.31 e applicable ate through ncy in % all	1.10 ind facto 0.28 case: n system owing fo	1.08 or) (21) x (2 0.28 or in-use fa	0.95 2a)m 0.24 ctor from T	0.95	0.93	1.00	1.08	1.13	1.18 0.30] (22a)] (22b)] (23a)
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.33 Calculate effective air chang If mechanical ventilation If balanced with heat rec	1.25 Ilowing for she 0.32 ge rate for the a: air change rate covery: efficient	1.23 elter and w 0.31 e applicable ate through ncy in % all	1.10 ind facto 0.28 case: n system owing fo	1.08 or) (21) x (2 0.28 or in-use fa	0.95 2a)m 0.24 ctor from T	0.95	0.93	1.00	1.08	1.13	1.18 0.30] (22a)] (22b)] (23a)
Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.33 Calculate effective air change If mechanical ventilation If balanced with heat rec d) natural ventilation or	1.25 Ilowing for she 0.32 ge rate for the a: air change ra covery: efficient whole house 0.55	1.23 elter and w 0.31 e applicable ate through ncy in % all positive inp 0.55	1.10 ind facto 0.28 case: o system owing fo out venti 0.54	1.08 or) (21) x (2 0.28 or in-use fa ilation from 0.54	0.95 2a)m 0.24 ctor from T	0.95 0.24 able 4h	0.93	1.00	0.28	0.29	1.18 0.30 N/A N/A] (22a)] (22b)] (23a)] (23a)] (23c)



3. Heat losses	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net a A, r		U-value W/m²K	A x U W	•	value, /m².K	Ахк, kJ/K	
Window						19.	92 x	1.24	= 24.62				(27)
Exposed floor						76.	52 x	0.12	= 9.18				(28b
External wall						23.	53 x	0.18	= 4.24				(29a)
Party wall						85.	38 x	0.00	= 0.00				(32)
Total area of ex	ternal eleme	ents ∑A, m²	!			119	.97						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(26	5)(30) + (32) =	38.03	(33)
Heat capacity C	m = ∑(А x к)							(28)	.(30) + (32) +	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Appen	dix K								16.12	(36)
Total fabric hea	t loss									(33) + (36) =	54.15	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ted month	ly 0.33 x (2	25)m x (5)									
	41.92	41.76	41.61	40.89	40.75	40.12	40.12	40.01	40.37	40.75	41.03	41.31	(38)
Heat transfer co	oefficient, W	//K (37)m +	+ (38)m										
	96.07	95.92	95.76	95.04	94.90	94.28	94.28	94.16	94.52	94.90	95.18	95.46	
									Average = ∑	(39)112,	/12 =	95.04	(39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)										
	1.26	1.25	1.25	1.24	1.24	1.23	1.23	1.23	1.24	1.24	1.24	1.25	
									Average = ∑	(40)112	/12 =	1.24	(40)
Number of days	in month (1	Fable 1a)											
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heati	ng energy r	equiremen	t										
Assumed occup	ancy, N											2.39	(42)
Annual average	hot water u	isage in litre	es per day '	Vd,average	= (25 x N) +	36						91.05	(43)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach month '	Vd,m = fact	tor from Tab	le 1c x (43)							
	100.15	96.51	92.87	89.23	85.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	
										∑(44)1	.12 =	1092.55	(44)
Energy content	of hot wate	r used = 4.1	L8 x Vd,m x	nm x Tm/3	3600 kWh/m	onth (see ⁻	Tables 1b	, 1c 1d)					
	148.52	129.90	134.04	116.86	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	
										∑(45)1	.12 =	1432.51	(45)
Distribution loss					T			1 -					٦
	22.28	19.48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume		iding any so	olar or WW	HRS storag	e within sam	ne vessel						2.00	(47)
Water storage l													
b) Manufacture													
Hot water st	-		Table 2 (kV	Vh/litre/day	y)							0.02	(51)
Volume facto												3.91	(52)
Temperature												1.00	(53)
Energy lost f		storage (kW	/h/day) (47	/) x (51) x (5	52) x (53)							0.12	(54)
Enter (50) or (54				-) ()								0.12	(55)
Water storage l		1		1									□ /= -·
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit lo	oss for each	month fror	n Table 3										
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	ach month f	from Table 3	3a, 3b or 3	с									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requi	red for wate	er heating ca	alculated f	or each mo	onth 0.85 x	(45)m + (46	6)m + (57)r	n + (59)m +	- (61)m				
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	(62)
Solar DHW input						_							(-)
·	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa							0.00	0.00	0.00	0.00	0.00	0.00	(00)
	175.47	154.24	160.99	142.94	139.08	122.84	116.61	129.84	130.20	148.29	158.53	170.78	
	175.47	134.24	100.55	142.34	155.00	122.04	110.01	125.04	150.20	∑(64)1		.749.80	(64)
Heat gains from	water beat	ing (k)Nh/m	onth) 0.25		$(15)m \pm (61)$	\ml + 0.8 v	[(46)m + (1)]	(50)	ml	2(04)1	12 1	.749.80	(04)
fieat gains nom										C1 00	64.00	60.20	
	70.94	62.66	66.13	59.72	58.84	53.04	51.37	55.77	55.48	61.90	64.90	69.38	(65)
5. Internal gain	ıs												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	(Table 5)							-					
C	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	(66)
Lighting gains (ca							115.00	115.00	115.00	115.00	115.00	119.00	(00)
8	18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12.30	15.61	18.22	19.43	(67)
Appliance gains							7.05	9.10	12.50	15.01	10.22	19.45	(07)
Appliance gains	212.01	214.21	208.67	196.87			159.61	156.41	161.06	172.76	199.66	202.66	(60)
Cooking going (c					181.97	167.97	158.61	156.41	161.96	173.76	188.66	202.66	(68)
Cooking gains (c							24.07	24.07	24.07	24.07	24.07	2407	(60)
	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	34.97	(69)
Pump and fan ga													()
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap												,	
	-95.74		-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Water heating g	ains (Table !	5)											
	95.35	93.25	88.88	82.94	79.09	73.66	69.05	74.96	77.06	83.20	90.14	93.26	(72)
Total internal ga	iins (66)m +	· (67)m + (68	8)m + (69)ı	m + (70)m ·	+ (71)m + (7	72)m							
	385.17	383.15	370.11	349.05	327.69	307.05	293.61	299.43	310.21	331.48	355.93	374.25	(73)
6. Solar gains			A 6		A	Cali	f l		_	FF		Colina	
			Access f Table		Area m ²		ar flux //m²	spec	g ific data	specific d	ata	Gains W	
									able 6b	or Table			
SouthWest			0.7	7 X	16.45	x 36	6.79 x	0.9 x 0).63 x	0.80	=	211.40	(79)
SouthEast			0.7	7 X	3.47	x 30	6.79 x	0.9 x 0	D.63 x	0.80		44.59	(77)
Solar gains in wa	atts ∑(74)m	(82)m						<u> </u>					
	255.99	436.05	596.62	739.25	828.02	822.03	792.52	726.30	646.02	481.93	306.62	219.08	(83)
Total gains - inte	ernal and so							1				J	. ,
0	641.16	819.20	966.73	1088.30	1155.70	1129.08	1086.13	1025.73	956.23	813.41	662.55	593.32	(84)
	011.10	010.20	500.75	1000.50	1133.70	1125.00	1000.15	1023.73	550.25	013.11	002.55	333.32	(01)
7. Mean intern	al temperat	ture (heatin	ıg season)										
Temperature du	iring heating	g periods in	the living a	area from T	able 9, Th1	(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	r for gains fo	or living are	a n1,m (se	e Table 9a)									

	0.99	0.98	0.94	0.85	0.70	0.52	0.38	0.42	0.64	0.89	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	.)								-
	19.83	20.10	20.42	20.73	20.91	20.98	21.00	20.99	20.95	20.69	20.19	19.78	(87)
Temperature du	Iring heating	g periods ir	the rest of	f dwelling fr	om Table 9], ,
	19.88	19.88	19.88	19.89	19.89	19.89	19.89	19.90	19.89	19.89	19.89	19.88	(88)
Utilisation facto	r for gains f	1		m		1		1		1	1	1], ,
	0.99	0.97	0.92	0.81	0.63	0.44	0.29	0.32	0.55	0.86	0.97	0.99	(89)
Mean internal to								0.01] (,
	18.36	18.74	19.18	19.59	19.81	19.88	19.89	19.89	19.86	19.56	18.87	18.28	(90)
Living area fract		10.71	19.10	19.09	13.01	15.00	13.05	10.00		ving area ÷	·	0.35	(91)
Mean internal to		for the wh	ole dwellin	σfIA x T1 +	(1 - fl A) x T	т2				ing area .	(0.55] (31)
	18.87	19.21	19.61	19.99	20.19	20.27	20.28	20.28	20.24	19.95	19.33	18.80	(92)
Apply adjustme								20.20	20.24	15.55	15.55	10.00] (32)
	18.87	19.21	19.61	19.99	20.19	20.27	20.28	20.28	20.24	19.95	19.33	18.80	(93)
	10.07	19.21	19.01	19.99	20.19	20.27	20.28	20.28	20.24	19.95	19.55	18.80] (95)
8. Space heating	ng requirem	ient											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains,	ηm											
	0.99	0.96	0.91	0.81	0.65	0.47	0.32	0.35	0.58	0.86	0.97	0.99	(94)
Useful gains, ηπ	nGm, W (94	l)m x (84)m	1									_	.
	632.11	788.29	882.71	883.49	755.26	525.98	345.54	363.22	557.79	699.15	641.78	587.17	(95)
Monthly average	e external t	emperatur	e from Tabl	e U1						1	1	4], ,
, 0	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo] ()
	1399.60	1372.92	1255.67	1053.70	805.99	534.08	346.57	364.94	580.38	887.57	1164.01	1393.58	(97)
Space heating re							0.001		000.00	00/10/	110.001	1000.00] (37)
	571.02	392.87	277.48	122.55	37.74	0.00	0.00	0.00	0.00	140.18	376.01	599.96]
	0/1101	00107		111.00	0.11.	0.00	0.00	0.00		B)15, 10	·	2517.81	(98)
Space heating re	auirement	kWh/m²/v	ear						2(50			32.90	(99)
Space neuting re	quirement	, , , , , , , , , , , , , , , , , , ,	cui							(50)	• (•)	52.50] (33)
9b. Energy req	uirements -	communit	ty heating s	cheme									
Fraction of spac	e heat from	secondary	/suppleme	ntary syster	m (table 11	.)				'0' if ı	none	0.00	(301)
Fraction of spac	e heat from	communit	y system							1 - (30	01) =	1.00	(302)
Fraction of com	munity heat	from boile	ers									1.00	(303a)
Fraction of total	space heat	from com	nunity boil	ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and charg	ging metho	d (Table 4c	(3)) for com	munity spa	ace heating						1.00	(305)
Factor for charg	ing method	(Table 4c(3)) for comi	munity wate	er heating							1.00	(305a)
Distribution loss	factor (Tab	le 12c) for	community	heating sy	stem							1.05	(306)
													<u> </u>
Space heating													
Annual space he	ating requi	rement						2	517.81]			(98)
Space heat from								(98	3) x (304a) x	, k (305) x (30	06) =	2643.70	(307a)
								·		. , .	·], ,
Water heating													
Annual water he	eating requi	rement						1	749.80	1			(64)
Water heat fron) (305a) x (30	06) =	1837.29	(310a)
Electricity used		tribution					0.01	(04). . × [(307a)				44.81	(313)
Licenterty used	. Si neut uis						0.01				~/] = [] (313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

	0.00	(331)
	333.80	(332)
(307) + (309) + (310) + (312) + (315) + (331) + (332)(337b) =	4814.80	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price	Fuel cost £/year
Space heating from boilers	2643.70	x	4.24 x 0.02	1 = 112.09 (3
Water heating from boilers	1837.29	х	4.24 x 0.02	1 = 77.90 <mark>(3</mark>
Electricity for lighting	333.80	х	13.19 x 0.02	1 = 44.03 (3
Additional standing charges				120.00 (3
Total energy cost			(340a)(342e) + (345)(3	354) = 354.02 (3
11b. SAP rating - community heating scheme				
Energy cost deflator (Table 12)				0.42 (3
Energy cost factor (ECF)				1.22 (3
SAP value				82.93
SAP rating (section 13)				83 (3
SAP band				В
12b. CO ₂ emissions - community heating scheme				
	Energy kWh/year		Emission factor	Emissions (kg/year)

Emissions from other sources	(space heating)						
Efficiency of boilers		89.50					(367a)
CO2 emissions from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	5006.70	x	0.216	=	1081.45	(367)
Electrical energy for communit	ty heat distribution	44.81	x	0.519	=	23.26	(372)
Total CO2 associated with com	imunity systems					1104.70	(373)
Total CO2 associated with space	ce and water heating					1104.70	(376)
Electricity for lighting		333.80	x	0.519	=	173.24	(379)
Total CO ₂ , kg/year					(376)(382) =	1277.95	(383)
Dwelling CO ₂ emission rate					(383) ÷ (4) =	16.70	(384)
El value						85.91]
EI rating (section 14)						86	(385)
EI band						В]
13b. Primary energy - comm	unity heating scheme						
		Energy kWh/year		Primary factor		Primary energy (kWh/year)	,
Primary energy from other sou	arces (space heating)						

Primary energy from other sources (space)	neating)						
Efficiency of boilers		89.50					(367a)
Primary energy from boilers [(307a)+(3	310a)] x 100 ÷ (367a) =	5006.70	x	1.22	=	6108.17	(367)
Electrical energy for community heat distri	bution	44.81	x	3.07	=	137.57	(372)
Total primary energy associated with comm	nunity systems					6245.74	(373)
Total primary energy associated with space	e and water heating					6245.74	(376)
Electricity for lighting		333.80	x	3.07	=	1024.77	(379)
Primary energy kWh/year						7270.51	(383)
Dwelling primary energy rate kWh/m2/yea	ır					95.01	(384)



