
Paul Butler Associates

Environmental Standards Statement

Redevelopment at 436-436a Barlow Moor Road and 571-575 Wilbraham Road

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1 Executive Summary

This Environmental Standards Statement has been prepared by Watt Energy on behalf of Paul Bulter Associates, for the redevelopment of 436-436a Barlow Moor Road & 571-575 Wilbraham Road, Manchester. The statement specifically addresses the following Manchester City Council approved climate change action plans in addition to planning policies, as stipulated in the Manchester Core Strategy (July 2012):

- Guide to Development in Manchester SPD (2007)
- Our Manchester Strategy 2016-2025
- Manchester: A Certain Future (2013)
- Manchester Climate Change Board – The Zero Carbon Framework 2020-2038
- Climate Change and Low Emissions Implementation Plan 2016-2020
- Meeting Our Objectives and Targets – Manchester Climate Change Framework – 2020-25
- Manchester Residential Quality Guidance 2017
- Core Strategy Policy DM 1 - Development Management
- Core Strategy Policy EN 4 - Reducing CO2 Emissions by Enabling Low and Zero Carbon Development
- Core Strategy Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies
- Core Strategy Policy EN 8 – Adaptation to Climate Change
- Core Strategy Policy EN 9 – Green Infrastructure
- Core Strategy Policy EN 14 – Flood Risk
- Core Strategy Policy EN 15 – Biodiversity and Geological Conservation
- Core Strategy Policy T 1 – Sustainable Transport
- Places for Everyone Joint Development Plan Document (DPD)- Policy JP-S2- Carbon and Energy

The statement details how the development will incorporate sustainable design and resource efficiency in line with the Energy Hierarchy, so to meet the policy requirements and council targets whilst reducing its overall environmental impact. The methodology and calculations are consistent with the MCC Appendix A EN6 Energy Target Explanation and all figures used within this report have been based on the most recent issue of drawings and modelled using IESVE 2013 to accurately predict Energy Usage and CO2 reductions.

In relation to the planning documents and policies outlined above, the development is required to achieve a **10%** reduction in carbon emissions over Part L 2013 of the Building Regulations and also aim for a status of **carbon neutral**.

In order to achieve compliance the development has been designed with a holistic low energy design concept involving a fabric first approach. The U-values, design air permeability and ventilation targets all aspire to Passive House design standards along with the consideration and application of low zero carbon renewable technologies.

Following the LZC feasibility assessment, it is proposed that the development will incorporate a **Air Source Heat Pump supplying Hot Water**.

As a result of the above the predicted site wide reduction in CO₂ over Part L 2013 of the Building Regulations can be summarised as:

- **64.4% P 10.1 carbon factors (proposed improvements to Part L)**

This statement also examines how the design, specification and characteristics of the proposal will contribute to sustainability and meet the relevant objectives outlined within the National Planning Policy Framework (NPPF) 2023, in addition to the Manchester City Council approved climate change action plans and core strategy planning policies outlined above. The sustainability measures assessed included:

- Flood Risk Zone
- Green and Blue Infrastructure
- Sustainable Drainage Systems (SUDs)
- Biodiversity / Ecology
- Internal Water Efficiency
- Waste Management
- Materials
- Pollution Control
- Health and Wellbeing
- Sustainable Transport

The development therefore complies with all Manchester City Council's current and future policy requirements relating to creating a sustainable development.

In relation to the planning target centred around carbon emissions reduction, the proposed development is achieving a **64.4%** reduction in these emissions, over the Part L1A 2013 of the Building Regulations. This surpasses all of Manchester City Council's planning targets and therefore allows compliance to be reached.

2 Planning Statement

The following statement relates to the proposed redevelopment at 436-436a Barlow Moor Road and 571-575 Wilbraham Road.

2.1 The Site and Proposed Development

The site includes a part-vacant building located at the junction between Wilbraham Road and Barlow Moor Road, along with the land next to 436 Barlow Moor Road. This building is flanked by two- to three-story brick structures, presenting an excellent infill opportunity for mixed-use development, combining residential units above commercial spaces, consistent with the surrounding architecture.

The strategic location at the junction offers high visibility and easy access, making it attractive for potential businesses on the ground floor. The upper floors can accommodate five modern residential apartments, meeting the growing demand for housing in the area. This development would seamlessly blend with the existing urban fabric, enhancing the neighbourhood's appeal and vitality while giving use to an underutilised, unsightly site.

The propose is for a four-storey development with 96 sqm of commercial space to the ground, and five flats, a mix of one and two bed, totalling 294 sqm collectively. The ground floor will also be complimented by a bike store and bin store.



Figure 1: Site Plan

2.2 Relevant Policies and Guidance

2.2.1 Local Planning Policy

2.2.1.1 Manchester Core Strategy

Manchester's Core Strategy (CS) was adopted on 11th July 2012 and is the key Development Plan Document (DPD) guiding the measures assessed in this report.

CS Policy DM 1 - Development Management: Stipulates that all new development should have regard for several development principles relevant to sustainability, including: waste management, designing for health, flood risk, green infrastructure, biodiversity. Additionally, subject to scheme viability, developers will be required to demonstrate that new non-domestic development will achieve a BREEAM Rating of 'Very Good' or for domestic development to achieve the Code for Sustainable Homes standard.

CS Policy EN 4 – Reducing CO2 Emissions: This policy targets the reducing of CO2 emissions through the following of the energy hierarchy; firstly reducing the need for energy through efficient design measures, followed by clean energy and lastly, the application of renewable or LDC technologies. In addition to this point, MCC state within this policy all new development is required to use building materials that have low embodied carbon.

CS Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies: This Policy requires electricity intense residential development of 10 or more units to meet, as a minimum, a 15% reduction in domestic CO2 emissions over Part L of the 2010 Building Regulations, unless proven to be unviable. As Part L 2013 of the Building Regulations represents a 6% improvement on 2010 levels, this target is subsequently equivalent to a 9% improvement in CO2 emissions over Part L 2013. Section 2.3 provides evidence of how this target is achieved.

CS Policy EN 8 – Adaptation to Climate Change: Expects all new development to be adaptable to climate change in terms of its design, layout, siting, and function of both building associated external spaces.

CS Policy EN 9 – Green Infrastructure: Requires new developments to maintain existing green infrastructure whilst using every opportunity, in accordance with current Green Infrastructure Strategies, to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between area of green infrastructure.

CS Policy EN 14 – Flood Risk: This policy expects all new developments to minimise surface water run-off through the use of SUDs and Green Infrastructure.

CS Policy EN 15 – Biodiversity and Geological Enhancement: Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on or adjacent to the proposed site.

CS Policy T 1 – Sustainable Transport: Policy aims to deliver sustainable, high quality, integrated transport systems to encourage a shift away from car travel to public transport, cycling and walking.

2.2.1.2 Guide to Development in Manchester, Supplementary Planning Document 2007

The Development Guide in Manchester Supplementary Planning Documents (SPD) establish and set out the ongoing generation of the City by providing a set of set principles which will guide developers, architects, and residents in the design of the city. The MCC Core Strategy stipulates that all new residential developments should comply with the design guidance set out in the SPDs. These principles include the following environmental standards relevant to this report: energy strategy, water consumption, drainage management, weather resilience, waste management, construction management, biodiversity, and waterways.

2.2.1.3 Manchester Residential Quality Guide 2017

The Manchester Residential Quality Guide has been developed to help shape the creation of new homes and communities across the Greater Manchester city region, beginning with the Centre and its immediate surroundings. This document outlines the considerations, qualities, and opportunities that will help to deliver high quality residential development as part of successful and sustainable neighbourhoods across Manchester. The guidance includes the following nine components:

Make it Manchester – developers must understand the city’s unique character, heritage old and new, density and scale in various parts of the city and appreciate how new homes will fit in to what is already there.

Make it bring people together – new homes must encourage a sense of community and neighbourliness, offering a mix of tenures to promote a mix of people.

Make it animate streets and spaces – understand the relationship between new homes and its environment and create public space.

Make it easy to get around – make sure developments have good transport links, along with good walking and cycling provision.

Make work with the landscape – development should improve the connection with the local environment with improved biodiversity, as well as greening and water schemes.

Make it practical – dealing with waste, car parking, bike storage and visitors should be made as easy as possible.

Make it future proof – design must anticipate the impacts of climate change and extreme weather with efficient design and adaptability.

Make it a home – sufficient space, natural light, privacy and storage are essential for people to settle down and flourish.

Make it happen – ensuring proposals are delivered, to a high quality, with high design standards and high sustainability.



2.2.1.4 Manchester's Great Outdoors 2015-25

A Green and Blue Infrastructure Strategy for Manchester aims to invest to date in the city's Green and Blue infrastructure over the next 10 years (by 2025). Four objectives have been established to enable the vision to be achieved: 1. Improve the quality and function of existing green and blue Infrastructure, to maximize the benefits it delivers. 2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth. 3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond. 4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy, and the local environment.

2.2.1.5 Manchester Climate Change Framework 2020-25

Following the declaration of a climate emergency by MCC In July 2019, this framework was adopted and is an in-depth strategy to accompany the Draft Manchester Zero Carbon Framework 2020-38, which was published in February 2019. It is a framework that will continue to develop over the next five years, in line with changes in policy, climate science, rate of progress and other factors. The framework has set out four objectives to facilitate this:

Objective 1 – Staying within our carbon budgets.

- Direct CO2 emissions: staying within our 15-million-ton carbon budget for 2018-2100, including reducing the CO2 emitted from our homes, workplaces and ground transport by at least 50% during 2020-25.
- Indirect CO2 emissions: understanding and taking action on the things that we consume, and which generate greenhouse gases through their production, transportation and disposal.

Objective 2 – Climate adaptation and resilience

- Increase the amount of urban green infrastructure cover, aiming for a 10% increase by 2038 from 2018 levels, in line with the Greater Manchester aim.
- Respond to these risks by incorporating adaptation and resilience within our plans and strategies, and acting to make necessary changes to our buildings, infrastructure and our natural environment.

Objective 3 – Health and wellbeing

- Adapt the city's built and natural environment and prepare our residents to become more resilient to these changes. Increasing the amount and quality of green space to enable residents to benefit from the improved physical and mental health that will come as a result.
- Improving the energy efficiency of the city's homes and providing access to affordable, secure supplies of renewable energy are essential help get 38,000 Manchester households out of fuel poverty.

Objective 4 – Inclusive, zero carbon and climate resilient economy

- Ensure that Manchester establishes an inclusive, zero carbon and climate resilient economy where everyone can benefit from playing an active role in decarbonising and adapting the city to the changing climate.

2.2.2 Manchester City Council's Planning Document Targets

Manchester City Planning Policy currently uses the following documents to look to establish the carbon reduction targets to be achieved in new developments across the City.

These documents use different terminology to describe achieving the various reduced carbon emissions.

Please see below a summary of the terminology and targets set out within the current Manchester Planning Policy documents:

Planning Document:	Time of Production or Adoption:	Low Carbon Target:	Sustainable Design Definition:
Manchester Council's Core Strategy 2012-2027	Adopted 2012	Targets a 9% reduction in carbon emissions over Part L Building Regulations.	Low Carbon (9% over Part L 2013)
Climate Change and Low Emission Strategies 2016-2020	Adopted 2016	Targets a 48% reduction in carbon emissions from 1990 - 2020	Low Carbon (48% over 1990 emissions)
Manchester: A Certain Future	Produced in 2009, updated in 2013	Targets emitting 41% less CO ₂ in 2020 than in 2005 – Equates to 10% over Part L 2013 (if going by Part L requirements)	Low Carbon (10% over Part L 2013)

Table 1: Overview of Manchester Planning Documents Carbon Targets



2.2.3 Places For Everyone Joint Development Plan 2022 - 2039

Places for Everyone is a long-term plan of nine Greater Manchester districts (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) for jobs, new homes, and sustainable growth. It has been published by the GMCA on behalf of the nine districts.

The plan is a joint development plan of the nine districts which will determine the kind of development that takes place in their boroughs, maximising the use of brownfield land and urban spaces while protecting Green Belt land from the risk of unplanned development.

It will also ensure all new developments are sustainably integrated into Greater Manchester's transport network or supported by new infrastructure.

The Key DPD policies considered in this report are:

Policy JP-S2: Carbon and Energy

The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:

An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;

- a) Be net zero carbon which applies:
 - from adoption– to regulated operational carbon emissions;
 - from 2028 - to all emissions 'in construction'.

From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions. Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

- I. Minimise energy demand;
- II. Maximise energy efficiency;
- III. Use renewable energy;
- IV. Use low carbon energy; and
- V. Utilise other energy sources.

2.2.4 National Planning Policy

The NPPF (revised December 2023) sets out the Government's planning policies for England and how these are expected to be applied. The overall emphasis of the NPPF is to reiterate the Government's key objectives, including securing sustainable development.

The NPPF defines the purpose of the planning system as being to contribute to the achievement of sustainable development. It explains at Paragraph 8 that there are three dimensions to sustainable development. These are economic, social and environmental and should be pursued simultaneously through the planning system.

Paragraph 10 states that at the heart of the Framework is a presumption in favour of sustainable development.

2.3 Sustainable Design Strategy

2.3.1 Energy and Carbon Emissions

Building Services Strategy

In response to the policy requirements and climate change plan targets set out in section 2.2, developments should aim to assist and achieve the following carbon reduction targets:

1. Achieve a minimum of 10% CO₂ reduction over the Part L 2013 Target Emission Rate (TER), as per Target 2 (Electricity intense buildings) in Table 12.1 of Policy EN6.
2. Assist in achieving carbon neutrality by 2038.

To achieve the most accurate calculations and estimates, the proposed units have been modelled using SAP 2012 the governments Standard Assessment Procedure for residential dwellings.

The proposed strategy for minimising energy use and carbon emissions is based on the energy hierarchy described in CIBSE Guide F 2012 (Energy efficiency in buildings). The energy hierarchy has been adopted for the development to ensure that the correct approach to design is taken to promote an energy-efficient low carbon solution (see figure 2). This has ensured that the benefits of effective methods of energy use reduction have been maximised first. The approach adopted is as follows:



Fig 2: Energy Hierarchy

Minimise energy demand – Implement passive design measures and optimise the building envelope in terms of orientation, air tightness, and insulation. For example, the proposal is targeting a low carbon classification through a holistic low energy design concept as it will be designed with a fabric first approach whereby standards designed to exceed Building Regulations compliancy are aspired to for all fabric U-values and air permeability targets.

Meet demands efficiently – Specification of energy efficient decentralised plant, heating, ventilation, lighting, and system controls to facilitate efficient operation.

Particular attention is being paid to the wellbeing of occupants. The ventilation strategy has been developed to minimise noise ingress from the proposed location as far as possible while minimising the risk of overheating.

Additional Renewable Energy Measures

Opportunities for incorporating low and zero carbon technologies (LZCT) have been considered for this development. The viability of several separate technologies was examined in a LZCT study (see section 3).

Efficient and Sustainable Design Measures

In line with the above Sustainable Design Strategy, the following Energy Efficient design measures are specified.

- High levels of insulation throughout with minimal thermal bridges
- Passive solar gains and internal heat sources
- Excellent level of airtightness
- Good indoor air quality by openable windows

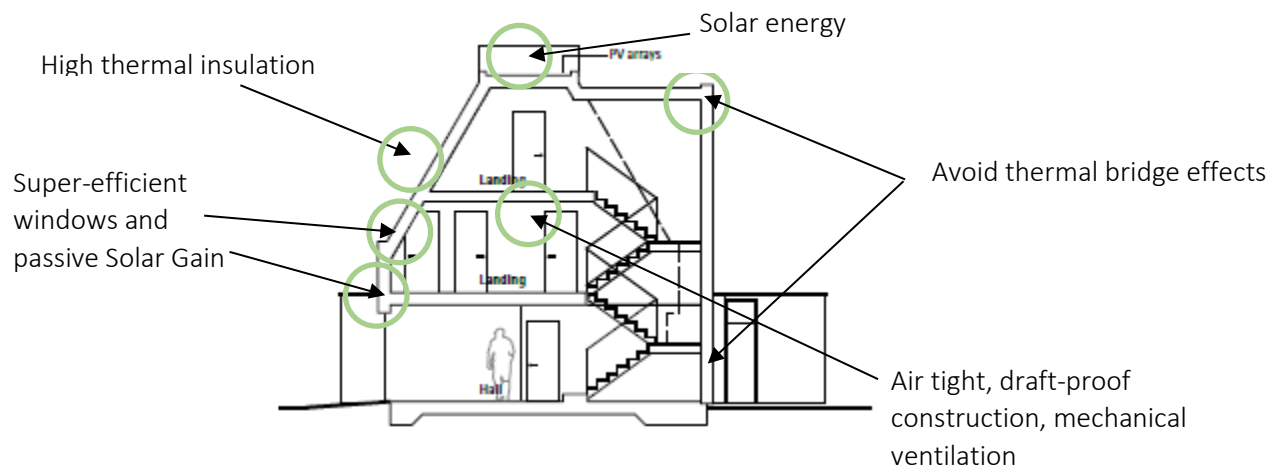


Fig 3. Efficient Design Measure examples

The Proposed specifications and key energy efficient design measures are as follows:

Residential Units:

- Upgraded Roof U-values of $0.15 \text{ W/m}^2\text{K}$
- Upgraded External Wall U-values of $0.18 \text{ W/m}^2\text{K}$
- Secondary Glazed Window U-values of $1.3 \text{ W/m}^2\text{K}$
- New Solid Frame Door U-values of $1.3 \text{ W/m}^2\text{K}$
- 100% low energy lighting throughout
- 100% efficient electric panel heaters to each flat
- Dimplex Edel - Air Source Heat Pump Hot Water Units to each flat
- CMEV to all flats
- 250L electric immersion cylinders to each flat
- Intermittent Extract Fans to wet rooms

2.3.2 Choice and Impact of Renewable Technology

All reasonable technologies were investigated for their suitability to the site and development; please refer to section 3 for details.

Following the feasibility study, a hot water air source heat pump (ASHP) was selected as the preferred technology. The Manchester Planning target is already being met solely through energy efficiency measures. Additionally, the total on-site energy is to be provided by a 100% renewable energy electricity provider, classifying the development as both **Low Carbon** and **Carbon Neutral**. Therefore, the hot water ASHP is the only LZC technology proposed at this stage.



2.3.3 Energy and CO₂ Reduction Summary

A summary of all stages of the energy demand assessment from baseline figures to final carbon reduction are shown in Figures 1 & 2 below:

	Summary of CO ₂ Emission Reductions	Total CO ₂ emissions (kgCO ₂ /year)
	Carbon Factors (Gas / Electric)	0.210 / 0.136
BASELINE	Baseline emissions	2961.2
BE GREEN	Improved emissions (after incorporation of renewable energy technology) % CO ₂ displaced in total	1054.5
	% CO ₂ displaced in total	64.4%

Table 2: Summary of CO₂ Reductions



		Energy Demand (kWh pa)	Energy saving achieved (%)	Regulated CO ₂ emissions (kg pa)	Saving achieved on residual CO ₂ emissions (%)
BASELINE	Building Regulations Part L compliance ("Baseline" energy demand & emissions)	13245.6		2961.2	
BE GREEN	Proposed scheme after on-site renewables	7753.6	41.5%	1054.5	64.4%
	Total savings on residual emissions				64.4%

Table 3. Total Energy and Carbon Emissions Savings Based on SAP 9.0 Carbon Factors



For a full Breakdown of the figures and calculations please see Appendix A – Energy Demand Assessment Spreadsheet.

Baseline energy demand

‘Standard Assessment Procedure - SAP 2012’ was used to produce example SAP reports to generate the figures used within the calculations.

Baseline energy demand (kWh pa)	13,245.6
Baseline carbon emissions (kg pa)	2,961.2

Be Green stage

The following table demonstrates how the development achieves the reduction in carbon dioxide emissions from LZC technologies.

Energy saving from the use of renewables (kWh)	-
Saving on residual emissions from the use of renewables (kg)	5,492.0
Saving on residual emissions from the use of renewables (%)	64.4%

2.3.4 Manchester City Council' Policy and Targets Summary

With regards to the Manchester City Council's planning documents policy and targets (outlined in section 2.2.1 to 2.2.3) the table below details how the Sustainable Design Strategy (outlined in section 2.3.1) achieves the current planning policy requirements and targets.

Planning Document:	Sustainable Design Strategy
Manchester Council's Core Strategy 2012-2027	The Sustainable Design Strategy achieves a 64.4% reduction in carbon emissions over Part L 2013 - exceeding the EN6 documents Low Carbon target of 9% over Part L 2013.
Climate Change and Low Emission Strategies 2016-2020	The Sustainable Design Strategy achieves a 64.4% reduction in carbon emissions over Part L 2013 – exceeding the documents Low Carbon target of 48% over 1990 Emissions.
Manchester: A Certain Future	The Sustainable Design Strategy achieves a 64.4% reduction in carbon emissions over Part L 2013 – exceeding the documents Low Carbon target of 10% over Part L 2013.

Table 4. Summary of MCC and Planning Targets

As a result of the sustainable design parameters outlined within section 2.3.1 and the energy and CO₂ reduction figures summarised above, the development of 5 flats at the 436-436a Barlow Moor Road/ 571-575 Wilbraham Road site achieves a total reduction of **64.4%** in carbon emissions over Part L 2013.

The low carbon classification for 436 Barlow Moor Road/ 571-575 Wilbraham Road Development can be derived from its prioritisation of fabric first carbon reduction through exceeding Building Regulation design standards, before the incorporation of on-site renewable technologies.

2.4 Adaptation to Climate Change

In addition to the primary building design and fabric, many other issues that will influence creating a Sustainable Development, including flood prevention, material use, waste minimisation and transport. All these issues feature regularly within the separate climate change action plans, outlined within section 2.2, as areas that Manchester is aiming to significantly improve on in order to become a more carbon neutral and clean city.

All the sections of creating a sustainable development should be taken into consideration from the start of the development and promoted throughout the building construction on site in order to maximise their benefits. Additionally, features which enable more efficient usage should also be specified to encourage the building users to maintain efficient use once construction has been completed.

2.4.1 Flood Risk Zone

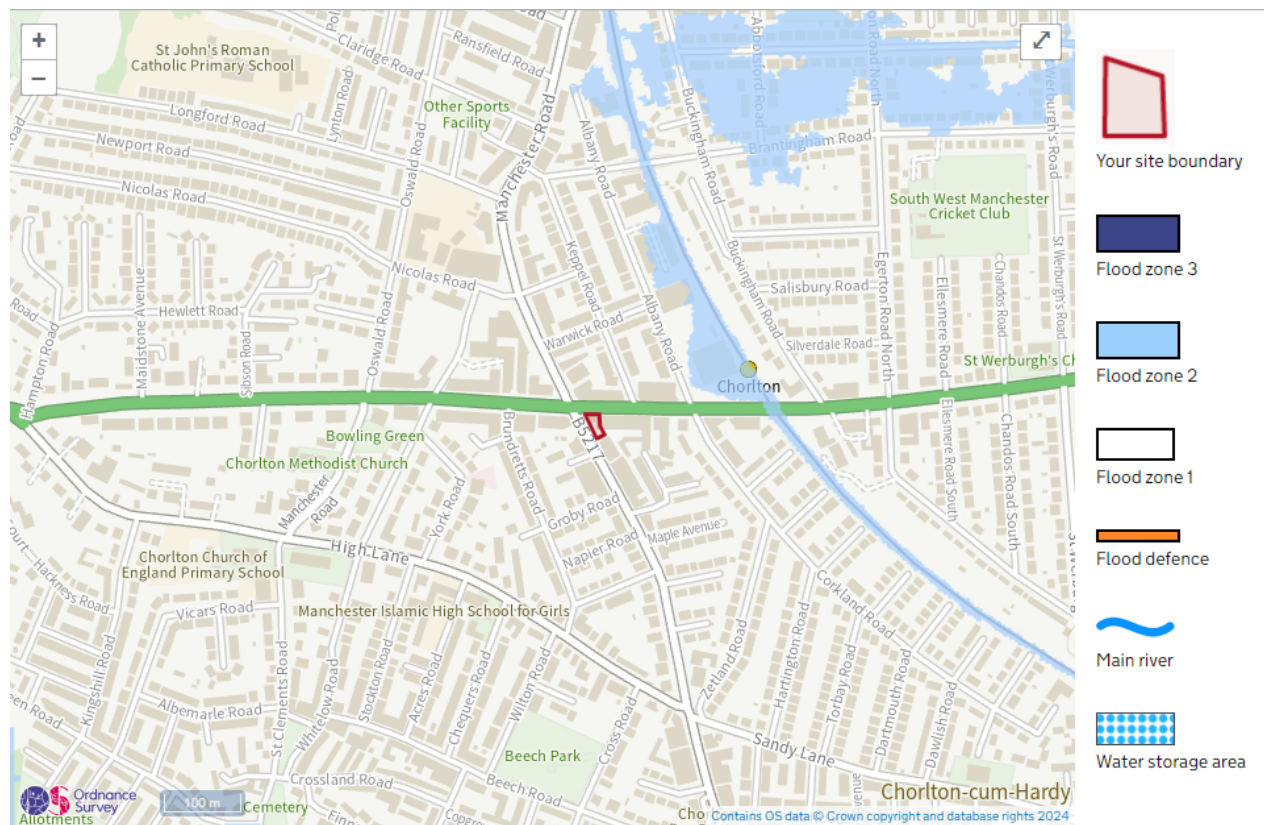


Fig 4: Flood Risk Map

The above map and snippet have been taken from a Government licenced flood risk map for Manchester. It can be seen that the site is just located within flood risk zone 1 and therefore has minimal to no risk of flooding.

2.4.2 Green Blue Infrastructure

2.4.2.1 Sustainable Drainage Systems (SUDs)

Even though it has been shown that the proposed scheme is located on a site with a low to zero flood risk, a drainage strategy assessment should be undertaken, by a suitably qualified professional, to assess the feasibility of introducing on-site SUDs measures, that will reduce surface water run-off and any flood risks associated.

By incorporating SuDs, flood risk can be managed and mitigated. Section 1.1 of the SuDs Manual (Ciria C753) states the following:

“Sustainable drainage systems (SuDS) can deliver multiple benefits.

Surface water is a valuable resource, and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural

aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate.”

The general concept of SUDs is to manage the flood and pollution risks in developed areas. This is done by efficiently managing surface water run-off by either slowing down the surface water run-off, or by reducing the quantity of surface water run-off. There are different methods to achieve this such as:

- Harvesting – capturing rainwater and facilitate its use within the development
- Infiltrating – rainwater infiltrates into the ground
- Storing – capturing rainwater and control the flow through the means of storing and releasing it slowly i.e. attenuation
- Conveying & treating – capturing rainwater and removing any contaminants, then convey the flow towards a downstream system

The SuDS Manual describes the four pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in Figure 3 below:

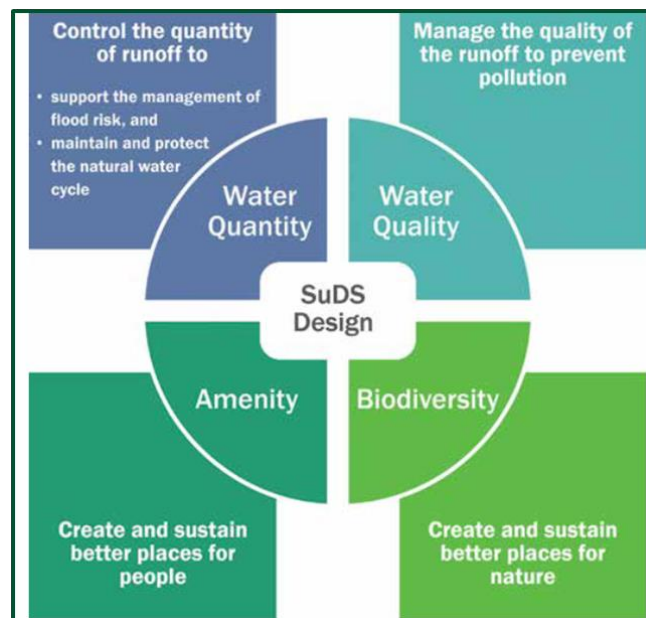


Fig 5. Representation of figure 2.1 of the SUDs Manual

SuDS are increasingly gaining popularity as a holistic solution to a wide range of pressing issues including flood risk, water pollution, groundwater depletion, biodiversity loss and urban decline.

Drainage Hierarchy

To alleviate pressure on existing sewer networks and to address issues of climate change the following hierarchy has been developed and implemented from a planning perspective.

The Planning Practice Guidance, states that:

“generally, the aim should be to discharge surface run-off as high up the following hierarchy of drainage options as reasonable practicably:

1. *Into the ground (infiltration)*
2. *To a surface water body*
3. *To a surface water sewer*
4. *To a combined sewer”*

The “Building Regulations Approved Document H” refer to this discharge hierarchy.

Description	Benefit
Flood risk management	SuDS aim to have an attenuating affect by slowing down and storing surface water run-off
Drainage resilience	Future proofing designed to be resilient against climate change
Natural flow regime protection	Mimic natural drainage arrangements to emulate natural flow
Water quality	Filter out pollutants and discharge cleaner water
Water reuse	Can be strategically placed to clean and capture water for reuse
Biodiversity and ecology	SuDS use vegetation and natural landscape to support biodiversity and ecology
Amenity	Improve visual integrity and desirability of the site by implementing green and blue features
Carbon reduction	SuDS can reduce carbon use throughout the life cycle including construction, maintenance, and demolition
Microclimate	Aim in reducing heat island effects
Education	Educate and engage the general public about surface water management

Table 5. Outline of types of green/blue infrastructure and associated benefit



2.4.2.2 Biodiversity

Similarly, to the previous section on SUDs, there could be adverse impacts on the surrounding ecology as well potential for the enhancement. Therefore, an ecology report should be produced, by a suitably qualified professional, in order to ensure that any existing ecology on or near the site is adequately protected and to determine the possibility of new habitat creation, planting schemes, green wall areas.

2.4.3 Internal Water Efficiency

Part G of the Building Regulations requires all new dwellings to have an internal water consumption of no greater than 110 litres / person / day, unless specified to be less. Therefore, fittings proposed should have low flow rates, capacities, effective flush volumes etc. Example targets for these to achieve the required internal consumption are as follows:

Appliance	Unit of measure	Amount (litres)
WC (Dual flush)	Full flush volume	4
WC (Dual flush)	Part flush volume	2.6
Taps (excluding kitchen)	Flow rate l/min	5
Kitchen taps	Flow rate l/min	6
Bath	Capacity to Overflow	170
Shower	Flow rate l/min	8
Washing Machine	Litres / kg dry load	8.17
Dishwasher	Litres / place setting	1.25

Table 6. Internal Water Efficiency Flow Rates

The above rates will achieve a total internal water consumption of 106.31 with a bath present and 98.25 with only a shower present.

The specifying of 'A' rated appliances should be prioritised where possible.



2.4.4 Waste Management

2.4.4.1 Occupational Waste

Manchester City Council's Waste Storage and Collection Guidance for New Developments 2017 encourages all new developments to incorporate a waste management strategy into the build at the earliest stage possible.

2.4.4.2 Construction Waste

A target of at least 90% of waste generated on site, throughout the construction stage of the development, to be diverted from landfill' will be included as part of a Construction Environmental Management Plan (CEMP) to be agreed with MCC.

The proposal will also endeavour to maximise the use of recycled materials on site, whereby further promoting the minimising of waste production.

2.4.5 Materials

The construction of new buildings and building elements has a large environmental impact in terms of both, energy, and embodied carbon of new materials. Therefore, Manchester City Council promote the prioritising of environmentally friendly materials, where possible, and encourages the use of recycled building materials. This information should also be incorporated into the SWMP mentioned in the previous subsection (Waste Management) as a means of promoting the re-using and recycling of materials.

Where new materials are to be used, careful consideration of their environmental impact should be taken. This can be achieved by ensuring that only materials that score well under The Green Guide to Specification. This useful online tool can be used as a reference that provides guidance on the relative environmental impacts for a wide range of different building specifications. The BRE's Environmental Profile Methodology determines the Life Cycle Assessment (LCA) of materials, which is what the Guide's specifications are based on.

In order to take full advantage of low impact materials, elements key to the scheme should be specified to achieve ratings of between A+ and C under The Green Guide's ratings. Insulation materials that are specified will also have a global warming potential (GWP) of 5 or less, with an ODP of 0. Additionally, 100% of all timber used as part of the scheme will be responsibly sourced from suppliers that are either Forest Stewardship Council (FSC) accredited, Programme for the Endorsement of Forestry Certification accredited, or a similar recognised accreditation body.

To further promote embodied energy and carbon savings, the scheme will first prioritise the reusing of any demolished materials within the site, however if this is not possible secondary priority must be given to the redirecting from landfill, in line with the waste hierarchy.

Finally, in addition to the above policy points, the development is also recommended to register with the Considerate Constructors Scheme, or a similar approved scheme.

2.4.6 Pollution Control

To reduce emissions of gases with high global warming potential (GWP) and nitrogen oxide (NOx) into the atmosphere, new buildings will be specified with insulating materials that have a GWP of less than 5. This will follow throughout the development to reduce the impact that the construction phase has upon climate change.