Assessor name	Miss Alicja Kreglew	rska				Ass	sessor numb	ber	4134	
Client						Las	t modified		13/06,	/2018
Address	A G 02 Ingestre Roa	ad, London, N	W5 1XE							
1. Overall dwelling dimer	isions									
			A	rea (m²)			age storey ight (m)		Vo	lume (m³)
Lowest occupied				76.52](1a) x		3.00	(2a) =		229.56 (<mark>3</mark>
Total floor area	(1a) + (1b) + (1	Lc) + (1d)(1	n) =	76.52] (4)			6		
Dwelling volume						(3a)	+ (3b) + (3c	+ 3d)'3	n) =	229.56 (5)
2. Ventilation rate							71.			
									m³	per hour
Number of chimneys								x 40 =		0 (6
Number of open flues							0	x 20 =		0 (6
Number of intermittent far	าร						3	x 10 =		30 (7
Number of passive vents							0	x 10 =		0 (7
Number of flueless gas fire	S				5		0	x 40 =		0 (7
				C					Air c	hanges per
								(-)		hour
Infiltration due to chimney If a pressurisation test has		intended pro			a) + (7b) + (7		30	÷ (5) =		0.13 (8)
Air permeability value, q50) (10)			5.00 (1
If based on air permeability						alea				0.38 (1
Number of sides on which			, otherwis	56 (10) – (10	5)					3 (1
Shelter factor	the dwelling is sherter	eu					1 - [0.075 x (19	a)] = [0.78 (2)
Infiltration rate incorporati	ing shelter factor						- 1	(18) x (2		0.30 (2
Infiltration rate modified for		4.						(10) / (2	0) =	0.50
Jan		Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan Monthly average wind spe	Feb Mə'	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind spe	Feb Mar ed from Table U2				1					
Monthly average wind spec	Feb Mə'	Apr 4.40	May 4.30	Jun 3.80	Jul 3.80	Aug 3.70	Sep 4.00	Oct 4.30	Nov	Dec 4.70 (2
Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4	Feb May ed from Table U2 200	4.40		3.80	3.80	3.70	4.00	4.30	4.50	4.70 (2
Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4 1.28	Feb May ed from Table U2 3.00 4.90 1.25 1.23	4.40	4.30	3.80 0.95	1					
Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4	Feb May ed from Table U2 3.00 4.90 1.25 1.23	4.40	4.30	3.80 0.95	3.80	3.70	4.00	4.30	4.50	4.70 (2
Monthly average wind specific terms of the second s	Feb Ma ed from Table U2 3.00 4.90 1.25 1.23 allowing for shelter an 0.37 0.36	4.40 1.10 d wind factor 0.32	4.30 1.08 (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (2
Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38	Feb May ed from Table U2 200 4.90 1.25 1.23 allowing for shelter an 0.37 0.36 nge rate for the application	4.40 1.10 d wind factor 0.32 able case:	4.30 1.08 (21) x (2	3.80 0.95 22a)m	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70 (2
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan	FebMayed from Table U22.004.901.251.251.23allowing for shelter an0.370.36nge rate for the application in air change rate throp	4.40 1.10 d wind factor 0.32 able case: bugh system	4.30 1.08 -) (21) × (2 0.32	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	4.30	4.50	4.70 (2 1.18 (2 0.35 (2
Monthly average wind spectrum 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio	Feb May ed from Table U2 200 200 4.90 1.25 1.23 allowing for shelter an 0.37 0.36 nge rate for the application of the state three ecovery: efficiency in %	4.40 1.10 d wind factor 0.32 able case: bugh system 6 allowing for	4.30 1.08 (21) x (2 0.32 • in-use fa	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	4.30	4.50	4.70 (2 1.18 (2 0.35 (2 N/A (2
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio If balanced with heat re	Feb May ed from Table U2 200 200 4.90 1.25 1.23 allowing for shelter an 0.37 0.36 nge rate for the application of the state three ecovery: efficiency in %	4.40 1.10 d wind factor 0.32 able case: bugh system 6 allowing for	4.30 1.08 (21) x (2 0.32 • in-use fa	3.80 0.95 22a)m 0.28	3.80 0.95 0.28	3.70 0.93	4.00	4.30	4.50	4.70 (2 1.18 (2 0.35 (2 N/A (2
Monthly average wind spec 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a 0.38 Calculate effective air chan If mechanical ventilatio If balanced with heat red d) natural ventilation on	FebMayed from Table 022004.901.251.251.23allowing for shelter an0.370.36nge rate for the applicationn: air change rate through the covery: efficiency in %r whole house positive0.570.57	4.40 1.10 d wind factor 0.32 able case: bugh system 6 allowing for e input ventile 0.55	4.30 1.08 (21) x (2 0.32 in-use fa ation from 0.55	3.80 0.95 22a)m 0.28 ctor from T n loft	3.80 0.95 0.28	3.70 0.93 0.27	4.00	4.30 1.08 0.32	4.50 1.13 0.33	4.70 (2 1.18 (2 0.35 (2 N/A (2 N/A (2



3. Heat losses	and heat lo	ss paramet	er										
Element			а	Gross rea, m²	Openings m ²	Net A,		U-value W/m²K	A x U \	•	value, /m².K	Ахк, kJ/K	
Window						19.	13 x	1.33	= 25.3	6			(27)
Exposed floor						76.	.52 x	0.13	= 9.9	5			(28b
External wall						24.	.33 x	0.18	= 4.3	8			(29a)
Party wall						85.	.38 x	0.00	= 0.0	D			(32)
Total area of ext	ternal eleme	ents ∑A, m²	2			119	.98						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(2	26)(30) + (32) =	39.69	(33)
Heat capacity C	m = ∑(А x к)							(28)) + (32a)(3		N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/r	n²K									250.00	(35)
Thermal bridges	s: Σ(Γ x Ψ) ca	alculated us	sing Appen	dix K								10.80	(36)
Total fabric heat			0 11							(33) + (36) =	50.49	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ited month	ly 0.33 x (2										
	43.24	43.03	42.82	41.87	41.69	40.85	40.85	40.70	41.17	41.6°	42.05	42.43	(38)
Heat transfer co											1		
	93.72	93.52	93.31	92.35	92.18	91.34	91.34	91.19	91.60	92.18	92.54	92.92	٦
	55.72	33.3L	55.51	52.55	52.10	51.51	51.51	1		Σ(39)112	·	92.35	(39)
Heat loss param	eter (HLP).	W/m²K (39	9)m ÷ (4)						, werug	2(00)112	,	52.55	
	1.22	1.22	1.22	1.21	1.20	1.19	1.19	1.10	1.20	1.20	1.21	1.21	
	1.22	1.22	1.22	1.21	1.20	1.15	1.15			Σ(40)112	·	1.21	(40)
Number of days	in month (Table 1a)						Υ'	Average -	2(40)112	/12	1.21	_ (40)
Number of days	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
	51.00	28.00	51.00	30.00	51.00	30.00	31.00	1 31.00	30.00	51.00	50.00	51.00	(40)
4. Water heati	ng energy r	equiremen	t			0							
Assumed occup	ancy, N											2.39	(42)
Annual average	hot water u	sage in litre	es per day	Vd,average	= (25 × N) +	36						91.05	(43)
	Jan	Feb	Mar	Apr	Mut	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach month	Vd,m = fact	to: iron Tab	le 1c x (43)						
	100.15	96.51	92.87	89.23	35.58	81.94	81.94	85.58	89.23	92.87	96.51	100.15	
										∑(44)1	12 =	1092.55	(44)
Energy content	of hot wate	r used = 4.3	18 x Vd .n x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1b,	1c 1d)					
	148.52	129.90	1.54.0	116.86	112.13	96.76	89.66	102.89	104.12	121.34	132.45	143.83	
			5					•		Σ(45)1	12 =	1432.51	(45)
Distribution loss	5 0.15 x (45)	m	×										
	22.28	1 48	20.11	17.53	16.82	14.51	13.45	15.43	15.62	18.20	19.87	21.58	(46)
Storage volume		iding any s						•				2.00	(47)
Water storage lo		,											
a) If manufactur		d loss facto	or is known	(kWh/day)								0.24	(48)
Temperature				(,,								0.54	(49)
Energy lost f			(h/day) (49	R) x (49)								0.13	(50)
Enter (50) or (54		torage (KM	////uuy/ (+c	5)								0.13	(55)
Water storage lo		d for each	month (F	$5) \times (11)$ m								0.15	_ (55)
valer storage i	Г		1	1	4.00	2 07	4.00	4.00	207	4.00	700	4.00	(EC)
If the vessel con	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
ii the vessel con	r		-	1	1 1			1	207	4.00	2.07	4.00	/>
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(57)
Primary circuit l	acc for anch	month tro	miania										

23.26 21.01 22.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 25.51 23.26 25.51 23.26 25.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 25.51 23.26 25.57 23.26 16.30 143.24 139.39 123.14 116.92 130.15 130.50 148.60 158.83 171.09 (62) Solution water heater for each month (WM/month) 0.25 × (0.55) 148.60 158.83 171.09 (64) Solution water heating (kWM/month) 0.25 × (0.55) 148.60 158.83 171.09 (64) Solution water heating (kWM/month) 0.25 × (0.56) 53.26 51.62 56.02 55.72 62.15 61.63 <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>-</th><th>-</th><th>1</th><th>-</th></td<>											-	-	1	-
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month 0.85 x (45)m + (45)m + (57)m + (59)m + (51)m Image: Calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (51)m Solar DHW input calculated using Appendix G or Appendix H 0.00<	Combi loss for e	ach month	from Table	3a, 3b or 3	С									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Solar DHW input calculated using Appendix G or Appendix H 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Total heat requi	red for wat	er heating o	calculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)r	n + (59)m +	- (61)m				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09	(62)
Output from water heater for each month (kWh/month) (62)m + (63)m Image: Construct of the state	Solar DHW inpu	t calculated	using Appe	endix G or A	Appendix H									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Output from wa	ter heater f	or each mo	onth (kWh/	month) (62	2)m + (63)m	1			•			•	-
Heat gains from water heating (kWh/month) 0.25 × (0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] 71.19 62.89 66.38 59.96 59.09 53.28 51.62 55.72 62.15 65.14 69.63 (65) 5. Internal gains S. Internal gains Metabolic gains (Table 5) 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 119.68 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 18.90 16.79 13.65 10.34 7.73 6.52 7.05 9.16 41.30 15.61 18.22 19.43 (67) Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 212.01 214.21 208.67 196.87 181.97 167.97 158.61 15.49 161.96 173.76 188.66 202.66 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 234.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 (69) Pump and fan gains (Table 5a) 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00		175.78	154.52	161.30	143.24	139.39	123.14	116.92	130.15	130.50	148.60	158.83	171.09]
T1.19 62.89 66.38 59.96 59.09 53.28 51.62 56.02 55.72 62.15 65.14 69.63 (65) S. Internal gains Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Metabolic gains (Table 5) 119.68 16.69 119.68 16.69 119.68 16.69 119.68 16.69 119.68 16.69 119.68 16.69			•	•	•	•	•	•			<u>Σ(64)1</u>	12 = 1	.753.47	(64)
S. Internal gains Summer in the second													-	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Metabolic gains (Table 5) 119.68 1660 Appliance gains (calculated in Appendix L, equation L15 or L13a), also see Table 5 212.01 214.97 34.97 34.97 <td></td> <td>71.19</td> <td>62.89</td> <td>66.38</td> <td>59.96</td> <td>59.09</td> <td>53.28</td> <td>51.62</td> <td>56.02</td> <td>55.72</td> <td>62.15</td> <td>65.14</td> <td>69.63</td> <td>(65)</td>		71.19	62.89	66.38	59.96	59.09	53.28	51.62	56.02	55.72	62.15	65.14	69.63	(65)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Metabolic gains (Table 5) 119.68 1660 Appliance gains (calculated in Appendix L, equation L15 or L13a), also see Table 5 212.01 214.97 34.97 34.97 <td></td> <td>-</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td></td> <td></td> <td>•</td> <td></td> <td>•</td> <td>-</td>		-	•	•	•	•	•	•			•		•	-
Metabolic gains (Table 5) 119.68 116.50 116.50 116.50	5. Internal gair	15												
119.68 119.68<		Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 18.90 16.79 13.65 10.34 7.73 6.52 7.05 9.16 42.30 15.61 18.22 19.43 (67) Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 212.01 214.21 208.67 196.87 181.97 167.97 158.61 15.44 161.96 173.76 188.66 202.66 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 (69) Pump and fan gains (Table 5a) 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00	Metabolic gains	(Table 5)									CA			
18.90 16.79 13.65 10.34 7.73 6.52 7.05 9.16 12.01 15.61 18.22 19.43 (67) Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 212.01 214.21 208.67 196.87 181.97 167.97 158.61 156.4# 1161.96 173.76 188.66 202.66 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.97 49.74 95.74 -95.74		119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	119.68	112.69	119.68	119.68] (66)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 212.01 214.21 208.67 196.87 181.97 167.97 158.61 155.42 161.96 173.76 188.66 202.66 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.97 <td>Lighting gains (c</td> <td>alculated in</td> <td>Appendix</td> <td>L, equation</td> <td>L9 or L9a),</td> <td>also see Ta</td> <td>able 5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Lighting gains (c	alculated in	Appendix	L, equation	L9 or L9a),	also see Ta	able 5							
212.01 214.21 208.67 196.87 181.97 167.97 158.61 15.4* 161.96 173.76 188.66 202.66 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.97		18.90	16.79	13.65	10.34	7.73	6.52	7.05	9.16	12 30	15.61	18.22	19.43	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 34.97 (69) Pump and fan gains (Table 5a) 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.00	Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L	13a), also se	ee Table 5							
34.97 34.97 <td< td=""><td></td><td>212.01</td><td>214.21</td><td>208.67</td><td>196.87</td><td>181.97</td><td>167.97</td><td>158.61</td><td>15 5.42</td><td>161.96</td><td>173.76</td><td>188.66</td><td>202.66</td><td>(68)</td></td<>		212.01	214.21	208.67	196.87	181.97	167.97	158.61	15 5.42	161.96	173.76	188.66	202.66	(68)
Pump and fan gains (Table 5a) 3.00	Cooking gains (c	alculated in	Appendix	L, equation	L15 or L15	a), also see	Table 5		\mathbf{X}					
3.00 3.00		34.97	34.97	34.97	34.97	34.97	34.97	34 97	34.97	34.97	34.97	34.97	34.97	(69)
Losses e.g. evaporation (Table 5) -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 -95.74 (71) Water heating gains (Table 5) 95.69 93.58 89.22 83.28 79.2 74.00 69.38 75.29 77.39 83.54 90.48 93.59 (72) Total internal gains (66)m + (67)m + (68)m + (70)m + (71)n + (72)m 388.51 386.49 373.44 352.33 31.02 310.39 296.95 302.77 313.55 334.81 359.26 377.58 (73) 6. Solar gains Access fastor Area m ² Solar flux g g FF Gains W/m ² specific data or Table 6b rable 6c W or Table 6c W (71) + (72)m (72) + (72)m (73) (73) (73) (73) (74) (75) (75) (75) (75) (75) (75) (75) (75	Pump and fan ga	ains (Table S	5a)					5						-
-95.74 -95.74		3.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	3.00] (70)
Water heating gains (Table 5) 95.69 93.58 89.22 83.28 -9.2 74.00 69.38 75.29 77.39 83.54 90.48 93.59 (72) Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)r + (72)m 388.51 386.49 373.44 352.35 531.02 310.39 296.95 302.77 313.55 334.81 359.26 377.58 (73) 6. Solar gains Access fastor Area Solar flux g FF Gains	Losses e.g. evap	oration (Tal	ole 5)				(
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	-95.74	(71)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)n + (72)m 388.51 386.49 373.44 352.32 331.02 310.39 296.95 302.77 313.55 334.81 359.26 377.58 (73) 6. Solar gains Access factor Area m ² Solar flux W/m ² g FF Gains W Solar flux g Specific data or Table 6b N SouthWest 0.77 x 15.80 x 36.79 SouthWest 0.63 x 0.63 x 0.70 177.67 (79)	Water heating g	ains (Table	5)									-		-
388.51 386.49 373.44 352.35 331.02 310.39 296.95 302.77 313.55 334.81 359.26 377.58 (73) 6. Solar gains Maccus factor Area m ² Solar flux W/m ² g specific data or Table 6b FF specific data or Table 6c Gains W SouthWest		95.69	93.58	89.22	83.28	79.4.2	74.00	69.38	75.29	77.39	83.54	90.48	93.59	(72)
6. Solar gains Accus factor Area m ² Solar flux W/m ² g specific data or Table 6b FF Gains W SouthWest 0.77 x 15.80 x 36.79 x 0.9 x 0.63 x 0.70 = 177.67 (79)	Total internal ga	ins (66)m +	+ (67)m + (6	58)m + (69)	m + (70)m	+ (/1)r. + (7	72)m							-
Access factor Toble 6dArea m²Solar flux W/m²g specific data or Table 6bFF specific data or Table 6cGains WSouthWest0.77x15.80x36.79x 0.9 x0.63x0.70=177.67(79)										1		250.26	377 58	(73)
Access factor Toble 6dArea m²Solar flux W/m²g specific data or Table 6bFF specific data or Table 6cGains WSouthWest0.77x15.80x36.79x 0.9 x0.63x0.70=177.67(79)		388.51	386.49	373.44	352.35	531.02	310.39	296.95	302.77	313.55	334.81	359.20	577.50	
SouthWest 0.77 x 15.80 x 36.79 x 0.9 x 0.63 x 0.70 = 177.67 (79)		388.51	386.49	373.44	352.35	331.02	310.39	296.95	302.77	313.55	334.81	359.20	577.50	
or Table 6b or Table 6c SouthWest 0.77 x 15.80 x 36.79 x 0.9 x 0.63 x 0.70 = 177.67 (79)	6. Solar gains	388.51	386.49		G	531.02			302.77	313.55		359.20		
	6. Solar gains	388.51	386.49	Accest	astor	Area	Sol	ar flux	1	g	FF		Gains	
	6. Solar gains	388.51	386.49	Accest	astor	Area	Sol	ar flux	spec	g ific data	FF specific d	lata	Gains	
		388.51	386.49	Accurs f	factor 6d	Area m²	Sol	ar flux //m²	spec or T	g ific data able 6b	FF specific d or Table	lata 6c	Gains W] (79)
Solar gains in watts ∑(74)m(82)m	SouthWest	388.51	386.49	Access 1 Table	antor 6d 7 x [Area m ² 15.80	Sol W	ar flux //m² 6.79 x	spec or T 0.9 x	g ific data able 6b 0.63 x	FF specific d or Table	lata 6c	Gains W 177.67	-

215.11 366.41 501.34 621.19 695.78 690.75 665.96 610.31 542.85 404.96 257.65 184.09 (83) Total gains - internal and solar (73)m + (83)m 874.78 603.62 752.90 973.57 1026.80 1001.14 962.90 913.08 856.40 739.78 616.91 561.67 (84)

7. Mean intern	7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1(°C) [21.00 (85)												(85)	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)													
	0.99	0.98	0.95	0.88	0.75	0.57	0.41	0.45	0.69	0.92	0.98	1.00	(86)
Mean internal to	of livin	g area T1 (s	tens 3 to 7	in Table 9c	•)								

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

	19.83	20.07	20.37	20.68	20.89	20.98	21.00	20.99	20.94	20.66	20.18	19.78	(87)
Temperature du] ()
	19.90	19.90	19.90	19.91	19.92	19.93	19.93	19.93	19.92	19.92	19.91	19.91	(88)
Utilisation facto	L				10:01	10.00	10.00	10.00	10:02	10101	10.01	10101] (00)
	0.99	0.98	0.94	0.85	0.68	0.48	0.31	0.35	0.60	0.88	0.98	0.99	(89)
Mean internal t								0.55	0.00	0.00	0.50	0.55] (03)
	18.37	18.72	19.14	19.57	19.82	19.91	19.92	19.92	19.88	19.55	18.88	18.31	(90)
Living area fract		10.72	19.14	19.57	19.82	19.91	19.92	19.92		ving area ÷		0.35) (91)
Mean internal t		for the who	ale dwellin	σ fl Δ v T1 ⊣	-(1 - fl Δ) γ	т2				ving area .	(4)	0.55] (31)
	18.88	19.19	19.57	-			20.30	20.20	20.25	19.94	10.22	10.07	(02)
Apply adjustma				19.96	20.19	20.28		20.30	20.25	19.94	19.33	18.82	(92)
Apply adjustme		,	-			1		20.20	20.25	10.04	10.22	10.02	
	18.88	19.19	19.57	19.96	20.19	20.28	20.30	20.30	20.25	19.94	19.33	18.82	93)
8. Space heati	ng requirem	ient											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains,	ηm								C			
	0.99	0.97	0.93	0.85	0.70	0.51	0.35	0.39	0.63	0.99	0.97	0.99	(94)
Useful gains, ηn	nGm, W (94	l)m x (84)m		1	I					3], ,
0 / 1	596.76	731.02	815.93	825.38	719.80	508.59	336.24	353.03	J35 26	654.71	601.47	556.95	(95)
Monthly averag					120.000	000.00		1 000.00	1.000,20	001112	002117	000000] (30)
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	1.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo				1			10.00	,	14.10	10.00	7.10	4.20] (30)
	1366.11	1336.03	1219.34	1021.13	782.60	518.94	337 56	255.20	563.86	860.56	1131.58	1358.39	(97)
Space heating r							337-10	53.20	505.80	800.50	1131.30	1558.55] (97)
Space nearing n	572.39	406.56	300.13	140.94	46.72	0.00	0.00	0.00	0.00	153.15	381.68	596.28	1
	572.59	400.50	500.15	140.94	40.72	0.00	5.0.5	0.00		8)15, 10			
Space heating r		1.1.1.1 /m 2 /				U)		2(9)	•		2597.86] (98)] (98)
space nearing n	equirement	күүп/ш-/уе	di							(98) -	÷ (4)	33.95	(99)
9a. Energy req	uirements -	individual l	heating sys	stems inclu	ding micro	-CHP							
Space heating					C								
Fraction of space	e heat from	secondary/	suppleme	ntary sy te	n (table 11	L)						0.00	(201)
Fraction of space				CX						1 - (20)1) =	1.00	(202)
Fraction of space										·		0.00	(202)
Fraction of tota									(20	02) x [1- (203	3)] =	1.00	(204)
Fraction of tota	•		\mathbf{C}						, -	(202) x (20		0.00	(205)
Efficiency of ma										() // (93.50	(206)
	Jan	Fru	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec] (200)
Space heating f					,								
opuce neuting n	612.18	434.83	321.00	150.74	49.97	0.00	0.00	0.00	0.00	163.80	408.21	637.73	1
	012.10	13 1103	321.00	130.71	13.37	0.00	0.00	0.00		1)15, 10		2778.46	(211)
Water heating									2(21)	1/15, 10	12	.,,0.40] (211)
Efficiency of wa	ter heater												
	87.74	87.28	86.45	84.77	82.24	79.80	79.80	79.80	79.80	84.89	87.07	87.87	(217)
Water heating f			80.45	04.77	02.24	79.80	79.80	/9.80	79.80	04.05	87.07	07.07](217)
water neating i	-		196 50	169.09	160.40	154.21	146 52	162.00	162 52	175.04	102 42	104 71	1
	200.35	177.04	186.59	168.98	169.49	154.31	146.52	163.09	163.53	175.04	182.42	194.71	
										∑(219a)1	12 = 2	2082.08	(219)
Annual totals												770 10	Т
Space heating for	uel - main sy	/stem 1									2	2778.46	

					7
Water heating fuel				2082.08	
Electricity for pumps, fans and electric keep-hot (Table 4f)			7		(000)
central heating pump or water pump within warm air he	eating unit	30.00			(230c)
boiler flue fan		45.00			(230e)
Total electricity for the above, kWh/year				75.00	(231)
Electricity for lighting (Appendix L)				333.80	(232)
Total delivered energy for all uses		(211)(221) + (231)	+ (232)(237b) =	5269.34	(238)
10a. Fuel costs - individual heating systems including mic	ro-CHP				
	Fuel kWh/year	Fuel price		Fuel cost £/year	
Space heating - main system 1	2778.46	x 3.48	x 0.01 =	96.69	(240)
Water heating	2082.08	x 3.48	x 0.01 =	72.46	(247)
Pumps and fans	75.00	x 13.19	x 0.01 =	9.89	(249)
Electricity for lighting	333.80	x 13.19	x 0.01 =	44.03	(250)
Additional standing charges			C	120.00	(251)
Total energy cost		(240)(242)) + (2-5)(7.54) =	343.07	(255)
11a. SAP rating - individual heating systems including mic	cro-CHP				
Energy cost deflator (Table 12)				0.42	(256)
Energy cost factor (ECF)				1.19	(257)
SAP value				83.46]
SAP rating (section 13)				83	(258)
SAP band				В]
		2			_
12a. CO ₂ emissions - individual heating systems including					
	Energ / kWh/year	Emission facto kg CO₂/kWh	or	Emissions kg CO ₂ /year	_
Space heating - main system 1	2778.46	x 0.216	=	600.15	(261)
Water heating	2082.08	x 0.216	=	440 70	(264)
				449.73	
Space and water heating	SY		+ (263) + (264) =	449.73 1049.88	(265)
Space and water heating Pumps and fans	75.00		+ (263) + (264) = =		-
Pumps and fans Electricity for lighting	75.00 333.80	(261) + (262)		1049.88	(265)
Pumps and fans Electricity for lighting		(261) + (262) x 0.519	=	1049.88 38.93] (265)] (267)
Pumps and fans Electricity for lighting		(261) + (262) x 0.519	= =	1049.88 38.93 173.24	(265) (267) (268)
Pumps and fans Electricity for lighting		(261) + (262) x 0.519	= = (265)(271) =	1049.88 38.93 173.24 1262.04	(265) (267) (268) (272)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate		(261) + (262) x 0.519	= = (265)(271) =	1049.88 38.93 173.24 1262.04 16.49	(265) (267) (268) (272)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value		(261) + (262) x 0.519	= = (265)(271) =	1049.88 38.93 173.24 1262.04 16.49 86.08	(265) (267) (268) (272) (273)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	333.80	(261) + (262) x 0.519	= = (265)(271) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86	(265) (267) (268) (272) (273)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	333.80	(261) + (262) x 0.519	= (265)(271) = (272) ÷ (4) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86	(265) (267) (268) (272) (273) (273) (274)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	333.80 g micro-CHP Energy	(261) + (262) x 0.519 x 0.519	= (265)(271) = (272) ÷ (4) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy	(265) (267) (268) (272) (273) (273) (274)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems includin	333.80 Ig micro-CHP Energy kWh/year	(261) + (262) x 0.519 x 0.519 Primary facto	= (265)(271) = (272) ÷ (4) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy kWh/year	(265) (267) (268) (272) (273) (273) (274)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems includin Space heating - main system 1	333.80 ag micro-CHP Energy kWh/year 2778.46	(261) + (262) x 0.519 x 0.519 x 0.519 x 1.22 x 1.22	= (265)(271) = (272) ÷ (4) = r =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy kWh/year 3389.72	(265) (267) (268) (272) (273) (273) (274)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems includin Space heating - main system 1 Water heating	333.80 ag micro-CHP Energy kWh/year 2778.46	(261) + (262) x 0.519 x 0.519 x 0.519 x 1.22 x 1.22	= (265)(271) = (272) ÷ (4) = = = =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy kWh/year 3389.72 2540.14	(265) (267) (268) (272) (273) (274) (274) (261) (261) (264)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems includin Space heating - main system 1 Water heating Space and water heating	333.80 ag micro-CHP Energy kWh/year 2778.46 2082.08	(261) + (262) x 0.519 x 0.519 x 0.519 x 1.22 x 1.22 x 1.22 (261) + (262)	= (265)(271) = (272) ÷ (4) = r = = + (263) + (264) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy kWh/year 3389.72 2540.14 5929.85	(265) (267) (268) (272) (273) (273) (274) (274) (261) (261) (265)
Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems includin Space heating - main system 1 Water heating Space and water heating Pumps and fans	333.80 g micro-CHP Energy kWh/year 2778.46 2082.08 75.00	(261) + (262) x 0.519 x 0.519 x 0.519 x 1.22 x 1.22 x 1.22 (261) + (262) x 3.07	= (265)(271) = (272) ÷ (4) =	1049.88 38.93 173.24 1262.04 16.49 86.08 86 B Primary Energy kWh/year 3389.72 2540.14 5929.85 230.25	(265) (267) (268) (272) (273) (273) (273) (274) (274) (261) (264) (265) (267)