Additionally, the following measures will be implemented:

- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase.
- External light fittings will be controlled through a time switch, or daylight sensor, to prevent operation during daylight hours to limit the impact of artificial lighting for the development's residents and surrounding environment.

Sound insulation will be specified to achieve Building Regulation Part E compliance standard (this will be verified by pre-completion testing) in addition to meeting the requirements of the council. This will reduce the impact of sound pollution for the occupants within adjoining dwellings.

2.4.7 Sustainable Transport

A key message from all climate change adaptation plans (as mentioned in section 2.2), specifically Our Manchester Strategy 2016-2025, The Zero Carbon Framework (formulated by the Manchester Climate Change Board) and Manchester City Council's Core Strategy 2012-2027, is the need to increase the proportion of cycling, walking and public transport journeys. This is due to it providing both environmental and social benefits through the reducing of emissions, improving air quality, and promoting a more active lifestyle.

The proposed development acknowledges the benefits associated with these forms of sustainable transport and is allowing access to a central cycle store, thereby encouraging all residents to commute in a sustainable manner. Barlow Moor Road also forms part of the designated cycle route around Chorlton.

Transport Links

- **Bus:** The site is in close proximity to multiple high frequency bus stops on with a lay-by located to the south with services to Manchester City Centre, The Trafford Centre, Stockport and other destinations.
- **Metrolink:** Both Chorlton and St Werburgh's Road metro stations are located 500m and provides routes to Rochdale, Manchester Airport, East Didsbury and the City Centre.

Local Amenities

Barlow Moor Road in Chorlton, Manchester, is a vibrant area teeming with a variety of local amenities that cater to diverse tastes and needs. This bustling thoroughfare is home to an array of independent cafes, trendy bars, and diverse restaurants, offering everything from casual brunch spots to fine dining experiences, many within a short 5-10 minute walk. For everyday conveniences, residents and visitors can find numerous grocery stores, specialty shops, and essential services such as pharmacies and banks, typically within a 5-minute walk. The road also boasts several green spaces, including the nearby Chorlton Park, just 0.5 miles away, and the extensive Chorlton Water Park, approximately 1 mile away, perfect for outdoor activities and leisurely strolls.

3 Feasibility Assessment of Renewable Energy and Low Carbon Technologies

Solar Hot Water (Thermal)

Solar water heating systems are one of the more familiar renewable technologies used at the moment. They use the energy from the sun to heat water, most commonly for hot water needs. Solar heating systems use a heat collector that is usually mounted on a roof in which the sun heats a fluid. This fluid is used to heat water that is stored in either a separate hot water cylinder or in a twin-coil hot water cylinder (the second coil is used to provide additional heating from a boiler or other heat source).

Solar hot water panels could be used however, PV will provide slightly better savings and avoid the need for water storage cylinders when compared.

Renewable Technology Not Chosen.

Photovoltaic Panels (PV)

Photovoltaic modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases of silicon. Through a process called doping, very small amounts of impurities are added to the semiconductor, which creates two different layers called n-type and p-type layers.

Certain wavelengths of light are able to ionize the silicon atoms, which separates some of the positive charges (holes) from the negative charges (electrons). The holes move into the positive or p-layer and the electrons into the negative or n-layer. These opposite charges are attracted to each other, but most of them can only re-combine by the electrons passing through an external circuit, due to an internal potential energy barrier. This flow of electrons produces a DC current.

The Manchester planning target is already being satisfied solely through the use of energy efficiency measures and the development is achieving a low carbon status.

Renewable Technology Not Chosen.

Ground Source Heat pumps

A heat pump is a device that takes up heat at a certain temperature and releases it at a higher temperature. The essential components of a heat pump are heat exchangers (through which energy is extracted and emitted) and a means of pumping heat between the exchangers. The effectiveness of the heat pump is measured by the ratio of the heating capacity to the effective power input, usually known as the coefficient of performance (COP). Ground-source heat pumps (GSHP) extract heat from the ground. They are classified as either water-to-air or water-to-water units depending on whether the heat distribution system in the building uses air or water. Ground source heat pumps either use long shallow trenches or deep vertical boreholes to take low grade heat from the ground and then compress it to create higher temperatures.

Ground source heat pumps would not be suitable due to the lack of land space around the properties and the associated costs.

Renewable Technology Not Viable

Air Source Heat pumps

Air source heat pumps absorb heat from the outside air. This is usually used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside.

The system performs down to air temperatures of -20°C which means that they are more than suitable for installations within the UK. Hot water and Heating can be provided 365 days a year. The hot water is produced without the aid of electrical immersions and at 55°C is more than hot enough for baths and showers.

There are two main types of air source heat pump system:

- An air-to-water system distributes heat via your wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. So they are more suitable for under-floor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time.
- An air-to-air system produces warm air which is circulated by fans to heat your home. They are unlikely to provide you with hot water as well.

A Dimplex Edel air source heat pump hot water unit has been chosen that fits into each utility cupboard of each apartment and solves the hot water heating requirement and any space constraints.

Renewable Technology Chosen



Biomass Heating

Biomass is any plant-derived organic material that renews itself over a short period.

Biomass energy systems are based on either the direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. The use of biomass is becoming increasingly common in some European countries.

The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate 20-fold energy return for woody biomass. Biomass-fuels can be used to produce energy on a continuous basis (unlike renewables such as wind or solar energy) and it can be an economic alternative to fossil fuels as it is a potential source of both heat and electricity.

However, Biomass systems have particular design management and maintenance requirements associated with sourcing, transportation and storage and are therefore more commonly used in commercial developments rather than domestic installations. It can be less convenient to operate than mains-supplied fuels such as natural gas and are more management intensive and require expertise in facilities management. Sources of biomass can also fluctuate, so boilers should be specified to operate on a variety of fuels without risk of overheating or tripping out.

A communal biomass system would not be feasible for this development due to the expense associated with the necessary output to heat all dwellings on the site.

Renewable Technology Not Chosen

Wind

Wind turbines convert the kinetic energy in wind into mechanical energy that is then converted to electricity. Turbines are available in a range of sizes and designs and can either be free-standing, mounted on a building or integrated into a building structure.

The wind speed in the area is under the advised minimum and the built-up area means that a wind turbine wouldn't be feasible.

Renewable Technology Not Viable

4 Conclusion

This statement has assessed the proposed development at the 436-436a Barlow Moor Road and 571-575 Wilbraham Road site against the relevant climate change and sustainability policies and targets, as outlined within: the Manchester City Council Core Strategy (July 2012), Our Manchester Strategy, Manchester: A Certain Future and The Zero Carbon Framework, through the following of the energy hierarchy, the modelling of apartments in the FSAP 2012 software and addressing all aspects of a sustainable development. In addition, the proposal has been assessed against national sustainable design definitions to determine how it can be classified.

As part of this process, the development was designed with a fabric first approach; with U-values, design air permeability and ventilation targets all aspiring to exceed Building Regulations Part L 2013 standards. This approach demonstrates a holistic low energy design concept, involving very low limiting values and thus led to high-energy performance targets and being defined as a low carbon development.

Furthermore, an LZC feasibility assessment was conducted, with all suitable technologies investigated for their suitability to the site and development. A hot water air source heat pump (ASHP) has been proposed as the chosen technology, resulting in a total carbon reduction of 64.4% when using 10.1 carbon factors. Additionally, the development can be defined as carbon neutral because it will achieve net zero carbon emissions. This will be accomplished by obtaining all on-site energy from a 100% renewable energy electricity provider.

The development will also be adapting to climate change by incorporating sustainable drainage measures into the design, protecting existing ecology, enhancing biodiversity where possible and providing cycle storage provision to residents.

In addition to the following of the energy hierarchy through the efficient design and renewable technology measures mentioned and meeting all relevant Manchester City Council carbon targets the proposal will include many sustainability measures throughout construction and once completed, which will contribute heavily to the development's sustainability performance and accord with the requirements of the NPPF. The key measures to be included and therefore can be taken from this report include:

- The proposal sits within Flood Risk Zone 1 and therefore has minimal to no risk of flooding.
- A SUDs strategy will be produced to outline all measures to be incorporated that will ensure any additional surface water is collected, treated and removed.
- Internal water efficiency will be prioritised by ensuring that efficient water fixtures are proposed so that each dwelling achieves less than 110L per person per day and 'A' rated appliances will be specified where possible.
- Waste minimisation will be targeted from throughout construction and occupational phase. It is targeted that at least 90% of construction waste will be diverted from landfill.
- The site layout promotes busy spaces and routes and facilitates natural surveillance. These will therefore reduce the fear of crime and subsequently improving mental health of residents, visitors and workers.

- Prioritising reusing existing materials and locally sourced materials for construction to reduce waste and transportation to landfill in addition and promote a low embodied carbon development.
- When new materials are specified that are not locally attainable then only those that score well on the BRE: The Green Guide to Specification are to be used; to further encourage the use of sustainable materials and reductions in embodied carbon.
- The proximity of the Chorlton District Centre means that the proposed site is highly sustainable in terms of transport and local amenities as it is serviced by a number of public transport nodes including multiple bus stops and the Metrolink, as well as a multitude of shops and other local amenities.
- The development will also include a cycle store provision, as well as being located on a cycle route.

As a result of all the above, the proposed sustainable design and energy strategy allows the development to comply with Manchester City Council's planning policy requirement and is in line with all targets put forward in their planning documents.

House Type / Name	Flat 1	Flat 2	Flat 3	Flat 4	Flat 5	TOTAL (kWh/yr)	SAP 10.2	TOTAL (kgCO2/yr)
Frequency	1	1	1	1	1	1		
BASELINE Dwelling Emission Rate (TER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
Main Heating Fuel Requirement (TER)	255.85	824.74	700.89	876.14	1503.88	4161.5	0.210	873.9
Secondary Main Heating Fuel Requirement (TER)						0	0.136	0.0
Secondary Heating Fuel Requirement (TER)						0	0.136	0.0
Water Fuel Requirement (TER)	2256.09	2328.31	2201.1	2327.38	2399.18	11512.06	0.210	2417.5
Electricity Pumps Fans Requirement (TER)	86	86	86	86	86	430	0.136	58.5
Electricity Lighting Requirement (TER)	151.73	174.86	143.33	150.67	173.88	794.47	0.136	108.0
PV Energy Produced (TER)	-661.83	-754.02	-637.61	-753.89	-845.09	-3652.4	0.136	-496.7
TOTAL PER DEVELOPMENT						13245.6		2961.2
FINAL Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
Main Heating Fuel Requirement (DER)	1049.66	2241.82	1845.01	1867.24	3497.75	10501.48	0.136	1428.2
Secondary Main Heating Fuel Requirement (DER)						0	0.136	0.0
Secondary Heating Fuel Requirement (DER)						0	0.136	0.0
Water Fuel Requirement (DER)	641.92	676.42	632.65	676.38	707.85	3335.22	0.136	453.6
Electricity Pumps Fans Requirement (DER)	0	0	0	0	0	0	0.136	0.0
Electricity Lighting Requirement (DER)	146.38	176.28	136.35	151.88	181.12	792.01	0.136	107.7
TOTAL PER DEVELOPMENT						14628.7		1989.5
PV Energy Produced (DER)	0	0	0	0	0	0.0	0.136	0.0
TOTAL PER DEVELOPMENT						14628.7		1989.5



Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 11 Jul 2024 11:28:29

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/027301	Assessment Date	2024-07-11

Dwelling Details			
Assessment Type	As designed	Total Floor Area	54 m ²
Site Reference	Apartment No 1	Plot Reference	Apartment No 1
Address	36-436a BarlowMoor road, Manchester , M21 0AB		

Client Details	
Name	Paul Butler Associates
Company	Paul Butler Associates
Address	31 Blackfriars Road, Manchester, M3 7AQ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	8.88 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	5.78 kgCO ₂ /m ²	OK

1b Target primary energy rate and dwelling primary energy		
Target primary energy	47.18 kWh _{PE} /m ²	
Dwelling primary energy	59.8 kWh _{PE} /m ²	FAIL

1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	10.3 kWh/m ²	
Dwelling fabric energy efficiency	23.8 kWh/m ²	FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.3	Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	15.72	0.18
Party wall: Party Wall (1)	21.93	0 (!)
Party wall: Party Wall (2)	23.46	0 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Windows, Window	5.54	South West	0.7	1.3

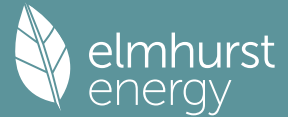
2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m ² K) used for thermal bridging	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	15 m ³ /hm ² , Assumed value	FAIL
Air permeability test certificate reference		

4 Space heating		
Main heating system 1: Room heaters - Electricity		
Efficiency	100.0%	
Emitter type		
Flow temperature		
System type	Panel, convector or radiant heaters	
Manufacturer		
Model		
Commissioning		
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	0.0%	
Emitter type		
Flow temperature		
System type	Heat Pump	
Manufacturer	Auer	
Model	EDL170-520RF	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	120 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	0.7 W/(l/s)	
Specific fan power	0.19 W/(l/s)	OK
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model	Sentinel Multivent	
Commissioning		
9 Local generation		

N/A	
10 Heat networks	
N/A	
11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

Full SAP Calculation Printout



Property Reference	Apartment No 1			Issued on Date	11/07/2024
Assessment Reference	Apartment No 1	Prop Type Ref	Apartment No 1		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	81 B	DER	5.78	TER	8.88
Environmental	96 A	% DER < TER			34.91
CO ₂ Emissions (t/year)	0.24	DFEE	23.80	TFEE	10.29
Compliance Check	See BREL	% DFEE < TFEE			-131.22
% DPER < TPER	-26.74	DPER	59.80	TPER	47.18
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.5600 (1b)	2.2500 (2b)	120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.5100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5813 (21)

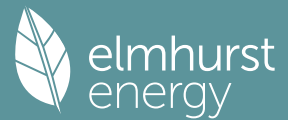
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296	60.0000	943.2000 (29a)
Total net area of external elements Aum(A, m ²)			21.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.6756		(33)
Party Wall shared by Apartment			21.9300	0.0000	0.0000	140.0000	3070.2000 (32)
Party Wall shared by Lobby			23.4600	0.0000	0.0000	140.0000	3284.4000 (32)
Party Floor			53.5600			40.0000	2142.4000 (32a)
Party Ceiling			53.5600			30.0000	1606.8000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11047.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							206.2547 (35)
Thermal bridges (Default value 0.200 * total exposed area)							4.2520 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	13.9276 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

Full SAP Calculation Printout



(38)m	Jan 39.4141	Feb 38.8362	Mar 38.2583	Apr 35.3689	May 34.7910	Jun 31.9016	Jul 31.9016	Aug 31.3238	Sep 33.0574	Oct 34.7910	Nov 35.9468	Dec 37.1026 (38)
Heat transfer coeff	53.3417	52.7638	52.1860	49.2965	48.7187	45.8292	45.8292	45.2514	46.9850	48.7187	49.8744	51.0302 (39)
Average = Sum(39)m / 12 =												49.1521
HLP	Jan 0.9959	Feb 0.9851	Mar 0.9743	Apr 0.9204	May 0.9096	Jun 0.8557	Jul 0.8557	Aug 0.8449	Sep 0.8772	Oct 0.9096	Nov 0.9312	Dec 0.9528 (40)
HLP (average)												0.9177
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7951 (42)
Hot water usage for mixer showers													
69.7184	68.6707	67.1439	64.2228	62.0670	59.6630	58.2965	59.8117	61.4726	64.0539	67.0378	69.4513	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)	
Average daily hot water use (litres/day)												94.2900 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
102.7316	100.4834	97.7562	93.6345	90.2783	86.6737	85.3073	88.0229	90.8844	94.6661	98.8505	102.4645	(44)	
Energy conte	162.7017	143.0870	150.2476	128.1810	121.5319	106.5755	103.1718	108.9908	112.0695	128.4610	140.8306	160.4346 (45)	
Energy content (annual)										Total = Sum(45)m =		1566.2829	
Distribution loss (46)m = 0.15 x (45)m													
24.4053	21.4631	22.5371	19.2271	18.2298	15.9863	15.4758	16.3486	16.8104	19.2691	21.1246	24.0652 (46)		
Water storage loss:													
Store volume												173.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.0368 (55)	
Total storage loss													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)	
If cylinder contains dedicated solar storage													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754 (62)		
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h													
194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754 (64)		
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	1944.7149 (64)		
Electric shower(s)											1945 (64)		
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)		
Heat gains from water heating, kWh/month													
54.0983	47.5764	49.9573	42.6202	40.4094	35.4363	34.3046	36.2394	37.2631	42.7133	46.8262	53.3445 (65)		

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	90.4811	100.1755	90.4811	93.4971	90.4811	93.4971	90.4811	90.4811	93.4971	90.4811	93.4971	90.4811 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023 (71)
Water heating gains (Table 5)												
	72.7128	70.7983	67.1469	59.1947	54.3137	49.2171	46.1083	48.7089	51.7543	57.4103	65.0364	71.6996 (72)
Total internal gains												
	369.5870	378.9905	361.5532	347.9066	329.0143	316.5998	303.5712	304.5482	314.7011	326.0515	347.6888	361.6700 (73)

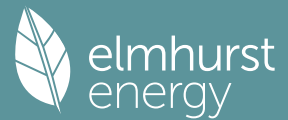
6. Solar gains

[Jan]												
	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southwest	5.5400	36.7938	0.7200	0.7000	0.7700	71.1948 (79)						
Solar gains	71.1948	121.2712	165.9285	205.5935	230.2818	228.6165	220.4107	201.9921	179.6655	134.0305	85.2750	60.9280 (83)
Total gains	440.7818	500.2616	527.4817	553.5001	559.2961	545.2163	523.9820	506.5403	494.3666	460.0819	432.9638	422.5980 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.5274	58.1575	58.8015	62.2480	62.9864	66.9575	66.9575	67.8126	65.3104	62.9864	61.5267	60.1333
alpha	4.8352	4.8772	4.9201	5.1499	5.1991	5.4638	5.4638	5.5208	5.3540	5.1991	5.1018	5.0089
util living area	0.9829	0.9675	0.9418	0.8670	0.7395	0.5294	0.3836	0.4091	0.6305	0.8763	0.9640	0.9851 (86)
MIT	19.9014	20.1204	20.3730	20.7154	20.9034	20.9884	20.9983	20.9977	20.9692	20.7467	20.3281	19.9311 (87)

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Th 2	20.0867	20.0957	20.1048	20.1502	20.1593	20.2054	20.2054	20.2146	20.1869	20.1593	20.1411	20.1229 (88)
util rest of house	0.9787	0.9598	0.9280	0.8382	0.6902	0.4671	0.3149	0.3402	0.5651	0.8437	0.9543	0.9815 (89)
MIT 2	18.8214	19.1025	19.4223	19.8663	20.0774	20.1982	20.2047	20.2137	20.1659	19.9159	19.3996	18.8857 (90)
Living area fraction									fLA = Living area / (4) =			0.5405 (91)
MIT	19.4052	19.6527	19.9362	20.3252	20.5238	20.6254	20.6337	20.6375	20.6001	20.3650	19.9015	19.4508 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4052	19.6527	19.9362	20.3252	20.5238	20.6254	20.6337	20.6375	20.6001	20.3650	19.9015	19.4508 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9747	0.9553	0.9250	0.8446	0.7123	0.5003	0.3520	0.3774	0.5990	0.8524	0.9511	0.9780	(94)
Useful gains	429.6476	477.9068	487.9448	467.4850	398.4048	272.7833	184.4561	191.1918	296.1131	392.1651	411.7728	413.2925	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	805.7354	778.4078	701.1805	563.2240	429.8856	276.1373	184.8599	191.7513	305.4057	475.7353	638.4661	778.2499	(97)
Space heating kWh	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(98a)
Space heating requirement - total per year (kWh/year)												1229.6708	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1229.6708	
Space heating per m2											(98c) / (4) =	22.9588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating													
Water heating requirement	194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754 (64)	
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)	
Fuel for water heating, kWh/month	64.3140	56.8129	60.2031	52.5771	50.7246	45.4455	44.6642	46.5850	47.2590	53.0118	56.7525	63.5657 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	3.3215	3.0001	3.3215	3.2143	3.3215	3.2143	3.3215	3.2143	3.2143	3.3215	3.2143	3.3215 (231)	
Lighting	18.1380	14.5510	13.1015	9.5987	7.4143	6.0576	6.7636	8.7916	11.4194	14.9829	16.9231	18.6421 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1229.6708 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												302.9550	
Water heating fuel used												641.9154 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)												39.1079 (230a)	
Total electricity for the above, kWh/year												39.1079 (231)	
Electricity for lighting (calculated in Appendix L)												146.3839 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	
Energy used												0.0000 (237)	
Total delivered energy for all uses												2057.0780 (238)	

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1229.6708	0.1565	192.5020 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	641.9154	0.1410	90.5332 (264)
Space and water heating			283.0352 (265)
Pumps, fans and electric keep-hot	39.1079	0.1387	5.4247 (267)
Energy for lighting	146.3839	0.1443	21.1277 (268)
Total CO2, kg/year			309.5877 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1229.6708	1.5796	1942.3327 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	641.9154	1.5215	976.6789 (278)
Space and water heating			2919.0116 (279)
Pumps, fans and electric keep-hot	39.1079	1.5128	59.1624 (281)
Energy for lighting	146.3839	1.5338	224.5285 (282)
Total Primary energy kWh/year			3202.7025 (286)
Dwelling Primary energy Rate (DPER)			59.8000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.5600 (1b)	x 2.2500 (2b)	= 120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5100 (5)

2. Ventilation rate

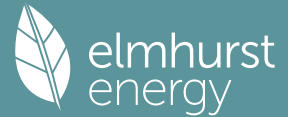
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1660 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4160 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4110	0.4030	0.3949	0.3546	0.3465	0.3063	0.3063	0.2982	0.3224	0.3465	0.3627	0.3788 (22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5600	0.5469	0.5469	0.5445	0.5520	0.5600	0.5658	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435		(27)
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296		(29a)
Total net area of external elements Aum(A, m2)			21.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.1731		(33)
Party Wall shared by Apartment			21.9300	0.0000	0.0000		(32)
Party Wall shared by Lobby			23.4600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							216.2547 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							1.0630 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss												(33) + (36) + (36a) =	10.2361 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.2434	23.1129	22.9851	22.3845	22.2721	21.7491	21.7491	21.6522	21.9506	22.2721	22.4994	22.7371	(38)
Heat transfer coeff	33.4795	33.3490	33.2212	32.6206	32.5083	31.9852	31.9852	31.8883	32.1867	32.5083	32.7356	32.9732	(39)
Average = Sum(39)m / 12 =												32.6201	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6251	0.6226	0.6203	0.6090	0.6070	0.5972	0.5972	0.5954	0.6009	0.6070	0.6112	0.6156	(40)
HLP (average)												0.6090	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.7951 (42)
Hot water usage for mixer showers													
	69.7184	68.6707	67.1439	64.2228	62.0670	59.6630	58.2965	59.8117	61.4726	64.0539	67.0378	69.4513	(42a)
Hot water usage for baths													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
	33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												94.2900	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	102.7316	100.4834	97.7562	93.6345	90.2783	86.6737	85.3073	88.0229	90.8844	94.6661	98.8505	102.4645	(44)
Energy conte	162.7017	143.0870	150.2476	128.1810	121.5319	106.5755	103.1718	108.9908	112.0695	128.4610	140.8306	160.4346	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	24.4053	21.4631	22.5371	19.2271	18.2298	15.9863	15.4758	16.3486	16.8104	19.2691	21.1246	24.0652	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	209.2966	185.1727	196.8425	173.2728	168.1268	151.6673	149.7667	155.5857	157.1613	175.0559	185.9225	207.0295	(62)
WWHRS	-31.8723	-28.1882	-29.5170	-24.4413	-22.7784	-19.4916	-18.2703	-19.4286	-20.1668	-23.7744	-26.9335	-31.2821	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	177.4243	156.9846	167.3254	148.8315	145.3485	132.1757	131.4964	136.1571	136.9946	151.2815	158.9889	175.7474	(64)
12Total per year (kWh/year)												1818.7558	(64)
Electric shower(s)												1819	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	91.3743	81.2450	87.2332	78.6936	77.6853	71.5098	71.5805	73.5154	73.3366	79.9892	82.8997	90.6204	(65)

5. Internal gains (see Table 5 and 5a)													

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.4811	100.1755	90.4811	93.4971	90.4811	93.4971	90.4811	90.4811	93.4971	90.4811	93.4971	90.4811	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	122.8149	120.9003	117.2490	109.2967	104.4157	99.3192	96.2104	98.8110	101.8564	107.5124	115.1384	121.8017	(72)
Total internal gains													
	422.6890	432.0925	414.6553	401.0087	382.1164	366.7019	353.6733	354.6502	364.8032	379.1535	400.7908	414.7721	(73)

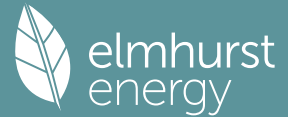
6. Solar gains													

[Jan]													
			Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor		W					
			W/m2	or Table 6b	or Table 6c	Table 6d							
Southwest		5.5400	36.7938	0.6300	0.7000	0.7700		62.2955	(79)				
Solar gains	62.2955	106.1123	145.1874	179.8943	201.4966	200.0395	192.8594	176.7431	157.2073	117.2767	74.6156	53.3120	(83)
Total gains	484.9845	538.2048	559.8427	580.9029	583.6129	566.7413	546.5327	531.3933	522.0105	496.4302	475.4065	468.0840	(84)

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	96.1004	96.4762	96.8476	98.6305	98.9714	100.5899	100.5899	100.8955	99.9603	98.9714	98.2842	97.5759	
alpha	7.4067	7.4317	7.4565	7.5754	7.5981	7.7060	7.7060	7.7264	7.6640	7.5981	7.5523	7.5051	
util living area													

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	0.9337	0.8803	0.8060	0.6674	0.5163	0.3611	0.2575	0.2760	0.4251	0.6689	0.8628	0.9425 (86)
MIT	20.7334	20.8416	20.9235	20.9823	20.9975	20.9999	21.0000	21.0000	20.9995	20.9848	20.8872	20.7164 (87)
Th 2	20.4075	20.4097	20.4118	20.4219	20.4237	20.4325	20.4325	20.4342	20.4291	20.4237	20.4199	20.4160 (88)
util rest of house												
	0.9223	0.8632	0.7826	0.6384	0.4849	0.3291	0.2243	0.2421	0.3901	0.6351	0.8415	0.9323 (89)
MIT 2	20.1113	20.2400	20.3343	20.4056	20.4218	20.4325	20.4325	20.4342	20.4289	20.4106	20.3038	20.0987 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.4475	20.5651	20.6527	20.7173	20.7330	20.7392	20.7393	20.7400	20.7373	20.7209	20.6191	0.5405 (91)
Temperature adjustment												20.4326 (92)
adjusted MIT	20.4475	20.5651	20.6527	20.7173	20.7330	20.7392	20.7393	20.7400	20.7373	20.7209	20.6191	0.0000 (93)

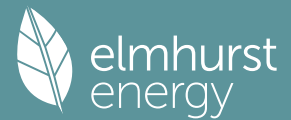
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9231	0.8679	0.7924	0.6533	0.5018	0.3464	0.2422	0.2604	0.4090	0.6526	0.8491	0.9326	(94)
Useful gains	447.6851	467.0911	443.6102	379.5066	292.8543	196.3256	132.3930	138.3921	213.4990	323.9945	403.6699	436.5192	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	540.6111	522.4170	470.1707	385.4886	293.6463	196.3620	132.3948	138.3953	213.6331	329.0136	442.5550	535.2400	(97)
Space heating kWh	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98a)
Space heating requirement - total per year (kWh/year)												236.1531	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												236.1531	
Space heating per m2										(98c) / (4) =		4.4091	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	74.9046	40.2806	21.4095	4.6664	0.6384	0.0000	0.0000	0.0000	0.0000	4.0457	30.3329	79.5757	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	177.4243	156.9846	167.3254	148.8315	145.3485	132.1757	131.4964	136.1571	136.9946	151.2815	158.9889	175.7474	(64)
Efficiency of water heater (217)m	82.1342	81.3793	80.6635	80.0281	79.8327	79.8000	79.8000	79.8000	79.8000	79.9953	81.0296	79.8000	(216)
Fuel for water heating, kWh/month	216.0175	192.9047	207.4363	185.9741	182.0664	165.6337	164.7824	170.6229	171.6724	189.1129	196.2108	213.6559	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.8002	15.0822	13.5798	9.9492	7.6850	6.2787	7.0105	9.1126	11.8363	15.5299	17.5410	19.3227	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-14.5022	-21.5633	-32.6697	-38.7878	-43.6492	-41.4310	-40.9546	-37.7762	-32.4595	-25.5820	-16.3456	-12.4129	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.1034	-10.9884	-22.3149	-34.2149	-45.9211	-46.3717	-45.7977	-38.4368	-27.7498	-15.9092	-6.8774	-4.0150	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												255.8538	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2256.0901	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												151.7282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-661.8343	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2087.8378	(238)

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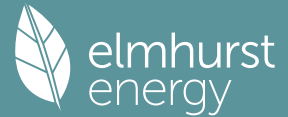
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	255.8538	0.2100	53.7293 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2256.0901	0.2100	473.7789 (264)
Space and water heating			527.5082 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	151.7282	0.1443	21.8991 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.1340	0.1335	-47.8001
PV Unit electricity exported	-303.7003	0.1253	-38.0565
Total			-85.8566 (269)
Total CO2, kg/year			475.4800 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	255.8538	1.1300	289.1148 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2256.0901	1.1300	2549.3818 (278)
Space and water heating			2838.4966 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	151.7282	1.5338	232.7258 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.1340	1.4932	-534.7723
PV Unit electricity exported	-303.7003	0.4599	-139.6852
Total			-674.4575 (283)
Total Primary energy kWh/year			2526.8657 (286)
Target Primary Energy Rate (TPER)			47.1800 (287)

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Property Reference	Apartment No 1			Issued on Date	11/07/2024
Assessment Reference	Apartment No 1	Prop Type Ref	Apartment No 1		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	81 B	DER	5.78	TER	8.88
Environmental	96 A	% DER < TER			34.91
CO ₂ Emissions (t/year)	0.24	DFEE	23.80	TFEE	10.29
Compliance Check	See BREL	% DFEE < TFEE			-131.22
% DPER < TPER	-26.74	DPER	59.80	TPER	47.18
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.5600 (1b)	2.2500 (2b)	120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.5100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1660 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9160 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.7099 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9051	0.8873	0.8696	0.7809	0.7631	0.6744	0.6744	0.6566	0.7099	0.7631	0.7986	0.8341 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.9096	0.8937	0.8781	0.8049	0.7912	0.7274	0.7274	0.7156	0.7520	0.7912	0.8189	0.8479 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296	60.0000	943.2000 (29a)
Total net area of external elements Aum(A, m ²)			21.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.6756		(33)
Party Wall shared by Apartment			21.9300	0.0000	0.0000	140.0000	3070.2000 (32)
Party Wall shared by Lobby			23.4600	0.0000	0.0000	140.0000	3284.4000 (32)
Party Floor			53.5600			40.0000	2142.4000 (32d)
Party Ceiling			53.5600			40.0000	2142.4000 (32b)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	11582.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.2547 (35)
Thermal bridges (Default value 0.200 * total exposed area)							4.2520 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	13.9276 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	36.1728	35.5403	34.9203	32.0083	31.4634	28.9271	28.9271
						28.4575	29.9041
							31.4634
							32.5656
							33.7179 (38)

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Heat transfer coeff	50.1004	49.4679	48.8479	45.9359	45.3910	42.8547	42.8547	42.3851	43.8317	45.3910	46.4932	47.6455 (39)
Average = Sum(39)m / 12 =												45.9333
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9354	0.9236	0.9120	0.8577	0.8475	0.8001	0.8001	0.7914	0.8184	0.8475	0.8681	0.8896 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7951 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)
Hot water usage for other uses												
33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												51.7828 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322 (45)
Energy content (annual)										Total = Sum(45)m =		860.0008
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824 (64)
12Total per year (kWh/year)												731.0006 (64)
Electric shower(s)	43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												494.7945 (64a)
Heat gains from water heating, kWh/month	29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4811	100.1755	90.4811	93.4971	90.4811	93.4971	90.4811	90.4811	93.4971	90.4811	93.4971	90.4811 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023 (71)
Water heating gains (Table 5)	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458 (72)
Total internal gains	337.0458	347.3524	332.0049	323.4005	307.4701	298.1823	287.2952	286.8521	295.2872	303.1464	319.9705	329.8162 (73)