DER Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Miss Alicja Kr	eglewska					As	sessor num	ber	4134		
Client							Las	st modified		13/06,	/2018	
Address	A G 04 above	gym Inges	tre Roa	d, London	, NW5 1XE							
1. Overall dwelling dimens	sions				(2)						1 (3)	
				А	rea (m²)			age storey ight (m)		Vo	lume (m³)	
Lowest occupied					54.41] (1a) x		3.00	(2a) =		163.23	(3a)
Total floor area	(1a) + (1	b) + (1c) +	(1d)(1	.n) =	54.41] (4)						
Dwelling volume							(3a)	+ (3b) + (3d	c) + (3d)(3	sn) =	163.23	(5)
2. Ventilation rate												
										mª	' per hour	
Number of chimneys								0	x 40 =		0	(6a)
Number of open flues								0	x 20 =		0	(6b)
Number of intermittent fans	S							2	x 10 =		20	(7a)
Number of passive vents								0	x 10 =		0	(7b)
Number of flueless gas fires								0	x 40 =		0	(7c)
C C										Air c	hanges per	
											hour	
Infiltration due to chimneys					+ (6b) + (7a			20	÷ (5) =		0.12	(8)
If a pressurisation test has b								o (16)				
Air permeability value, q50,							e area				4.00	(17)
If based on air permeability			20] + (8), otherwis	se (18) = (16	6)					0.32	(18)
Number of sides on which the	he dwelling is s	heltered									3	(19)
Shelter factor								1 -	[0.075 x (19		0.78	(20)
Infiltration rate incorporation	-								(18) x (2	20) =	0.25	(21)
Infiltration rate modified for							_		• •		_	
Jan Monthly average wind spee			Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
VIUITUIIV average with Spee												
			1.40	4 20	2 80	2 80	2 70	4.00	1 20	4 50	4 70	(22)
5.10			4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
5.10 Wind factor (22)m ÷ 4	5.00 4	1.90 4			1		1					
5.10 Wind factor (22)m ÷ 4 1.28	5.00 4 1.25 1	1.90 4 1.23 :	1.10	1.08	0.95	3.80 0.95	3.70 0.93	4.00	4.30	4.50	4.70	
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al	5.00 4 1.25 1 lowing for shelt 1	1.90 4	1.10 nd facto	1.08	0.95	0.95	1					(22a)
5.10 Wind factor (22)m ÷ 4 1.28	5.00 4 1.25 1 lowing for shelt 0.31	4.90 4 1.23 2 ter and wir 0.31 0	1.10 nd facto 0.27	1.08 r) (21) x (2	0.95 2a)m		0.93	1.00	1.08	1.13	1.18	(22a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.32	5.00 4 1.25 1 lowing for shelt 0.31 0.31 0 ge rate for the a	1.90 4 1.23 2 ter and wir 0.31 (applicable o	1.10 nd facto 0.27 case:	1.08 r) (21) x (2	0.95 2a)m	0.95	0.93	1.00	1.08	1.13	1.18	
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.32 Calculate effective air chang	5.0041.251lowing for shelf0.310ge rate for the a: air change rate	1.90 4 1.23 2 ter and wir 0.31 0 applicable of the through	1.10 nd facto 0.27 case: system	1.08 rr) (21) x (2 0.27	0.95 2a)m 0.24	0.95	0.93	1.00	1.08	1.13	0.29	(22a) (22b) (23a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.32 Calculate effective air change If mechanical ventilation	5.0041.251lowing for shelf0.310ge rate for the a: air change ratecovery: efficience	1.90 4 ter and wir 0.31 (applicable of ce through cy in % allo	1.10 nd facto 0.27 case: system wing fo	1.08 r) (21) x (2 0.27 r in-use fa	0.95 2a)m 0.24 ctor from T	0.95	0.93	1.00	1.08	1.13	1.18 0.29 N/A	(22a) (22b) (23a)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.32 Calculate effective air chang If mechanical ventilation If balanced with heat rec	5.00 4 1.25 1 lowing for shelf 0.31 0 ge rate for the a 3 1 is air change rate 1 1 covery: efficience 1 1 whole house point 1 1	1.23 2 ter and wir 0.31 (applicable of the through cy in % allo ositive inpu	1.10 nd facto 0.27 case: system wing fo	1.08 r) (21) x (2 0.27 r in-use fa	0.95 2a)m 0.24 ctor from T	0.95	0.93	0.25	1.08	1.13	1.18 0.29 N/A	(22a) (22b)
5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al 0.32 Calculate effective air change If mechanical ventilation If balanced with heat rec d) natural ventilation or	5.0041.251lowing for shelf0.310ge rate for the a: air change ratecovery: efficiencewhole house po0.550	1.90 4 1.23 2 ter and wir 0.31 0 applicable of cy in % allo ositive inpu 0.55 0	1.10 Ind factor 0.27 case: system wing for ut ventil 0.54	1.08 r) (21) x (2 0.27 r in-use fa lation from 0.54	0.95 2a)m 0.24 ctor from T	0.95 0.24 able 4h	0.93	1.00	0.27	1.13 0.28	1.18 0.29 N/A N/A	(22a) (22b) (23a) (23c)



3. Heat losses	and heat lo	ss paramet	er										
Element				Gross rea, m²	Openings m ²	Net a		U-value W/m²K	A x U W		value, /m².K	Ахк, kJ/K	
Window						15.	56 x	1.24	= 19.23	-			(27)
Exposed floor						54.	41 x	0.06	= 3.26				(28b
External wall						21.	39 x	0.18	= 3.85				(29a)
Party wall						76.	23 x	0.00	= 0.00				(32)
Total area of ext	ternal eleme	ents ∑A, m²	:			91.	36						(31)
Fabric heat loss,	, W/K = ∑(A	× U)							(26	5)(30) + (32) =	26.34	(33)
Heat capacity C	m = ∑(А x к)							(28)	.(30) + (32) -	+ (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	MP) in kJ/n	n²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) ca	alculated us	sing Append	dix K								7.66	(36)
Total fabric heat	t loss									(33) + (36) =	34.01	(37)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	t loss calcula	ated month	ly 0.33 x (2	25)m x (5)									
	29.67	29.56	29.46	28.97	28.88	28.45	28.45	28.37	28.62	28.88	29.06	29.26	(38)
Heat transfer co	oefficient, W	//K (37)m +	+ (38)m										
	63.67	63.57	63.46	62.97	62.88	62.46	62.46	62.38	62.62	62.88	63.07	63.26	
									Average = >	<u>(</u> 39)112	/12 =	62.97	(39)
Heat loss param	neter (HLP),	W/m²K (39	9)m ÷ (4)						-				_
	1.17	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.16	1.16	1.16	
									Average = 2	(40)112,	/12 =	1.16	(40)
Number of days	in month (1	Table 1a)											_
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
4. Water heati	ng energy r	equiremen	t										
Assumed occup	ancy, N											1.82	(42)
Annual average	hot water u	isage in litro	es per day V	Vd,average	= (25 x N) +	36						77.43	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe	r day for ea	ach month '	Vd,m = fact	or from Tab	le 1c x (43)						
	85.17	82.07	78.97	75.88	72.78	69.68	69.68	72.78	75.88	78.97	82.07	85.17	
										∑(44)1	.12 =	929.11	(44)
Energy content	of hot wate	r used = 4.1	L8 x Vd,m x	nm x Tm/3	3600 kWh/m	onth (see	Tables 1t	o, 1c 1d)					
	126.30	110.47	113.99	99.38	95.36	82.29	76.25	87.50	88.54	103.19	112.64	122.32	
										∑(45)1	.12 =	1218.22	(45)
Distribution loss			17.10	14.01	14.20	12.24	11 //	12.12	12.20	1 - 10	16.00	10.25	
Storago volumo	18.95	16.57	17.10	14.91	14.30	12.34	11.44	13.12	13.28	15.48	16.90	18.35	(46)
Storage volume Water storage le		ung any so		TRS SLOTAG	e within san	le vessei						2.00	(47)
b) Manufacture		loss factor	is not know	vn									
Hot water st					d							0.02	(51)
Volume facto	-			vii/iitie/ua	¥)							3.91	(52)
Temperature												1.00	(53)
			(h/day) (47	7) v (51) v (5	5) v (52)							0.12	(54)
Energy lost f Enter (50) or (54		iorage (KW	(47) (47) × (JT) X (3	521 ~ (33)							0.12	(54)
Water storage lo		ed for each	month (55	5) x (41)m							L	0.12	
	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(56)
	5.05	5.55	5.05	J.J/	3.03	5.57	5.05	5.05	5.57	5.05		5.05	

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.69	3.33	3.69	3.57	3.69	3.57	3.69	3.69	3.57	3.69	3.57	3.69	(57)
Primary circuit	loss for each	month fro	m Table 3										-
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for e	each month	from Table	3a, 3b or 3	с				•				-	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requ					onth 0.85 x			י m + (59)m +				4], ,
·	153.25	134.81	140.94	125.46	122.31	108.36	103.20	114.45	114.62	130.14	138.72	149.27	(62)
Solar DHW inpu						100.00	100.20	11.1.0	11.00	100121	1000.7] (0=)
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wa							0.00	0.00	0.00	0.00	0.00	0.00] (03)
output nom we	153.25	134.81	140.94	125.46	122.31	108.36	103.20	114.45	114.62	130.14	138.72	149.27	1
	155.25	134.01	140.94	123.40	122.51	100.50	105.20	114.45	114.02	Σ(64)1		1535.51	」](64)
Heat gains from	water beat	ing (k\Mb/m	a_{a}		(15)m + (61)m] ± 0.8 v	[(46)m + (1)]	$57m \pm (50)$	ml	2(04)1	12	1555.51] (04)
neat gains non		. .	-	-					-	FF 07	50.22		
	63.55	56.20	59.46	53.91	53.26	48.22	46.91	50.65	50.30	55.87	58.32	62.23	(65)
5. Internal gai	ns												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains	s (Table 5)			•				Ţ					
0	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	(66)
Lighting gains (51.00	51.00	51.00	51.00	51.00	51.00] (00)
8	14.14	12.56	10.22	7.74	5.78	4.88	5.27	6.86	9.20	11.68	13.64	14.54	(67)
Appliance gains							5.27	0.80	9.20	11.08	15.04	14.54] (07)
Appliance gains			156.16	147.33	· · · ·		119 70	117.05	121.20	120.02	141 10	151.66	
Cooking going (158.66	160.31			136.18	125.70	118.70	117.05	121.20	130.03	141.18	151.66	(68)
Cooking gains (-				22.40	22.40	22.40	22.40	22.40		
D	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	(69)
Pump and fan g	· ·	-										1	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evap													-
	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	(71)
Water heating §	gains (Table	5)											-
	85.42	83.63	79.92	74.87	71.59	66.98	63.05	68.08	69.87	75.09	80.99	83.64	(72)
Total internal g	ains (66)m +	- (67)m + (6	58)m + (69)	m + (70)m	+ (71)m + (7	72)m							_
	308.53	306.81	296.60	280.24	263.85	247.86	237.33	242.29	250.57	267.11	286.12	300.14	(73)
6. Solar gains													
0. Solai gailis			Access f	iantar	A.r.o.o	Co.	ar flux		-	FF		Caina	
			Table		Area m²		ar nux V/m²	spec	g ific data	specific d	lata	Gains W	
								or T	able 6b	or Table	6c		
SouthEast			0.7	7 X	7.78	x 3	6.79 x	0.9 x 0	0.63 x	0.80	=	99.98	(77)
NorthEast			0.7	7 X	7.78	 x1	1.28 x	0.9 x 0	0.63 x	0.80	=	30.66	(75)
Solar gains in w	atts ∑(74)m	(82)m											-
	130.64	232.71	345.46	473.38	571.61	585.68	557.08	481.02	389.32	264.49	158.33	110.60	(83)
Total gains - int	ernal and so	lar (73)m +					1	ļ	ļ			4], ,
Ū	439.17	539.52	642.06	753.62	835.46	833.54	794.41	723.31	639.89	531.60	444.45	410.74	(84)
		233.32	0.2.00	. 55.02	000.10	233.34			000.00	001.00		1 .10.74	
7. Mean inter	nal tempera	ture (heatii	ng season)										
Temperature de	uring heating	g periods in	the living a	area from T	Table 9, Th1	(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	or for gains f	or living are	ea n1,m (se	e Table 9a))								