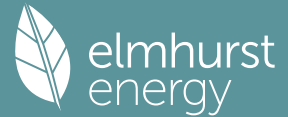
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
-----									-----					
Southwest					5.5400	36.7938	0.7200	0.7000			0.7700			71.1948 (79)
-----									-----					
Solar gains	71.1948	121.2712	165.9285	205.5935	230.2818	228.6165	220.4107	201.9921	179.6655	134.0305	85.2750	60.9280	(83)	
Total gains	408.2407	468.6236	497.9333	528.9940	537.7519	526.7988	507.7060	488.8443	474.9526	437.1769	405.2455	390.7441	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.2188	65.0399	65.8654	70.0409	70.8816	75.0766	75.0766	75.9086	73.4033	70.8816	69.2012	67.5276
alpha	5.2813	5.3360	5.3910	5.6694	5.7254	6.0051	6.0051	6.0606	5.8936	5.7254	5.6134	5.5018
util living area	0.9883	0.9748	0.9503	0.8703	0.7325	0.5156	0.3708	0.3979	0.6198	0.8819	0.9715	0.9900 (86)
MIT	19.9850	20.2023	20.4464	20.7726	20.9326	20.9936	20.9993	20.9989	20.9807	20.7934	20.3997	20.0213 (87)
Th 2	20.1375	20.1475	20.1573	20.2036	20.2124	20.2532	20.2532	20.2608	20.2374	20.2124	20.1947	20.1764 (88)
util rest of house	0.9853	0.9686	0.9380	0.8420	0.6843	0.4575	0.3082	0.3345	0.5576	0.8505	0.9635	0.9874 (89)
MIT 2	19.2208	19.4420	19.6862	20.0278	20.1685	20.2502	20.2530	20.2605	20.2274	20.0583	19.6756	19.2882 (90)
Living area fraction												
MIT	19.6338	19.8529	20.0971	20.4303	20.5815	20.6521	20.6564	20.6596	20.6346	20.4557	20.0670	19.6845 (92)

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Temperature adjustment												0.0000
adjusted MIT	19.6338	19.8529	20.0971	20.4303	20.5815	20.6521	20.6564	20.6596	20.6346	20.4557	20.0670	19.6845 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9660	0.9371	0.8506	0.7076	0.4888	0.3420	0.3688	0.5905	0.8609	0.9620	0.9855	(94)
Useful gains	401.3244	452.7051	466.5912	449.9585	380.4882	257.4779	173.6511	180.2719	280.4677	376.3791	389.8440	385.0856	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	768.2319	739.6898	664.1914	529.6566	403.1398	259.3593	173.8343	180.5442	286.4209	447.3593	602.8770	737.7654	(97)
Space heating kWh	272.9792	192.8538	147.0145	57.3827	16.8528	0.0000	0.0000	0.0000	0.0000	52.8092	153.3838	262.3937	(98a)
Space heating requirement - total per year (kWh/year)												1155.6697	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	272.9792	192.8538	147.0145	57.3827	16.8528	0.0000	0.0000	0.0000	0.0000	52.8092	153.3838	262.3937	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1155.6697	
Space heating per m2										(98c) / (4) =		21.5771	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	402.8346	317.1251	322.1265	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9613	0.9847	0.9809	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	387.2477	312.2785	315.9794	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	574.4115	554.1865	533.9804	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.7579	179.9795	162.1928	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.6895	44.9949	40.5482	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												119.2326 (107)
Energy for space heating												21.5771 (99)
Energy for space cooling												2.2261 (108)
Total												23.8033 (109)
Fabric Energy Efficiency (DFEE)												23.8 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

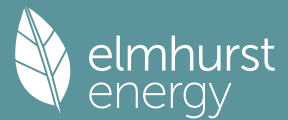
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.5600 (1b)	x 2.2500 (2b)	= 120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	120.5100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1660 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4160 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4110	0.4030	0.3949	0.3546	0.3465	0.3063	0.3063	0.2982	0.3224	0.3465	0.3627	0.3788 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)

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Effective ac 0.5845 0.5812 0.5780 0.5629 0.5600 0.5469 0.5469 0.5445 0.5520 0.5600 0.5658 0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435			(27)					
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296			(29a)					
Total net area of external elements Aum(A, m2)			21.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	9.1731			(33)					
Party Wall shared by Apartment			21.9300	0.0000	0.0000			(32)					
Party Wall shared by Lobby			23.4600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							216.2547	(35)					
Thermal bridges (User defined value 0.050 * total exposed area)							1.0630	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	10.2361	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	23.2434	23.1129	22.9851	22.3845	22.2721	21.7491	21.7491	21.6522	21.9506	22.2721	22.4994	22.7371	(38)
Heat transfer coeff	33.4795	33.3490	33.2212	32.6206	32.5083	31.9852	31.9852	31.8883	32.1867	32.5083	32.7356	32.9732	(39)
Average = Sum(39)m / 12 =												32.6201	
HLP	0.6251	0.6226	0.6203	0.6090	0.6070	0.5972	0.5972	0.5954	0.6009	0.6070	0.6112	0.6156	(40)
HLP (average)												0.6090	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7951 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)
Hot water usage for other uses	33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												51.7828	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy content (annual)	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Total = Sum(45)m =		860.0008	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		731.0006	(64)
Electric shower(s)	43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)
												494.7945	(64a)
Heat gains from water heating, kWh/month	29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4811	100.1755	90.4811	93.4971	90.4811	93.4971	90.4811	90.4811	93.4971	90.4811	93.4971	90.4811	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains	337.0458	347.3524	332.0049	323.4005	307.4701	298.1823	287.2952	286.8521	295.2872	303.1464	319.9705	329.8162	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	5.5400	36.7938	0.6300	0.7000	0.7700	62.2955 (79)

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Solar gains	62.2955	106.1123	145.1874	179.8943	201.4966	200.0395	192.8594	176.7431	157.2073	117.2767	74.6156	53.3120 (83)
Total gains	399.3413	453.4647	477.1923	503.2948	508.9667	498.2217	480.1546	463.5952	452.4945	420.4230	394.5861	383.1282 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	96.1004	96.4762	96.8476	98.6305	98.9714	100.5899	100.5899	100.8955	99.9603	98.9714	98.2842	97.5759
alpha	7.4067	7.4317	7.4565	7.5754	7.5981	7.7060	7.7060	7.7264	7.6640	7.5981	7.5523	7.5051
util living area												
	0.9749	0.9417	0.8859	0.7536	0.5893	0.4106	0.2931	0.3164	0.4897	0.7686	0.9357	0.9797 (86)
MIT	20.5740	20.7241	20.8518	20.9611	20.9940	20.9997	21.0000	21.0000	20.9988	20.9624	20.7840	20.5510 (87)
Th 2	20.4075	20.4097	20.4118	20.4219	20.4237	20.4325	20.4325	20.4342	20.4291	20.4237	20.4199	20.4160 (88)
util rest of house												
	0.9695	0.9308	0.8672	0.7242	0.5543	0.3743	0.2553	0.2775	0.4497	0.7346	0.9222	0.9753 (89)
MIT 2	20.0258	20.1708	20.2903	20.3933	20.4200	20.4324	20.4325	20.4342	20.4285	20.3973	20.2383	20.0111 (90)
Living area fraction									fLA = Living area / (4) =			0.5405 (91)
MIT	20.3221	20.4699	20.5938	20.7002	20.7303	20.7390	20.7392	20.7400	20.7368	20.7027	20.5333	20.3029 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3221	20.4699	20.5938	20.7002	20.7303	20.7390	20.7392	20.7400	20.7368	20.7027	20.5333	20.3029 (93)

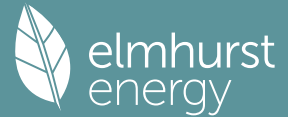
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9687	0.9320	0.8732	0.7386	0.5730	0.3939	0.2757	0.2985	0.4713	0.7514	0.9250	0.9744 (94)
Useful gains	386.8230	422.6313	416.6864	371.7288	291.6432	196.2665	132.3899	138.3863	213.2565	315.9216	364.9968	373.3020 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	536.4120	519.2399	468.2136	384.9304	293.5584	196.3576	132.3946	138.3948	213.6150	328.4226	439.7460	530.9636 (97)
Space heating kWh												
	111.2942	64.9210	38.3363	9.5051	1.4249	0.0000	0.0000	0.0000	0.0000	9.3008	53.8195	117.3003 (98a)
Space heating requirement - total per year (kWh/year)												405.9021
Solar heating kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh												
	111.2942	64.9210	38.3363	9.5051	1.4249	0.0000	0.0000	0.0000	0.0000	9.3008	53.8195	117.3003 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												405.9021
Space heating per m2										(98c) / (4) =		7.5785 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	300.6608	236.6904	242.3513	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9952	0.9988	0.9982	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	299.2077	236.3984	241.9140	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	541.0097	521.9837	504.4686	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	174.0975	212.4754	195.3406	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	43.5244	53.1189	48.8352	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												145.4784 (107)
Energy for space heating												7.5785 (99)
Energy for space cooling												2.7162 (108)
Total												10.2946 (109)
Fabric Energy Efficiency (TFEE)												10.3 (109)

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Property Reference	Apartment No 1			Issued on Date	11/07/2024
Assessment Reference	Apartment No 1	Prop Type Ref	Apartment No 1		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	81 B	DER	5.78	TER	8.88
Environmental	96 A	% DER < TER			34.91
CO ₂ Emissions (t/year)	0.24	DFEE	23.80	TFEE	10.29
Compliance Check	See BREL	% DFEE < TFEE			-131.22
% DPER < TPER	-26.74	DPER	59.80	TPER	47.18
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.5600 (1b)	2.2500 (2b)	120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	120.5100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		3	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5813	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (25)

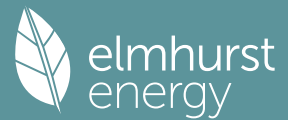
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296	60.0000	943.2000 (29a)
Total net area of external elements Aum(A, m ²)			21.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		9.6756		(33)
Party Wall shared by Apartment			21.9300	0.0000	0.0000	140.0000	3070.2000 (32)
Party Wall shared by Lobby			23.4600	0.0000	0.0000	140.0000	3284.4000 (32)
Party Floor			53.5600			40.0000	2142.4000 (32a)
Party Ceiling			53.5600			30.0000	1606.8000 (32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11047.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		206.2547	(35)
Thermal bridges (Default value 0.200 * total exposed area)		4.2520	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	13.9276	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

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(38)m	Jan 39.4141	Feb 38.8362	Mar 38.2583	Apr 35.3689	May 34.7910	Jun 31.9016	Jul 31.9016	Aug 31.3238	Sep 33.0574	Oct 34.7910	Nov 35.9468	Dec 37.1026 (38)
Heat transfer coeff	53.3417	52.7638	52.1860	49.2965	48.7187	45.8292	45.8292	45.2514	46.9850	48.7187	49.8744	51.0302 (39)
Average = Sum(39)m / 12 =												49.1521
HLP	Jan 0.9959	Feb 0.9851	Mar 0.9743	Apr 0.9204	May 0.9096	Jun 0.8557	Jul 0.8557	Aug 0.8449	Sep 0.8772	Oct 0.9096	Nov 0.9312	Dec 0.9528 (40)
HLP (average)												0.9177
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7951 (42)
Hot water usage for mixer showers													
69.7184	68.6707	67.1439	64.2228	62.0670	59.6630	58.2965	59.8117	61.4726	64.0539	67.0378	69.4513	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)	
Average daily hot water use (litres/day)												94.2900 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
102.7316	100.4834	97.7562	93.6345	90.2783	86.6737	85.3073	88.0229	90.8844	94.6661	98.8505	102.4645	(44)	
Energy conte	162.7017	143.0870	150.2476	128.1810	121.5319	106.5755	103.1718	108.9908	112.0695	128.4610	140.8306	160.4346 (45)	
Energy content (annual)										Total = Sum(45)m =		1566.2829	
Distribution loss (46)m = 0.15 x (45)m													
24.4053	21.4631	22.5371	19.2271	18.2298	15.9863	15.4758	16.3486	16.8104	19.2691	21.1246	24.0652 (46)		
Water storage loss:													
Store volume												173.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.0368 (55)	
Total storage loss													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)	
If cylinder contains dedicated solar storage													
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754 (62)		
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h													
194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754 (64)		
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	1944.7149 (64)		
Electric shower(s)											1945 (64)		
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)		
Heat gains from water heating, kWh/month													
54.0983	47.5764	49.9573	42.6202	40.4094	35.4363	34.3046	36.2394	37.2631	42.7133	46.8262	53.3445 (65)		

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	90.4811	100.1755	90.4811	93.4971	90.4811	93.4971	90.4811	90.4811	93.4971	90.4811	93.4971	90.4811 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023 (71)
Water heating gains (Table 5)												
	72.7128	70.7983	67.1469	59.1947	54.3137	49.2171	46.1083	48.7089	51.7543	57.4103	65.0364	71.6996 (72)
Total internal gains												
	369.5870	378.9905	361.5532	347.9066	329.0143	316.5998	303.5712	304.5482	314.7011	326.0515	347.6888	361.6700 (73)

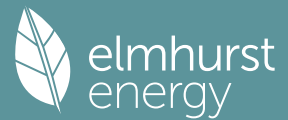
6. Solar gains

[Jan]												
	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southwest	5.5400	36.7938	0.7200	0.7000	0.7700	71.1948 (79)						
Solar gains	71.1948	121.2712	165.9285	205.5935	230.2818	228.6165	220.4107	201.9921	179.6655	134.0305	85.2750	60.9280 (83)
Total gains	440.7818	500.2616	527.4817	553.5001	559.2961	545.2163	523.9820	506.5403	494.3666	460.0819	432.9638	422.5980 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	57.5274	58.1575	58.8015	62.2480	62.9864	66.9575	66.9575	67.8126	65.3104	62.9864	61.5267	60.1333
alpha	4.8352	4.8772	4.9201	5.1499	5.1991	5.4638	5.4638	5.5208	5.3540	5.1991	5.1018	5.0089
util living area	0.9829	0.9675	0.9418	0.8670	0.7395	0.5294	0.3836	0.4091	0.6305	0.8763	0.9640	0.9851 (86)
MIT	19.9014	20.1204	20.3730	20.7154	20.9034	20.9884	20.9983	20.9977	20.9692	20.7467	20.3281	19.9311 (87)

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Th 2	20.0867	20.0957	20.1048	20.1502	20.1593	20.2054	20.2054	20.2146	20.1869	20.1593	20.1411	20.1229 (88)
util rest of house	0.9787	0.9598	0.9280	0.8382	0.6902	0.4671	0.3149	0.3402	0.5651	0.8437	0.9543	0.9815 (89)
MIT 2	18.8214	19.1025	19.4223	19.8663	20.0774	20.1982	20.2047	20.2137	20.1659	19.9159	19.3996	18.8857 (90)
Living area fraction									flA = Living area / (4) =			0.5405 (91)
MIT	19.4052	19.6527	19.9362	20.3252	20.5238	20.6254	20.6337	20.6375	20.6001	20.3650	19.9015	19.4508 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4052	19.6527	19.9362	20.3252	20.5238	20.6254	20.6337	20.6375	20.6001	20.3650	19.9015	19.4508 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9747	0.9553	0.9250	0.8446	0.7123	0.5003	0.3520	0.3774	0.5990	0.8524	0.9511	0.9780	(94)
Useful gains	429.6476	477.9068	487.9448	467.4850	398.4048	272.7833	184.4561	191.1918	296.1131	392.1651	411.7728	413.2925	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	805.7354	778.4078	701.1805	563.2240	429.8856	276.1373	184.8599	191.7513	305.4057	475.7353	638.4661	778.2499	(97)
Space heating kWh	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(98a)
Space heating requirement - total per year (kWh/year)												1229.6708	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1229.6708	
Space heating per m2											(98c) / (4) =	22.9588	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	279.8093	201.9367	158.6474	68.9320	23.4217	0.0000	0.0000	0.0000	0.0000	62.1762	163.2192	271.5283	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	194.8425	172.1174	182.3884	159.2850	153.6727	137.6795	135.3126	141.1316	143.1735	160.6018	171.9346	192.5754	(64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
Fuel for water heating, kWh/month	64.3140	56.8129	60.2031	52.5771	50.7246	45.4455	44.6642	46.5850	47.2590	53.0118	56.7525	63.5657	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.3215	3.0001	3.3215	3.2143	3.3215	3.2143	3.3215	3.3215	3.2143	3.3215	3.2143	3.3215	(231)
Lighting	18.1380	14.5510	13.1015	9.5987	7.4143	6.0576	6.7636	8.7916	11.4194	14.9829	16.9231	18.6421	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1229.6708	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	
Water heating fuel used												641.9154	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)												39.1079	(230a)
Total electricity for the above, kWh/year												39.1079	(231)
Electricity for lighting (calculated in Appendix L)												146.3839	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energv for all uses												2057.0780	(238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1229.6708	0.1565	192.5020 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	641.9154	0.1410	90.5332 (264)
Space and water heating			283.0352 (265)
Pumps, fans and electric keep-hot	39.1079	0.1387	5.4247 (267)
Energy for lighting	146.3839	0.1443	21.1277 (268)
Total CO2, kg/year			309.5877 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.7800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1229.6708	1.5796	1942.3327 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	641.9154	1.5215	976.6789 (278)
Space and water heating			2919.0116 (279)
Pumps, fans and electric keep-hot	39.1079	1.5128	59.1624 (281)
Energy for lighting	146.3839	1.5338	224.5285 (282)
Total Primary energy kWh/year			3202.7025 (286)
Dwelling Primary energy Rate (DPER)			59.8000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.5600 (1b)	x 2.2500 (2b)	= 120.5100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5100 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1660 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4160 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4110	0.4030	0.3949	0.3546	0.3465	0.3063	0.3063	0.2982	0.3224	0.3465	0.3627	0.3788 (22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5600	0.5469	0.5469	0.5445	0.5520	0.5600	0.5658	0.5717 (25)

3. Heat losses and heat loss parameter

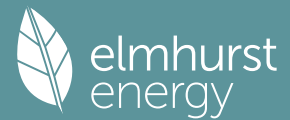
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435		(27)
External Walls	21.2600	5.5400	15.7200	0.1800	2.8296		(29a)
Total net area of external elements Aum(A, m2)			21.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.1731		(33)
Party Wall shared by Apartment			21.9300	0.0000	0.0000		(32)
Party Wall shared by Lobby			23.4600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							216.2547 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							1.0630 (36)
Point Thermal bridges						(36a) =	0.0000

elmhurst
energy

$$(33) + (36) + (36a) = 10.2361 \quad (37)$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6251	0.6226	0.6203	0.6090	0.6070	0.5972	0.5972	0.5954	0.6009	0.6070	0.6112	0.6156 (40)
HLP (average)												0.6090
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

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	0.9337	0.8803	0.8060	0.6674	0.5163	0.3611	0.2575	0.2760	0.4251	0.6689	0.8628	0.9425 (86)
MIT	20.7334	20.8416	20.9235	20.9823	20.9975	20.9999	21.0000	21.0000	20.9995	20.9848	20.8872	20.7164 (87)
Th 2	20.4075	20.4097	20.4118	20.4219	20.4237	20.4325	20.4325	20.4342	20.4291	20.4237	20.4199	20.4160 (88)
util rest of house												
	0.9223	0.8632	0.7826	0.6384	0.4849	0.3291	0.2243	0.2421	0.3901	0.6351	0.8415	0.9323 (89)
MIT 2	20.1113	20.2400	20.3343	20.4056	20.4218	20.4325	20.4325	20.4342	20.4289	20.4106	20.3038	20.0987 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	20.4475	20.5651	20.6527	20.7173	20.7330	20.7392	20.7393	20.7400	20.7373	20.7209	20.6191	0.5405 (91)
Temperature adjustment												20.4326 (92)
adjusted MIT	20.4475	20.5651	20.6527	20.7173	20.7330	20.7392	20.7393	20.7400	20.7373	20.7209	20.6191	0.0000 (93)

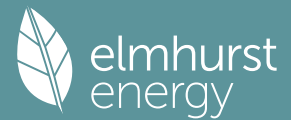
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9231	0.8679	0.7924	0.6533	0.5018	0.3464	0.2422	0.2604	0.4090	0.6526	0.8491	0.9326	(94)
Useful gains	447.6851	467.0911	443.6102	379.5066	292.8543	196.3256	132.3930	138.3921	213.4990	323.9945	403.6699	436.5192	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	540.6111	522.4170	470.1707	385.4886	293.6463	196.3620	132.3948	138.3953	213.6331	329.0136	442.5550	535.2400	(97)
Space heating kWh	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98a)
Space heating requirement - total per year (kWh/year)												236.1531	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												236.1531	
Space heating per m2										(98c) / (4) =		4.4091	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	69.1370	37.1790	19.7610	4.3070	0.5892	0.0000	0.0000	0.0000	0.0000	3.7342	27.9973	73.4483	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	74.9046	40.2806	21.4095	4.6664	0.6384	0.0000	0.0000	0.0000	0.0000	4.0457	30.3329	79.5757	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	177.4243	156.9846	167.3254	148.8315	145.3485	132.1757	131.4964	136.1571	136.9946	151.2815	158.9889	175.7474	(64)
Efficiency of water heater (217)m	82.1342	81.3793	80.6635	80.0281	79.8327	79.8000	79.8000	79.8000	79.8000	79.9953	81.0296	79.8000	(216)
Fuel for water heating, kWh/month	216.0175	192.9047	207.4363	185.9741	182.0664	165.6337	164.7824	170.6229	171.6724	189.1129	196.2108	213.6559	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.8002	15.0822	13.5798	9.9492	7.6850	6.2787	7.0105	9.1126	11.8363	15.5299	17.5410	19.3227	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-14.5022	-21.5633	-32.6697	-38.7878	-43.6492	-41.4310	-40.9546	-37.7762	-32.4595	-25.5820	-16.3456	-12.4129	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.1034	-10.9884	-22.3149	-34.2149	-45.9211	-46.3717	-45.7977	-38.4368	-27.7498	-15.9092	-6.8774	-4.0150	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												255.8538	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2256.0901	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												151.7282	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-661.8343	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2087.8378	(238)

Full SAP Calculation Printout



12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	255.8538	0.2100	53.7293 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2256.0901	0.2100	473.7789 (264)
Space and water heating			527.5082 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	151.7282	0.1443	21.8991 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.1340	0.1335	-47.8001
PV Unit electricity exported	-303.7003	0.1253	-38.0565
Total			-85.8566 (269)
Total CO2, kg/year			475.4800 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			8.8800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	255.8538	1.1300	289.1148 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2256.0901	1.1300	2549.3818 (278)
Space and water heating			2838.4966 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	151.7282	1.5338	232.7258 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-358.1340	1.4932	-534.7723
PV Unit electricity exported	-303.7003	0.4599	-139.6852
Total			-674.4575 (283)
Total Primary energy kWh/year			2526.8657 (286)
Target Primary Energy Rate (TPER)			47.1800 (287)

Predicted Energy Assessment



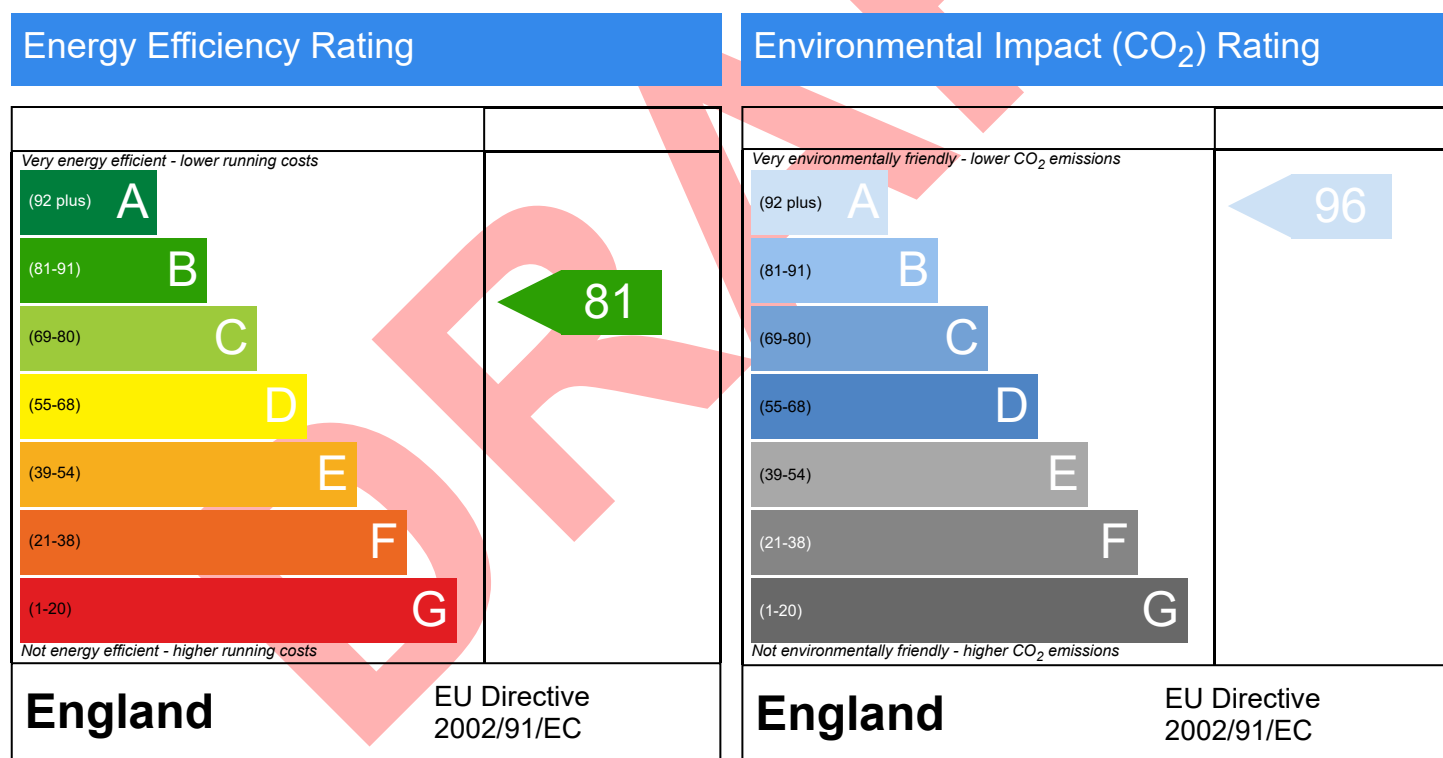
36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB

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

Flat, Mid-Terrace
11/07/2024
Daniel Watt
53.56 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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

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

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 11 Jul 2024 11:28:29

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/027301	Assessment Date	2024-07-11

Dwelling Details			
Assessment Type	As designed	Total Floor Area	61 m ²
Site Reference	Apartment No 2	Plot Reference	Apartment No 2
Address	36-436a BarlowMoor road, Manchester , M21 0AB		

Client Details	
Name	Paul Butler Associates
Company	Paul Butler Associates
Address	31 Blackfriars Road, Manchester, M3 7AQ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	9.86 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	8.28 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	52.38 kWh _{PE} /m ²		
Dwelling primary energy	85.42 kWh _{PE} /m ²		FAIL

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	18.6 kWh/m ²		
Dwelling fabric energy efficiency	41.1 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.3	Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	45.37	0.18	
Party wall: Party Wall (1)	19.91	0 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Windows, Window	5.54	North West	0.7	1.3

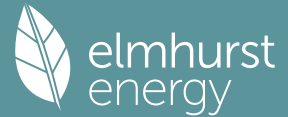
2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m ² K) used for thermal bridging	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	15 m ³ /hm ² , Assumed value		
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Room heaters - Electricity		
Efficiency	100.0%	
Emitter type		
Flow temperature		
System type	Panel, convector or radiant heaters	
Manufacturer		
Model		
Commissioning		
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	0.0%	
Emitter type		
Flow temperature		
System type	Heat Pump	
Manufacturer	Auer	
Model	EDL170-520RF	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	120 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	0.7 W/(l/s)	
Specific fan power	0.19 W/(l/s)	OK
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model	Sentinel Multivent	
Commissioning		
9 Local generation		

N/A	
10 Heat networks	
N/A	
11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
<p>This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.</p>	
<p>Signed:</p> <p>Name:</p>	<p>Assessor ID:</p> <p>Date:</p>
b. Client Declaration	
N/A	

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Property Reference	Apartment No 2			Issued on Date	11/07/2024
Assessment Reference	Apartment No 2	Prop Type Ref	Apartment No 2		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	71 C	DER	8.28	TER	9.86
Environmental	94 A	% DER < TER			16.02
CO ₂ Emissions (t/year)	0.41	DFEE	41.06	TFEE	18.57
Compliance Check	See BREL	% DFEE < TFEE			-121.09
% DPER < TPER	-63.08	DPER	85.42	TPER	52.38
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	2.2500 (2b)	137.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2950 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

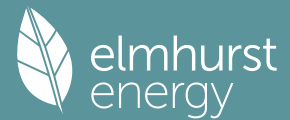
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666	60.0000	2722.2000 (29a)
Total net area of external elements Aum(A, m ²)			50.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0126		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	2787.4000 (32)
Party Floor			61.0200			40.0000	2440.8000 (32d)
Party Ceiling			61.0200			30.0000	1830.6000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9781.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.2917 (35)
Thermal bridges (Default value 0.200 * total exposed area)							10.1820 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	25.1946 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	51.4026	50.6168	49.8310	45.9020	45.1162	41.1872	41.1872	40.4014	42.7588	45.1162	46.6878	48.2594 (38)
Heat transfer coeff	76.5972	75.8114	75.0256	71.0966	70.3108	66.3818	66.3818	65.5960	67.9534	70.3108	71.8824	73.4540 (39)
Average = Sum(39)m / 12 =												70.9002
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2553	1.2424	1.2295	1.1651	1.1523	1.0879	1.0879	1.0750	1.1136	1.1523	1.1780	1.2038 (40)
HLP (average)												1.1619
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Hot water usage for mixer showers												
74.3705	73.2528	71.6242	68.5081	66.2085	63.6441	62.1864	63.8027	65.5745	68.3279	71.5110	74.0855 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177 (42c)	
Average daily hot water use (litres/day)												100.5832 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
109.5882	107.1899	104.2806	99.8839	96.3037	92.4585	91.0009	93.8978	96.9502	100.9844	105.4480	109.3032 (44)	
Energy content	173.5609	152.6370	160.2754	136.7361	129.6432	113.6886	110.0577	116.2651	119.5493	137.0348	150.2300	171.1425 (45)
Energy content (annual)										Total = Sum(45)m =		1670.8206
Distribution loss (46)m = 0.15 x (45)m												
26.0341	22.8955	24.0413	20.5104	19.4465	17.0533	16.5087	17.4398	17.9324	20.5552	22.5345	25.6714 (46)	
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)	
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (64)	
Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2049.2526 (64)
Electric shower(s)												2049 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
57.7090	50.7518	53.2916	45.4647	43.1064	37.8014	36.5942	38.6582	39.7502	45.5641	49.9515	56.9049 (65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	104.2740	107.7498	104.2740	107.7498	104.2740 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)												
	77.5659	75.5235	71.6285	63.1455	57.9387	52.5020	49.1857	51.9599	55.2086	61.2420	69.3771	76.4850 (72)
Total internal gains												
	410.5066	421.4577	401.8009	387.0232	366.0070	352.4543	337.9182	338.8711	350.1851	362.5133	386.4577	401.6817 (73)

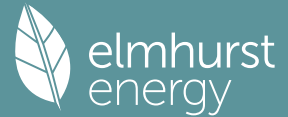
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d		Gains W	
Northwest				5.5400	11.2829	0.7200	0.7000			0.7700		21.8321 (81)	
Solar gains	21.8321	44.4399	80.0666	131.4923	176.7515	188.4358	176.2778	140.5307	97.5624	54.3091	27.4705	17.8292 (83)	
Total gains	432.3387	465.8976	481.8675	518.5155	542.7585	540.8901	514.1960	479.4018	447.7474	416.8224	413.9282	419.5109 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	35.4705	35.8382	36.2136	38.2148	38.6419	40.9290	40.9290	41.4193	39.9825	38.6419	37.7971	36.9884
alpha	3.3647	3.3892	3.4142	3.5477	3.5761	3.7286	3.7286	3.7613	3.6655	3.5761	3.5198	3.4659
util living area												
	0.9826	0.9760	0.9645	0.9267	0.8478	0.6849	0.5360	0.5835	0.8034	0.9376	0.9732	0.9842 (86)
MIT	18.9594	19.1649	19.5021	20.0723	20.5251	20.8644	20.9590	20.9449	20.7298	20.1656	19.5478	19.0133 (87)
Th 2	19.8760	19.8862	19.8965	19.9480	19.9584	20.0108	20.0108	20.0213	19.9897	19.9584	19.9376	19.9170 (88)

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util rest of house	0.9788	0.9707	0.9560	0.9082	0.8070	0.6074	0.4285	0.4770	0.7396	0.9183	0.9663	0.9807 (89)
MIT 2	17.5163	17.7834	18.2171	18.9620	19.5098	19.9128	19.9913	19.9929	19.7703	19.0927	18.3040	17.6102 (90)
Living area fraction									FLA = Living area / (4) =			0.3371 (91)
MIT	18.0028	18.2491	18.6503	19.3363	19.8521	20.2336	20.3175	20.3138	20.0937	19.4544	18.7233	18.0832 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0028	18.2491	18.6503	19.3363	19.8521	20.2336	20.3175	20.3138	20.0937	19.4544	18.7233	18.0832 (93)

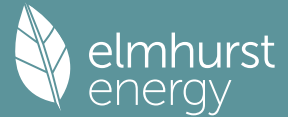
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9696	0.9597	0.9431	0.8949	0.8023	0.6261	0.4632	0.5105	0.7470	0.9063	0.9556	0.9724 (94)	
Useful gains	419.2066	447.1373	454.4601	464.0410	435.4369	338.6499	238.2002	244.7340	334.4705	377.7864	395.5301	407.9265 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1049.5964	1012.0178	911.5847	741.9823	573.1798	373.9672	246.7766	256.7316	407.2949	622.5596	835.5096	1019.7767 (97)	
Space heating kWh	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (98a)	
Space heating requirement - total per year (kWh/year)												2445.4220	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2445.4220	
Space heating per m2												(98c) / (4) =	40.0757 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2												0.0000 (213)	
Water heating													
Water heating requirement	205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (64)	
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)	
Fuel for water heating, kWh/month	67.8984	59.9651	63.5131	55.4010	53.4020	47.7934	46.9372	48.9861	49.7280	55.8418	59.8551	67.1001 (219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	3.7841	3.4179	3.7841	3.6621	3.7841	3.6621	3.7841	3.7841	3.6621	3.7841	3.6621	3.7841 (231)	
Lighting	21.8417	17.5222	15.7768	11.5588	8.9283	7.2945	8.1447	10.5868	13.7512	18.0424	20.3788	22.4488 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												2445.4220 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												302.9550	
Water heating fuel used												676.4215 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)												44.5550 (230a)	
Total electricity for the above, kWh/year												44.5550 (231)	
Electricity for lighting (calculated in Appendix L)												176.2751 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	
Energy used												0.0000 (237)	
Total delivered energy for all uses												3342.6736 (238)	

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2445.4220	0.1546	378.1663 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	676.4215	0.1411	95.4192 (264)
Space and water heating			473.5855 (265)
Pumps, fans and electric keep-hot	44.5550	0.1387	6.1803 (267)
Energy for lighting	176.2751	0.1443	25.4419 (268)
Total CO2, kg/year			505.2078 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2445.4220	1.5725	3845.5175 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	676.4215	1.5216	1029.2526 (278)
Space and water heating			4874.7701 (279)
Pumps, fans and electric keep-hot	44.5550	1.5128	67.4028 (281)
Energy for lighting	176.2751	1.5338	270.3766 (282)
Total Primary energy kWh/year			5212.5495 (286)
Dwelling Primary energy Rate (DPER)			85.4200 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.0200 (1b)	x 2.2500 (2b)	= 137.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2950 (5)

2. Ventilation rate

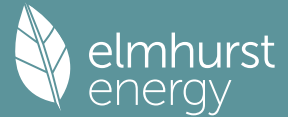
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4666	0.4575	0.4483	0.4026	0.3934	0.3477	0.3477	0.3385	0.3660	0.3934	0.4117	0.4300 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5810	0.5774	0.5604	0.5604	0.5573	0.5670	0.5774	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435		(27)
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666		(29a)
Total net area of external elements Aum(A, m2)			50.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5101		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							170.2917 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							2.5455 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	17.0556 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5867	27.3951	27.2074	26.3255	26.1605	25.3923	25.3923	25.2501	25.6882	26.1605	26.4943	26.8432	(38)
Heat transfer coeff	44.6423	44.4507	44.2630	43.3811	43.2161	42.4480	42.4480	42.3057	42.7438	43.2161	43.5499	43.8988	(39)
Average = Sum(39)m / 12 =												43.3803	
HLP	0.7316	0.7285	0.7254	0.7109	0.7082	0.6956	0.6956	0.6933	0.7005	0.7082	0.7137	0.7194	(40)
HLP (average)												0.7109	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0103 (42)
Hot water usage for mixer showers	74.3705	73.2528	71.6242	68.5081	66.2085	63.6441	62.1864	63.8027	65.5745	68.3279	71.5110	74.0855	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177	(42c)
Average daily hot water use (litres/day)												100.5832	(43)
Daily hot water use	109.5882	107.1899	104.2806	99.8839	96.3037	92.4585	91.0009	93.8978	96.9502	100.9844	105.4480	109.3032	(44)
Energy conte	173.5609	152.6370	160.2754	136.7361	129.6432	113.6886	110.0577	116.2651	119.5493	137.0348	150.2300	171.1425	(45)
Energy content (annual)										Total = Sum(45)m =		1670.8206	
Distribution loss (46)m = 0.15 x (45)m	26.0341	22.8955	24.0413	20.5104	19.4465	17.0533	16.5087	17.4398	17.9324	20.5552	22.5345	25.6714	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	220.1558	194.7227	206.8703	181.8279	176.2381	158.7804	156.6526	162.8600	164.6412	183.6297	195.3219	217.7374	(62)
WWHRS	-33.9991	-30.0691	-31.4866	-26.0721	-24.2983	-20.7922	-19.4894	-20.7250	-21.5124	-25.3608	-28.7307	-33.3695	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	186.1567	164.6536	175.3838	155.7558	151.9398	137.9882	137.1632	142.1350	143.1287	158.2689	166.5912	184.3679	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1903.5329	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	94.9849	84.4204	90.5675	81.5382	80.3823	73.8749	73.8701	75.9341	75.8236	82.8400	86.0250	94.1808	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	104.2740	107.7498	104.2740	107.7498	104.2740	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)	127.6679	125.6256	121.7305	113.2475	108.0407	102.6041	99.2878	102.0619	105.3106	111.3441	119.4791	126.5871	(72)
Total internal gains	463.6086	474.5597	454.9030	440.1252	419.1090	402.5563	388.0202	388.9731	400.2871	415.6153	439.5597	454.7837	(73)

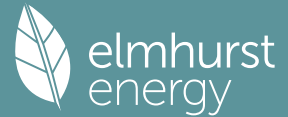
6. Solar gains

[Jan]																				
				Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d						Gains W		
Northwest				5.5400		11.2829		0.6300		0.7000		0.7700						19.1031	(81)	
Solar gains	19.1031	38.8849	70.0583	115.0558	154.6575	164.8813	154.2431	122.9644	85.3671	47.5205	24.0366	15.6006	(83)							
Total gains	482.7117	513.4447	524.9612	555.1810	573.7666	567.4377	542.2633	511.9375	485.6542	463.1358	463.5964	470.3843	(84)							

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	64.6572	64.9358	65.2112	66.5370	66.7910	67.9996	67.9996	68.2282	67.5289	66.7910	66.2791	65.7522	
alpha	5.3105	5.3291	5.3474	5.4358	5.4527	5.5333	5.5333	5.5485	5.5019	5.4527	5.4186	5.3835	
util living area	0.9625	0.9451	0.9138	0.8200	0.6670	0.4745	0.3438	0.3790	0.5913	0.8321	0.9327	0.9659	(86)

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MIT	20.2654	20.3970	20.5753	20.8168	20.9494	20.9936	20.9991	20.9985	20.9796	20.8313	20.5455	20.2570 (87)
Th 2	20.3130	20.3158	20.3185	20.3312	20.3336	20.3447	20.3447	20.3467	20.3404	20.3336	20.3287	20.3237 (88)
util rest of house												
	0.9559	0.9358	0.8992	0.7933	0.6271	0.4274	0.2929	0.3257	0.5399	0.8017	0.9200	0.9599 (89)
MIT 2	19.4626	19.6281	19.8492	20.1439	20.2886	20.3403	20.3443	20.3460	20.3250	20.1668	19.8243	19.4608 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.7332	19.8873	20.0940	20.3707	20.5114	20.5605	20.5650	20.5660	20.5457	20.3908	20.0674	19.7292 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7332	19.8873	20.0940	20.3707	20.5114	20.5605	20.5650	20.5660	20.5457	20.3908	20.0674	19.7292 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9494	0.9291	0.8939	0.7949	0.6380	0.4430	0.3100	0.3437	0.5562	0.8044	0.9144	0.9536	(94)
Useful gains	458.2789	477.0613	469.2511	441.3345	366.0499	251.3969	168.1274	175.9319	270.1070	372.5692	423.9168	448.5594	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	688.9746	666.1959	601.7095	497.6134	380.7929	253.0113	168.3066	176.2436	275.5128	423.1219	564.7280	681.7130	(97)
Space heating kWh	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663	(98a)
Space heating requirement - total per year (kWh/year)												761.2362	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												761.2362	
Space heating per m2										(98c) / (4) =			12.4752 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	185.9562	137.7014	106.7703	43.9012	11.8838	0.0000	0.0000	0.0000	0.0000	40.7489	109.8419	187.9375	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	186.1567	164.6536	175.3838	155.7558	151.9398	137.9882	137.1632	142.1350	143.1287	158.2689	166.5912	184.3679	(64)
Efficiency of water heater (217)m	83.8781	83.4861	82.8198	81.5054	80.3483	79.8000	79.8000	79.8000	79.8000	81.3838	82.9819	83.9233	(216)
Fuel for water heating, kWh/month	221.9372	197.2228	211.7656	191.0987	189.1015	172.9175	171.8837	178.1141	179.3593	194.4723	200.7560	219.6862	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.6661	17.3813	15.6500	11.4658	8.8565	7.2359	8.0792	10.5017	13.6407	17.8973	20.2149	22.2682	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-16.4639	-24.4471	-36.9842	-43.8358	-49.2544	-46.7133	-46.1689	-42.6209	-36.6773	-28.9670	-18.5431	-14.0952	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-5.8725	-12.6385	-25.6587	-39.3349	-52.7915	-53.3188	-52.6666	-44.2072	-31.9181	-18.3033	-7.9145	-4.6209	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												824.7413	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2328.3149	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												174.8577	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-754.0166	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												2659.8973	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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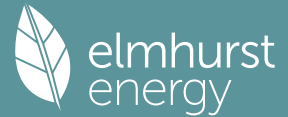


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	824.7413	0.2100	173.1957 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2328.3149	0.2100	488.9461 (264)
Space and water heating			662.1418 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	174.8577	0.1443	25.2374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-404.7710	0.1335	-54.0394
PV Unit electricity exported	-349.2456	0.1253	-43.7641
Total			-97.8034 (269)
Total CO2, kg/year			601.5050 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	824.7413	1.1300	931.9576 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2328.3149	1.1300	2630.9959 (278)
Space and water heating			3562.9535 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	174.8577	1.5338	268.2025 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-404.7710	1.4934	-604.4665
PV Unit electricity exported	-349.2456	0.4599	-160.6346
Total			-765.1011 (283)
Total Primary energy kWh/year			3196.1558 (286)
Target Primary Energy Rate (TPER)			52.3800 (287)

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Property Reference	Apartment No 2			Issued on Date	11/07/2024
Assessment Reference	Apartment No 2	Prop Type Ref	Apartment No 2		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	71 C	DER	8.28	TER	9.86
Environmental	94 A	% DER < TER			16.02
CO ₂ Emissions (t/year)	0.41	DFEE	41.06	TFEE	18.57
Compliance Check	See BREL	% DFEE < TFEE			-121.09
% DPER < TPER	-63.08	DPER	85.42	TPER	52.38
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	2.2500 (2b)	137.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2950 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1457 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8285 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	1.0563	1.0356	1.0149	0.9113	0.8906	0.7871	0.7871	0.7664	0.8285	0.8906	0.9321	0.9735 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	1.0563	1.0356	1.0149	0.9153	0.8966	0.8097	0.8097	0.7937	0.8432	0.8966	0.9344	0.9738 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666	60.0000	2722.2000 (29a)
Total net area of external elements Aum(A, m ²)			50.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0126		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	2787.4000 (32)
Party Floor			61.0200			40.0000	2440.8000 (32d)
Party Ceiling			61.0200			40.0000	2440.8000 (32b)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	10391.2000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							170.2917 (35)
Thermal bridges (Default value 0.200 * total exposed area)							10.1820 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	25.1946 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.8596	46.9212	45.9828	41.4687	40.6232	36.6872	36.6872
Heat transfer coeff						35.9583	38.2033
							40.6232
							42.3337
							44.1219 (38)

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Average = Sum(39)m / 12 =	73.0542	72.1158	71.1774	66.6633	65.8178	61.8818	61.8818	61.1529	63.3979	65.8178	67.5283	69.3165 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1972	1.1818	1.1665	1.0925	1.0786	1.0141	1.0141	1.0022	1.0390	1.0786	1.1067	1.1360 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	25.0333	24.6616	24.1380	23.1727	22.4499	21.6484	21.2154	21.7353	22.3014	23.1590	24.1442	24.9487 (42b)
Hot water usage for other uses	35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177 (42c)
Average daily hot water use (litres/day)												55.2259 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	60.2510	58.5986	56.7944	54.5485	52.5450	50.4629	50.0299	51.8305	53.6772	55.8154	58.0813	60.1664 (44)
Distribution loss (46)m = 0.15 x (45)m	95.4229	83.4437	87.2909	74.6741	70.7357	62.0500	60.5069	64.1769	66.1893	75.7410	82.7474	94.2061 (45)
Water storage loss:												Total = Sum(45)m = 917.1849
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	81.1095	70.9271	74.1973	63.4730	60.1253	52.7425	51.4308	54.5504	56.2609	64.3799	70.3353	80.0752 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
12Total per year (kWh/year)	81.1095	70.9271	74.1973	63.4730	60.1253	52.7425	51.4308	54.5504	56.2609	64.3799	70.3353	80.0752 (64)
Electric shower(s)												Total per year (kWh/year) = Sum(64)m = 779.6072 (64)
	46.3891	41.3331	45.1342	43.0710	43.8792	41.8565	43.2517	43.8792	43.0710	45.1342	44.2855	46.3891 (64a)
Heat gains from water heating, kWh/month												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 527.6736 (64a)
	31.8747	28.0651	29.8329	26.6360	26.0011	23.6497	23.6706	24.6074	24.8330	27.3785	28.6552	31.6161 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	104.2740	107.7498	104.2740	107.7498	104.2740 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)	42.8423	41.7635	40.0979	36.9944	34.9478	32.8469	31.8154	33.0745	34.4902	36.7991	39.7989	42.4947 (72)
Total internal gains	375.7830	387.6977	370.2704	360.8721	343.0161	332.7992	320.5478	319.9856	329.4667	338.0703	356.8795	367.6914 (73)

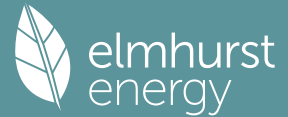
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
-----										-----				
Northwest					5.5400	11.2829	0.7200	0.7000			0.7700			21.8321 (81)
-----										-----				
Solar gains	21.8321	44.4399	80.0666	131.4923	176.7515	188.4358	176.2778	140.5307	97.5624	54.3091	27.4705	17.8292	(83)	
Total gains	397.6151	432.1376	450.3370	492.3644	519.7675	521.2349	496.8256	460.5164	427.0291	392.3794	384.3500	385.5206	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.5110	40.0251	40.5528	43.2988	43.8551	46.6445	46.6445	47.2004	45.5290	43.8551	42.7442	41.6415
alpha	3.6341	3.6683	3.7035	3.8866	3.9237	4.1096	4.1096	4.1467	4.0353	3.9237	3.8496	3.7761
util living area	0.9885	0.9831	0.9733	0.9372	0.8564	0.6816	0.5261	0.5774	0.8109	0.9486	0.9808	0.9897 (86)
MIT	19.0797	19.2841	19.6110	20.1777	20.6009	20.9009	20.9735	20.9625	20.7800	20.2535	19.6667	19.1547 (87)
Th 2	19.9222	19.9346	19.9469	20.0070	20.0183	20.0716	20.0716	20.0815	20.0510	20.0183	19.9954	19.9716 (88)
util rest of house	0.9858	0.9791	0.9666	0.9206	0.8171	0.6061	0.4245	0.4757	0.7489	0.9318	0.9756	0.9873 (89)
MIT 2	18.1823	18.3937	18.7262	19.3229	19.7248	20.0166	20.0620	20.0667	19.9123	19.4105	18.8184	18.2921 (90)
Living area fraction												fLA = Living area / (4) = 0.3371 (91)
MIT	18.4848	18.6939	19.0245	19.6111	20.0201	20.3147	20.3693	20.3687	20.2048	19.6947	19.1043	18.5828 (92)
Temperature adjustment												0.0000

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adjusted MIT 18.4848 18.6939 19.0245 19.6111 20.0201 20.3147 20.3693 20.3687 20.2048 19.6947 19.1043 18.5828 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9729	0.9589	0.9126	0.8171	0.6271	0.4581	0.5088	0.7602	0.9249	0.9694	0.9829	(94)
Useful gains	389.9834	420.4214	431.8220	449.3193	424.7258	326.8565	227.5979	234.3263	324.6149	362.9233	372.6076	378.9099	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1036.2606	994.7555	891.4579	714.0346	547.6110	353.6350	233.2500	242.6971	387.0298	598.5944	810.6309	996.9683	(97)
Space heating kWh	480.8302	385.9525	341.9691	190.5950	91.4266	0.0000	0.0000	0.0000	0.0000	175.3393	315.3768	459.8354	(98a)
Space heating requirement - total per year (kWh/year)												2441.3249	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	480.8302	385.9525	341.9691	190.5950	91.4266	0.0000	0.0000	0.0000	0.0000	175.3393	315.3768	459.8354	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2441.3249	
Space heating per m2										(98c) / (4) =		40.0086	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	581.6891	457.9254	464.7623	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7880	0.8601	0.8285	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	458.3678	393.8676	385.0353	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	559.0326	532.9669	492.6813	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	72.4786	103.4899	80.0886	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	18.1197	25.8725	20.0222	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												64.0143	(107)
Energy for space heating												40.0086	(99)
Energy for space cooling												1.0491	(108)
Total												41.0577	(109)
Fabric Energy Efficiency (DFEE)												41.1	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

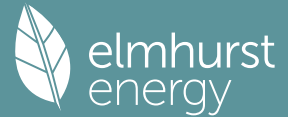
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	61.0200 (1b)	x 2.2500 (2b)	= 137.2950 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		4	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	137.2950 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	20.0000 / (5) =	0.1457 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000	(17)
Number of sides sheltered	0.3957	(18)
	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4666	0.4575	0.4483	0.4026	0.3934	0.3477	0.3477	0.3385	0.3660	0.3934	0.4117	0.4300	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.6089	0.6047	0.6005	0.5810	0.5774	0.5604	0.5604	0.5573	0.5670	0.5774	0.5848	0.5925	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435			(27)					
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666			(29a)					
Total net area of external elements Aum(A, m2)			50.9100					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =			14.5101		(33)					
Party Wall shared by Apartment			19.9100	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								170.2917 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)								2.5455 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	17.0556	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 27.5867	Feb 27.3951	Mar 27.2074	Apr 26.3255	May 26.1605	Jun 25.3923	Jul 25.3923	Aug 25.2501	Sep 25.6882	Oct 26.1605	Nov 26.4943	Dec 26.8432	(38)
Heat transfer coeff	44.6423	44.4507	44.2630	43.3811	43.2161	42.4480	42.4480	42.3057	42.7438	43.2161	43.5499	43.8988	(39)
Average = Sum(39)m / 12 =												43.3803	
HLP	Jan 0.7316	Feb 0.7285	Mar 0.7254	Apr 0.7109	May 0.7082	Jun 0.6956	Jul 0.6956	Aug 0.6933	Sep 0.7005	Oct 0.7082	Nov 0.7137	Dec 0.7194	(40)
HLP (average)												0.7109	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0103 (42)
Hot water usage for mixer showers													(42a)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Hot water usage for baths													(42b)
25.0333	24.6616	24.1380	23.1727	22.4499	21.6484	21.2154	21.7353	22.3014	23.1590	24.1442	24.9487	24.9487	
Hot water usage for other uses													(42c)
35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177	35.2177	
Average daily hot water use (litres/day)												55.2259	(43)
Daily hot water use	Jan 60.2510	Feb 58.5986	Mar 56.7944	Apr 54.5485	May 52.5450	Jun 50.4629	Jul 50.0299	Aug 51.8305	Sep 53.6772	Oct 55.8154	Nov 58.0813	Dec 60.1664	(44)
Energy conte	95.4229	83.4437	87.2909	74.6741	70.7357	62.0500	60.5069	64.1769	66.1893	75.7410	82.7474	94.2061	(45)
Energy content (annual)										Total = Sum(45)m =		917.1849	
Distribution loss (46)m = 0.15 x (45)m													(46)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Water storage loss:													
Total storage loss													(56)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
If cylinder contains dedicated solar storage													(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
81.1095	70.9271	74.1973	63.4730	60.1253	52.7425	51.4308	54.5504	56.2609	64.3799	70.3353	80.0752	80.0752	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	81.1095	70.9271	74.1973	63.4730	60.1253	52.7425	51.4308	54.5504	56.2609	64.3799	70.3353	80.0752	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		779.6072	(64)
Electric shower(s)	46.3891	41.3331	45.1342	43.0710	43.8792	41.8565	43.2517	43.8792	43.0710	45.1342	44.2855	46.3891	(64a)
												527.6736	(64a)
Heat gains from water heating, kWh/month	31.8747	28.0651	29.8329	26.6360	26.0011	23.6497	23.6706	24.6074	24.8330	27.3785	28.6552	31.6161	(65)

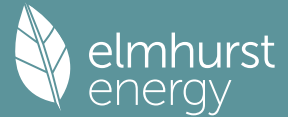
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 100.5161	Feb 100.5161	Mar 100.5161	Apr 100.5161	May 100.5161	Jun 100.5161	Jul 100.5161	Aug 100.5161	Sep 100.5161	Oct 100.5161	Nov 100.5161	Dec 100.5161	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	107.7498	104.2740	107.7498	104.2740	107.7498	104.2740	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678	167.7678	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	(71)
Water heating gains (Table 5)													
42.8423	41.7635	40.0979	36.9944	34.9478	32.8469	31.8154	33.0745	34.4902	36.7991	39.7989	42.4947	42.4947	(72)
Total internal gains	375.7830	387.6977	370.2704	360.8721	343.0161	332.7992	320.5478	319.9856	329.4667	338.0703	356.8795	367.6914	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northwest	5.5400	11.2829	0.6300	0.7000	0.7700	19.1031 (81)

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Solar gains	19.1031	38.8849	70.0583	115.0558	154.6575	164.8813	154.2431	122.9644	85.3671	47.5205	24.0366	15.6006 (83)
Total gains	394.8861	426.5826	440.3286	475.9279	497.6736	497.6805	474.7909	442.9500	414.8338	385.5908	380.9162	383.2919 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.6572	64.9358	65.2112	66.5370	66.7910	67.9996	67.9996	68.2282	67.5289	66.7910	66.2791	65.7522
alpha	5.3105	5.3291	5.3474	5.4358	5.4527	5.5333	5.5333	5.5485	5.5019	5.4527	5.4186	5.3835
util living area	0.9836	0.9734	0.9539	0.8828	0.7428	0.5370	0.3920	0.4368	0.6757	0.9019	0.9682	0.9856 (86)
MIT	20.0661	20.2136	20.4190	20.7245	20.9152	20.9883	20.9983	20.9970	20.9614	20.7324	20.3784	20.0561 (87)
Th 2	20.3130	20.3158	20.3185	20.3312	20.3336	20.3447	20.3447	20.3467	20.3404	20.3336	20.3287	20.3237 (88)
util rest of house	0.9804	0.9682	0.9448	0.8614	0.7035	0.4851	0.3343	0.3759	0.6216	0.8793	0.9613	0.9828 (89)
MIT 2	19.4560	19.6033	19.8060	20.1052	20.2730	20.3383	20.3440	20.3455	20.3170	20.1188	19.7770	19.4549 (90)
Living area fraction	19.6616	19.8090	20.0127	20.3140	20.4895	20.5574	20.5646	20.5651	20.5342	20.3257	19.9798	19.6576 (92)
MIT	19.6616	19.8090	20.0127	20.3140	20.4895	20.5574	20.5646	20.5651	20.5342	20.3257	19.9798	19.6576 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6616	19.8090	20.0127	20.3140	20.4895	20.5574	20.5646	20.5651	20.5342	20.3257	19.9798	19.6576 (93)

8. Space heating requirement

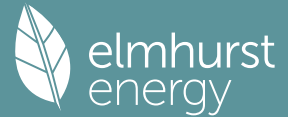
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9767	0.9637	0.9401	0.8608	0.7131	0.5021	0.3537	0.3964	0.6380	0.8790	0.9570	0.9794 (94)
Useful gains	385.6692	411.1003	413.9708	409.6982	354.8664	249.9085	167.9384	175.5697	264.6469	338.9394	364.5349	375.3816 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	685.7783	662.7164	598.1116	495.1516	379.8479	252.8804	168.2883	176.2087	275.0221	420.3047	560.9116	678.5694 (97)
Space heating kWh	223.2812	169.0860	137.0007	61.5265	18.5863	0.0000	0.0000	0.0000	0.0000	60.5357	141.3912	225.5718 (98a)
Space heating requirement - total per year (kWh/year)												1036.9794
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	223.2812	169.0860	137.0007	61.5265	18.5863	0.0000	0.0000	0.0000	0.0000	60.5357	141.3912	225.5718 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1036.9794
Space heating per m2										(98c) / (4) =		16.9941 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	399.0108	314.1149	321.5234	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9397	0.9719	0.9588	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	374.9617	305.2924	308.2879	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	531.5014	507.2121	472.1492	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.7086	150.2282	121.9129	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	28.1771	37.5571	30.4782	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												96.2124 (107)
Energy for space heating												16.9941 (99)
Energy for space cooling												1.5767 (108)
Total												18.5708 (109)
Fabric Energy Efficiency (TFEE)												18.6 (109)

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Property Reference	Apartment No 2				Issued on Date	11/07/2024
Assessment Reference	Apartment No 2		Prop Type Ref	Apartment No 2		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB					
SAP Rating	71 C	DER	8.28	TER	9.86	
Environmental	94 A	% DER < TER				16.02
CO ₂ Emissions (t/year)	0.41	DFEE	41.06	TFEE	18.57	
Compliance Check	See BREL	% DFEE < TFEE				-121.09
% DPER < TPER	-63.08	DPER	85.42	TPER	52.38	
Assessor Details	Mr. Daniel Watt				Assessor ID	AV75-0001
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0200 (1b)	2.2500 (2b)	137.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2950 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

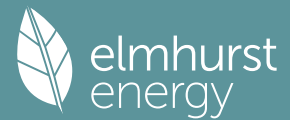
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.5400	1.2357	6.8460		(27)
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666	60.0000	2722.2000 (29a)
Total net area of external elements Aum(A, m ²)			50.9100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.0126		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	2787.4000 (32)
Party Floor			61.0200			40.0000	2440.8000 (32d)
Party Ceiling			61.0200			30.0000	1830.6000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9781.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							160.2917 (35)
Thermal bridges (Default value 0.200 * total exposed area)							10.1820 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	25.1946 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	51.4026	50.6168	49.8310	45.9020	45.1162	41.1872	41.1872	40.4014	42.7588	45.1162	46.6878	48.2594 (38)
Heat transfer coeff	76.5972	75.8114	75.0256	71.0966	70.3108	66.3818	66.3818	65.5960	67.9534	70.3108	71.8824	73.4540 (39)
Average = Sum(39)m / 12 =												70.9002
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2553	1.2424	1.2295	1.1651	1.1523	1.0879	1.0879	1.0750	1.1136	1.1523	1.1780	1.2038 (40)
HLP (average)												1.1619
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0103 (42)
Hot water usage for mixer showers												
74.3705	73.2528	71.6242	68.5081	66.2085	63.6441	62.1864	63.8027	65.5745	68.3279	71.5110	74.0855 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177 (42c)	
Average daily hot water use (litres/day)												100.5832 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
109.5882	107.1899	104.2806	99.8839	96.3037	92.4585	91.0009	93.8978	96.9502	100.9844	105.4480	109.3032 (44)	
Energy content	173.5609	152.6370	160.2754	136.7361	129.6432	113.6886	110.0577	116.2651	119.5493	137.0348	150.2300	171.1425 (45)
Energy content (annual)										Total = Sum(45)m =		1670.8206
Distribution loss (46)m = 0.15 x (45)m												
26.0341	22.8955	24.0413	20.5104	19.4465	17.0533	16.5087	17.4398	17.9324	20.5552	22.5345	25.6714 (46)	
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)	
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (64)	
Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			2049.2526 (64)
Electric shower(s)												2049 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
57.7090	50.7518	53.2916	45.4647	43.1064	37.8014	36.5942	38.6582	39.7502	45.5641	49.9515	56.9049 (65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	104.2740	107.7498	104.2740	107.7498	104.2740 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Water heating gains (Table 5)												
	77.5659	75.5235	71.6285	63.1455	57.9387	52.5020	49.1857	51.9599	55.2086	61.2420	69.3771	76.4850 (72)
Total internal gains												
	410.5066	421.4577	401.8009	387.0232	366.0070	352.4543	337.9182	338.8711	350.1851	362.5133	386.4577	401.6817 (73)

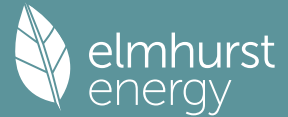
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d		Gains W	
Northwest				5.5400	11.2829	0.7200	0.7000			0.7700		21.8321 (81)	
Solar gains	21.8321	44.4399	80.0666	131.4923	176.7515	188.4358	176.2778	140.5307	97.5624	54.3091	27.4705	17.8292 (83)	
Total gains	432.3387	465.8976	481.8675	518.5155	542.7585	540.8901	514.1960	479.4018	447.7474	416.8224	413.9282	419.5109 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	35.4705	35.8382	36.2136	38.2148	38.6419	40.9290	40.9290	41.4193	39.9825	38.6419	37.7971	36.9884
alpha	3.3647	3.3892	3.4142	3.5477	3.5761	3.7286	3.7286	3.7613	3.6655	3.5761	3.5198	3.4659
util living area												
	0.9826	0.9760	0.9645	0.9267	0.8478	0.6849	0.5360	0.5835	0.8034	0.9376	0.9732	0.9842 (86)
MIT	18.9594	19.1649	19.5021	20.0723	20.5251	20.8644	20.9590	20.9449	20.7298	20.1656	19.5478	19.0133 (87)
Th 2	19.8760	19.8862	19.8965	19.9480	19.9584	20.0108	20.0108	20.0213	19.9897	19.9584	19.9376	19.9170 (88)

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util rest of house	0.9788	0.9707	0.9560	0.9082	0.8070	0.6074	0.4285	0.4770	0.7396	0.9183	0.9663	0.9807 (89)
MIT 2	17.5163	17.7834	18.2171	18.9620	19.5098	19.9128	19.9913	19.9929	19.7703	19.0927	18.3040	17.6102 (90)
Living area fraction									FLA = Living area / (4) =			0.3371 (91)
MIT	18.0028	18.2491	18.6503	19.3363	19.8521	20.2336	20.3175	20.3138	20.0937	19.4544	18.7233	18.0832 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0028	18.2491	18.6503	19.3363	19.8521	20.2336	20.3175	20.3138	20.0937	19.4544	18.7233	18.0832 (93)

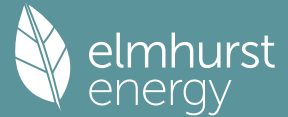
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9696	0.9597	0.9431	0.8949	0.8023	0.6261	0.4632	0.5105	0.7470	0.9063	0.9556	0.9724	(94)
Useful gains	419.2066	447.1373	454.4601	464.0410	435.4369	338.6499	238.2002	244.7340	334.4705	377.7864	395.5301	407.9265	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1049.5964	1012.0178	911.5847	741.9823	573.1798	373.9672	246.7766	256.7316	407.2949	622.5596	835.5096	1019.7767	(97)
Space heating kWh	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166	(98a)
Space heating requirement - total per year (kWh/year)												2445.4220	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2445.4220	
Space heating per m2										(98c) / (4) =		40.0757	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	469.0100	379.5997	340.1007	200.1178	102.4807	0.0000	0.0000	0.0000	0.0000	182.1113	316.7853	455.2166 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	205.7017	181.6674	192.4162	167.8401	161.7840	144.7926	142.1985	148.4059	150.6533	169.1756	181.3340	203.2833 (64)
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	67.8984	59.9651	63.5131	55.4010	53.4020	47.7934	46.9372	48.9861	49.7280	55.8418	59.8551	67.1001 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.7841	3.4179	3.7841	3.6621	3.7841	3.6621	3.7841	3.7841	3.6621	3.7841	3.6621	3.7841 (231)
Lighting	21.8417	17.5222	15.7768	11.5588	8.9283	7.2945	8.1447	10.5868	13.7512	18.0424	20.3788	22.4488 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2445.4220 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.9550
Water heating fuel used												676.4215 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)												
mechanical ventilation fans (SFP = 0.2660)												44.5550 (230a)
Total electricity for the above, kWh/year												44.5550 (231)
Electricity for lighting (calculated in Appendix L)												176.2751 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3342.6736 (238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2445.4220	0.1546	378.1663 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	676.4215	0.1411	95.4192 (264)
Space and water heating			473.5855 (265)
Pumps, fans and electric keep-hot	44.5550	0.1387	6.1803 (267)
Energy for lighting	176.2751	0.1443	25.4419 (268)
Total CO2, kg/year			505.2078 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2445.4220	1.5725	3845.5175 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	676.4215	1.5216	1029.2526 (278)
Space and water heating			4874.7701 (279)
Pumps, fans and electric keep-hot	44.5550	1.5128	67.4028 (281)
Energy for lighting	176.2751	1.5338	270.3766 (282)
Total Primary energy kWh/year			5212.5495 (286)
Dwelling Primary energy Rate (DPER)			85.4200 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.0200 (1b)	x 2.2500 (2b)	= 137.2950 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2950 (5)