	0.99	0.98	0.94	0.84	0.66	0.47	0.34	0.39	0.64	0.91	0.98	0.99	(86)
Mean internal te	emp of livin	g area T1 (s	steps 3 to 7	in Table 9c	.)								-
	19.92	20.15	20.46	20.77	20.94	20.99	21.00	21.00	20.96	20.70	20.24	19.87	(87)
Temperature du	Iring heating	g periods ir	the rest of	f dwelling fr	om Table 9	9, Th2(°C)	1], ,
	19.94	19.95	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95	(88)
Utilisation facto	r for gains f	1				1		I		1	1], ,
	0.99	0.97	0.93	0.80	0.60	0.40	0.26	0.31	0.56	0.87	0.98	0.99	(89)
Mean internal te] (,
	18.53	18.86	19.30	19.72	19.91	19.96	19.96	19.96	19.93	19.64	19.00	18.47	(90)
Living area fract		10.00	15.50	13.72	13.51	13.50	13.50	15.50		ving area ÷	·	0.53	(91)
Mean internal te		for the wh	ole dwellin	g fl A x T1 +	(1 - fl A) x T	т2				ing area i	(.)	0.00] (31)
	19.27	19.55	19.92	20.28	20.46	20.51	20.52	20.51	20.48	20.21	19.66	19.22	(92)
Apply adjustme			I			I		20.31	20.40	20.21	15.00	15.22] (32)
	19.27	19.55	19.92	20.28	20.46	20.51	20.52	20.51	20.48	20.21	19.66	19.22	(93)
	19.27	19.55	19.92	20.28	20.40	20.31	20.32	20.31	20.48	20.21	19.00	19.22] (53)
8. Space heatir	ng requirem	ent											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains,	ηm											
	0.99	0.97	0.93	0.81	0.63	0.44	0.31	0.35	0.60	0.88	0.97	0.99	(94)
Useful gains, nm	nGm, W (94)m x (84)m	1								•		-
	434.04	523.79	594.38	611.75	525.44	365.62	244.08	255.77	384.73	468.87	433.23	407.14	(95)
Monthly average	e external t	emperatur	e from Tabl	e U1								- !]
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]						-], ,
	953.38	931.12	851.42	716.74	550.84	369.05	244.53	256.67	399.74	604.21	792.42	950.01	(97)
Space heating re] (- : /
	386.39	273.73	191.24	75.59	18.90	0.00	0.00	0.00	0.00	100.70	258.62	403.89	1
										3)15, 10	·	1709.06	(98)
Space heating re	auirement	kWh/m²/v	ear						2134			31.41	(99)
opuce neuting re	quirement	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	cui							(50)	. (.)	51.11] (33)
9b. Energy req	uirements -	communit	ty heating s	cheme									
Fraction of space	e heat from	secondary	/suppleme	ntary syste	m (table 11	.)				'0' if ı	none	0.00	(301)
Fraction of space	e heat from	communit	y system							1 - (30	01) =	1.00	(302)
Fraction of com	munity heat	from boile	ers									1.00	(303a)
Fraction of total	space heat	from com	nunity boil	ers						(302) x (303	3a) =	1.00	(304a)
Factor for contro	ol and char	ging metho	d (Table 4c	(3)) for com	munity spa	ace heating						1.00	(305)
Factor for charg	ing method	(Table 4c(3	3)) for com	nunity wate	er heating							1.00	(305a)
Distribution loss	factor (Tab	le 12c) for	community	heating sy	stem							1.05	(306)
													-
Space heating													
Annual space he	eating requi	rement						1	709.06]			(98)
Space heat from	boilers							(98	3) x (304a) x	- k (305) x (30	06) =	1794.51	(307a)
]
Water heating													
Annual water he	eating requi	rement						1	535.51]			(64)
Water heat from										」 (305a) x (30	06) =	1612.28	(310a)
Electricity used		tribution					0.01	(° ., L × [(307a)				34.07	(313)
							0.01		(· (-		- / J] (2-0)

Electricity for pumps, fans and electric keep-hot (Table 4f)

Total electricity for the above, kWh/year

Electricity for lighting (Appendix L)

Total delivered energy for all uses

0.00	(331)
249.81	(332)
3656.60	(338)

(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) = <u>3656.60</u> (338)

10b. Fuel costs - community heating scheme

10b. Fuel costs - community heating scheme			
	Fuel kWh/year	Fuel price	Fuel cost £/year
Space heating from boilers	1794.51	x 4.24 x 0.01	= 76.09 (340a)
Water heating from boilers	1612.28	x 4.24 x 0.01	= 68.36 (342a)
Electricity for lighting	249.81	x 13.19 x 0.01	= <u>32.95</u> (350)
Additional standing charges			120.00 (351)
Total energy cost		(340a)(342e) + (345)(35	54) = <u>297.40</u> (355)
11b. SAP rating - community heating scheme			
Energy cost deflator (Table 12)			0.42 (356)
Energy cost factor (ECF)			1.26 (357)
SAP value			82.47
SAP rating (section 13)			82 (358)
SAP band			В

12b. CO₂ emissions - community heating scheme

	(367a)
0.216	= 822.20 (367)
0.519	= 17.68 (372)
	839.88 (<mark>373</mark>)
	839.88 (376)
0.519	= 129.65 (379)
(376)(382) = 969.53 (<mark>383</mark>)
(38	(3) ÷ (4) = 17.82 (384)
	86.93
	87 (<mark>385</mark>)
	В
Primary factor	Primary energy (kWh/year)
	(367a)
1.22	= 4643.91 (367)
3.07	= 104.59 (372)
	4748.49 (373)
	4748.49 (376)
3.07	= 766.90 (379)
	5515.40 (383)
	101.37 (384)
	0.519 (376 (38 Primary factor

TER Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Miss Alicja Kreglewska			Ass	essor numb	er	4134		
Client				Las	t modified		13/06	/2018	
Address	A G 04 above gym Ingestre Road,	London, NW5 1XE							
1. Overall dwelling dimens	ions								
		Area (m²)			age storey ght (m)		Vo	lume (m³)	
Lowest occupied		54.41] (1a) x		3.00	(2a) =		163.23	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1n)) = 54.41	(4)			6			
Dwelling volume				(3a)	+ (3b) + (3c)	+ 3d)'3	n) =	163.23	(5)
2. Ventilation rate					70.				
					入		m	' per hour	
Number of chimneys						x 40 =		0	(6a)
, Number of open flues					0	x 20 =		0	(6b)
Number of intermittent fans	5				2	x 10 =		20	(7a)
Number of passive vents					0	x 10 =		0	(7b)
Number of flueless gas fires			5		0	x 40 =		0	(7c)
							Air o	hanges per	
		C.						hour	
Infiltration due to chimneys,		(6a) + (6b) + (7			20	÷ (5) =		0.12	(8)
	een carried out or is intended, proc				o (16)				
	expressed in cubic metres per hou			area				5.00	(17)
	value, then (18) = [(17) ÷ 20] + (8),	otherwise (18) = (1	6)					0.37	(18)
Number of sides on which th	ne dwelling is sheltered							3	(19)
Shelter factor	. 0.				1 - [0.075 x (19		0.78	(20)
Infiltration rate incorporatin						(18) x (2	0) =	0.29	(21)
Infiltration rate modified for				_				_	
Jan	Feb May Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed		4.20 2.00	2.00	2 70	4.00	4.20	4.50	4.70	(22)
5.10 Vind factor (22)m ÷ 4	5 00 4.90 4.40	4.30 3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
1.28	1.25 1.23 1.10	1.08 0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22-)
	lowing for shelter and wind factor)		0.95	0.95	1.00	1.08	1.15	1.10	(22a)
0.37	0.36 0.35 0.32	0.31 0.27	0.27	0.27	0.29	0.31	0.32	0.34	(22b)
	e rate for the applicable case:	0.27	0.27	0.27	0.23	0.01	0.52	0.54	(220)
-	: air change rate through system							N/A	(23a)
	overy: efficiency in % allowing for i	in-use factor from T	able 4h					N/A	(23c)
	whole house positive input ventilat						L	, -	(•/
0.57	0.57 0.56 0.55	0.55 0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)
	nter (24a) or (24b) or (24c) or (24d)		I		I	-			7
0.57	0.57 0.56 0.55	0.55 0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)
			1 · · · · · ·			-			/



3. Heat losses	and heat lo	ss paramet	.er										
Element			а	Gross rea, m²	Openings m ²	Net a		U-value W/m²K	AxU	•	value, I/m².K	Ахк, kJ/K	
Window						13.	.61 x	1.33	= 18.0)4			(27)
Exposed floor						54.	.41 x	0.13	= 7.0	7			(28b
External wall						23.	.35 x	0.18	= 4.2	0			(29a)
Party wall						76.	.23 x	0.00	= 0.0	0			(32)
Total area of ext	ternal elem	ents ∑A, m²	2			91.	.37						(31)
Fabric heat loss,	W/K = ∑(A	× U)							(26)(30) + ((32) =	29.32	(33)
Heat capacity Cr								(28)	(30) + (32) + (32a)(3	2e) =	N/A	(34)
Thermal mass p	arameter (T	·MP) in kJ/r	m²K									250.00	(35)
Thermal bridges	s: Σ(L x Ψ) c	alculated u	sing Appen	dix K								4.43	(36)
Total fabric heat										(33) + ((36) =	33.75	(37)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat	loss calcula	ated month	ily 0.33 x (2	25)m x (5)									
	30.58	30.44	30.30	29.65	29.53	28.96	28.96	28.85	29.18	79.52	29.77	30.03	(38)
Heat transfer co	efficient, W	' //K (37)m⊣	+ (38)m		I I			-					• •
	64.33	64.19	64.05	63.39	63.27	62.70	62.70	62.60	62.92	63.27	63.52	63.78	
		•			1				Avera ₆ =	- Σ(39)112	/12 =	63.39	(39)
Heat loss param	eter (HLP),	W/m²K (39	9)m ÷ (4)										
	1.18	1.18	1.18	1.17	1.16	1.15	1.15	1.15	1.16	1.16	1.17	1.17	7
	<u> </u>						•			- Σ(40)112	/12 =	1.17	(40)
Number of days	in month (Table 1a)					C	X			·		
	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)
		•	•	•	· ·						•	·	
4. Water heati	ng energy r	equiremen	t										_
Assumed occup												1.82	(42)
Annual average	hot water ι	usage in litr	es per day	Vd,average	= (25 × N) +	36						77.43	(43)
	Jan	Feb	Mar	Apr	Mut	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage	e in litres pe				ter from Tab	le 1c x (43)			_			_
	85.17	82.07	78.97	75.88	72.78	69.68	69.68	72.78	75.88	78.97	82.07	85.17	
				U'						∑(44)1.	12 =	929.11	(44)
Energy content							Tables 1b,	, 1c 1d)					_
	126.30	110.47	113.9.	99.38	95.36	82.29	76.25	87.50	88.54	103.19	112.64	122.32	
		7								∑(45)1.	12 =	1218.22	(45)
Distribution loss										_			_
	18.95	1 57	17.10	14.91	14.30	12.34	11.44	13.12	13.28	15.48	16.90	18.35	(46)
Storage volume		uding any s	olar or WW	/HRS storag	ge within sam	ne vessel						2.00	(47)
Water storage lo	DSS:												_
a) If manufactur	er's declare	ed loss facto	or is known	(kWh/day)								0.24	(48)
Temperature	e factor fror	n Table 2b										0.54	(49)
Energy lost f	rom water s	storage (kW	/h/day) (48	8) x (49)								0.13	(50)
Enter (50) or (54	1) in (55)											0.13	(55)
Water storage lo	oss calculat	ed for each	month (5	5) x (41)m							_		_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(56)
If the vessel con	tains dedica	ated solar s	torage or c	ledicated V	/WHRS (56)r	n x [(47) -	Vs] ÷ (47),	else (56)					_
	4.00	3.61	4.00	3.87	4.00	3.87	4.00	4.00	3.87	4.00	3.87	4.00	(57)
	· ·		m Table 3										

													٦
	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for ea					1			1					7
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat requir		-		I.	1	(45)m + (4		m + (59)m + -					-
	153.56	135.09	141.25	125.76	122.62	108.67	103.51	114.76	114.92	130.45	139.02	149.58	(62)
Solar DHW input	calculated	using Appe	endix G or A	Appendix H	l 								_
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from wat	er heater f	or each mo	nth (kWh/i	month) (62	2)m + (63)m	ו							_
	153.56	135.09	141.25	125.76	122.62	108.67	103.51	114.76	114.92	130.45	139.02	149.58	
										∑(64)1	12 = 1	539.18	(64)
Heat gains from	water heat	ing (kWh/m	nonth) 0.25	5 × [0.85 ×	(45)m + (61	.)m] + 0.8 ×	: [(46)m + (57)m + (59)	m]				
	63.80	56.43	59.71	54.15	53.51	48.46	47.16	50.90	50.55	56.12	58.56	62.48	(65)
5. Internal gains	-												
5. Internal gains		Fab	Mar	A	Max	lua	Int	Aug	for	Oct	Nev	Dee	
	Jan (Table C)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains		04.00	04.00	04.00	04.00	04.00	01.00	04.00	04.00		01.00		
	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	(66)
Lighting gains (ca			-		1	1		1					٦
	14.14	12.56	10.22	7.74	5.78	4.88	5.27	6.86	9.70	11.68	13.64	14.54	(67)
Appliance gains (1	1	1							7
	158.66	160.31	156.16	147.33	136.18	125.70	118.70	11/.05	121.20	130.03	141.18	151.66	(68)
Cooking gains (ca	alculated in	Appendix I	L, equation	L15 or L15	5a), also see	Table 5	•						-
	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	32.10	(69)
Pump and fan ga	ins (Table 5	5a)			i							. <u> </u>	_
	3.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evapo	oration (Tal	ole 5)											_
	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	-72.80	(71)
Water heating ga	ins (Table	5)				•							
	85.76	83.97	80.26	75.21	713	67.31	63.39	68.42	70.20	75.43	81.33	83.98	(72)
Total internal gai	ns (66)m +	- (67)m + (6	58)m + (69)	m + (70)m	+ (71)r i + (1	72)m							
	311.87	310.14	299.93	283.57	267.19	251.19	240.66	245.63	253.91	270.45	289.45	303.48	(73)
				0,									
6. Solar gains					Avec	C el	ar flux		_	FF		Coine	
			Accins f Toble		Area m²		ar nux V/m²	spec	g ific data	specific d	lata	Gains W	
		N	5					or T	able 6b	or Table			
SouthEast		2	0.7	7 x [6.81	x 3	6.79 x	0.9 x 0	D.63 x	0.70	=	76.58	(77)
NorthEast		V)	0.7	7 X	6.80	x 1	1.28 x	0.9 x 0	D.63 x	0.70	=	23.45	(75)
Solar gains in wa	tts ∑(74)m	(82)m											-
	100.02	178.17	264.46	362.36	437.52	448.28	426.39	368.19	298.03	202.49	121.22	84.68	(83)
Total gains - inte												-	
-	411.89	488.31	564.40	645.93	704.71	699.47	667.06	613.82	551.94	472.94	410.68	388.16	(84)
					,								_ , = • ∕
7. Mean interna	al tempera	ture (heatii	ng season)										
Temperature du	ring heating	g periods in	the living a	area from T	Table 9, Th1	.(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