2. Ventilation rate

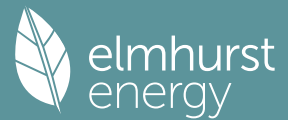
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4666	0.4575	0.4483	0.4026	0.3934	0.3477	0.3477	0.3385	0.3660	0.3934	0.4117	0.4300 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5810	0.5774	0.5604	0.5604	0.5573	0.5670	0.5774	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.5400	1.1450	6.3435		(27)
External Walls	50.9100	5.5400	45.3700	0.1800	8.1666		(29a)
Total net area of external elements Aum(A, m2)			50.9100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.5101		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							170.2917 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							2.5455 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	17.0556 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.5867	27.3951	27.2074	26.3255	26.1605	25.3923	25.3923	25.2501	25.6882	26.1605	26.4943	26.8432 (38)
Average = Sum(39)m / 12 =	44.6423	44.4507	44.2630	43.3811	43.2161	42.4480	42.4480	42.3057	42.7438	43.2161	43.5499	43.8988 (39)
												43.3803
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7316	0.7285	0.7254	0.7109	0.7082	0.6956	0.6956	0.6933	0.7005	0.7082	0.7137	0.7194 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

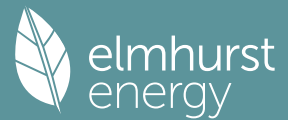
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0103 (42)
Hot water usage for mixer showers												
	74.3705	73.2528	71.6242	68.5081	66.2085	63.6441	62.1864	63.8027	65.5745	68.3279	71.5110	74.0855 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	35.2177	33.9371	32.6564	31.3758	30.0951	28.8145	28.8145	30.0951	31.3758	32.6564	33.9371	35.2177 (42c)
Average daily hot water use (litres/day)												100.5832 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	109.5882	107.1899	104.2806	99.8839	96.3037	92.4585	91.0009	93.8978	96.9502	100.9844	105.4480	109.3032 (44)
Energy conte	173.5609	152.6370	160.2754	136.7361	129.6432	113.6886	110.0577	116.2651	119.5493	137.0348	150.2300	171.1425 (45)
Energy content (annual)												Total = Sum(45)m = 1670.8206
Distribution loss (46)m = 0.15 x (45)m												
	26.0341	22.8955	24.0413	20.5104	19.4465	17.0533	16.5087	17.4398	17.9324	20.5552	22.5345	25.6714 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	220.1558	194.7227	206.8703	181.8279	176.2381	158.7804	156.6526	162.8600	164.6412	183.6297	195.3219	217.7374 (62)
PV diverter	-33.9991	-30.0691	-31.4866	-26.0721	-24.2983	-20.7922	-19.4894	-20.7250	-21.5124	-25.3608	-28.7307	-33.3695 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h												
	186.1567	164.6536	175.3838	155.7558	151.9398	137.9882	137.1632	142.1350	143.1287	158.2689	166.5912	184.3679 (64)
12Total per year (kWh/year)												1903.5329 (64)
Electric shower(s)												1904 (64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	94.9849	84.4204	90.5675	81.5382	80.3823	73.8749	73.8701	75.9341	75.8236	82.8400	86.0250	94.1808 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161	100.5161 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	104.2740	115.4462	104.2740	107.7498	104.2740	107.7498	104.2740	104.2740	107.7498	104.2740	107.7498	104.2740 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	175.5119	177.3331	172.7436	162.9731	150.6395	139.0477	131.3036	129.4823	134.0719	143.8424	156.1760	167.7678 (68)
Pumps, fans	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516	33.0516 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129	-80.4129 (71)
Total internal gains	127.6679	125.6256	121.7305	113.2475	108.0407	102.6041	99.2878	102.0619	105.3106	111.3441	119.4791	126.5871 (72)
	463.6086	474.5597	454.9030	440.1252	419.1090	402.5563	388.0202	388.9731	400.2871	415.6153	439.5597	454.7837 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northwest	5.5400											19.1031 (81)
Solar gains	19.1031	38.8849	70.0583	115.0558	154.6575	164.8813	154.2431	122.9644	85.3671	47.5205	24.0366	15.6006 (83)
Total gains	482.7117	513.4447	524.9612	555.1810	573.7666	567.4377	542.2633	511.9375	485.6542	463.1358	463.5964	470.3843 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.6572	64.9358	65.2112	66.5370	66.7910	67.9996	67.9996	68.2282	67.5289	66.7910	66.2791	65.7522
alpha	5.3105	5.3291	5.3474	5.4358	5.4527	5.5333	5.5333	5.5485	5.5019	5.4527	5.4186	5.3835
util living area												
	0.9625	0.9451	0.9138	0.8200	0.6670	0.4745	0.3438	0.3790	0.5913	0.8321	0.9327	0.9659 (86)

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MIT	20.2654	20.3970	20.5753	20.8168	20.9494	20.9936	20.9991	20.9985	20.9796	20.8313	20.5455	20.2570 (87)
Th 2	20.3130	20.3158	20.3185	20.3312	20.3336	20.3447	20.3447	20.3467	20.3404	20.3336	20.3287	20.3237 (88)
util rest of house												
	0.9559	0.9358	0.8992	0.7933	0.6271	0.4274	0.2929	0.3257	0.5399	0.8017	0.9200	0.9599 (89)
MIT 2	19.4626	19.6281	19.8492	20.1439	20.2886	20.3403	20.3443	20.3460	20.3250	20.1668	19.8243	19.4608 (90)
Living area fraction									fLA = Living area / (4) =			0.3371 (91)
MIT	19.7332	19.8873	20.0940	20.3707	20.5114	20.5605	20.5650	20.5660	20.5457	20.3908	20.0674	19.7292 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7332	19.8873	20.0940	20.3707	20.5114	20.5605	20.5650	20.5660	20.5457	20.3908	20.0674	19.7292 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9494	0.9291	0.8939	0.7949	0.6380	0.4430	0.3100	0.3437	0.5562	0.8044	0.9144	0.9536 (94)	
Useful gains	458.2789	477.0613	469.2511	441.3345	366.0499	251.3969	168.1274	175.9319	270.1070	372.5692	423.9168	448.5594 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	688.9746	666.1959	601.7095	497.6134	380.7929	253.0113	168.3066	176.2436	275.5128	423.1219	564.7280	681.7130 (97)	
Space heating kWh	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663 (98a)	
Space heating requirement - total per year (kWh/year)												761.2362	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												761.2362	
Space heating per m2										(98c) / (4) =		12.4752 (99)	

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	171.6376	127.0984	98.5490	40.5208	10.9688	0.0000	0.0000	0.0000	0.0000	37.6112	101.3841	173.4663 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	185.9562	137.7014	106.7703	43.9012	11.8838	0.0000	0.0000	0.0000	0.0000	40.7489	109.8419	187.9375 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	186.1567	164.6536	175.3838	155.7558	151.9398	137.9882	137.1632	142.1350	143.1287	158.2689	166.5912	184.3679 (64)	
Efficiency of water heater (217)m	83.8781	83.4861	82.8198	81.5054	80.3483	79.8000	79.8000	79.8000	79.8000	81.3838	82.9819	79.8000 (216)	
Fuel for water heating, kWh/month	221.9372	197.2228	211.7656	191.0987	189.1015	172.9175	171.8837	178.1141	179.3593	194.4723	200.7560	83.9233 (217)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	21.6661	17.3813	15.6500	11.4658	8.8565	7.2359	8.0792	10.5017	13.6407	17.8973	20.2149	22.2682 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.4639	-24.4471	-36.9842	-43.8358	-49.2544	-46.7133	-46.1689	-42.6209	-36.6773	-28.9670	-18.5431	-14.0952 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-5.8725	-12.6385	-25.6587	-39.3349	-52.7915	-53.3188	-52.6666	-44.2072	-31.9181	-18.3033	-7.9145	-4.6209 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												824.7413 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												79.8000	
Water heating fuel used												2328.3149 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	
Electricity for lighting (calculated in Appendix L)												174.8577 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-754.0166 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	
Energy used												0.0000 (237)	
Total delivered energy for all uses												2659.8973 (238)	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	824.7413	0.2100	173.1957 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2328.3149	0.2100	488.9461 (264)
Space and water heating			662.1418 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	174.8577	0.1443	25.2374 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-404.7710	0.1335	-54.0394
PV Unit electricity exported	-349.2456	0.1253	-43.7641
Total			-97.8034 (269)
Total CO2, kg/year			601.5050 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	824.7413	1.1300	931.9576 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2328.3149	1.1300	2630.9959 (278)
Space and water heating			3562.9535 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	174.8577	1.5338	268.2025 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-404.7710	1.4934	-604.4665
PV Unit electricity exported	-349.2456	0.4599	-160.6346
Total			-765.1011 (283)
Total Primary energy kWh/year			3196.1558 (286)
Target Primary Energy Rate (TPER)			52.3800 (287)

Predicted Energy Assessment



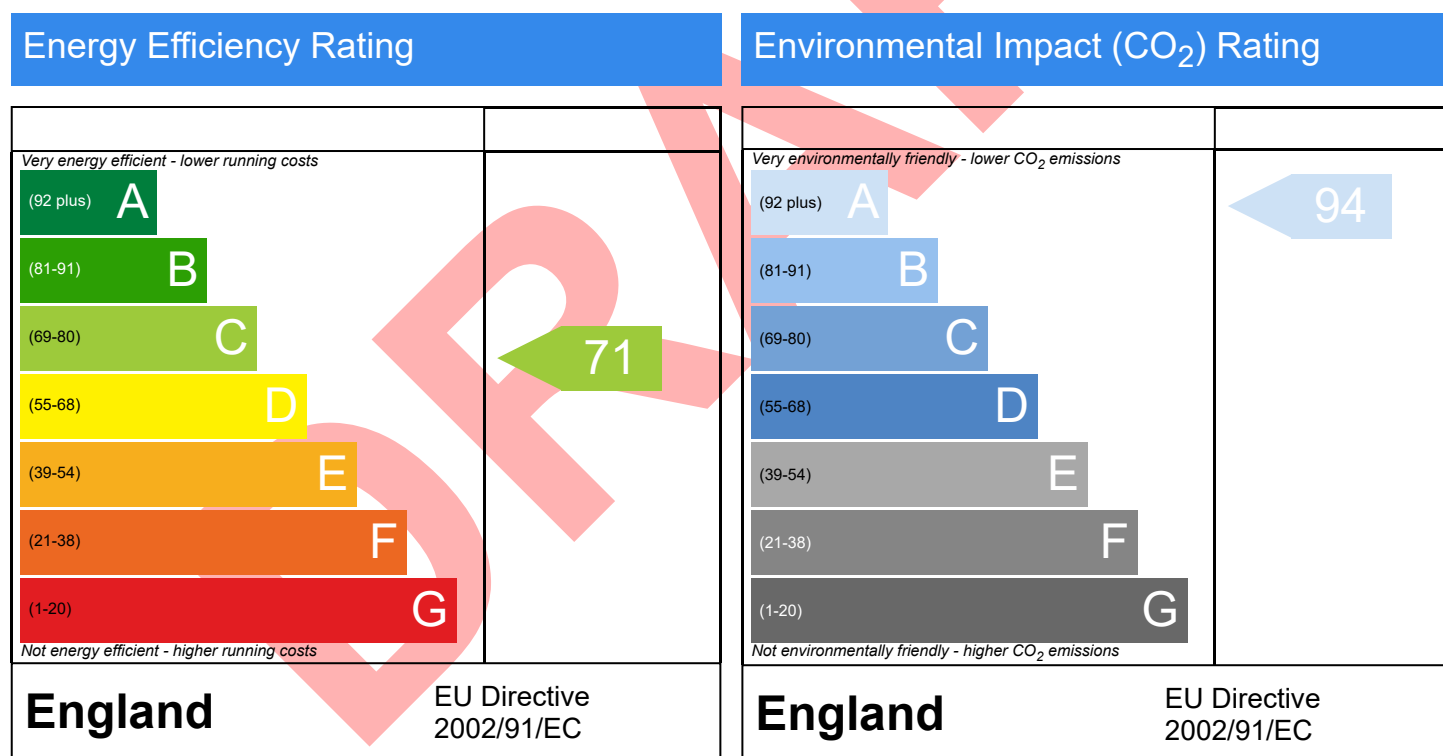
36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB

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

Flat, Mid-Terrace
11/07/2024
Daniel Watt
61.02 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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

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

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 11 Jul 2024 11:28:29

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/027301	Assessment Date	2024-07-11

Dwelling Details			
Assessment Type	As designed	Total Floor Area	52 m ²
Site Reference	Apartment No 3	Plot Reference	Apartment No 3
Address	36-436a BarlowMoor road, Manchester , M21 0AB		

Client Details	
Name	Paul Butler Associates
Company	Paul Butler Associates
Address	31 Blackfriars Road, Manchester, M3 7AQ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	10.84 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	8.24 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	57.73 kWh _{PE} /m ²		
Dwelling primary energy	84.99 kWh _{PE} /m ²		FAIL

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	19.4 kWh/m ²		
Dwelling fabric energy efficiency	40.1 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.3	Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	55.21	0.18	
Party wall: Party Wall (1)	19.91	0 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Windows, Window	5.96	South West	0.7	1.3

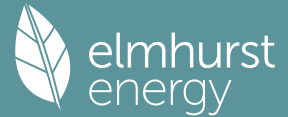
2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m ² K) used for thermal bridging	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	15 m ³ /hm ² , Assumed value		
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Room heaters - Electricity		
Efficiency	100.0%	
Emitter type		
Flow temperature		
System type	Panel, convector or radiant heaters	
Manufacturer		
Model		
Commissioning		
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	0.0%	
Emitter type		
Flow temperature		
System type	Heat Pump	
Manufacturer	Auer	
Model	EDL170-520RF	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	120 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	0.7 W/(l/s)	
Specific fan power	0.19 W/(l/s)	OK
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model	Sentinel Multivent	
Commissioning		
9 Local generation		

N/A	
10 Heat networks	
N/A	
11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
<p>This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.</p>	
<p>Signed:</p> <p>Name:</p>	<p>Assessor ID:</p> <p>Date:</p>
b. Client Declaration	
N/A	

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Property Reference	Apartment No 3			Issued on Date	11/07/2024
Assessment Reference	Apartment No 3	Prop Type Ref	Apartment No 3		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	73 C	DER	8.24	TER	10.84
Environmental	94 A	% DER < TER			23.99
CO ₂ Emissions (t/year)	0.35	DFEE	40.13	TFEE	19.43
Compliance Check	See BREL	% DFEE < TFEE			-106.55
% DPER < TPER	-47.23	DPER	84.99	TPER	57.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.6000 (1b)	2.2500 (2b)	116.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		116.1000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	116.1000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5813 (21)

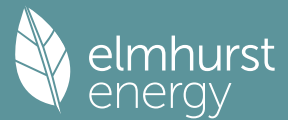
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.9600	1.2357	7.3650		(27)
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378	60.0000	3312.6000 (29a)
Total net area of external elements Aum(A, m ²)			61.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.3028		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	(32)
Party Floor			51.6000			40.0000	2064.0000 (32d)
Party Ceiling			51.6000			30.0000	1548.0000 (32b)
Heat capacity Cm = Sum(A x k)							9712.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.2171 (35)
Thermal bridges (Default value 0.200 * total exposed area)							12.2340 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.5368 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	37.9718	37.4150	36.8583	34.0746	33.5179	30.7342	30.7342	30.1775	31.8477	33.5179	34.6314	35.7448 (38)
Heat transfer coeff	67.5086	66.9519	66.3951	63.6114	63.0547	60.2710	60.2710	59.7143	61.3845	63.0547	64.1682	65.2817 (39)
Average = Sum(39)m / 12 =												63.4723
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3083	1.2975	1.2867	1.2328	1.2220	1.1680	1.1680	1.1573	1.1896	1.2220	1.2436	1.2651 (40)
HLP (average)												1.2301
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers												
68.4696	67.4406	65.9412	63.0724	60.9553	58.5943	57.2523	58.7403	60.3715	62.9065	65.8370	68.2073 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)	
Average daily hot water use (litres/day)												92.6007 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
100.8910	98.6830	96.0047	91.9569	88.6608	85.1208	83.7788	86.4459	89.2560	92.9700	97.0794	100.6286 (44)	
Energy content (annual)	159.7866	140.5233	147.5556	125.8844	119.3545	104.6660	101.3232	107.0380	110.0616	126.1594	138.3074	157.5601 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1538.2202
23.9680	21.0785	22.1333	18.8827	17.9032	15.6999	15.1985	16.0557	16.5092	18.9239	20.7461	23.6340 (46)	
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)	
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009 (62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009 (64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			1916.6522 (64)
Electric shower(s)												1917 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =
												0.0000 (64a)
Heat gains from water heating, kWh/month												
53.1291	46.7240	49.0622	41.8566	39.6854	34.8014	33.6900	35.5901	36.5955	41.9480	45.9872	52.3887 (65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	71.4100	69.5298	65.9439	58.1341	53.3405	48.3353	45.2822	47.8362	50.8270	56.3817	63.8711	70.4150 (72)
Total internal gains	357.3295	366.1780	349.4756	336.0873	317.8063	305.6516	293.0698	294.0529	303.8515	314.9847	335.9615	349.6549 (73)

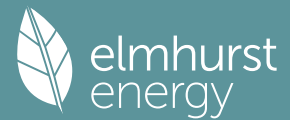
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				5.9600	36.7938	0.7200		0.7000		0.7700		76.5923 (79)	
Solar gains	76.5923	130.4650	178.5079	221.1800	247.7400	245.9485	237.1206	217.3056	193.2863	144.1916	91.7399	65.5470 (83)	
Total gains	433.9218	496.6430	527.9835	557.2673	565.5463	551.6001	530.1904	511.3584	497.1378	459.1763	427.7014	415.2019 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.9620	40.2943	40.6322	42.4103	42.7847	44.7608	44.7608	45.1781	43.9488	42.7847	42.0423	41.3252
alpha	3.6641	3.6863	3.7088	3.8274	3.8523	3.9841	3.9841	4.0119	3.9299	3.8523	3.8028	3.7550
util living area												
	0.9812	0.9682	0.9483	0.8985	0.8080	0.6385	0.4838	0.5157	0.7289	0.9077	0.9672	0.9836 (86)
MIT	19.2511	19.5082	19.8429	20.3182	20.6712	20.9138	20.9777	20.9717	20.8434	20.3928	19.7908	19.2680 (87)
Th 2	19.8343	19.8428	19.8512	19.8939	19.9024	19.9457	19.9457	19.9543	19.9283	19.9024	19.8853	19.8682 (88)

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util rest of house	0.9765	0.9604	0.9352	0.8721	0.7570	0.5535	0.3753	0.4078	0.6506	0.8784	0.9580	0.9796 (89)
MIT 2	17.8354	18.1646	18.5893	19.2000	19.6121	19.8899	19.9368	19.9421	19.8157	19.3051	18.5529	17.8789 (90)
Living area fraction									FLA =	Living area /	(4) =	0.5269 (91)
MIT	18.5814	18.8726	19.2498	19.7892	20.1702	20.4294	20.4853	20.4846	20.3572	19.8783	19.2052	18.6109 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5814	18.8726	19.2498	19.7892	20.1702	20.4294	20.4853	20.4846	20.3572	19.8783	19.2052	18.6109 (93)

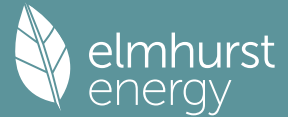
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9698	0.9521	0.9267	0.8692	0.7706	0.5941	0.4320	0.4639	0.6840	0.8776	0.9507	0.9736	(94)
Useful gains	420.8025	472.8448	489.2984	484.3794	435.8093	327.7011	229.0437	237.2011	340.0648	402.9771	406.6293	404.2240	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.1175	935.4903	846.5265	692.6796	534.0847	351.3453	234.1717	243.9109	384.0976	585.0387	776.7690	940.7643	(97)
Space heating kWh	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98a)
Space heating requirement - total per year (kWh/year)												2005.1353	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2005.1353	
Space heating per m2										(98c) / (4) =		38.8592	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													0.0000 (213)
Water heating													
Water heating requirement	191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009	(64)
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
(217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(217)
Fuel for water heating, kWh/month	63.3518	55.9666	59.3146	51.8190	50.0059	44.8152	44.0541	45.9404	46.5962	52.2520	55.9196	62.6169	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.1999	2.8903	3.1999	3.0967	3.1999	3.0967	3.1999	3.1999	3.0967	3.1999	3.0967	3.1999	(231)
Lighting	16.8948	13.5537	12.2036	8.9409	6.9062	5.6424	6.3000	8.1890	10.6367	13.9560	15.7633	17.3644	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													2005.1353 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													302.9550
Water heating fuel used													632.6524 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)													37.6768 (230a)
Total electricity for the above, kWh/year													37.6768 (231)
Electricity for lighting (calculated in Appendix L)													136.3509 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													2811.8154 (238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2005.1353	0.1552	311.1252 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	632.6524	0.1410	89.2216 (264)
Space and water heating			400.3468 (265)
Pumps, fans and electric keep-hot	37.6768	0.1387	5.2262 (267)
Energy for lighting	136.3509	0.1443	19.6797 (268)
Total CO2, kg/year			425.2527 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2005.1353	1.5744	3156.9834 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	632.6524	1.5215	962.5656 (278)
Space and water heating			4119.5490 (279)
Pumps, fans and electric keep-hot	37.6768	1.5128	56.9974 (281)
Energy for lighting	136.3509	1.5338	209.1396 (282)
Total Primary energy kWh/year			4385.6860 (286)
Dwelling Primary energy Rate (DPER)			84.9900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	51.6000 (1b)	x 2.2500 (2b)	= 116.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.1000 (5)

2. Ventilation rate

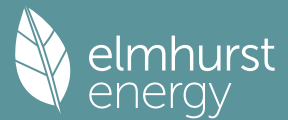
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1723 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4223 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3273 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4173	0.4091	0.4009	0.3600	0.3518	0.3109	0.3109	0.3027	0.3273	0.3518	0.3682	0.3845 (22b)
Effective ac	0.5870	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5535	0.5619	0.5678	0.5739 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.9600	1.1450	6.8244		(27)
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378		(29a)
Total net area of external elements Aum(A, m2)			61.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.7622		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							198.2171 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.0585 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	19.8207 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4916	22.3621	22.2352	21.6389	21.5274	21.0081	21.0081	20.9119	21.2081	21.5274	21.7530	21.9890	(38)
Heat transfer coeff	42.3123	42.1828	42.0559	41.4597	41.3481	40.8288	40.8288	40.7326	41.0288	41.3481	41.5738	41.8097	(39)
Average = Sum(39)m / 12 =												41.4591	
HLP	0.8200	0.8175	0.8150	0.8035	0.8013	0.7913	0.7913	0.7894	0.7951	0.8013	0.8057	0.8103	(40)
HLP (average)												0.8035	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7373 (42)
Hot water usage for mixer showers	68.4696	67.4406	65.9412	63.0724	60.9553	58.5943	57.2523	58.7403	60.3715	62.9065	65.8370	68.2073	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214	(42c)
Average daily hot water use (litres/day)												92.6007	(43)
Daily hot water use	100.8910	98.6830	96.0047	91.9569	88.6608	85.1208	83.7788	86.4459	89.2560	92.9700	97.0794	100.6286	(44)
Energy conte	159.7866	140.5233	147.5556	125.8844	119.3545	104.6660	101.3232	107.0380	110.0616	126.1594	138.3074	157.5601	(45)
Energy content (annual)										Total = Sum(45)m =		1538.2202	
Distribution loss (46)m = 0.15 x (45)m	23.9680	21.0785	22.1333	18.8827	17.9032	15.6999	15.1985	16.0557	16.5092	18.9239	20.7461	23.6340	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	206.3815	182.6091	194.1505	170.9762	165.9494	149.7578	147.9181	153.6329	155.1534	172.7543	183.3992	204.1550	(62)
WWHRS	-31.3014	-27.6832	-28.9883	-24.0035	-22.3704	-19.1425	-17.9430	-19.0806	-19.8055	-23.3486	-26.4511	-30.7218	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	175.0801	154.9258	165.1622	146.9728	143.5790	130.6154	129.9751	134.5523	135.3479	149.4057	156.9481	173.4332	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1795.9977	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	90.4050	80.3926	86.3382	77.9300	76.9613	70.8749	70.9659	72.8661	72.6689	79.2239	82.0607	89.6647	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	(71)
Water heating gains (Table 5)	121.5121	119.6318	116.0459	108.2362	103.4426	98.4374	95.3843	97.9383	100.9291	106.4837	113.9732	120.5170	(72)
Total internal gains	410.4316	419.2800	402.5777	389.1894	370.9084	355.7537	343.1719	344.1549	353.9535	368.0867	389.0636	402.7569	(73)

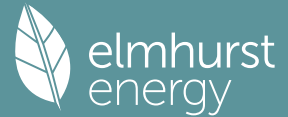
6. Solar gains

[Jan]														
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				5.9600	36.7938		0.6300		0.7000		0.7700		67.0183 (79)	
Solar gains	67.0183	114.1569	156.1944	193.5325	216.7725	215.2049	207.4805	190.1424	169.1255	126.1677	80.2724	57.3537	(83)	
Total gains	477.4498	533.4369	558.7721	582.7218	587.6809	570.9586	550.6523	534.2973	523.0790	494.2544	469.3360	460.1106	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	67.1462	67.3523	67.5556	68.5271	68.7120	69.5860	69.5860	69.7503	69.2467	68.7120	68.3390	67.9534	
alpha	5.4764	5.4902	5.5037	5.5685	5.5808	5.6391	5.6391	5.6500	5.6164	5.5808	5.5559	5.5302	
util living area	0.9589	0.9280	0.8807	0.7778	0.6317	0.4546	0.3258	0.3501	0.5332	0.7834	0.9206	0.9645	(86)

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MIT	20.3340	20.5069	20.6846	20.8699	20.9643	20.9953	20.9994	20.9991	20.9887	20.8849	20.6084	20.3062 (87)
Th 2	20.2360	20.2382	20.2403	20.2503	20.2522	20.2609	20.2609	20.2625	20.2576	20.2522	20.2484	20.2444 (88)
util rest of house												
	0.9506	0.9148	0.8601	0.7449	0.5871	0.4033	0.2713	0.2943	0.4788	0.7451	0.9041	0.9573 (89)
MIT 2	19.4790	19.6918	19.9059	20.1244	20.2226	20.2580	20.2607	20.2622	20.2499	20.1458	19.8269	19.4515 (90)
Living area fraction												0.5269 (91)
MIT	19.9296	20.1213	20.3162	20.5173	20.6134	20.6465	20.6499	20.6505	20.6392	20.5352	20.2387	19.9019 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9296	20.1213	20.3162	20.5173	20.6134	20.6465	20.6499	20.6505	20.6392	20.5352	20.2387	19.9019 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9469	0.9126	0.8623	0.7570	0.6090	0.4302	0.3001	0.3237	0.5070	0.7601	0.9038	0.9535	(94)
Useful gains	452.0792	486.8164	481.8229	441.1337	357.8929	245.6283	165.2233	172.9324	265.1842	375.6969	424.2048	438.7347	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	661.3231	642.0772	581.0523	481.6478	368.5537	246.8724	165.3543	173.1335	268.2957	410.8025	546.2246	656.4903	(97)
Space heating kWh													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102	(98a)
Space heating requirement - total per year (kWh/year)												646.9241	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												646.9241	
Space heating per m2												(98c) / (4) =	12.5373 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102 (98)	
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)													
	168.6646	113.0393	79.9856	31.6036	8.5933	0.0000	0.0000	0.0000	0.0000	28.2974	95.1834	175.5257 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement													
	175.0801	154.9258	165.1622	146.9728	143.5790	130.6154	129.9751	134.5523	135.3479	149.4057	156.9481	173.4332 (64)	
Efficiency of water heater (217)m													
	83.7974	83.1932	82.3792	81.1622	80.2257	79.8000	79.8000	79.8000	79.8000	81.0219	82.8121	83.9073 (217)	
Fuel for water heating, kWh/month													
	208.9327	186.2241	200.4902	181.0851	178.9689	163.6784	162.8761	168.6119	169.6089	184.4016	189.5232	206.6964 (219)	
Space cooling fuel requirement (221)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa													
	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting													
	17.7595	14.2473	12.8281	9.3984	7.2596	5.9312	6.6225	8.6081	11.1811	14.6702	16.5700	18.2530 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m													
	-13.9826	-20.7978	-31.5228	-37.4445	-42.1572	-40.0248	-39.5652	-36.4840	-31.3344	-24.6810	-15.7626	-11.9675 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m													
	-4.9055	-10.5626	-21.4496	-32.8867	-44.1353	-44.5648	-44.0124	-36.9400	-26.6715	-15.2919	-6.6106	-3.8593 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													700.8928 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													2201.0975 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													143.3290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-637.6148 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													2493.7045 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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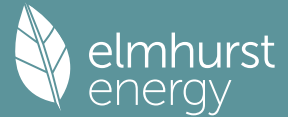


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	700.8928	0.2100	147.1875 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2201.0975	0.2100	462.2305 (264)
Space and water heating			609.4180 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	143.3290	0.1443	20.6868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.7245	0.1335	-46.1403
PV Unit electricity exported	-291.8903	0.1253	-36.5772
Total			-82.7176 (269)
Total CO2, kg/year			559.3165 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	700.8928	1.1300	792.0089 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2201.0975	1.1300	2487.2402 (278)
Space and water heating			3279.2491 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	143.3290	1.5338	219.8428 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.7245	1.4932	-516.2291
PV Unit electricity exported	-291.8903	0.4600	-134.2558
Total			-650.4849 (283)
Total Primary energy kWh/year			2978.7077 (286)
Target Primary Energy Rate (TPER)			57.7300 (287)

Full SAP Calculation Printout



Property Reference	Apartment No 3			Issued on Date	11/07/2024
Assessment Reference	Apartment No 3	Prop Type Ref	Apartment No 3		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	73 C	DER	8.24	TER	10.84
Environmental	94 A	% DER < TER			23.99
CO ₂ Emissions (t/year)	0.35	DFEE	40.13	TFEE	19.43
Compliance Check	See BREL	% DFEE < TFEE			-106.55
% DPER < TPER	-47.23	DPER	84.99	TPER	57.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	51.6000 (1b)	2.2500 (2b)	116.1000 (1b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000			(1b) - (3b)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	116.1000 (5)	(4)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1723 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.9223	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7148 (21)

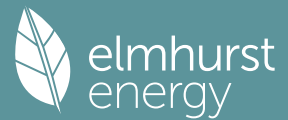
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.9113	0.8934	0.8756	0.7862	0.7684	0.6790	0.6790	0.6611	0.7148	0.7684	0.8041	0.8398	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.9152	0.8991	0.8833	0.8091	0.7952	0.7305	0.7305	0.7186	0.7554	0.7952	0.8233	0.8527	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Window (Uw = 1.30)			5.9600	1.2357	7.3650			(27)
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378	60.0000	3312.6000	(29a)
Total net area of external elements Aum(A, m ²)			61.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.3028			(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	2787.4000	(32)
Party Floor			51.6000			40.0000	2064.0000	(32d)
Party Ceiling			51.6000			40.0000	2064.0000	(32b)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	10228.0000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							198.2171	(35)
Thermal bridges (Default value 0.200 * total exposed area)							12.2340	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	29.5368	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	35.0658	34.4480	33.8425	30.9983	30.4661	27.9889	27.9889	27.5301	28.9431	30.4661	31.5427	32.6681	(38)
Heat transfer coeff													

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Average = Sum(39)m / 12 =	64.6026	63.9849	63.3793	60.5351	60.0029	57.5257	57.5257	57.0670	58.4799	60.0029	61.0795	62.2049 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2520	1.2400	1.2283	1.1732	1.1628	1.1148	1.1148	1.1059	1.1333	1.1628	1.1837	1.2055 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866 (42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)
Average daily hot water use (litres/day)												50.8584 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	55.4859	53.9644	52.3031	50.2347	48.3898	46.4724	46.0735	47.7314	49.4319	51.4011	53.4878	55.4079 (44)
Energy content (annual)	87.8761	76.8446	80.3879	68.7688	65.1420	57.1432	55.7219	59.1015	60.9545	69.7508	76.2031	86.7554 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	74.6947	65.3179	68.3297	58.4535	55.3707	48.5717	47.3636	50.2363	51.8114	59.2882	64.7726	73.7421 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	74.6947	65.3179	68.3297	58.4535	55.3707	48.5717	47.3636	50.2363	51.8114	59.2882	64.7726	73.7421 (64)
12Total per year (kWh/year)												717.9524 (64)
Electric shower(s)	42.7227	38.0663	41.5669	39.6668	40.4111	38.5483	39.8332	40.4111	39.6668	41.5669	40.7853	42.7227 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												485.9682 (64a)
Heat gains from water heating, kWh/month	29.3544	25.8460	27.4742	24.5301	23.9454	21.7800	21.7992	22.6619	22.8695	25.2138	26.3895	29.1162 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	39.4548	38.4614	36.9276	34.0695	32.1847	30.2500	29.3000	30.4595	31.7632	33.8895	36.6521	39.1347 (72)
Total internal gains	325.3743	335.1096	320.4594	312.0228	296.6505	287.5663	277.0876	276.6761	284.7877	292.4924	308.7425	318.3746 (73)