0.99 0.99 0.96 0.90

Utilisation factor for gains for living area n1,m (see Table 9a)

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

1.00

(86)

0.56

0.41

0.75

0.72

0.46

0.94

0.99

	19.86	20.05	20.34	20.68	20.90	20.98	21.00	20.99	20.94	20.63	20.18	19.82	(87)
Temperature du					rom Table 9								
·	19.93	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.95	19.95	19.95	19.94	(88)
Utilisation facto	r for gains for	or rest of dw	velling n2,r	m								1]	
	0.99	0.98	0.95	0.86	0.69	0.47	0.32	0.36	0.64	0.91	0.98	0.99	(89)
Mean internal to		II			I								()
	18.43	18.72	19.13	19.59	19.86	19.95	, 19.96	19.96	19.91	19.54	18.91	18.39	(90)
Living area fract		1007	10110	10.00	10.00	10100	10.00	10.00		ving area ÷			(91)
Mean internal te		for the who	ole dwellin	g fLA x T1 +	+(1 - fLA) x T	72			_			0.00	(5-)
	19.20	19.43	19.77	20.17	20.41	20.50	20.51	20.51	20.46	20.12	19.59	19.15	(92)
Apply adjustme		I							20110		10.00	10.10	(3=)
	19.20	19.43	19.77	20.17	20.41	20.50	20.51	20.51	20.46	20.12	19.59	19.15	(93)
	15.20	13.13	13.77	20.17	20.11	20.00	20.01	20.51	20.10	20.12	19.35	15.15	(55)
8. Space heating	ng requirem	ent											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto	r for gains, r	յՠ								CA			
	0.99	0.98	0.95	0.87	0.72	0.52	0.37	0.42	0.68	0.92	0.98	0.99	(94)
Useful gains, ηm	nGm, W (94)m x (84)m								\sim			
	408.17	478.48	536.83	562.99	505.38	362.61	244.28	255.44	.37 1 35	433.16	402.98	385.46	(95)
Monthly average	e external te	emperature	from Table	e U1									
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	1 . 40	14.10	10.60	7.10	4.20	(96)
Heat loss rate fo	or mean inte	ernal temper	rature, Lm,	, W [(39)m	x [(93)m -	(96)m]							
	958.17	932.61	850.19	714.42	551.27	369.90	245 31	157.34	400.09	602.60	793.13	953.67	(97)
Space heating re	equirement,	kWh/mont	h 0.024 x	[(97)m - (9	5)m] x (41)ı	m	5						
	409.20	305.17	233.14	109.03	34.14	0.00	<i>J</i> .30	0.00	0.00	126.07	280.90	422.75	
					0	0.00	0.00	0.00	0.00	120.07	200.50		
		L I			0.111		0.00	0.00	· · · · · · · · · · · · · · · · · · ·	8)15, 10			(98)
Space heating re	equirement					C	0.00	0.00	· · · · · · · · · · · · · · · · · · ·		12 = 1	1920.41	(98) (99)
		kWh/m²/ye	ar			Č,			· · · · · · · · · · · · · · · · · · ·	8)15, 10	12 = 1	1920.41	
Space heating re		kWh/m²/ye	ar			Č,			· · · · · · · · · · · · · · · · · · ·	8)15, 10	12 = 1	1920.41	
9a. Energy req Space heating	uirements -	kWh/m²/ye	ar neating sys	stems inclu	iding mi2ro	-CHP		0.00	· · · · · · · · · · · · · · · · · · ·	8)15, 10	12 = 1	1920.41	
9a. Energy req Space heating Fraction of space	uirements - e heat from	kWh/m²/ye individual h secondary/s	ar neating sys supplemer	stems inclu	iding mi2ro	-CHP		0.00	· · · · · · · · · · · · · · · · · · ·	8)15, 10	12 = 1	1920.41 35.30	
9a. Energy req Space heating	uirements - e heat from	kWh/m²/ye individual h secondary/s	ar neating sys supplemer	stems inclu	iding mi2ro	-CHP		0.00	· · · · · · · · · · · · · · · · · · ·	8)15, 10	12 = ÷ (4)	0.00	(99)
9a. Energy req Space heating Fraction of space	uirements - e heat from e heat from	kWh/m²/ye individual h secondary/s main syster	ar neating sys supplemer n(s)	stems inclu	iding mi2ro	-CHP		0.00	· · · · · · · · · · · · · · · · · · ·	8)15, 10 (98)	12 = ÷ (4)	0.00 1.00	(99)
9a. Energy req Space heating Fraction of spac Fraction of spac	uirements - e heat from e heat from e heat from	kWh/m²/ye individual h secondary/ main syster main syster	ar neating sys supplemer n(s) n 2	stems inclu	iding mi2ro	-CHP		0.00	Σ(ə	8)15, 10 (98)	12 = ÷ (4))1) =	0.00 1.00 0.00	(99) (201) (202)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac	uirements - e heat from e heat from e heat from space heat	kWh/m²/ye individual h secondary/ main syster main syster from main s	ar neating sys supplemer n(s) n 2 system 1	stems inclu	iding mi2ro	-CHP		0.00	Σ(ə	8)15, 10 (98) 1 - (20	12 = ÷ (4) 01) = 3)] =	0.00 1.00 1.00 1.00	(99) (201) (202) (202)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total	e heat from e heat from e heat from e heat from space heat space heat	kWh/m²/ye individual h secondary/s main syster main syster from main s from main s	ar neating sys supplemer n(s) n 2 system 1	stems inclu	iding mi2ro	-CHP		0.00	Σ(ə	8)15, 10 (98) 1 - (20 02) x [1- (20	12 = ÷ (4) 01) = 3)] =	0.00 1.00 1.00 0.00 1.00 0.00	(99) (201) (202) (202) (202)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total	e heat from e heat from e heat from e heat from space heat space heat	kWh/m²/ye individual h secondary/s main syster main syster from main s from main s	ar neating sys supplemer n(s) n 2 system 1	stems inclu	iding mi2ro	-CHP	Jul	Aug	Σ(ð	8)15, 10 (98) 1 - (20 02) x [1- (20	12 = ÷ (4) 01) = 3)] =	0.00 1.00 1.00 0.00 1.00 0.00	(99) (201) (202) (202) (202) (204) (205)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total	e heat from e heat from e heat from space heat space heat in system 1 Jan	kWh/m²/ye individual h secondary/ main syster main syster from main s from main s (%)	ar neating sys supplemen m(s) m 2 system 1 System 2 Mar	stems inclu	iding mi ro	-CHP			<u>Σ</u> (9)	8)15, 10 (98) 1 - (20 02) x [1- (20 (202) x (20	12 = ÷ (4) (1) = (3)] = (3) =	1920.41 35.30 0.00 1.00 0.00 1.00 0.00 93.50	(99) (201) (202) (202) (202) (204) (205)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from e heat from e heat from space heat space heat in system 1 Jan	kWh/m²/ye individual h secondary/ main syster main syster from main s from main s (%)	ar neating sys supplemen m(s) m 2 system 1 System 2 Mar	stems inclu	iding mi ro	-CHP			<u>Σ</u> (9)	8)15, 10 (98) 1 - (20 02) x [1- (20 (202) x (20	12 = ÷ (4) (1) = (3)] = (3) =	1920.41 35.30 0.00 1.00 0.00 1.00 0.00 93.50	(99) (201) (202) (202) (202) (204) (205)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW	ar neating sys supplemen n(s) n 2 system 1 System 2 Mar h/month	stems inclu ntary syste Apr	iding micro m (table 11 May	-CHP) Jun	Jul	Aug	Σ(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20 02) x [1- (20 (202) x (20 Oct	12 = 222 +	0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14	(99) (201) (202) (202) (202) (204) (205)
9a. Energy req Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW	ar neating sys supplemen n(s) n 2 system 1 System 2 Mar h/month	stems inclu ntary syste Apr	iding micro m (table 11 May	-CHP) Jun	Jul	Aug	Σ(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20) (202) x (20 0ct 134.83	12 = 222 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14	(99) (201) (202) (202) (204) (205) (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW	ar neating sys supplemen n(s) n 2 system 1 System 2 Mar h/month	stems inclu ntary syste Apr	iding micro m (table 11 May	-CHP) Jun	Jul	Aug	Σ(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20) (202) x (20 0ct 134.83	12 = 222 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14	(99) (201) (202) (202) (204) (205) (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65	kWh/m²/ye individual f secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW	ar neating sys supplemen n(s) n 2 system 1 System 2 Mar h/month	stems inclu ntary syste Apr	iding micro m (table 11 May	-CHP) Jun	Jul	Aug	Σ(98 (20 Sep 0.00	8)15, 10 (98) 1 - (20)2) x [1- (20) (202) x (20 0ct 134.83	12 = 222 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91	(99) (201) (202) (202) (204) (205) (206)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65 ter heater 87.31	kWh/m ² /ye individual h secondary/s main syster main syster from main s from main s	ar neating sys supplemen n(s) m 2 system 2 Mar h/month 249.35	stems inclu ntary sy te Apr 116.61	May 36.52	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) × [1- (20) (202) × (20 0ct 134.83 1)15, 10	12 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91	(99) (201) (202) (202) (204) (205) (206) (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wat	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65 ter heater 87.31	kWh/m ² /ye individual h secondary/s main syster main syster from main s from main s	ar neating sys supplemen n(s) m 2 system 2 Mar h/month 249.35	stems inclu ntary sy te Apr 116.61	May 36.52	-CHP) Jun 0.00	Jul 0.00	Aug 0.00	Σ(98 (20 Sep 0.00 Σ(21)	8)15, 10 (98) 1 - (20)2) × [1- (20) (202) × (20 0ct 134.83 1)15, 10	12 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91	(99) (201) (202) (202) (204) (205) (206) (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wat	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65 ter heater 87.31 uel, kWh/m	kWh/m ² /yei individual h secondary/ main syster main syster from main s from main s from main s (%) Fr J stem 1), kW 326.39 86.92 onth	ar neating sys supplemen n(s) m 2 system 2 Mar h/month 249.35 86.14	stems inclu ntary syste Apr 116.61 84.44	May 36.52	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(93 (20 Sep 0.00 Σ(21) 79.80	8)15, 10 (98) 1 - (20)2) × [1- (20) (202) × (20 0ct 134.83 1)15, 10 84.72	12 = 2 $(4) = 2$ $(4) = 2$ $(3) =$	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91 87.44 171.07	(99) (201) (202) (202) (204) (205) (206) (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wat	e heat from e heat from e heat from space heat space heat in system 1 Jan uel (main sys 437.65 ter heater 87.31 uel, kWh/m	kWh/m ² /yei individual h secondary/ main syster main syster from main s from main s from main s (%) Fr J stem 1), kW 326.39 86.92 onth	ar neating sys supplemen n(s) m 2 system 2 Mar h/month 249.35 86.14	stems inclu ntary syste Apr 116.61 84.44	May 36.52	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(93 (20 Sep 0.00 Σ(21) 79.80	8)15, 10 (98) 1 - (20)2) × [1- (20) (202) × (20 0ct 134.83 1)15, 10 84.72 153.97	12 = 2 $(4) = 2$ $(4) = 2$ $(3) =$	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91 87.44 171.07	(99) (201) (202) (202) (204) (205) (206) (211) (211)
9a. Energy req Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating fu Water heating Efficiency of wat	e heat from e heat from e heat from space heat space heat in system 1 Jan Jel (main sys 437.65 ter heater 87.31 uel, kWh/m 175.89	kWh/m²/ye individual r secondary/ main syster main syster from main s from main s (%) Fro stem 1), kW 326.39 86.92 onth 155.41	ar neating sys supplemen n(s) m 2 system 2 Mar h/month 249.35 86.14	stems inclu ntary syste Apr 116.61 84.44	May 36.52	-CHP) Jun 0.00 79.80	Jul 0.00 79.80	Aug 0.00 79.80	Σ(93 (20 Sep 0.00 Σ(21) 79.80	8)15, 10 (98) 1 - (20)2) × [1- (20) (202) × (20 0ct 134.83 1)15, 10 84.72 153.97	12 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 +	0.00 1.00 0.00 1.00 0.00 1.00 0.00 93.50 Dec 452.14 2053.91 87.44 171.07	(99) (201) (202) (202) (204) (205) (206) (211) (211)