6. Solar gains

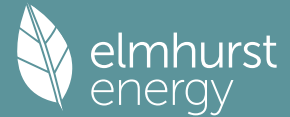
[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
-----					Southwest	5.9600	36.7938	0.7200	0.7000	0.7700		76.5923 (79)

Solar gains	76.5923	130.4650	178.5079	221.1800	247.7400	245.9485	237.1206	217.3056	193.2863	144.1916	91.7399	65.5470 (83)
Total gains	401.9666	465.5746	498.9673	533.2027	544.3905	533.5148	514.2082	493.9817	478.0740	436.6841	400.4824	383.9216 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.9783	44.4029	44.8271	46.9333	47.3495	49.3885	49.3885	49.7856	48.5827	47.3495	46.5150	45.6734
alpha	3.9319	3.9602	3.9885	4.1289	4.1566	4.2926	4.2926	4.3190	4.2388	4.1566	4.1010	4.0449
util living area	0.9870	0.9759	0.9580	0.9088	0.8159	0.6395	0.4800	0.5146	0.7350	0.9191	0.9752	0.9889 (86)
MIT	19.3422	19.5971	19.9228	20.3872	20.7180	20.9324	20.9843	20.9792	20.8701	20.4483	19.8694	19.3668 (87)
Th 2	19.8786	19.8881	19.8974	19.9415	19.9498	19.9887	19.9887	19.9960	19.9737	19.9498	19.9331	19.9156 (88)
util rest of house	0.9836	0.9697	0.9468	0.8841	0.7660	0.5559	0.3754	0.4099	0.6580	0.8921	0.9678	0.9860 (89)
MIT 2	18.3936	18.6515	18.9773	19.4545	19.7565	19.9552	19.9840	19.9891	19.9016	19.5251	18.9559	18.4452 (90)
Living area fraction									fLA = Living area / (4) =			0.5269 (91)
MIT	18.8935	19.1498	19.4755	19.9460	20.2631	20.4701	20.5111	20.5108	20.4119	20.0116	19.4372	18.9308 (92)
Temperature adjustment												0.0000

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adjusted MIT 18.8935 19.1498 19.4755 19.9460 20.2631 20.4701 20.5111 20.5108 20.4119 20.0116 19.4372 18.9308 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9796	0.9646	0.9416	0.8842	0.7821	0.5971	0.4304	0.4647	0.6929	0.8940	0.9635	0.9826	(94)
Useful gains	393.7687	449.0766	469.8103	471.4449	425.7662	318.5851	221.2996	229.5556	331.2461	390.3871	385.8569	377.2280	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	942.7762	911.7715	822.3807	668.6706	513.8138	337.6836	224.9878	234.5923	369.1204	564.7247	753.5522	916.3302	(97)
Space heating kWh	408.4616	310.9310	262.3124	142.0025	65.5074	0.0000	0.0000	0.0000	0.0000	129.7072	264.7406	401.0921	(98a)
Space heating requirement - total per year (kWh/year)												1984.7548	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	408.4616	310.9310	262.3124	142.0025	65.5074	0.0000	0.0000	0.0000	0.0000	129.7072	264.7406	401.0921	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1984.7548	
Space heating per m2										(98c) / (4) =		38.4642	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	540.7417	425.6903	433.7090	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8422	0.9060	0.8910	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	455.4221	385.6895	386.4194	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	586.1158	565.4801	543.5575	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	94.0994	133.7642	116.9107	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	fc = cooled area / (4) =											
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	23.5249	33.4411	29.2277	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												0.0000 (107)
Energy for space heating												86.1936 (107)
Energy for space cooling												38.4642 (99)
Total												1.6704 (108)
Fabric Energy Efficiency (DFEE)												40.1347 (109)
												40.1 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

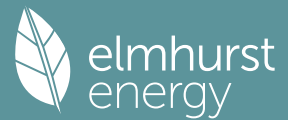
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	51.6000 (1b)	x 2.2500 (2b)	= 116.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	116.1000 (5)

2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											2 * 10 =	20.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											20.0000 / (5) =	0.1723 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											5.0000 (17)		
Infiltration rate											0.4223 (18)		
Number of sides sheltered											3 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3273 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4173	0.4091	0.4009	0.3600	0.3518	0.3109	0.3109	0.3027	0.3273	0.3518	0.3682	0.3845	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5870	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5535	0.5619	0.5678	0.5739	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.20)			5.9600	1.1450	6.8244			(27)					
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378			(29a)					
Total net area of external elements Aum(A, m2)			61.1700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =			16.7622		(33)					
Party Wall shared by Apartment			19.9100	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								198.2171 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)								3.0585 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	19.8207	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 22.4916	Feb 22.3621	Mar 22.2352	Apr 21.6389	May 21.5274	Jun 21.0081	Jul 21.0081	Aug 20.9119	Sep 21.2081	Oct 21.5274	Nov 21.7530	Dec 21.9890	(38)
Heat transfer coeff	42.3123	42.1828	42.0559	41.4597	41.3481	40.8288	40.8288	40.7326	41.0288	41.3481	41.5738	41.8097	(39)
Average = Sum(39)m / 12 =												41.4591	
HLP	Jan 0.8200	Feb 0.8175	Mar 0.8150	Apr 0.8035	May 0.8013	Jun 0.7913	Jul 0.7913	Aug 0.7894	Sep 0.7951	Oct 0.8013	Nov 0.8057	Dec 0.8103	(40)
HLP (average)												0.8035	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7373 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths	23.0645	22.7220	22.2396	21.3502	20.6842	19.9458	19.5469	20.0259	20.5474	21.3376	22.2453	22.9866	(42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214	(42c)
Average daily hot water use (litres/day)												50.8584	(43)
Daily hot water use	Jan 55.4859	Feb 53.9644	Mar 52.3031	Apr 50.2347	May 48.3898	Jun 46.4724	Jul 46.0735	Aug 47.7314	Sep 49.4319	Oct 51.4011	Nov 53.4878	Dec 55.4079	(44)
Energy conte	87.8761	76.8446	80.3879	68.7688	65.1420	57.1432	55.7219	59.1015	60.9545	69.7508	76.2031	86.7554	(45)
Energy content (annual)										Total = Sum(45)m =		844.6499	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	74.6947	65.3179	68.3297	58.4535	55.3707	48.5717	47.3636	50.2363	51.8114	59.2882	64.7726	73.7421	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	74.6947	65.3179	68.3297	58.4535	55.3707	48.5717	47.3636	50.2363	51.8114	59.2882	64.7726	73.7421	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		717.9524	(64)
Electric shower(s)	42.7227	38.0663	41.5669	39.6668	40.4111	38.5483	39.8332	40.4111	39.6668	41.5669	40.7853	42.7227	(64a)
Heat gains from water heating, kWh/month	29.3544	25.8460	27.4742	24.5301	23.9454	21.7800	21.7992	22.6619	22.8695	25.2138	26.3895	29.1162	(65)

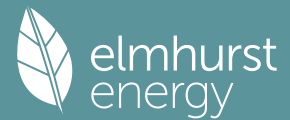
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 86.8635	Feb 86.8635	Mar 86.8635	Apr 86.8635	May 86.8635	Jun 86.8635	Jul 86.8635	Aug 86.8635	Sep 86.8635	Oct 86.8635	Nov 86.8635	Dec 86.8635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	(71)
Water heating gains (Table 5)	39.4548	38.4614	36.9276	34.0695	32.1847	30.2500	29.3000	30.4595	31.7632	33.8895	36.6521	39.1347	(72)
Total internal gains	325.3743	335.1096	320.4594	312.0228	296.6505	287.5663	277.0876	276.6761	284.7877	292.4924	308.7425	318.3746	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	5.9600	36.7938	0.6300	0.7000	0.7700	67.0183 (79)

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Solar gains	67.0183	114.1569	156.1944	193.5325	216.7725	215.2049	207.4805	190.1424	169.1255	126.1677	80.2724	57.3537 (83)
Total gains	392.3926	449.2665	476.6538	505.5552	513.4230	502.7712	484.5681	466.8185	453.9132	418.6601	389.0149	375.7282 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	67.1462	67.3523	67.5556	68.5271	68.7120	69.5860	69.5860	69.7503	69.2467	68.7120	68.3390	67.9534
alpha	5.4764	5.4902	5.5037	5.5685	5.5808	5.6391	5.6391	5.6500	5.6164	5.5808	5.5559	5.5302
util living area	0.9819	0.9624	0.9295	0.8445	0.7049	0.5134	0.3699	0.4000	0.6064	0.8592	0.9608	0.9851 (86)
MIT	20.1399	20.3391	20.5532	20.7992	20.9392	20.9914	20.9989	20.9983	20.9788	20.8109	20.4518	20.1086 (87)
Th 2	20.2360	20.2382	20.2403	20.2503	20.2522	20.2609	20.2609	20.2625	20.2576	20.2522	20.2484	20.2444 (88)
util rest of house	0.9778	0.9545	0.9150	0.8158	0.6595	0.4566	0.3082	0.3365	0.5472	0.8270	0.9512	0.9818 (89)
MIT 2	19.4581	19.6538	19.8605	20.0941	20.2118	20.2567	20.2606	20.2619	20.2461	20.1101	19.7741	19.4344 (90)
Living area fraction	19.8174	20.0149	20.2255	20.4656	20.5951	20.6439	20.6496	20.6499	20.6322	20.4794	20.1312	19.7897 (92)
MIT	19.8174	20.0149	20.2255	20.4656	20.5951	20.6439	20.6496	20.6499	20.6322	20.4794	20.1312	19.7897 (93)
Temperature adjustment												0.0000
adjusted MIT	19.8174	20.0149	20.2255	20.4656	20.5951	20.6439	20.6496	20.6499	20.6322	20.4794	20.1312	19.7897 (93)

8. Space heating requirement

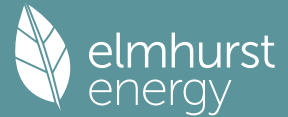
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9751	0.9518	0.9147	0.8245	0.6808	0.4862	0.3407	0.3700	0.5775	0.8374	0.9495	0.9793 (94)
Useful gains	382.6252	427.6188	435.9929	416.8113	349.5500	244.4724	165.0866	172.7094	262.1364	350.5974	369.3568	367.9516 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	656.5767	637.5905	577.2386	479.5061	367.7954	246.7635	165.3402	173.1107	268.0085	408.4943	541.7575	651.7998 (97)
Space heating kWh	203.8199	141.1010	105.0868	45.1402	13.5746	0.0000	0.0000	0.0000	0.0000	43.0753	124.1285	211.1831 (98a)
Space heating requirement - total per year (kWh/year)												887.1094
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	203.8199	141.1010	105.0868	45.1402	13.5746	0.0000	0.0000	0.0000	0.0000	43.0753	124.1285	211.1831 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												887.1094
Space heating per m2										(98c) / (4) =		17.1920 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	383.7906	302.1330	309.5679	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9563	0.9816	0.9761	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	367.0260	296.5778	302.1643	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	550.1818	530.8359	511.8083	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.8721	174.2880	155.9751	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.9680	43.5720	38.9938	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												115.5338 (107)
Energy for space heating												17.1920 (99)
Energy for space cooling												2.2390 (108)
Total												19.4311 (109)
Fabric Energy Efficiency (TFEE)												19.4 (109)

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Property Reference	Apartment No 3			Issued on Date	11/07/2024
Assessment Reference	Apartment No 3	Prop Type Ref	Apartment No 3		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	73 C	DER	8.24	TER	10.84
Environmental	94 A	% DER < TER			23.99
CO ₂ Emissions (t/year)	0.35	DFEE	40.13	TFEE	19.43
Compliance Check	See BREL	% DFEE < TFEE			-106.55
% DPER < TPER	-47.23	DPER	84.99	TPER	57.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.6000 (1b)	2.2500 (2b)	116.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	116.1000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5813 (21)

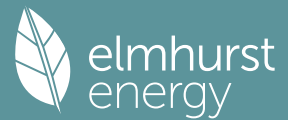
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7411	0.7266	0.7120	0.6394	0.6248	0.5522	0.5522	0.5377	0.5813	0.6248	0.6539	0.6830 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.9911	0.9766	0.9620	0.8894	0.8748	0.8022	0.8022	0.7877	0.8313	0.8748	0.9039	0.9330 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			5.9600	1.2357	7.3650		(27)
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378	60.0000	3312.6000 (29a)
Total net area of external elements Aum(A, m ²)			61.1700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.3028		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000	140.0000	(32)
Party Floor			51.6000			40.0000	2064.0000 (32d)
Party Ceiling			51.6000			30.0000	1548.0000 (32b)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9712.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							188.2171 (35)
Thermal bridges (Default value 0.200 * total exposed area)							12.2340 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.5368 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	37.9718	37.4150	36.8583	34.0746	33.5179	30.7342	30.7342	30.1775	31.8477	33.5179	34.6314	35.7448 (38)
Heat transfer coeff	67.5086	66.9519	66.3951	63.6114	63.0547	60.2710	60.2710	59.7143	61.3845	63.0547	64.1682	65.2817 (39)
Average = Sum(39)m / 12 =												63.4723
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3083	1.2975	1.2867	1.2328	1.2220	1.1680	1.1680	1.1573	1.1896	1.2220	1.2436	1.2651 (40)
HLP (average)												1.2301
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7373 (42)
Hot water usage for mixer showers	68.4696	67.4406	65.9412	63.0724	60.9553	58.5943	57.2523	58.7403	60.3715	62.9065	65.8370	68.2073 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214 (42c)
Average daily hot water use (litres/day)												92.6007 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.8910	98.6830	96.0047	91.9569	88.6608	85.1208	83.7788	86.4459	89.2560	92.9700	97.0794	100.6286 (44)
Energy conte	159.7866	140.5233	147.5556	125.8844	119.3545	104.6660	101.3232	107.0380	110.0616	126.1594	138.3074	157.5601 (45)
Energy content (annual)										Total = Sum(45)m =		1538.2202
Distribution loss (46)m = 0.15 x (45)m	23.9680	21.0785	22.1333	18.8827	17.9032	15.6999	15.1985	16.0557	16.5092	18.9239	20.7461	23.6340 (46)
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009 (64)
										Total per year (kWh/year) = Sum(64)m =		1916.6522 (64)
12Total per year (kWh/year)												1917 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	53.1291	46.7240	49.0622	41.8566	39.6854	34.8014	33.6900	35.5901	36.5955	41.9480	45.9872	52.3887 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	71.4100	69.5298	65.9439	58.1341	53.3405	48.3353	45.2822	47.8362	50.8270	56.3817	63.8711	70.4150 (72)
Total internal gains	357.3295	366.1780	349.4756	336.0873	317.8063	305.6516	293.0698	294.0529	303.8515	314.9847	335.9615	349.6549 (73)

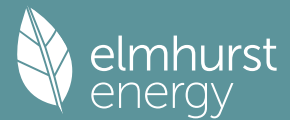
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d		Gains W	
				5.9600	36.7938	0.7200	0.7000			0.7700			
Southwest												76.5923 (79)	
Solar gains	76.5923	130.4650	178.5079	221.1800	247.7400	245.9485	237.1206	217.3056	193.2863	144.1916	91.7399	65.5470 (83)	
Total gains	433.9218	496.6430	527.9835	557.2673	565.5463	551.6001	530.1904	511.3584	497.1378	459.1763	427.7014	415.2019 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.9620	40.2943	40.6322	42.4103	42.7847	44.7608	44.7608	45.1781	43.9488	42.7847	42.0423	41.3252
alpha	3.6641	3.6863	3.7088	3.8274	3.8523	3.9841	3.9841	4.0119	3.9299	3.8523	3.8028	3.7550
util living area	0.9812	0.9682	0.9483	0.8985	0.8080	0.6385	0.4838	0.5157	0.7289	0.9077	0.9672	0.9836 (86)
MIT	19.2511	19.5082	19.8429	20.3182	20.6712	20.9138	20.9777	20.9717	20.8434	20.3928	19.7908	19.2680 (87)
Th 2	19.8343	19.8428	19.8512	19.8939	19.9024	19.9457	19.9457	19.9543	19.9283	19.9024	19.8853	19.8682 (88)

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util rest of house	0.9765	0.9604	0.9352	0.8721	0.7570	0.5535	0.3753	0.4078	0.6506	0.8784	0.9580	0.9796 (89)
MIT 2	17.8354	18.1646	18.5893	19.2000	19.6121	19.8899	19.9368	19.9421	19.8157	19.3051	18.5529	17.8789 (90)
Living area fraction									FLA =	Living area /	(4) =	0.5269 (91)
MIT	18.5814	18.8726	19.2498	19.7892	20.1702	20.4294	20.4853	20.4846	20.3572	19.8783	19.2052	18.6109 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5814	18.8726	19.2498	19.7892	20.1702	20.4294	20.4853	20.4846	20.3572	19.8783	19.2052	18.6109 (93)

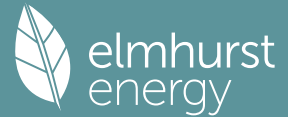
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9698	0.9521	0.9267	0.8692	0.7706	0.5941	0.4320	0.4639	0.6840	0.8776	0.9507	0.9736	(94)
Useful gains	420.8025	472.8448	489.2984	484.3794	435.8093	327.7011	229.0437	237.2011	340.0648	402.9771	406.6293	404.2240	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	964.1175	935.4903	846.5265	692.6796	534.0847	351.3453	234.1717	243.9109	384.0976	585.0387	776.7690	940.7643	(97)
Space heating kWh	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98a)
Space heating requirement - total per year (kWh/year)												2005.1353	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2005.1353	
Space heating per m2											(98c) / (4) =	38.8592	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	404.2263	310.8977	265.7777	149.9761	73.1169	0.0000	0.0000	0.0000	0.0000	135.4538	266.5006	399.1860	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	191.9274	169.5537	179.6964	156.9884	151.4953	135.7700	133.4640	139.1788	141.1656	158.3002	169.4114	189.7009	(64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
Fuel for water heating, kWh/month	63.3518	55.9666	59.3146	51.8190	50.0059	44.8152	44.0541	45.9404	46.5962	52.2520	55.9196	62.6169	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
Pumps and Fa	3.1999	2.8903	3.1999	3.0967	3.1999	3.0967	3.1999	3.1999	3.0967	3.1999	3.0967	3.1999	(221)
Lighting	16.8948	13.5537	12.2036	8.9409	6.9062	5.6424	6.3000	8.1890	10.6367	13.9560	15.7633	17.3644	(222)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													2005.1353 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													302.9550
Water heating fuel used													632.6524 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)													37.6768 (230a)
Total electricity for the above, kWh/year													37.6768 (231)
Electricity for lighting (calculated in Appendix L)													136.3509 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													2811.8154 (238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2005.1353	0.1552	311.1252 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	632.6524	0.1410	89.2216 (264)
Space and water heating			400.3468 (265)
Pumps, fans and electric keep-hot	37.6768	0.1387	5.2262 (267)
Energy for lighting	136.3509	0.1443	19.6797 (268)
Total CO ₂ , kg/year			425.2527 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.2400 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2005.1353	1.5744	3156.9834 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	632.6524	1.5215	962.5656 (278)
Space and water heating			4119.5490 (279)
Pumps, fans and electric keep-hot	37.6768	1.5128	56.9974 (281)
Energy for lighting	136.3509	1.5338	209.1396 (282)
Total Primary energy kWh/year			4385.6860 (286)
Dwelling Primary energy Rate (DPER)			84.9900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	51.6000 (1b)	x 2.2500 (2b)	= 116.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 116.1000 (5)

2. Ventilation rate

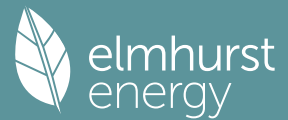
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1723 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4223 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3273 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4173	0.4091	0.4009	0.3600	0.3518	0.3109	0.3109	0.3027	0.3273	0.3518	0.3682	0.3845 (22b)
Effective ac	0.5870	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5535	0.5619	0.5678	0.5739 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (Uw = 1.20)			5.9600	1.1450	6.8244		(27)
External Walls	61.1700	5.9600	55.2100	0.1800	9.9378		(29a)
Total net area of external elements Aum(A, m ²)			61.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.7622		(33)
Party Wall shared by Apartment			19.9100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							198.2171 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							3.0585 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	19.8207 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.4916	22.3621	22.2352	21.6389	21.5274	21.0081	21.0081	20.9119	21.2081	21.5274	21.7530	21.9890	(38)
Heat transfer coeff	42.3123	42.1828	42.0559	41.4597	41.3481	40.8288	40.8288	40.7326	41.0288	41.3481	41.5738	41.8097	(39)
Average = Sum(39)m / 12 =												41.4591	
HLP	0.8200	0.8175	0.8150	0.8035	0.8013	0.7913	0.7913	0.7894	0.7951	0.8013	0.8057	0.8103	(40)
HLP (average)												0.8035	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7373 (42)
Hot water usage for mixer showers													
68.4696	67.4406	65.9412	63.0724	60.9553	58.5943	57.2523	58.7403	60.3715	62.9065	65.8370	68.2073	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
32.4214	31.2424	30.0635	28.8845	27.7055	26.5266	26.5266	27.7055	28.8845	30.0635	31.2424	32.4214	(42c)	
Average daily hot water use (litres/day)												92.6007 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.8910	98.6830	96.0047	91.9569	88.6608	85.1208	83.7788	86.4459	89.2560	92.9700	97.0794	100.6286	(44)
Energy content	159.7866	140.5233	147.5556	125.8844	119.3545	104.6660	101.3232	107.0380	110.0616	126.1594	138.3074	157.5601	(45)
Energy content (annual)										Total = Sum(45)m =		1538.2202	
Distribution loss (46)m = 0.15 x (45)m													
23.9680	21.0785	22.1333	18.8827	17.9032	15.6999	15.1985	16.0557	16.5092	18.9239	20.7461	23.6340	(46)	
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
206.3815	182.6091	194.1505	170.9762	165.9494	149.7578	147.9181	153.6329	155.1534	172.7543	183.3992	204.1550	(62)	
WWHRS	-31.3014	-27.6832	-28.9883	-24.0035	-22.3704	-19.1425	-17.9430	-19.0806	-19.8055	-23.3486	-26.4511	-30.7218	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
175.0801	154.9258	165.1622	146.9728	143.5790	130.6154	129.9751	134.5523	135.3479	149.4057	156.9481	173.4332	(64)	
12Total per year (kWh/year)												1795.9977	(64)
Electric shower(s)												1796	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month													
90.4050	80.3926	86.3382	77.9300	76.9613	70.8749	70.9659	72.8661	72.6689	79.2239	82.0607	89.6647	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635	86.8635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	85.4723	94.6300	85.4723	88.3214	85.4723	88.3214	85.4723	85.4723	88.3214	85.4723	88.3214	85.4723 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	151.3882	152.9591	149.0004	140.5728	129.9344	119.9359	113.2562	111.6853	115.6440	124.0716	134.7100	144.7085 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863	31.6863 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908	-69.4908 (71)
Water heating gains (Table 5)	121.5121	119.6318	116.0459	108.2362	103.4426	98.4374	95.3843	97.9383	100.9291	106.4837	113.9732	120.5170 (72)
Total internal gains	410.4316	419.2800	402.5777	389.1894	370.9084	355.7537	343.1719	344.1549	353.9535	368.0867	389.0636	402.7569 (73)

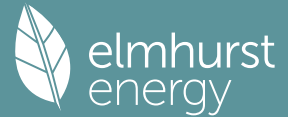
6. Solar gains

[Jan]														
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				5.9600	36.7938		0.6300		0.7000		0.7700		67.0183 (79)	
Solar gains	67.0183	114.1569	156.1944	193.5325	216.7725	215.2049	207.4805	190.1424	169.1255	126.1677	80.2724	57.3537	(83)	
Total gains	477.4498	533.4369	558.7721	582.7218	587.6809	570.9586	550.6523	534.2973	523.0790	494.2544	469.3360	460.1106	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	67.1462	67.3523	67.5556	68.5271	68.7120	69.5860	69.5860	69.7503	69.2467	68.7120	68.3390	67.9534
alpha	5.4764	5.4902	5.5037	5.5685	5.5808	5.6391	5.6391	5.6500	5.6164	5.5808	5.5559	5.5302
util living area												
	0.9589	0.9280	0.8807	0.7778	0.6317	0.4546	0.3258	0.3501	0.5332	0.7834	0.9206	0.9645 (86)

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MIT	20.3340	20.5069	20.6846	20.8699	20.9643	20.9953	20.9994	20.9991	20.9887	20.8849	20.6084	20.3062 (87)
Th 2	20.2360	20.2382	20.2403	20.2503	20.2522	20.2609	20.2609	20.2625	20.2576	20.2522	20.2484	20.2444 (88)
util rest of house												
	0.9506	0.9148	0.8601	0.7449	0.5871	0.4033	0.2713	0.2943	0.4788	0.7451	0.9041	0.9573 (89)
MIT 2	19.4790	19.6918	19.9059	20.1244	20.2226	20.2580	20.2607	20.2622	20.2499	20.1458	19.8269	19.4515 (90)
Living area fraction												0.5269 (91)
MIT	19.9296	20.1213	20.3162	20.5173	20.6134	20.6465	20.6499	20.6505	20.6392	20.5352	20.2387	19.9019 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9296	20.1213	20.3162	20.5173	20.6134	20.6465	20.6499	20.6505	20.6392	20.5352	20.2387	19.9019 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9469	0.9126	0.8623	0.7570	0.6090	0.4302	0.3001	0.3237	0.5070	0.7601	0.9038	0.9535	(94)
Useful gains	452.0792	486.8164	481.8229	441.1337	357.8929	245.6283	165.2233	172.9324	265.1842	375.6969	424.2048	438.7347	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	661.3231	642.0772	581.0523	481.6478	368.5537	246.8724	165.3543	173.1335	268.2957	410.8025	546.2246	656.4903	(97)
Space heating kWh													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102	(98a)
Space heating requirement - total per year (kWh/year)												646.9241	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												646.9241	
Space heating per m2												(98c) / (4) =	12.5373 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	155.6774	104.3353	73.8267	29.1701	7.9316	0.0000	0.0000	0.0000	0.0000	26.1185	87.8543	162.0102 (98)	
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)													
	168.6646	113.0393	79.9856	31.6036	8.5933	0.0000	0.0000	0.0000	0.0000	28.2974	95.1834	175.5257 (211)	
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement													
	175.0801	154.9258	165.1622	146.9728	143.5790	130.6154	129.9751	134.5523	135.3479	149.4057	156.9481	173.4332 (64)	
Efficiency of water heater (217)m													
	83.7974	83.1932	82.3792	81.1622	80.2257	79.8000	79.8000	79.8000	79.8000	81.0219	82.8121	83.9073 (217)	
Fuel for water heating, kWh/month													
	208.9327	186.2241	200.4902	181.0851	178.9689	163.6784	162.8761	168.6119	169.6089	184.4016	189.5232	206.6964 (219)	
Space cooling fuel requirement (221)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa													
	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting													
	17.7595	14.2473	12.8281	9.3984	7.2596	5.9312	6.6225	8.6081	11.1811	14.6702	16.5700	18.2530 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m													
	-13.9826	-20.7978	-31.5228	-37.4445	-42.1572	-40.0248	-39.5652	-36.4840	-31.3344	-24.6810	-15.7626	-11.9675 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m													
	-4.9055	-10.5626	-21.4496	-32.8867	-44.1353	-44.5648	-44.0124	-36.9400	-26.6715	-15.2919	-6.6106	-3.8593 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													700.8928 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													79.8000
Water heating fuel used													2201.0975 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													143.3290 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-637.6148 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													2493.7045 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	700.8928	0.2100	147.1875 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2201.0975	0.2100	462.2305 (264)
Space and water heating			609.4180 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	143.3290	0.1443	20.6868 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.7245	0.1335	-46.1403
PV Unit electricity exported	-291.8903	0.1253	-36.5772
Total			-82.7176 (269)
Total CO2, kg/year			559.3165 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.8400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	700.8928	1.1300	792.0089 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2201.0975	1.1300	2487.2402 (278)
Space and water heating			3279.2491 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	143.3290	1.5338	219.8428 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-345.7245	1.4932	-516.2291
PV Unit electricity exported	-291.8903	0.4600	-134.2558
Total			-650.4849 (283)
Total Primary energy kWh/year			2978.7077 (286)
Target Primary Energy Rate (TPER)			57.7300 (287)

Predicted Energy Assessment



36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB

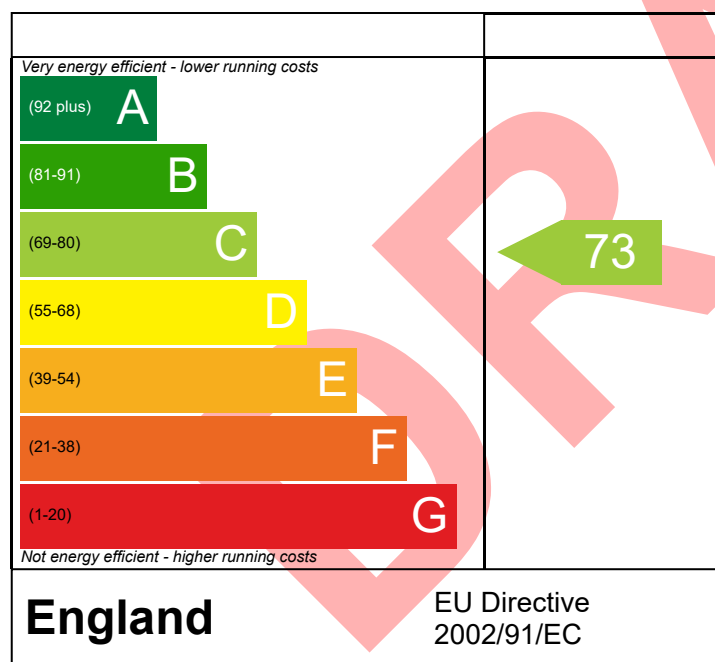
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Mid-Terrace
11/07/2024
Daniel Watt
51.6 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

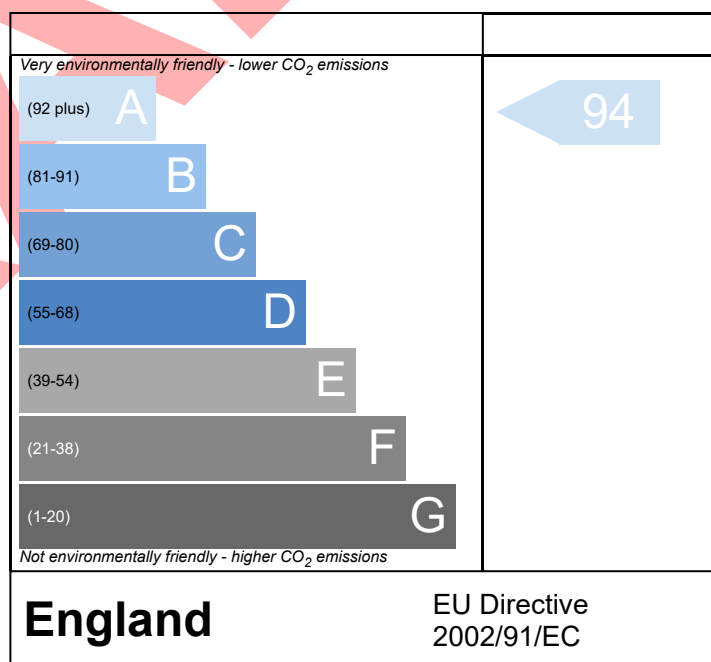
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 11 Jul 2024 11:28:29

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/027301	Assessment Date	2024-07-11

Dwelling Details			
Assessment Type	As designed	Total Floor Area	61 m ²
Site Reference	Apartment No 4	Plot Reference	Apartment No 4
Address	36-436a BarlowMoor road, Manchester , M21 0AB		

Client Details	
Name	Paul Butler Associates
Company	Paul Butler Associates
Address	31 Blackfriars Road, Manchester, M3 7AQ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	9.98 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	8.04 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	52.73 kWh _{PE} /m ²		
Dwelling primary energy	82.8 kWh _{PE} /m ²		FAIL

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	20.4 kWh/m ²		
Dwelling fabric energy efficiency	41.3 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.15	Roof (1) (0.15)	OK
Windows, doors, and roof windows	1.6	1.3	Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	39.7	0.18	
Party wall: Party Wall (1)	20.02	0 (!)	
Exposed roof: Roof (1)	4.05	0.15	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Windows, Window	6.56	South West	0.7	1.3
Windows, Window	1.62	South East	0.7	1.3
Windows, Window	3.26	North East	0.7	1.3

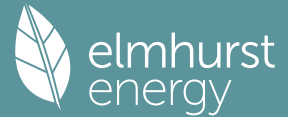
2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m ² K) used for thermal bridging	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	15 m ³ /hm ² , Assumed value		FAIL
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Room heaters - Electricity		
Efficiency	100.0%	
Emitter type		
Flow temperature		
System type	Panel, convector or radiant heaters	
Manufacturer		
Model		
Commissioning		
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	0.0%	
Emitter type		
Flow temperature		
System type	Heat Pump	
Manufacturer	Auer	
Model	EDL170-520RF	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	120 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	0.7 W/(l/s)	
Specific fan power	0.19 W/(l/s)	OK
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model	Sentinel Multivent	
Commissioning		
9 Local generation		

N/A	
10 Heat networks	
N/A	
11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
<p>This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.</p>	
<p>Signed:</p> <p>Name:</p>	<p>Assessor ID:</p> <p>Date:</p>
b. Client Declaration	
N/A	

Full SAP Calculation Printout



Property Reference	Apartment No 4			Issued on Date	11/07/2024
Assessment Reference	Apartment No 4	Prop Type Ref	Apartment No 4		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	72 C	DER	8.04	TER	9.98
Environmental	94 A	% DER < TER			19.44
CO ₂ Emissions (t/year)	0.4	DFEE	41.32	TFEE	20.37
Compliance Check	See BREL	% DFEE < TFEE			-102.82
% DPER < TPER	-57.02	DPER	82.80	TPER	52.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0100 (1b)	2.2500 (2b)	137.2725 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2725 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

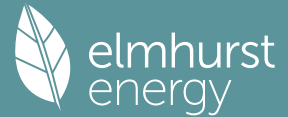
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			11.4400	1.2357	14.1369		(27)
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460	60.0000	2382.0000 (29a)
Roof	4.0500		4.0500	0.1500	0.6075	9.0000	36.4500 (30)
Total net area of external elements Aum(A, m ²)			55.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.8904		(33)
Party Wall shared by Apartment			20.0200	0.0000	0.0000	140.0000	2802.8000 (32)
Party Floor			61.0100			40.0000	2440.4000 (32a)
Party Ceiling			56.9600			30.0000	1708.8000 (32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9370.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							153.5888 (35)
Thermal bridges (Default value 0.200 * total exposed area)							11.0380 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		32.9284 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

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(38)m	Jan 51.3942	Feb 50.6085	Mar 49.8228	Apr 45.8945	May 45.1088	Jun 41.1805	Jul 41.1805	Aug 40.3948	Sep 42.7518	Oct 45.1088	Nov 46.6802	Dec 48.2515	(38)
Heat transfer coeff	84.3226	83.5369	82.7512	78.8229	78.0372	74.1088	74.1088	73.3232	75.6802	78.0372	79.6085	81.1799	(39)
Average = Sum(39)m / 12 =												78.6265	
HLP	Jan 1.3821	Feb 1.3692	Mar 1.3564	Apr 1.2920	May 1.2791	Jun 1.2147	Jul 1.2147	Aug 1.2018	Sep 1.2405	Oct 1.2791	Nov 1.3048	Dec 1.3306	(40)
HLP (average)												1.2887	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0100 (42)
Hot water usage for mixer showers													
74.3644	73.2469	71.6184	68.5026	66.2031	63.6389	62.1813	63.7975	65.5691	68.3224	71.5051	74.0795	(42a)	
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses													
35.2148	33.9343	32.6538	31.3732	30.0927	28.8121	28.8121	30.0927	31.3732	32.6538	33.9343	35.2148	(42c)	
Average daily hot water use (litres/day)												100.5750 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
109.5793	107.1812	104.2721	99.8758	96.2958	92.4510	90.9935	93.8902	96.9424	100.9761	105.4394	109.2944	(44)	
Energy content (annual)	173.5468	152.6246	160.2624	136.7249	129.6327	113.6793	110.0487	116.2557	119.5396	137.0237	150.2178	171.1285	(45)
Energy content (annual)										Total = Sum(45)m =		1670.6848	
Distribution loss (46)m = 0.15 x (45)m	26.0320	22.8937	24.0394	20.5087	19.4449	17.0519	16.5073	17.4384	17.9309	20.5536	22.5327	25.6693	(46)
Water storage loss:													
Store volume												173.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0368	(55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2049.1168	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	57.7043	50.7477	53.2872	45.4610	43.1029	37.7984	36.5912	38.6550	39.7469	45.5604	49.9474	56.9002	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 100.5021	Feb 100.5021	Mar 100.5021	Apr 100.5021	May 100.5021	Jun 100.5021	Jul 100.5021	Aug 100.5021	Sep 100.5021	Oct 100.5021	Nov 100.5021	Dec 100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)	77.5595	75.5174	71.6226	63.1403	57.9340	52.4977	49.1817	51.9557	55.2041	61.2371	69.3714	76.4788	(72)
Total internal gains	396.0455	405.4510	387.3407	372.0842	351.5511	337.5196	323.4657	324.4187	335.2509	348.0581	371.5192	387.2218	(73)

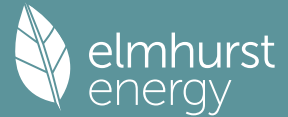
6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access	Gains	
				m2	Table 6a	Specific data		Specific data		factor	W	
					W/m2	or Table 6b		or Table 6c		Table 6d		
Northeast				3.2600	11.2829	0.7200		0.7000		0.7700	12.8471 (75)	
Southeast				1.6200	36.7938	0.7200		0.7000		0.7700	20.8187 (77)	
Southwest				6.5600	36.7938	0.7200		0.7000		0.7700	84.3029 (79)	
Solar gains	117.9687	205.2116	292.1141	380.9421	444.0280	448.4447	429.1743	380.9432	322.6926	229.8586	142.0764	100.4538 (83)
Total gains	514.0142	610.6626	679.4549	753.0264	795.5791	785.9644	752.6400	705.3619	657.9435	577.9167	513.5956	487.6756 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
Jan	30.8684	31.1587	31.4546	33.0222	33.3546	35.1227	35.1227	35.4990	34.3935	33.3546	32.6963	32.0634		
alpha	3.0579	3.0772	3.0970	3.2015	3.2236	3.3415	3.3415	3.3666	3.2929	3.2236	3.1798	3.1376		
util living area	0.9704	0.9499	0.9174	0.8431	0.7271	0.5536	0.4178	0.4565	0.6721	0.8735	0.9514	0.9741	(86)	

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MIT	18.8331	19.1717	19.6175	20.2229	20.6398	20.9027	20.9712	20.9619	20.8024	20.2499	19.4990	18.8550 (87)
Th 2	19.7771	19.7870	19.7970	19.8471	19.8573	19.9083	19.9083	19.9185	19.8878	19.8573	19.8370	19.8169 (88)
util rest of house	0.9641	0.9396	0.9002	0.8110	0.6724	0.4745	0.3205	0.3578	0.5951	0.8404	0.9397	0.9687 (89)
MIT 2	17.3020	17.7325	18.2932	19.0586	19.5384	19.8430	19.8957	19.9006	19.7406	19.1146	18.1809	17.3538 (90)
Living area fraction									fLA = Living area / (4) =			0.3372 (91)
MIT	17.8183	18.2178	18.7397	19.4512	19.9098	20.2003	20.2583	20.2584	20.0986	19.4974	18.6253	17.8599 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8183	18.2178	18.7397	19.4512	19.9098	20.2003	20.2583	20.2584	20.0986	19.4974	18.6253	17.8599 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9220	0.8813	0.7984	0.6751	0.4966	0.3525	0.3898	0.6109	0.8280	0.9237	0.9560	(94)
Useful gains	488.2863	563.0418	598.7838	601.1893	537.1131	390.2937	265.3249	274.9424	401.9227	478.4880	474.3982	466.2036	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1139.8937	1112.5251	1012.8510	831.6744	640.6664	415.0298	271.1143	282.9111	453.9766	694.3252	917.5123	1108.9114	(97)
Space heating kWh	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(98a)
Space heating requirement - total per year (kWh/year)												2362.9073	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2362.9073	
Space heating per m2											(98c) / (4) =	38.7298	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Water heating													
Water heating requirement	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693	(64)
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
(217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(217)
Fuel for water heating, kWh/month	67.8938	59.9610	63.5088	55.3973	53.3985	47.7904	46.9342	48.9830	49.7248	55.8382	59.8511	67.0956	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.7835	3.4174	3.7835	3.6615	3.7835	3.6615	3.7835	3.7835	3.6615	3.7835	3.6615	3.7835	(231)
Lighting	18.8191	15.0974	13.5935	9.9592	7.6928	6.2851	7.0176	9.1218	11.8483	15.5456	17.5587	19.3422	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2362.9073	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	
Water heating fuel used												676.3766	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)												44.5477	(230a)
Total electricity for the above, kWh/year												44.5477	(231)
Electricity for lighting (calculated in Appendix L)												151.8812	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)

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Total delivered energy for all uses

3235.7127 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2362.9073	0.1554	367.0939 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	676.3766	0.1411	95.4129 (264)
Space and water heating			462.5067 (265)
Pumps, fans and electric keep-hot	44.5477	0.1387	6.1793 (267)
Energy for lighting	151.8812	0.1443	21.9211 (268)
Total CO ₂ , kg/year			490.6072 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0400 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2362.9073	1.5752	3721.9529 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	676.3766	1.5216	1029.1843 (278)
Space and water heating			4751.1372 (279)
Pumps, fans and electric keep-hot	44.5477	1.5128	67.3917 (281)
Energy for lighting	151.8812	1.5338	232.9604 (282)
Total Primary energy kWh/year			5051.4893 (286)
Dwelling Primary energy Rate (DPER)			82.8000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0100 (1b)	x 2.2500 (2b)	= 137.2725 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2725 (5)

2. Ventilation rate

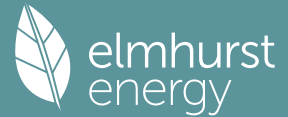
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4667	0.4575	0.4484	0.4026	0.3935	0.3477	0.3477	0.3386	0.3660	0.3935	0.4118	0.4301 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5811	0.5774	0.5605	0.5605	0.5573	0.5670	0.5774	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			11.4400	1.1450	13.0992		(27)
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460		(29a)
Roof	4.0500		4.0500	0.1100	0.4455		(30)
Total net area of external elements A _{um} (A, m ²)			55.1900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.6907		(33)
Party Wall shared by Apartment			20.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							162.9249 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
 Point Thermal bridges (36a) = 2.7595 (36)
 Total fabric heat loss (33) + (36) + (36a) = 23.4502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5828	27.3912	27.2035	26.3216	26.1566	25.3885	25.3885	25.2463	25.6844	26.1566	26.4904	26.8393	(38)
Heat transfer coeff	51.0330	50.8415	50.6537	49.7718	49.6068	48.8387	48.8387	48.6965	49.1346	49.6068	49.9406	50.2896	(39)
Average = Sum(39)m / 12 =												49.7710	
HLP	0.8365	0.8333	0.8303	0.8158	0.8131	0.8005	0.8005	0.7982	0.8054	0.8131	0.8186	0.8243	(40)
HLP (average)												0.8158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0100 (42)
Hot water usage for mixer showers													
74.3644	73.2469	71.6184	68.5026	66.2031	63.6389	62.1813	63.7975	65.5691	68.3224	71.5051	74.0795	74.0795	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
35.2148	33.9343	32.6538	31.3732	30.0927	28.8121	28.8121	30.0927	31.3732	32.6538	33.9343	35.2148	35.2148	(42c)
Average daily hot water use (litres/day)												100.5750	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
109.5793	107.1812	104.2721	99.8758	96.2958	92.4510	90.9935	93.8902	96.9424	100.9761	105.4394	109.2944	109.2944	(44)
Energy conte	173.5468	152.6246	160.2624	136.7249	129.6327	113.6793	110.0487	116.2557	119.5396	137.0237	150.2178	171.1285	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
26.0320	22.8937	24.0394	20.5087	19.4449	17.0519	16.5073	17.4384	17.9309	20.5536	22.5327	25.6693	25.6693	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
220.1417	194.7103	206.8573	181.8168	176.2276	158.7712	156.6436	162.8506	164.6315	183.6186	195.3097	217.7234	217.7234	(62)
WWHRS	-33.9963	-30.0666	-31.4840	-26.0700	-24.2963	-20.7905	-19.4878	-20.7233	-21.5107	-25.3587	-28.7284	-33.3667	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	186.1454	164.6437	175.3733	155.7468	151.9313	137.9806	137.1558	142.1272	143.1208	158.2599	166.5813	184.3567	(64)
12Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
94.9802	84.4162	90.5632	81.5345	80.3788	73.8718	73.8671	75.9309	75.8204	82.8363	86.0209	94.1762	94.1762	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)													
127.6616	125.6194	121.7247	113.2424	108.0360	102.5998	99.2838	102.0577	105.3061	111.3391	119.4735	126.5809	126.5809	(72)
Total internal gains	449.1476	458.5530	440.4428	425.1863	404.6531	387.6217	373.5678	374.5207	385.3529	401.1602	424.6213	440.3239	(73)

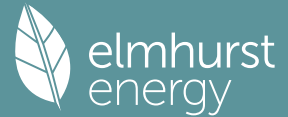
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				3.2600	11.2829	0.6300	0.7000	0.7700	11.2412 (75)				
Southeast				1.6200	36.7938	0.6300	0.7000	0.7700	18.2164 (77)				
Southwest				6.5600	36.7938	0.6300	0.7000	0.7700	73.7651 (79)				
Solar gains	103.2226	179.5601	255.5998	333.3244	388.5245	392.3891	375.5275	333.3253	282.3560	201.1263	124.3169	87.8970	(83)
Total gains	552.3702	638.1132	696.0426	758.5106	793.1776	780.0108	749.0953	707.8461	667.7089	602.2865	548.9381	528.2209	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
 Utilisation factor for gains for living area, nil,m (see Table 9a)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.1047	54.3085	54.5098	55.4757	55.6602	56.5355	56.5355	56.7007	56.1951	55.6602	55.2882	54.9045	
alpha	4.6070	4.6206	4.6340	4.6984	4.7107	4.7690	4.7690	4.7800	4.7463	4.7107	4.6859	4.6603	
util living area	0.9477	0.9074	0.8439	0.7183	0.5618	0.3976	0.2863	0.3156	0.4975	0.7556	0.9055	0.9548	(86)
MIT	20.1346	20.3690	20.6121	20.8481	20.9583	20.9936	20.9989	20.9983	20.9819	20.8389	20.4786	20.1008	(87)
Th 2	20.2218	20.2245	20.2272	20.2397	20.2420	20.2529	20.2529	20.2549	20.2487	20.2420	20.2373	20.2323	(88)
util rest of house	0.9389	0.8933	0.8221	0.6858	0.5209	0.3523	0.2380	0.2649	0.4467	0.7187	0.8889	0.9471	(89)
MIT 2	19.2291	19.5178	19.8106	20.0895	20.2060	20.2486	20.2524	20.2541	20.2355	20.0876	19.6665	19.1955	(90)
Living area fraction	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	FLA = Living area / (4) =	20.3409	19.9403	19.5007	(91)
MIT	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	20.4871	20.3409	19.9403	19.5007	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	20.4871	20.3409	19.9403	19.5007	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9297	0.8848	0.8176	0.6905	0.5328	0.3674	0.2543	0.2819	0.4630	0.7238	0.8816	0.9384	(94)
Useful gains	513.5439	564.5873	569.1158	523.7242	422.6142	286.5598	190.4632	199.5595	309.1482	435.9278	483.9319	495.6600	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	777.4573	757.7806	687.9211	569.6506	434.5381	288.1379	190.6716	199.9000	313.8296	483.2156	641.2538	769.4666	(97)
Space heating kWh	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98a)
Space heating requirement - total per year (kWh/year)												808.6731	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												808.6731	
Space heating per m2										(98c) / (4) =		13.2548	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating fuel (main heating system)	212.7319	140.6565	95.7651	35.8255	9.6115	0.0000	0.0000	0.0000	0.0000	38.1172	122.7214	220.7065	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	186.1454	164.6437	175.3733	155.7468	151.9313	137.9806	137.1558	142.1272	143.1208	158.2599	166.5813	184.3567	(64)	
Efficiency of water heater (217)m	84.1797	83.5326	82.6056	81.2420	80.2487	79.8000	79.8000	79.8000	79.8000	81.2986	83.2136	84.2842	(216)	
Fuel for water heating, kWh/month	221.1286	197.1012	212.3018	191.7072	189.3255	172.9081	171.8745	178.1043	179.3493	194.6649	200.1851	218.7322	(217)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	18.6687	14.9768	13.4849	9.8796	7.6313	6.2348	6.9615	9.0489	11.7536	15.4213	17.4184	19.1876	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-16.4290	-24.3851	-36.8848	-43.7202	-49.1344	-46.6048	-46.0487	-42.4876	-36.5485	-28.8728	-18.4952	-14.0656	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-5.9036	-12.6944	-25.7479	-39.4369	-52.8949	-53.4109	-52.7705	-44.3262	-32.0356	-18.3898	-7.9581	-4.6474	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1													876.1356	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2327.3828	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													150.6675	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-753.8930	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													2686.2929	(238)

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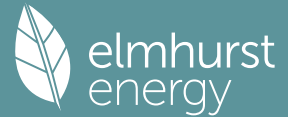
----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	876.1356	0.2100	183.9885 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2327.3828	0.2100	488.7504 (264)
Space and water heating			672.7389 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.6675	0.1443	21.7460 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.6768	0.1335	-53.8943
PV Unit electricity exported	-350.2162	0.1253	-43.8932
Total			-97.7875 (269)
Total CO2, kg/year			608.6266 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	876.1356	1.1300	990.0332 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2327.3828	1.1300	2629.9426 (278)
Space and water heating			3619.9758 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.6675	1.5338	231.0988 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.6768	1.4934	-602.8364
PV Unit electricity exported	-350.2162	0.4600	-161.1088
Total			-763.9452 (283)
Total Primary energy kWh/year			3217.2303 (286)
Target Primary Energy Rate (TPER)			52.7300 (287)

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Property Reference	Apartment No 4			Issued on Date	11/07/2024
Assessment Reference	Apartment No 4	Prop Type Ref	Apartment No 4		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	72 C	DER	8.04	TER	9.98
Environmental	94 A	% DER < TER			19.44
CO ₂ Emissions (t/year)	0.4	DFEE	41.32	TFEE	20.37
Compliance Check	See BREL	% DFEE < TFEE			-102.82
% DPER < TPER	-57.02	DPER	82.80	TPER	52.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0100 (1b)	2.2500 (2b)	137.2725 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2725 (5)

2. Ventilation rate

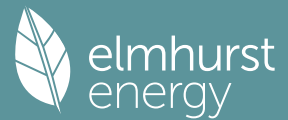
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1457 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8285 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0564	1.0356	1.0149	0.9114	0.8907	0.7871	0.7871	0.7664	0.8285	0.8907	0.9321	0.9735 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	1.0564	1.0356	1.0149	0.9153	0.8966	0.8098	0.8098	0.7937	0.8432	0.8966	0.9344	0.9739 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			11.4400	1.2357	14.1369		(27)
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460	60.0000	2382.0000 (29a)
Roof	4.0500		4.0500	0.1500	0.6075	9.0000	36.4500 (30)
Total net area of external elements Aum(A, m ²)			55.1900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	21.8904	(33)
Party Wall shared by Apartment			20.0200	0.0000	0.0000	140.0000	2802.8000 (32)
Party Floor			61.0100			40.0000	2440.4000 (32d)
Party Ceiling			56.9600			40.0000	2278.4000 (32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9940.0500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							162.9249 (35)
Thermal bridges (Default value 0.200 * total exposed area)							11.0380 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		32.9284 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	47.8531	46.9148	45.9765	41.4629	40.6175	36.6819	36.6819
	35.9531	38.1979	40.6175	42.3278	44.1158	(38)	

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Heat transfer coeff
80.7815 79.8432 78.9049 74.3913 73.5459 69.6103 69.6103 68.8815 71.1262 73.5459 75.2562 77.0442 (39)
Average = Sum(39)m / 12 = 74.3784

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3241	1.3087	1.2933	1.2193	1.2055	1.1410	1.1410	1.1290	1.1658	1.2055	1.2335	1.2628	(40)
HLP (average)												1.2191	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0100 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 25.0313 24.6596 24.1361 23.1708 22.4481 21.6466 21.2137 21.7336 22.2996 23.1571 24.1423 24.9467 (42b)

Hot water usage for other uses 35.2148 33.9343 32.6538 31.3732 30.0927 28.8121 28.8121 30.0927 31.3732 32.6538 33.9343 35.2148 (42c)

Average daily hot water use (litres/day) 55.2215 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	60.2462	58.5939	56.7898	54.5440	52.5407	50.4588	50.0259	51.8263	53.6728	55.8109	58.0766	60.1615	(44)
Energy conte	95.4152	83.4369	87.2839	74.6681	70.7299	62.0449	60.5020	64.1717	66.1839	75.7349	82.7407	94.1984	(45)
Energy content (annual)										Total = Sum(45)m =		917.1106	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.1029	70.9214	74.1913	63.4679	60.1204	52.7382	51.4267	54.5460	56.2564	64.3746	70.3296	80.0687	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	81.1029	70.9214	74.1913	63.4679	60.1204	52.7382	51.4267	54.5460	56.2564	64.3746	70.3296	80.0687	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				779.5440	(64)
Electric shower(s)	46.3854	41.3298	45.1305	43.0675	43.8756	41.8531	43.2482	43.8756	43.0675	45.1305	44.2819	46.3854	(64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				527.6309	(64a)
Heat gains from water heating, kWh/month	31.8721	28.0628	29.8304	26.6338	25.9990	23.6478	23.6687	24.6054	24.8310	27.3763	28.6529	31.6135	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)	42.8388	41.7601	40.0947	36.9914	34.9449	32.8442	31.8128	33.0718	34.4874	36.7961	39.7957	42.4913	(72)
Total internal gains	361.3248	371.6937	355.8128	345.9353	328.5620	317.8661	306.0968	305.5348	314.5343	323.6171	341.9435	353.2343	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	3.2600	11.2829	0.7200	0.7000	0.7700	12.8471	(75)						
Southeast	1.6200	36.7938	0.7200	0.7000	0.7700	20.8187	(77)						
Southwest	6.5600	36.7938	0.7200	0.7000	0.7700	84.3029	(79)						
Solar gains	117.9687	205.2116	292.1141	380.9432	322.6926	229.8586	142.0764	100.4538	(83)				
Total gains	479.2935	576.9053	647.9269	726.8775	772.5900	766.3108	735.2711	686.4780	637.2269	553.4758	484.0199	453.6881	(84)

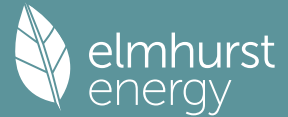
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.1802	34.5819	34.9931	37.1162	37.5429	39.6655	39.6655	40.0851	38.8201	37.5429	36.6897	35.8382	
alpha	3.2787	3.3055	3.3329	3.4744	3.5029	3.6444	3.6444	3.6723	3.5880	3.5029	3.4460	3.3892	
util living area	0.9781	0.9597	0.9288	0.8513	0.7283	0.5447	0.4064	0.4466	0.6708	0.8840	0.9610	0.9812	(86)
MIT	18.9551	19.2937	19.7307	20.3295	20.7100	20.9317	20.9818	20.9750	20.8471	20.3409	19.6204	18.9978	(87)
Th 2	19.8220	19.8340	19.8461	19.9046	19.9156	19.9675	19.9675	19.9772	19.9474	19.9156	19.8933	19.8701	(88)
util rest of house	0.9732	0.9510	0.9132	0.8202	0.6744	0.4687	0.3154	0.3536	0.5956	0.8526	0.9512	0.9771	(89)
MIT 2	17.9927	18.3331	18.7662	19.3745	19.7168	19.9323	19.9615	19.9682	19.8596	19.4057	18.7003	18.0687	(90)

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Living area fraction									fLA = Living area / (4) =	0.3372 (91)	
MIT	18.3172	18.6569	19.0914	19.6965	20.0517	20.2693	20.3055	20.3076	20.1925	19.7210	18.3820 (92)
Temperature adjustment											0.0000
adjusted MIT	18.3172	18.6569	19.0914	19.6965	20.0517	20.2693	20.3055	20.3076	20.1925	19.7210	18.3820 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9647	0.9397	0.9007	0.8136	0.6817	0.4917	0.3458	0.3843	0.6143	0.8460	0.9412	0.9696	(94)
Useful gains	462.3691	542.1325	583.6171	591.3561	526.6944	376.7739	254.2309	263.8416	391.4379	468.2546	455.5457	439.9068	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1132.3313	1098.3976	993.5241	803.1631	614.2299	394.6397	257.9406	269.1646	433.3391	670.8146	896.3381	1092.6367	(97)
Space heating kWh	498.4518	373.8101	304.9708	152.5011	65.1264	0.0000	0.0000	0.0000	0.0000	150.7046	317.3706	485.6310	(98a)
Space heating requirement - total per year (kWh/year)												2348.5665	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	498.4518	373.8101	304.9708	152.5011	65.1264	0.0000	0.0000	0.0000	0.0000	150.7046	317.3706	485.6310	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2348.5665	
Space heating per m2										(98c) / (4) =		38.4948	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	654.3371	515.1164	523.4995	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8777	0.9245	0.9076	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	574.3018	476.2146	475.1414	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	861.6371	827.1582	771.8724	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	206.8814	261.1021	220.7678	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.7204	65.2755	55.1920	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												172.1878	(107)
Energy for space heating												38.4948	(99)
Energy for space cooling												2.8223	(108)
Total												41.3171	(109)
Fabric Energy Efficiency (DFEE)												41.3	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

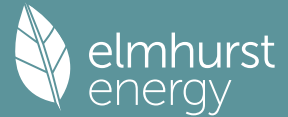
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	61.0100 (1b)	x	2.2500 (2b)	=
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	137.2725 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1457 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3957	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4667	0.4575	0.4484	0.4026	0.3935	0.3477	0.3477	0.3386	0.3660	0.3935	0.4118	0.4301	(22b)

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If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)
 If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23b)
 Effective ac 0.6089 0.6047 0.6005 0.5811 0.5774 0.5605 0.5605 0.5573 0.5670 0.5774 0.5848 0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.20)			11.4400	1.1450	13.0992			(27)					
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460			(29a)					
Roof	4.0500		4.0500	0.1100	0.4455			(30)					
Total net area of external elements Aum(A, m2)			55.1900					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	20.6907			(33)					
Party Wall shared by Apartment			20.0200	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								162.9249 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)								2.7595 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	23.4502	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 27.5828	Feb 27.3912	Mar 27.2035	Apr 26.3216	May 26.1566	Jun 25.3885	Jul 25.3885	Aug 25.2463	Sep 25.6844	Oct 26.1566	Nov 26.4904	Dec 26.8393	(38)
Heat transfer coeff	51.0330	50.8415	50.6537	49.7718	49.6068	48.8387	48.8387	48.6965	49.1346	49.6068	49.9406	50.2896	(39)
Average = Sum(39)m / 12 =												49.7710	
HLP	Jan 0.8365	Feb 0.8333	Mar 0.8303	Apr 0.8158	May 0.8131	Jun 0.8005	Jul 0.8005	Aug 0.7982	Sep 0.8054	Oct 0.8131	Nov 0.8186	Dec 0.8243	(40)
HLP (average)												0.8158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0100 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	25.0313	24.6596	24.1361	23.1708	22.4481	21.6466	21.2137	21.7336	22.2996	23.1571	24.1423	24.9467	(42b)
Hot water usage for other uses	35.2148	33.9343	32.6538	31.3732	30.0927	28.8121	28.8121	30.0927	31.3732	32.6538	33.9343	35.2148	(42c)
Average daily hot water use (litres/day)													55.2215 (43)
Daily hot water use	Jan 60.2462	Feb 58.5939	Mar 56.7898	Apr 54.5440	May 52.5407	Jun 50.4588	Jul 50.0259	Aug 51.8263	Sep 53.6728	Oct 55.8109	Nov 58.0766	Dec 60.1615	(44)
Energy conte	95.4152	83.4369	87.2839	74.6681	70.7299	62.0449	60.5020	64.1717	66.1839	75.7349	82.7407	94.1984	(45)
Energy content (annual)										Total = Sum(45)m =		917.1106	
Distribution loss (46)m = 0.15 x (45)m													0.0000 (46)
Water storage loss:													
Total storage loss													0.0000 (56)
If cylinder contains dedicated solar storage													0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	81.1029	70.9214	74.1913	63.4679	60.1204	52.7382	51.4267	54.5460	56.2564	64.3746	70.3296	80.0687	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	81.1029	70.9214	74.1913	63.4679	60.1204	52.7382	51.4267	54.5460	56.2564	64.3746	70.3296	80.0687	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		779.5440	(64)
Electric shower(s)	46.3854	41.3298	45.1305	43.0675	43.8756	41.8531	43.2482	43.8756	43.0675	45.1305	44.2819	46.3854	(64a)
Heat gains from water heating, kWh/month	31.8721	28.0628	29.8304	26.6338	25.9990	23.6478	23.6687	24.6054	24.8310	27.3763	28.6529	31.6135	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 100.5021	Feb 100.5021	Mar 100.5021	Apr 100.5021	May 100.5021	Jun 100.5021	Jul 100.5021	Aug 100.5021	Sep 100.5021	Oct 100.5021	Nov 100.5021	Dec 100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)	42.8388	41.7601	40.0947	36.9914	34.9449	32.8442	31.8128	33.0718	34.4874	36.7961	39.7957	42.4913	(72)
Total internal gains	361.3248	371.6937	355.8128	345.9353	328.5620	317.8661	306.0968	305.5348	314.5343	323.6171	341.9435	353.2343	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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Northeast	3.2600	11.2829	0.6300	0.7000	0.7700	11.2412 (75)
Southeast	1.6200	36.7938	0.6300	0.7000	0.7700	18.2164 (77)
Southwest	6.5600	36.7938	0.6300	0.7000	0.7700	73.7651 (79)

Solar gains	103.2226	179.5601	255.5998	333.3244	388.5245	392.3891	375.5275	333.3253	282.3560	201.1263	124.3169	87.8970 (83)
Total gains	464.5474	551.2538	611.4126	679.2597	717.0865	710.2553	681.6243	638.8601	596.8903	524.7434	466.2603	441.1313 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.1047	54.3085	54.5098	55.4757	55.6602	56.5355	56.5355	56.7007	56.1951	55.6602	55.2882	54.9045
alpha	4.6070	4.6206	4.6340	4.6984	4.7107	4.7690	4.7690	4.7800	4.7463	4.7107	4.6859	4.6603
util living area	0.9713	0.9411	0.8888	0.7715	0.6121	0.4351	0.3144	0.3491	0.5506	0.8178	0.9432	0.9763 (86)
MIT	19.9444	20.2103	20.4963	20.7931	20.9406	20.9906	20.9984	20.9974	20.9724	20.7702	20.3272	19.9062 (87)
Th 2	20.2218	20.2245	20.2272	20.2397	20.2420	20.2529	20.2529	20.2549	20.2487	20.2420	20.2373	20.2323 (88)
util rest of house	0.9659	0.9310	0.8710	0.7406	0.5696	0.3861	0.2614	0.2932	0.4961	0.7846	0.9318	0.9718 (89)
MIT 2	19.2642	19.5241	19.7980	20.0774	20.2015	20.2479	20.2523	20.2539	20.2327	20.0656	19.6511	19.2353 (90)
Living area fraction	FLA = Living area / (4) = 0.3372 (91)											
MIT	19.4936	19.7554	20.0334	20.3187	20.4507	20.4983	20.5039	20.5046	20.4821	20.3032	19.8791	19.4615 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4936	19.7554	20.0334	20.3187	20.4507	20.4983	20.5039	20.5046	20.4821	20.3032	19.8791	19.4615 (93)

8. Space heating requirement

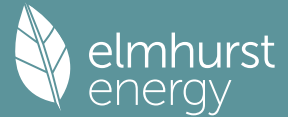
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9599	0.9240	0.8661	0.7440	0.5815	0.4023	0.2793	0.3120	0.5133	0.7875	0.9256	0.9663 (94)
Useful gains	445.9110	509.3590	529.5387	505.3802	417.0188	285.7398	190.3440	199.3467	306.3918	413.2340	431.5844	426.2828 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	775.3727	755.2708	685.5174	568.3295	434.0937	288.0673	190.6598	199.8789	313.5830	481.3433	638.1938	767.4921 (97)
Space heating kWh	245.1195	165.2528	116.0482	45.3235	12.7038	0.0000	0.0000	0.0000	0.0000	50.6733	148.7588	253.8597 (98a)
Space heating requirement - total per year (kWh/year)	1037.7395											
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000											
Space heating kWh	245.1195	165.2528	116.0482	45.3235	12.7038	0.0000	0.0000	0.0000	0.0000	50.6733	148.7588	253.8597 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1037.7395											
Space heating per m2	(98c) / (4) = 17.0093 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	459.0842	361.4067	370.0935	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9680	0.9850	0.9789	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	444.3981	355.9846	362.3029	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	796.1176	764.4542	716.2151	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	253.2380	303.9014	263.3107	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.3095	75.9754	65.8277	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	205.1125 (107)											
Energy for space heating	17.0093 (99)											
Energy for space cooling	3.3619 (108)											
Total	20.3713 (109)											
Fabric Energy Efficiency (TFEE)	20.4 (109)											