Water heating fuel				[1833.10	7
Electricity for pumps, fans and electric keep-hot (Table 4f)						
central heating pump or water pump within warm air heat	ing unit		30.00			(230c)
boiler flue fan	-		45.00			(230e)
Total electricity for the above, kWh/year				[75.00	(231)
Electricity for lighting (Appendix L)				[249.81	(232)
Total delivered energy for all uses		(211	L)(221) + (231) + (2	32)(237b) =	4211.81	(238)
						_
10a. Fuel costs - individual heating systems including micro-			Fuel and a		E I	
	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating - main system 1	2053.91	x	3.48	x 0.01 =	71.48	(240)
Water heating	1833.10	x	3.48	x 0.01 =	63.79	(247)
Pumps and fans	75.00	x	13.19	x 0.01 =	9.89	(249)
Electricity for lighting	249.81	x	13.19	x 0.01 =	32.95	(250)
Additional standing charges					120.00	(251)
Total energy cost			(240)(242) + (245)(1.54) =	298.11	(255)
	CUD					
11a. SAP rating - individual heating systems including micro				•	0.42	(250)
Energy cost deflator (Table 12)				[(256)
Energy cost factor (ECF)]	1.26	_ (257) _
SAP value				[82.43	 (250)
SAP rating (section 13) SAP band				[82	_ (258)
		5		l	В	
12a. CO ₂ emissions - individual heating systems including m						
12a. CO2 emissions - mulvidual heating systems including m						
12a. CO ₂ emissions - mulvidual neating systems including m	Energ / kWh/yea		Emission factor kg CO ₂ /kWh		Emissions kg CO₂/year	
Space heating - main system 1	Energ	x		= [] (261)
	Energ / kWh/year	x x	kg CO₂/kWh	= [= [kg CO₂/year] (261)] (264)
Space heating - main system 1	Energ / kWh/year 2053.91		kg CO₂/kWh	= [kg CO₂/year 443.64	
Space heating - main system 1 Water heating	Energ / kWh/year 2053.91		kg CO₂/kWh 0.216 0.216	= [kg CO ₂ /year 443.64 395.95	(264)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 2053.91 1.1833.10	x	kg CO₂/kWh 0.216 0.216 (261) + (262) + (2	= [263) + (264) = [kg CO ₂ /year 443.64 395.95 839.59] (264)] (265)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 2053.91 1833.10 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [kg CO₂/year 443.64 395.95 839.59 38.93	(264) (265) (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 2053.91 1833.10 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [= [kg CO ₂ /year 443.64 395.95 839.59 38.93 129.65	(264) (265) (267) (268)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kWh/year 2053.91 1833.10 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [265)(271) = [kg CO₂/year 443.64 395.95 839.59 38.93 129.65 1008.17	(264) (265) (267) (268) (268) (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate	Energ / kWh/year 2053.91 1833.10 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [265)(271) = [kg CO ₂ /year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53	(264) (265) (267) (268) (268) (272)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	Energ / kWh/year 2053.91 1833.10 75.00	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [265)(271) = [kg CO₂/year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41	(264) (265) (267) (268) (272) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	Energ / kwh/year 2055.91 1833.10 75.00 249.81	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [265)(271) = [kg CO2/year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86	(264) (265) (267) (268) (272) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kWh/yea.	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519	= [263) + (264) = [= [265)(271) = [(272) ÷ (4) = [[kg CO ₂ /year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86 B Primary Energy	(264) (265) (267) (268) (272) (273) (273)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kWh/yea. 2055.91 1833.10 75.00 249.81	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519 (= [263) + (264) = [= [265)(271) = [(272) ÷ (4) = [[kg CO ₂ /year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86 B Primary Energy kWh/year	(264) (265) (267) (268) (272) (273) (273) (274)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band	Energ / kwh/year 2055.91 1833.10 75.00 249.81 hicro-CHP Energy kwh/year 2053.91	x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519 (Primary factor 1.22	= [263) + (264) = [= [265)(271) = [(272) ÷ (4) = [[kg CO2/year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86 B Primary Energy kWh/year	(264) (265) (267) (268) (272) (273) (273) (274)
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Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including r Space heating - main system 1 Water heating Space and water heating Pumps and fans	Energ / kwh/year 2053.91 1833.10 75.00 249.81 hicro-CHP Energy kwh/year 2053.91 1833.10 75.00	x x x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519 (Primary factor 1.22 (261) + (262) + (2 3.07	$= \begin{bmatrix} 263 + (264) = 0 \\ = 0 \\ = 0 \\ = 0 \\ (272) \div (4) = 0 \\ $	kg CO2/year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86 B Primary Energy kWh/year 2505.77 2236.38 4742.15 230.25	(264) (265) (267) (268) (272) (273) (273) (273) (274) (274) (261) (264) (265) (265) (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems including r Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energ / kwh/year 2053.91 1833.10 75.00 249.81 hicro-CHP Energy kwh/year 2053.91 1833.10 75.00	x x x x x	kg CO ₂ /kWh 0.216 0.216 (261) + (262) + (2 0.519 0.519 (Primary factor 1.22 (261) + (262) + (2 3.07	$= \begin{bmatrix} 263 + (264) = 0 \\ = 0 \\ = 0 \\ = 0 \\ (272) \div (4) = 0 \\ $	kg CO2/year 443.64 395.95 839.59 38.93 129.65 1008.17 18.53 86.41 86 B Primary Energy kWh/year 2505.77 2236.38 4742.15 230.25 766.90	(264) (265) (267) (268) (272) (273) (273) (273) (274) (274) (274) (261) (264) (265) (265) (267) (268)

APPENDIX B

BRUKL Output Document IM Government

Compliance with England Building Regulations Part L 2013

Project name

Assisted Living Development

Date: Thu Jun 28 10:47:24 2018

Administrative information

Building Details

Address: 12 Ingestre Road, Address 2, London, NW5 1XE

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.a.1

Interface to calculation engine: Virtual Environment Interface to calculation engine version: v7.0.9 BRUKL compliance check version: v5.4.a.1

Owner Details

Name: Available upon request Telephone number: Phone Address: Street Address, City, Postcode

Certifier details

Name: Alicja Kreglewska Telephone number: Phone Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	31.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	31.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	30.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red. **Building fabric**

Element	Ua-Limit	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wali**	0.35	0.18	0.18	BS000003_W1
Floor	0.25	0.16	0.22	BS000009_F
Roof	0.25	0.1	0.1	BS000003_C
Windows***, roof windows, and rooflights	2.2	1.37	1.41	BS000009_W1_00
Personnel doors	2.2	1.4	1.4	1S000006_W3_O0
Vehicle access & similar large doors	1.5	0.41	0.41	GF00000A_W1_00
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Usum = Limiting area-weighted average U-values [V	V/(m²K)]			

U+cat = Calculated area-weighted average U-values [W/(m²K)]

Uscale = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m ¹ /(h.m ²) at 50 Pa	10	4

As designed

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- ASHP heating/cooling/mech vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	3.5	5	-		-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for thi	is HVAC syster	n YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- No heating - ventilation only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	0.91	<i>5</i>	•	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES					
* Standard shown is I	for gas single boiler system	s <=2 MW output. For sing	le boiler systems >2 MW o	r multi-boiler system	s. (overall) limiting

efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- ASHP gas heated/mech vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	3.5	•		-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Bud a sub a training of		the standard for a set of			L VGO

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- SYST0002-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.012
Standard value	N/A	N/A

2- SYST0003-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	•
Standard value	N/A	N/A

3- SYST0000-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Ę	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
	Zonal extract system where the fan is remote from the zone with grease filter

Zone name				SI	•P [W/	(l/s)]					
ID of system type	A	В	C	D	E	F	G	н	1	HR e	efficiency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Gym	-	-	-	0.5	-	-	-		-	0.8	0.5
Classes	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Hairdressers	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF hobby rooms	-	-	-	0.5	-	-	-	-	-	0.8	0.5
1 st floor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Residents Lounge - no nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Residents Lounge - nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Reception - nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Reception - no nat light	-	-	-	0.5	-	•	-	-	-	0.8	0.5
GF Cafe - nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Cafe - no nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Laundry store	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Plant store	-	-	-	0.5	-	•	-	-	-	0.8	0.5
Refuse	-	-	-	0.5	-	•	-	-	-	0.8	0.5
GF Bar store	-	-	-	0.5	-	•	-	•	-	0.8	0.5
GF cycle store	-	-	-	0.5	-	•	-	-	-	0.8	0.5
GF car lift	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Plant store	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Cycle and scooter store	-	-	-	0.5	•	-	-	-	-	0.8	0.5
Car park	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Kitchen store		-	-	0.5	-	-	-	-	-	0.8	0.5
Laundry store	-	-	-	0.5	-	-	-	-		0.8	0.5
Staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Changing rooms	-	_	-	0.5	-	-	-	-		0.8	0.5
Toilets	25	-	-	0.5	-	-	-	1 3		0.8	0.5
Corridor to gym	-	-	-	0.5	-	-	-			0.8	0.5
Staircase	-	-	-	0.5	-	-	-	-		0.8	0.5
Toilet & changing rooms	-	-	-	0.5	-	-	-	-		0.8	0.5
Access corridor	-	-	-	0.5	-	-	-	а. С	-	0.8	0.5
GF staircase	-	-	-	0.5	-	•	-	-	-	0.8	0.5
GF toilets to lounge	-	-	-	0.5	-	-	-	-	-	0.8	0.5

Zone name				SF	- P [W/	/(l/s)]					
ID of system type	Α	В	С	D	E	F	G	Н	1	- HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
GF Guest accomm.	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Guest Accomm	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Commercial kitchen	0.3	-	-	0.5	-	-	-	-	-	0.8	0.5
GF staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Staff facilities	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
staff office	-	-	-	0.5	-	-	-	-	-	0.8	0.5
1st floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
1st floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
2nd floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
2nd floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
3rd floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
3rd floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
4th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
4th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
5th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
5th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF toilets to cafe	-	-	-	0.5	-	-	-	-	•	0.8	0.5
GF toilet to reception	-	-	-	0.5	-	-	-	-	•	0.8	0.5
GF access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5

General lighting and display lighting	Lumino	ous effic	acy [lm/W]]
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Gym	•	100	-	441
Classes	-	100	-	340
GF Hairdressers	-	100	30	764
GF hobby rooms	50	-	-	749
1st floor	50	-	-	2559
GF Residents Lounge - no nat light	-	100	-	555
GF Residents Lounge - nat light	-	100	-	386
GF Reception - nat light	-	100	30	705
GF Reception - no nat light	-	100	30	1033
GF Cafe - nat light	-	100	-	194
GF Cafe - no nat light	-	100	-	166
Laundry store	-	100	-	395
Plant store	50	-	•	264
Refuse	50	-	-	331
GF Bar store	50	-	-	83
GF cycle store	50	-	•	177
GF car lift	-	100	•	123

General lighting and display lighting		ous effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting (W)
Standard value	60	60	22	
Plant store	50	-	.	297
Cycle and scooter store	50	-	-	712
Car park	-	100	-	1503
Kitchen store	50	-	-	76
Laundry store	-	100	-	439
Staircase	-	100	-	75
Changing rooms	-	100	-	39
Toilets	-	100	-	39
Corridor to gym	-	100	-	56
Staircase	• 9	100	-	74
Toilet & changing rooms	-	100	-	69
Access corridor		100		111
GF staircase	-	100	-	77
GF toilets to lounge	•	100	-	299
GF Guest accomm.	-	100	-	109
GF Guest Accomm	-	100	•	110
GF Commercial kitchen	-	100	-	359
GF staircase	-	100	-	78
GF access corridor	-	100	-	253
GF Staff facilities	50		•	523
Access corridor	•	100	•	97
staff office	50	•		186
1st floor access corridor	•	100	-	236
1st floor access corridor	•	100	-	232
2nd floor access corridor	•	100		252
2nd floor access corridor	•	100	-	253
3rd floor access corridor	• 54	100		251
3rd floor access corridor	•	100		252
4th floor access corridor	•	100	-	249
4th floor access corridor	•	100	-	251
5th floor access corridor	•	100	-	232
5th floor access corridor	-	100	-	235
GF toilets to cafe	-	100	•	132
GF toilet to reception	-	100		66
GF access corridor	-	100		299
Access corridor	-	100		176

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Gym	N/A	N/A
Classes	NO (-79.3%)	NO
GF Hairdressers	NO (-77.2%)	NO
GF hobby rooms	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1st floor	NO (-55.1%)	NO
GF Residents Lounge - no nat light	N/A	N/A
GF Residents Lounge - nat light	YES (+29.2%)	NO
GF Reception - nat light	N/A	N/A
GF Reception - no nat light	N/A	N/A
GF Cafe - nat light	N/A	N/A
GF Cafe - no nat light	N/A	N/A
GF Guest accomm.	NO (-77.3%)	NO
GF Guest Accomm	NO (-77.7%)	NO
GF Staff facilities	N/A	N/A
staff office	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional	9
Area (m²)	3558.1	3558.1	1
External area [m ²]	3319.6	3319.6	
Weather	LON	LON	1
Infiltration [m ³ /hm ² @ 50Pa]	4	3	
Average conductance [W/K]	819.38	1276.69	2
Average U-value [W/m²K]	0.25	0.38	6
Alpha value* (%)	21.67	13.3	

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
1	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
17	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
2	C1 Hotels
67	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
7	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions Crown and County Courts
6	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.28	1.8
Cooling	9.88	5.85
Auxiliary	7.04	8.63
Lighting	22.79	21.07
Hot water	20.14	25.53
Equipment*	56.35	56.35
TOTAL**	60.13	62.88

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is not of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	222.85	192.84
Primary energy* [kWh/m ²]	179.93	187.78
Total emissions [kg/m ²]	30.4	31.7

* Primary energy is not of any electrical energy displaced by CHP generators, if applicable.

	stems Pe								
System Type	Heat dem MJ/m2		Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or I	multi-split sy	stem, [HS]	Heat pump	(electric): a	air source,	[HFT] Elect	ricity, [CFT] Electricity	
Actual	6.1	424.1	0.5	36.7	7.7	3.43	3.21	3.5	4.3
Notional	15.7	281.4	1.8	21.7	10.9	2.43	3.6		
[ST] Central I	neating using	y water: rad	liators, [HS]] LTHW boi	ler, [HFT] N	atural Gas	[CFT] Elec	tricity	
Actual	0.2	80.3	0.1	0	2.5	0.86	0	0.91	0
Notional	2.3	54.6	0.8	0	2.8	0.82	0		
[ST] Central I	neating using	g water: rad	liators, [HS]] Heat pum	p (electric):	air source	, [HFT] Elec	tricity, [CFT] Electrici
Actual	3.4	192.6	0.3	0	10	3.29	0	3.5	0
Notional	22.5	205.4	2.6	0	11.6	2.43	0		

Key to terms

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption Cool con [kWh/m2] = Cooling energy consumption Aux con [kWh/m2] = Auxiliary energy consumption = Heating system seasonal efficiency (for notional building, value depends on activity glazing class) Heat SSEFF Cool SSEER = Cooling system seasonal energy efficiency ratio Heat gen SSEFF Heating generator seasonal efficiency Cool gen SSEER = Cooling generator seasonal energy efficiency ratio ST = System type HS = Heat source HFT = Heating fuel type CFT = Cooling fuel type

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Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	Uнтур	Ui-Min	Surface where the minimum value occurs*		
Wall	0.23	0.18	BS000003_W1		
Floor	0.2	0.12	1S000006_F		
Roof	0.15	0.1	BS000003_C		
Windows, roof windows, and rooflights	1.5	1	BS000010_C_00		
Personnel doors	1.5	1.4	GF000000_W1_O0		
Vehicle access & similar large doors	1.5	0.41	GF00000A_W1_00		
High usage entrance doors 1.5 -		-	"No external high usage entrance doors"		
ULTYP = Typical individual element U-values [W/(m*K)] ULTYP = Minimum individual element U-values [W/(m*K)]					
* There might be more than one surface where the minimum U-value occurs.					

Air Permeability	Typical value	This building
m3/(h.m3) at 50 Pa	5	4

BRUKL Output Document Compliance with England Building Regulations Part L 2013

Project name

Assisted Living Development

Date: Thu Jun 28 09:51:41 2018

Administrative information

Building Details

Address: 12 Ingestre Road, Address 2, London, NW5 1XE

Certification tool

Calculation engine: SBEM Calculation engine version: v5.4.a.1 Interface to calculation engine: Virtual Environment Interface to calculation engine version: v7.0.9 BRUKL compliance check version: v5.4.a.1

Owner Details

Name: Available upon request Telephone number: Phone Address: Street Address, City, Postcode

As designed

Certifier details

Name: Alicja Kreglewska Telephone number: Phone Address: Street Address, City, Postcode

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	35.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	35.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	36.8
Are emissions from the building less than or equal to the target?	BER > TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	Ua-Limit	Ua-Calc	Ui-cale	Surface where the maximum value occurs
Wall**	0.35	0.18	0.18	BS000003_W1
Floor	0,25	0.16	0.22	BS000009_F
Roof	0.25	0.1	0.1	BS000003_C
Windows***, roof windows, and rooflights	2.2	1.37	1.41	BS000009_W1_O0
Personnel doors	2.2	1.4	1.4	1S000006_W3_O0
Vehicle access & similar large doors	1.5	0.41	0.41	GF00000A_W1_00
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U-um = Limiting area-weighted average U-values IV	V/(m²K)I	<u> </u>		

U+care = Calculated area-weighted average U-values [W/(m²K)]

U=c=e = Calculated maximum individual element U-values [W/(m²K)]

There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	4

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Base case - gas heating/cooling/mech vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.91	5	-		•	
Standard value	0.91*	2.6	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						

* Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- No heating - ventilation only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.91	•	•		-	
Standard value	0.91*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						
* Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.						

3- Base case - gas heated/mech vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.91			-	-	
Standard value	0.91*	N/A	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						
* Standard shown is for gas single boiler systems <= 2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.						

1- SYST0002-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.012
Standard value	N/A	N/A

2- SYST0003-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	
Standard value	N/A	N/A

3- SYST0000-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
н	Fan coil units

I Zonal extract system where the fan is remote from the zone with grease filter

Zone name				SF	P [W/	(l/s)]					
ID of system type	Α	В	С	D	E	F	G	н	1	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Gym	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Classes		-	-	0.5	-	•	-		-	0.8	0.5
GF Hairdressers	-	-	-	0.5		-	-	-	-	0.8	0.5
GF hobby rooms	-	-	-	0.5	-	-	-	-	- 15	0.8	0.5
1st floor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Residents Lounge - no nat light	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Residents Lounge - nat light	-	•	•	0.5	_		-	-	•	0.8	0.5
GF Reception - nat light	-	-	-	0.5	-	-	•	-	•	0.8	0.5
GF Reception - no nat light	-	•	•	0.5	-	-	-	-	-	0.8	0.5
GF Cafe - nat light	_	-	-	0.5	-	•		-	-	0.8	0.5
GF Cafe - no nat light	-	•	-	0.5	-	-	•	-	-	0.8	0.5
Laundry store	-	-	-	0.5	-	-	•	-	•	0.8	0.5
Plant store	-		-	0.5	-	-		-		0.8	0.5
Refuse	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF Bar store	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF cycle store	-	-	-	0.5	-	•	-	-	-	0.8	0.5
GF car lift	-	-	-	0.5	-		-	-	-	0.8	0.5
Plant store	-	- 1	-	0.5	-	-	-	-	-	0.8	0.5
Cycle and scooter store	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Car park	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Kitchen store	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Laundry store	-	-		0.5	-	•		-	-	0.8	0.5
Staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Changing rooms	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Toilets	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Corridor to gym	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Toilet & changing rooms	-	-	-	0.5	-	-	-	-	-	0.8	0.5
Access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5
GF toilets to lounge	-	-	-	0.5	-	-	-	-	-	0.8	0.5

Zone name		SFP [W/(I/s)]										
ID of system type	A	В	С	D	E	F	G	H	1		HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
GF Guest accomm.	-	-	-	0.5	-		-	-	-	0.8	0.5	
GF Guest Accomm	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
GF Commercial kitchen	0.3	-	-	0.5	-	-	-	-	-	0.8	0.5	
GF staircase	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
GF access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
GF Staff facilities	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
Access corridor	-	•	-	0.5	-	-	-	-	-	0.8	0.5	
staff office	-	-	-	0.5	-	-	- 1	-	-	0.8	0.5	
1st floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
1st floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
2nd floor access corridor	-	-	-	0.5	-	-	-	-		0.8	0.5	
2nd floor access corridor	-	-	-	0.5	-	-	•	-	-	0.8	0.5	
3rd floor access corridor	-	-	-	0.5	-	-	-	-		0.8	0.5	
3rd floor access corridor	-	-	-	0.5	-	-	-	-		0.8	0.5	
4th floor access corridor	-	-	-	0.5	-	-	-	-		0.8	0.5	
4th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
5th floor access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
5th floor access corridor	-	-	-	0.5	- 1	-	-	-	-	0.8	0.5	
GF toilets to cafe	-	-	-	0.5	- 1	-	-	-	-	0.8	0.5	
GF toilet to reception	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
GF access corridor	-	-	-	0.5	-	-	-	-	-	0.8	0.5	
Access corridor	-	-	-	0.5	-	•	-	-	-	0.8	0.5	

General lighting and display lighting	Lumino	ous effic	acy [im/W]]
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Gym	-	100	-	441
Classes	-	100		340
GF Hairdressers	-	100	30	764
GF hobby rooms	-	100	-	449
1st floor	-	100	-	1535
GF Residents Lounge - no nat light	-	100	-	555
GF Residents Lounge - nat light	-	100	-	386
GF Reception - nat light	-	100	30	705
GF Reception - no nat light	-	100	30	1033
GF Cafe - nat light	-	100	-	194
GF Cafe - no nat light	-	100	-	166
Laundry store	-	100	-	395
Plant store	50	-	-	264
Refuse	50	-	-	331
GF Bar store	50	-	-	83
GF cycle store	50	-	-	177
GF car lift	-	100	2	123

. . .

General lighting and display lighting	÷	ous effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W
Standard value	60	60	22	
Plant store	50	-	-	297
Cycle and scooter store	50	-	-	712
Car park	-	100	-	1503
Kitchen store	50	-	-	76
Laundry store	-	100	-	439
Staircase	-	100	-	75
Changing rooms	-	100	-	39
Toilets	-	100	-	39
Corridor to gym	-	100	-	56
Staircase	-	100	-	74
Toilet & changing rooms	-	100	-	69
Access corridor	-	100	-	111
GF staircase		100	-	77
GF toilets to lounge	-	100	-	299
GF Guest accomm.	-	100	-	109
GF Guest Accomm	-	100	-	110
GF Commercial kitchen		100	-	359
GF staircase	-	100	-	78
GF access corridor	-	100	-	253
GF Staff facilities	50	-	-	523
Access corridor	_	100	_	97
staff office	50	-	-	186
1st floor access corridor	-	100	-	236
1st floor access corridor	-	100	•	232
2nd floor access corridor	-	100	-	252
2nd floor access corridor	-	100	-	253
3rd floor access corridor	- 2	100	-	251
3rd floor access corridor	-	100	-	252
4th floor access corridor	-	100	-	249
4th floor access corridor	-	100	-	251
5th floor access corridor	-	100	-	232
5th floor access corridor	•	100	-	235
GF toilets to cafe	-	100	-	132
GF toilet to reception	-	100	-	66
GF access corridor	-	100		299
Access corridor	-	100	-	176

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Gym	N/A	N/A
Classes	NO (-79.3%)	NO
GF Hairdressers	NO (-77.2%)	NO
GF hobby rooms	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1st floor	NO (-55.1%)	NO
GF Residents Lounge - no nat light	N/A	N/A
GF Residents Lounge - nat light	YES (+29.2%)	NO
GF Reception - nat light	N/A	N/A
GF Reception - no nat light	N/A	N/A
GF Cafe - nat light	N/A	N/A
GF Cafe - no nat light	N/A	N/A
GF Guest accomm.	NO (-77.3%)	NO
GF Guest Accomm	NO (-77.7%)	NO
GF Staff facilities	N/A	N/A
staff office	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional	% F
Area (m²)	3558.1	3558.1	1
External area [m ²]	3319.6	3319.6	
Weather	LON	LON	17
Infiltration (m ³ /hm ² @ 50Pa)	4	3	
Average conductance [W/K]	819.38	1276.69	2
Average U-value [W/m ² K]	0.25	0.38	67
Alpha value* [%]	21.67	13.3	

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
1	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
17	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
2	C1 Hotels
67	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces,
7	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
6	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional		
Heating	1.29	5.18		
Cooling	10.33	6.22		
Auxiliary	7.13	8.69		
Lighting	21.84	20.23		
Hot water	76.85	75.13		
Equipment*	55.64	55.64		
TOTAL**	117.45	115.45		

* Energy used by equipment does not count lowards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	229.03	198.53
Primary energy* [kWh/m ²]	212.97	203.15
Total emissions [kg/m ²]	36.8	35.1

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

ŀ	HVAC Sys	stems Pe	rformanc	е						
Sy	stem Type	The state of the s	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[S1	[] Split or m	ulti-split sy	stem, [HS]	LTHW boile	er, [HFT] Na	itural Gas,	[CFT] Elect	ricity		
	Actual	9.6	443.6	3	38.3	8.1	0.89	3.21	0.91	4.3
	Notional	19.3	298.9	6.5	23.1	11.2	0.82	3.6		
[S]	[] Central h	eating using	y water: rad	iators, [HS] LTHW boi	ler, [HFT] N	latural Gas	, [CFT] Ele	ctricity	
	Actual	0.2	80.3	0.1	0	2.5	0.86	0	0.91	0
	Notional	2.3	54.6	0.8	0	2.8	0.82	0		
[\$1] Central h	eating using	water: rad	iators, [HS] LTHW boi	ler, [HFT] N	latural Gas	, [CFT] Ele	ctricity	
	Actual	3.4	192.6	1.1	0	10	0.86	0	0.91	0
	Notional	22.5	205.4	7.6	0	11.5	0.82	0		

Key to terms

CFT

- = Heating energy demand = Cooling energy demand Heat dem [MJ/m2] Cool dem [MJ/m2] Heat con [kWh/m2] = Heating energy consumption Cool con [kWh/m2] = Cooling energy consumption Aux con [kWh/m2] = Auxiliary energy consumption Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
 Cooling system seasonal energy efficiency ratio Heat SSEFF Cool SSEER Heating generator seasonal efficiency
 Cooling generator seasonal energy efficiency ratio Heat gen SSEFF Cool gen SSEER ST = System type HS = Heat source HFT = Heating fuel type
 - = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U і-тур	Ui-Min	Surface where the minimum value occurs*
Wall	0.23	0.18	BS000003_W1
Floor	0.2	0.12	1S000006_F
Roof	0.15	0.1	BS000003_C
Windows, roof windows, and rooflights	1.5	1	BS000010_C_00
Personnel doors	1.5	1.4	GF000000_W1_00
Vehicle access & similar large doors	1.5	0.41	GF00000A_W1_00
High usage entrance doors 1.5		-	"No external high usage entrance doors"
U+Typ = Typical individual element U-values [W/(m ² K	0]		U+Mm = Minimum individual element U-values [W/(m ² K)]
* There might be more than one surface where the	minimum L	J-value oc	curs.

Air Permeability	Typical value	This building		
m³/(h.m²) at 50 Pa	5	4		