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Property Reference	Apartment No 4			Issued on Date	11/07/2024
Assessment Reference	Apartment No 4	Prop Type Ref	Apartment No 4		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	72 C	DER	8.04	TER	9.98
Environmental	94 A	% DER < TER			19.44
CO ₂ Emissions (t/year)	0.4	DFEE	41.32	TFEE	20.37
Compliance Check	See BREL	% DFEE < TFEE			-102.82
% DPER < TPER	-57.02	DPER	82.80	TPER	52.73
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0100 (1b)	2.2500 (2b)	137.2725 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	137.2725 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

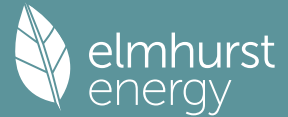
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			11.4400	1.2357	14.1369		(27)
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460	60.0000	2382.0000 (29a)
Roof	4.0500		4.0500	0.1500	0.6075	9.0000	36.4500 (30)
Total net area of external elements Aum(A, m ²)			55.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.8904		(33)
Party Wall shared by Apartment			20.0200	0.0000	0.0000	140.0000	2802.8000 (32)
Party Floor			61.0100			40.0000	2440.4000 (32a)
Party Ceiling			56.9600			30.0000	1708.8000 (32b)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9370.4500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							153.5888 (35)
Thermal bridges (Default value 0.200 * total exposed area)							11.0380 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		32.9284 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

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(38)m	Jan 51.3942	Feb 50.6085	Mar 49.8228	Apr 45.8945	May 45.1088	Jun 41.1805	Jul 41.1805	Aug 40.3948	Sep 42.7518	Oct 45.1088	Nov 46.6802	Dec 48.2515	(38)
Heat transfer coeff	84.3226	83.5369	82.7512	78.8229	78.0372	74.1088	74.1088	73.3232	75.6802	78.0372	79.6085	81.1799	(39)
Average = Sum(39)m / 12 =												78.6265	
HLP	Jan 1.3821	Feb 1.3692	Mar 1.3564	Apr 1.2920	May 1.2791	Jun 1.2147	Jul 1.2147	Aug 1.2018	Sep 1.2405	Oct 1.2791	Nov 1.3048	Dec 1.3306	(40)
HLP (average)												1.2887	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0100	(42)
Hot water usage for mixer showers	74.3644	73.2469	71.6184	68.5026	66.2031	63.6389	62.1813	63.7975	65.5691	68.3224	71.5051	74.0795	(42a)	
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)	
Hot water usage for other uses	35.2148	33.9343	32.6538	31.3732	30.0927	28.8121	28.8121	30.0927	31.3732	32.6538	33.9343	35.2148	(42c)	
Average daily hot water use (litres/day)													100.5750	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	109.5793	107.1812	104.2721	99.8758	96.2958	92.4510	90.9935	93.8902	96.9424	100.9761	105.4394	109.2944	(44)	
Energy content (annual)	173.5468	152.6246	160.2624	136.7249	129.6327	113.6793	110.0487	116.2557	119.5396	137.0237	150.2178	171.1285	(45)	
Distribution loss (46)m = 0.15 x (45)m	26.0320	22.8937	24.0394	20.5087	19.4449	17.0519	16.5073	17.4384	17.9309	20.5536	22.5327	25.6693	(46)	
Water storage loss:														
Store volume													173.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.9200	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.0368	(55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)	
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2049.1168	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
													0.0000	(64a)
Heat gains from water heating, kWh/month	57.7043	50.7477	53.2872	45.4610	43.1029	37.7984	36.5912	38.6550	39.7469	45.5604	49.9474	56.9002	(65)	

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 100.5021	Feb 100.5021	Mar 100.5021	Apr 100.5021	May 100.5021	Jun 100.5021	Jul 100.5021	Aug 100.5021	Sep 100.5021	Oct 100.5021	Nov 100.5021	Dec 100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)	77.5595	75.5174	71.6226	63.1403	57.9340	52.4977	49.1817	51.9557	55.2041	61.2371	69.3714	76.4788	(72)
Total internal gains	396.0455	405.4510	387.3407	372.0842	351.5511	337.5196	323.4657	324.4187	335.2509	348.0581	371.5192	387.2218	(73)

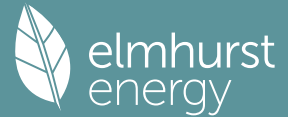
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
Northeast				3.2600	11.2829	0.7200	0.7000	0.7700		12.8471 (75)		
Southeast				1.6200	36.7938	0.7200	0.7000	0.7700		20.8187 (77)		
Southwest				6.5600	36.7938	0.7200	0.7000	0.7700		84.3029 (79)		
Solar gains	117.9687	205.2116	292.1141	380.9421	444.0280	448.4447	429.1743	380.9432	322.6926	229.8586	142.0764	100.4538 (83)
Total gains	514.0142	610.6626	679.4549	753.0264	795.5791	785.9644	752.6400	705.3619	657.9435	577.9167	513.5956	487.6756 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
Jan	30.8684	31.1587	31.4546	33.0222	33.3546	35.1227	35.1227	35.4990	34.3935	33.3546	32.6963	32.0634		
alpha	3.0579	3.0772	3.0970	3.2015	3.2236	3.3415	3.3415	3.3666	3.2929	3.2236	3.1798	3.1376		
util living area	0.9704	0.9499	0.9174	0.8431	0.7271	0.5536	0.4178	0.4565	0.6721	0.8735	0.9514	0.9741	(86)	

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MIT	18.8331	19.1717	19.6175	20.2229	20.6398	20.9027	20.9712	20.9619	20.8024	20.2499	19.4990	18.8550 (87)
Th 2	19.7771	19.7870	19.7970	19.8471	19.8573	19.9083	19.9083	19.9185	19.8878	19.8573	19.8370	19.8169 (88)
util rest of house	0.9641	0.9396	0.9002	0.8110	0.6724	0.4745	0.3205	0.3578	0.5951	0.8404	0.9397	0.9687 (89)
MIT 2	17.3020	17.7325	18.2932	19.0586	19.5384	19.8430	19.8957	19.9006	19.7406	19.1146	18.1809	17.3538 (90)
Living area fraction									fLA = Living area / (4) =			0.3372 (91)
MIT	17.8183	18.2178	18.7397	19.4512	19.9098	20.2003	20.2583	20.2584	20.0986	19.4974	18.6253	17.8599 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8183	18.2178	18.7397	19.4512	19.9098	20.2003	20.2583	20.2584	20.0986	19.4974	18.6253	17.8599 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9499	0.9220	0.8813	0.7984	0.6751	0.4966	0.3525	0.3898	0.6109	0.8280	0.9237	0.9560	(94)
Useful gains	488.2863	563.0418	598.7838	601.1893	537.1131	390.2937	265.3249	274.9424	401.9227	478.4880	474.3982	466.2036	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1139.8937	1112.5251	1012.8510	831.6744	640.6664	415.0298	271.1143	282.9111	453.9766	694.3252	917.5123	1108.9114	(97)
Space heating kWh	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(98a)
Space heating requirement - total per year (kWh/year)												2362.9073	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2362.9073	
Space heating per m2										(98c) / (4) =		38.7298	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	484.7959	369.2528	308.0660	165.9493	77.0436	0.0000	0.0000	0.0000	0.0000	160.5828	319.0421	478.1747 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating													
Water heating requirement	205.6876	181.6550	192.4032	167.8289	161.7735	144.7833	142.1895	148.3965	150.6436	169.1645	181.3218	203.2693 (64)	
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)	
Fuel for water heating, kWh/month	67.8938	59.9610	63.5088	55.3973	53.3985	47.7904	46.9342	48.9830	49.7248	55.8382	59.8511	67.0956 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	3.7835	3.4174	3.7835	3.6615	3.7835	3.6615	3.7835	3.7835	3.6615	3.7835	3.6615	3.7835 (231)	
Lighting	18.8191	15.0974	13.5935	9.9592	7.6928	6.2851	7.0176	9.1218	11.8483	15.5456	17.5587	19.3422 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												2362.9073 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												302.9550	
Water heating fuel used												676.3766 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)													
mechanical ventilation fans (SFP = 0.2660)													44.5477 (230a)
Total electricity for the above, kWh/year													44.5477 (231)
Electricity for lighting (calculated in Appendix L)													151.8812 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)

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Total delivered energy for all uses

3235.7127 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2362.9073	0.1554	367.0939 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	676.3766	0.1411	95.4129 (264)
Space and water heating			462.5067 (265)
Pumps, fans and electric keep-hot	44.5477	0.1387	6.1793 (267)
Energy for lighting	151.8812	0.1443	21.9211 (268)
Total CO ₂ , kg/year			490.6072 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			8.0400 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	2362.9073	1.5752	3721.9529 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	676.3766	1.5216	1029.1843 (278)
Space and water heating			4751.1372 (279)
Pumps, fans and electric keep-hot	44.5477	1.5128	67.3917 (281)
Energy for lighting	151.8812	1.5338	232.9604 (282)
Total Primary energy kWh/year			5051.4893 (286)
Dwelling Primary energy Rate (DPER)			82.8000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.0100 (1b)	x 2.2500 (2b)	= 137.2725 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	137.2725 (5)

2. Ventilation rate

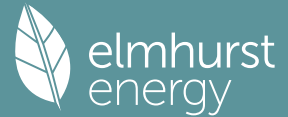
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1457 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3957 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3660 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4667	0.4575	0.4484	0.4026	0.3935	0.3477	0.3477	0.3386	0.3660	0.3935	0.4118	0.4301 (22b)
Effective ac	0.6089	0.6047	0.6005	0.5811	0.5774	0.5605	0.5605	0.5573	0.5670	0.5774	0.5848	0.5925 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			11.4400	1.1450	13.0992		(27)
External Walls	51.1400	11.4400	39.7000	0.1800	7.1460		(29a)
Roof	4.0500		4.0500	0.1100	0.4455		(30)
Total net area of external elements A _{um} (A, m ²)			55.1900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.6907		(33)
Party Wall shared by Apartment			20.0200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							162.9249 (35)

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Thermal bridges (User defined value 0.050 * total exposed area)
 Point Thermal bridges (36a) = 2.7595 (36)
 Total fabric heat loss (33) + (36) + (36a) = 23.4502 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.5828	27.3912	27.2035	26.3216	26.1566	25.3885	25.3885	25.2463	25.6844	26.1566	26.4904	26.8393	(38)
Heat transfer coeff	51.0330	50.8415	50.6537	49.7718	49.6068	48.8387	48.8387	48.6965	49.1346	49.6068	49.9406	50.2896	(39)
Average = Sum(39)m / 12 =												49.7710	
HLP	0.8365	0.8333	0.8303	0.8158	0.8131	0.8005	0.8005	0.7982	0.8054	0.8131	0.8186	0.8243	(40)
HLP (average)												0.8158	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0100 (42)
Hot water usage for mixer showers													
74.3644	73.2469	71.6184	68.5026	66.2031	63.6389	62.1813	63.7975	65.5691	68.3224	71.5051	74.0795	74.0795	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
35.2148	33.9343	32.6538	31.3732	30.0927	28.8121	28.8121	30.0927	31.3732	32.6538	33.9343	35.2148	35.2148	(42c)
Average daily hot water use (litres/day)												100.5750	(43)
Daily hot water use													
109.5793	107.1812	104.2721	99.8758	96.2958	92.4510	90.9935	93.8902	96.9424	100.9761	105.4394	109.2944	109.2944	(44)
Energy conte	173.5468	152.6246	160.2624	136.7249	129.6327	113.6793	110.0487	116.2557	119.5396	137.0237	150.2178	171.1285	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
26.0320	22.8937	24.0394	20.5087	19.4449	17.0519	16.5073	17.4384	17.9309	20.5536	22.5327	25.6693	25.6693	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
220.1417	194.7103	206.8573	181.8168	176.2276	158.7712	156.6436	162.8506	164.6315	183.6186	195.3097	217.7234	217.7234	(62)
WWHRS	-33.9963	-30.0666	-31.4840	-26.0700	-24.2963	-20.7905	-19.4878	-20.7233	-21.5107	-25.3587	-28.7284	-33.3667	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	186.1454	164.6437	175.3733	155.7468	151.9313	137.9806	137.1558	142.1272	143.1208	158.2599	166.5813	184.3567	(64)
12Total per year (kWh/year)												1903.4227	(64)
Electric shower(s)												1903	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
94.9802	84.4162	90.5632	81.5345	80.3788	73.8718	73.8671	75.9309	75.8204	82.8363	86.0209	94.1762	94.1762	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	100.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
89.8485	99.4752	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	92.8435	89.8485	92.8435	89.8485	89.8485	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
175.4868	177.3078	172.7189	162.9498	150.6180	139.0278	131.2849	129.4638	134.0527	143.8219	156.1537	167.7439	167.7439	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	33.0502	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	-80.4017	(71)
Water heating gains (Table 5)													
127.6616	125.6194	121.7247	113.2424	108.0360	102.5998	99.2838	102.0577	105.3061	111.3391	119.4735	126.5809	126.5809	(72)
Total internal gains	449.1476	458.5530	440.4428	425.1863	404.6531	387.6217	373.5678	374.5207	385.3529	401.1602	424.6213	440.3239	(73)

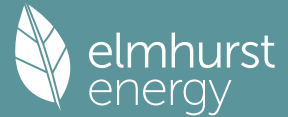
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				3.2600	11.2829	0.6300	0.7000	0.7700	11.2412 (75)			
Southeast				1.6200	36.7938	0.6300	0.7000	0.7700	18.2164 (77)			
Southwest				6.5600	36.7938	0.6300	0.7000	0.7700	73.7651 (79)			
Solar gains	103.2226	179.5601	255.5998	333.3244	388.5245	392.3891	375.5275	333.3253	282.3560	201.1263	124.3169	87.8970 (83)
Total gains	552.3702	638.1132	696.0426	758.5106	793.1776	780.0108	749.0953	707.8461	667.7089	602.2865	548.9381	528.2209 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
 Utilisation factor for gains for living area, nil,m (see Table 9a)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.1047	54.3085	54.5098	55.4757	55.6602	56.5355	56.5355	56.7007	56.1951	55.6602	55.2882	54.9045	
alpha	4.6070	4.6206	4.6340	4.6984	4.7107	4.7690	4.7690	4.7800	4.7463	4.7107	4.6859	4.6603	
util living area	0.9477	0.9074	0.8439	0.7183	0.5618	0.3976	0.2863	0.3156	0.4975	0.7556	0.9055	0.9548	(86)
MIT	20.1346	20.3690	20.6121	20.8481	20.9583	20.9936	20.9989	20.9983	20.9819	20.8389	20.4786	20.1008	(87)
Th 2	20.2218	20.2245	20.2272	20.2397	20.2420	20.2529	20.2529	20.2549	20.2487	20.2420	20.2373	20.2323	(88)
util rest of house	0.9389	0.8933	0.8221	0.6858	0.5209	0.3523	0.2380	0.2649	0.4467	0.7187	0.8889	0.9471	(89)
MIT 2	19.2291	19.5178	19.8106	20.0895	20.2060	20.2486	20.2524	20.2541	20.2355	20.0876	19.6665	19.1955	(90)
Living area fraction	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	FLA = Living area / (4) =	20.3409	19.9403	19.5007	(91)
MIT	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	20.4871	20.3409	19.9403	19.5007	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5344	19.8048	20.0809	20.3452	20.4596	20.4998	20.5041	20.5050	20.4871	20.3409	19.9403	19.5007	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9297	0.8848	0.8176	0.6905	0.5328	0.3674	0.2543	0.2819	0.4630	0.7238	0.8816	0.9384	(94)
Useful gains	513.5439	564.5873	569.1158	523.7242	422.6142	286.5598	190.4632	199.5595	309.1482	435.9278	483.9319	495.6600	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	777.4573	757.7806	687.9211	569.6506	434.5381	288.1379	190.6716	199.9000	313.8296	483.2156	641.2538	769.4666	(97)
Space heating kWh	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98a)
Space heating requirement - total per year (kWh/year)												808.6731	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												808.6731	
Space heating per m2										(98c) / (4) =		13.2548	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	196.3516	129.8259	88.3911	33.0670	8.8714	0.0000	0.0000	0.0000	0.0000	35.1822	113.2718	203.7121	(98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating fuel (main heating system)	212.7319	140.6565	95.7651	35.8255	9.6115	0.0000	0.0000	0.0000	0.0000	38.1172	122.7214	220.7065	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	186.1454	164.6437	175.3733	155.7468	151.9313	137.9806	137.1558	142.1272	143.1208	158.2599	166.5813	184.3567	(64)	
Efficiency of water heater (217)m	84.1797	83.5326	82.6056	81.2420	80.2487	79.8000	79.8000	79.8000	79.8000	81.2986	83.2136	84.2842	(216)	
Fuel for water heating, kWh/month	221.1286	197.1012	212.3018	191.7072	189.3255	172.9081	171.8745	178.1043	179.3493	194.6649	200.1851	218.7322	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	18.6687	14.9768	13.4849	9.8796	7.6313	6.2348	6.9615	9.0489	11.7536	15.4213	17.4184	19.1876	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-16.4290	-24.3851	-36.8848	-43.7202	-49.1344	-46.6048	-46.0487	-42.4876	-36.5485	-28.8728	-18.4952	-14.0656	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	-5.9036	-12.6944	-25.7479	-39.4369	-52.8949	-53.4109	-52.7705	-44.3262	-32.0356	-18.3898	-7.9581	-4.6474	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												876.1356	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												79.8000		
Water heating fuel used												2327.3828	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												150.6675	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-753.8930	(233)	
Wind generation												0.0000	(234)	
Hydro-electric generation (Appendix N)												0.0000	(235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)	
Appendix Q - special features														
Energy saved or generated												-0.0000	(236)	
Energy used												0.0000	(237)	
Total delivered energy for all uses												2686.2929	(238)	

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----- 12a. Carbon dioxide emissions - Individual heating systems including micro-CHP -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	876.1356	0.2100	183.9885 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2327.3828	0.2100	488.7504 (264)
Space and water heating			672.7389 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	150.6675	0.1443	21.7460 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.6768	0.1335	-53.8943
PV Unit electricity exported	-350.2162	0.1253	-43.8932
Total			-97.7875 (269)
Total CO2, kg/year			608.6266 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.9800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	876.1356	1.1300	990.0332 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2327.3828	1.1300	2629.9426 (278)
Space and water heating			3619.9758 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	150.6675	1.5338	231.0988 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.6768	1.4934	-602.8364
PV Unit electricity exported	-350.2162	0.4600	-161.1088
Total			-763.9452 (283)
Total Primary energy kWh/year			3217.2303 (286)
Target Primary Energy Rate (TPER)			52.7300 (287)

Predicted Energy Assessment



36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB

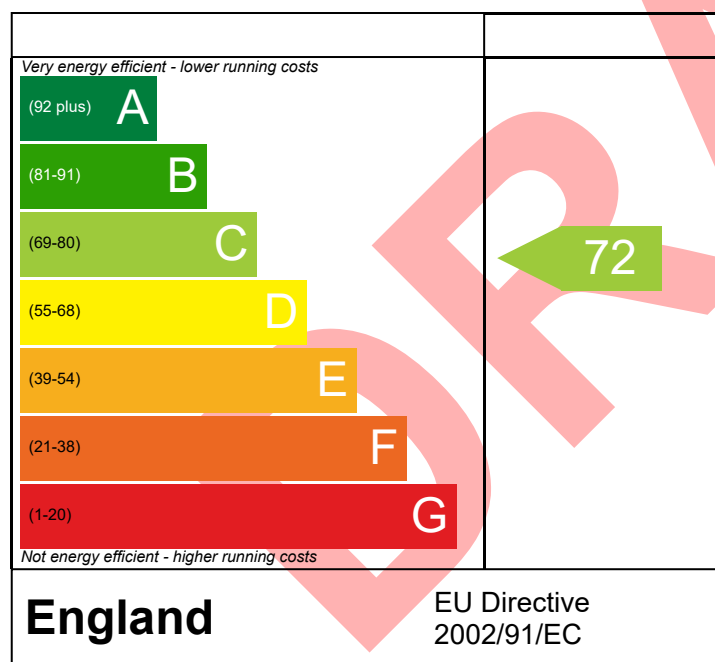
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Mid-Terrace
11/07/2024
Daniel Watt
61.01 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

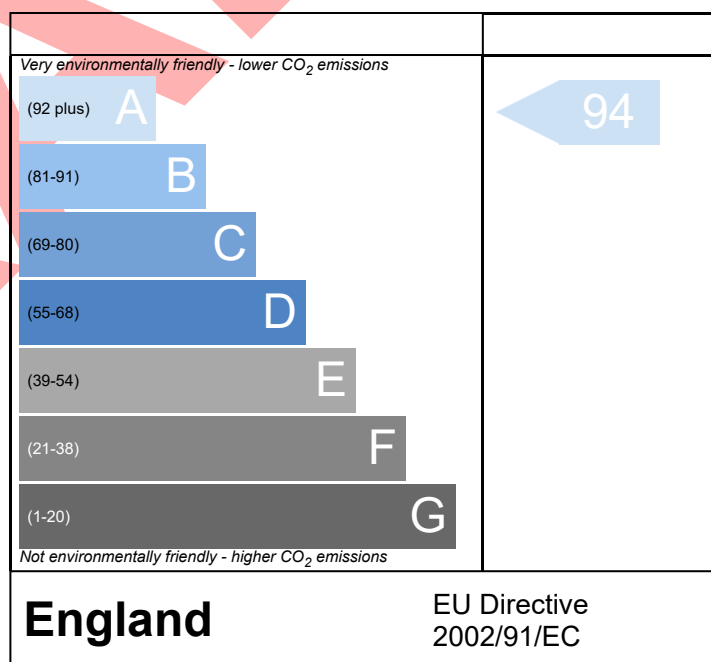
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 11 Jul 2024 11:28:30

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Mid-terrace
OCDEA Registration	EES/027301	Assessment Date	2024-07-11

Dwelling Details			
Assessment Type	As designed	Total Floor Area	68 m ²
Site Reference	Apartment No 5	Plot Reference	Apartment No 5
Address	36-436a BarlowMoor road, Manchester , M21 0AB		

Client Details	
Name	Paul Butler Associates
Company	Paul Butler Associates
Address	31 Blackfriars Road, Manchester, M3 7AQ

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	10.92 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.02 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	57.82 kWh _{PE} /m ²		
Dwelling primary energy	103.09 kWh _{PE} /m ²		FAIL

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	26.7 kWh/m ²		
Dwelling fabric energy efficiency	55.0 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.15	Roof (1) (0.15)	OK
Windows, doors, and roof windows	1.6	1.3	Windows (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	48.05	0.18
Party wall: Party Wall (1)	20.75	0 (!)
Exposed roof: Roof (1)	68.39	0.15

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Windows, Window	8.2	South West	0.7	1.3
Windows, Window	1.82	North East	0.7	1.3

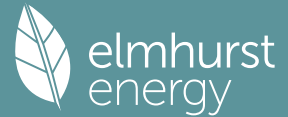
2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: SAP default y-value (0.2 W/m ² K) used for thermal bridging	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))			
Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	15 m ³ /hm ² , Assumed value		
Air permeability test certificate reference			

4 Space heating		
Main heating system 1: Room heaters - Electricity		
Efficiency	100.0%	
Emitter type		
Flow temperature		
System type	Panel, convector or radiant heaters	
Manufacturer		
Model		
Commissioning		
Main heating system 2: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	0.0%	
Emitter type		
Flow temperature		
System type	Heat Pump	
Manufacturer	Auer	
Model	EDL170-520RF	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Programmer and room thermostats		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	120 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Centralised mechanical extract		
Maximum permitted specific fan power	0.7 W/(l/s)	
Specific fan power	0.19 W/(l/s)	OK
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model	Sentinel Multivent	
Commissioning		
9 Local generation		

N/A	
10 Heat networks	
N/A	
11 Supporting documentary evidence	
N/A	
12 Declarations	
a. Assessor Declaration	
<p>This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.</p>	
<p>Signed:</p> <p>Name:</p>	<p>Assessor ID:</p> <p>Date:</p>
b. Client Declaration	
N/A	

Full SAP Calculation Printout



Property Reference	Apartment No 5			Issued on Date	11/07/2024
Assessment Reference	Apartment No 5	Prop Type Ref	Apartment No 5		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	63 D	DER	10.02	TER	10.92
Environmental	92 A	% DER < TER			8.24
CO ₂ Emissions (t/year)	0.58	DFEE	54.95	TFEE	26.70
Compliance Check	See BREL	% DFEE < TFEE			-105.78
% DPER < TPER	-78.30	DPER	103.09	TPER	57.82
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3900 (1b)	2.2500 (2b)	153.8775 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		153.8775 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.8775 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

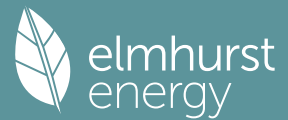
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			10.0200	1.2357	12.3821		(27)
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490	60.0000	2883.0000 (29a)
Flat Ceiling	68.3900		68.3900	0.1500	10.2585	9.0000	615.5100 (30)
Total net area of external elements Aum(A, m ²)			126.4600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.2896	(33)
Party Wall shared by Apartment			20.7500	0.0000	0.0000	140.0000	2905.0000 (32)
Party Floor			68.3900			40.0000	2735.6000 (32a)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9139.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.6323 (35)
Thermal bridges (Default value 0.200 * total exposed area)							25.2920 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		56.5816 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	57.6110	56.7303	55.8496	51.4461	50.5653	46.1618	46.1618	45.2811	47.9232	50.5653	52.3268	54.0882 (38)
Heat transfer coeff	114.1926	113.3119	112.4312	108.0277	107.1470	102.7434	102.7434	101.8627	104.5049	107.1470	108.9084	110.6698 (39)
Average = Sum(39)m / 12 =												107.8075

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6697	1.6568	1.6440	1.5796	1.5667	1.5023	1.5023	1.4894	1.5281	1.5667	1.5925	1.6182 (40)
HLP (average)												1.5764
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2064 (42)
Hot water usage for mixer showers												
78.6081	77.4268	75.7054	72.4117	69.9811	67.2705	65.7298	67.4382	69.3109	72.2213	75.5857	78.3069	(42a)
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses												
37.2259	35.8722	34.5185	33.1649	31.8112	30.4575	30.4575	31.8112	33.1649	34.5185	35.8722	37.2259	(42c)
Average daily hot water use (litres/day)												106.3157 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
115.8340	113.2990	110.2239	105.5766	101.7923	97.7280	96.1873	99.2494	102.4758	106.7398	111.4578	115.5328	(44)
Energy content (annual)												
183.4527	161.3362	169.4100	144.5291	137.0320	120.1680	116.3302	122.8915	126.3629	144.8449	158.7921	180.8964	(45)
Energy content (annual)												
Total = Sum(45)m =												1766.0460
Distribution loss (46)m = 0.15 x (45)m												
27.5179	24.2004	25.4115	21.6794	20.5548	18.0252	17.4495	18.4337	18.9544	21.7267	23.8188	27.1345	(46)
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372	(64)
Total per year (kWh/year)												2144.4780 (64)
Electric shower(s)												2144 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
60.9980	53.6443	56.3288	48.0559	45.5631	39.9559	38.6798	40.8614	42.0157	48.1609	52.7984	60.1481	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.6907	114.8004	103.6907	107.1470	103.6907	107.1470	103.6907	103.6907	107.1470	103.6907	107.1470	103.6907 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.5106	195.5187	190.4585	179.6859	166.0876	153.3070	144.7688	142.7608	147.8209	158.5935	172.1919	184.9724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565 (71)
Water heating gains (Table 5)	81.9866	79.8278	75.7108	66.7443	61.2408	55.4943	51.9890	54.9212	58.3551	64.7324	73.3311	80.8442 (72)
Total internal gains	435.2841	446.2430	425.9561	409.6735	387.1152	372.0445	356.5446	357.4689	369.4192	383.1128	408.7662	425.6034 (73)

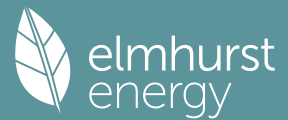
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
Northeast				1.8200	11.2829		0.7200		0.7000		0.7700	7.1723 (75)
Southwest				8.2000	36.7938		0.7200		0.7000		0.7700	105.3787 (79)
Solar gains	112.5509	194.0982	271.9016	347.5058	398.9167	400.2904	384.1505	345.1446	297.9820	216.2261	135.2439	96.0394 (83)
Total gains	547.8350	640.3413	697.8577	757.1793	786.0319	772.3348	740.6951	702.6135	667.4012	599.3388	544.0101	521.6429 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	22.2312	22.4040	22.5795	23.4999	23.6931	24.7086	24.7086	24.9222	24.2921	23.6931	23.3099	22.9389
alpha	2.4821	2.4936	2.5053	2.5667	2.5795	2.6472	2.6472	2.6615	2.6195	2.5795	2.5540	2.5293
util living area												
	0.9673	0.9510	0.9281	0.8792	0.7999	0.6652	0.5332	0.5691	0.7511	0.8953	0.9518	0.9708 (86)
MIT	18.0297	18.3701	18.8668	19.5844	20.1857	20.6763	20.8714	20.8448	20.5084	19.7208	18.8092	18.0438 (87)

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Th 2	19.5626	19.5719	19.5812	19.6283	19.6378	19.6858	19.6858	19.6954	19.6665	19.6378	19.6189	19.6000 (88)
util rest of house	0.9605	0.9409	0.9124	0.8511	0.7484	0.5741	0.4009	0.4403	0.6724	0.8653	0.9402	0.9647 (89)
MIT 2	16.1951	16.6286	17.2579	18.1714	18.8928	19.4573	19.6277	19.6192	19.2849	18.3599	17.2144	16.2322 (90)
Living area fraction									FLA = Living area / (4) =			0.2837 (91)
MIT	16.7155	17.1226	17.7143	18.5722	19.2596	19.8030	19.9805	19.9669	19.6320	18.7460	17.6667	16.7461 (92)
Temperature adjustment												0.0000
adjusted MIT	16.7155	17.1226	17.7143	18.5722	19.2596	19.8030	19.9805	19.9669	19.6320	18.7460	17.6667	16.7461 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9399	0.9158	0.8840	0.8236	0.7314	0.5832	0.4331	0.4697	0.6700	0.8393	0.9164	0.9458	(94)
Useful gains	514.8981	586.4086	616.8783	623.6105	574.8743	450.4634	320.8076	330.0231	447.1464	503.0529	498.5123	493.3708	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1417.7640	1384.9694	1260.8360	1044.8675	809.9841	534.5792	347.3261	363.3294	578.1179	872.8164	1150.8075	1388.4741	(97)
Space heating kWh	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568	(98a)
Space heating requirement - total per year (kWh/year)												3576.4098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3576.4098	
Space heating per m2											(98c) / (4) =	52.2943	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372 (64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	71.1635	62.8366	66.5283	57.9733	55.8409	49.9322	49.0076	51.1734	51.9770	58.4198	62.6813	70.3198 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	4.2412	3.8307	4.2412	4.1044	4.2412	4.1044	4.2412	4.2412	4.1044	4.2412	4.1044	4.2412 (231)
Lighting	22.4418	18.0036	16.2103	11.8764	9.1736	7.4949	8.3685	10.8777	14.1290	18.5381	20.9387	23.0655 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3576.4098 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.9550
Water heating fuel used												707.8536 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)												
mechanical ventilation fans (SFP = 0.2660)												49.9363 (230a)
Total electricity for the above, kWh/year												49.9363 (231)
Electricity for lighting (calculated in Appendix L)												181.1182 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energv for all uses												4515.3179 (238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3576.4098	0.1543	552.0015 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	707.8536	0.1411	99.8699 (264)
Space and water heating			651.8715 (265)
Pumps, fans and electric keep-hot	49.9363	0.1387	6.9268 (267)
Energy for lighting	181.1182	0.1443	26.1410 (268)
Total CO2, kg/year			684.9392 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3576.4098	1.5714	5620.0423 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	707.8536	1.5217	1077.1430 (278)
Space and water heating			6697.1853 (279)
Pumps, fans and electric keep-hot	49.9363	1.5128	75.5437 (281)
Energy for lighting	181.1182	1.5338	277.8051 (282)
Total Primary energy kWh/year			7050.5341 (286)
Dwelling Primary energy Rate (DPER)			103.0900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	68.3900 (1b)	x 2.2500 (2b)	= 153.8775 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.8775 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1300 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3800 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3515 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4481	0.4393	0.4306	0.3866	0.3778	0.3339	0.3339	0.3251	0.3515	0.3778	0.3954	0.4130 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			10.0200	1.1450	11.4733		(27)
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490		(29a)
Flat Ceiling	68.3900		68.3900	0.1100	7.5229		(30)
Total net area of external elements Aum(A, m2)			126.4600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6452		(33)
Party Wall shared by Apartment			20.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							133.6323 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.3230 (36)
Point Thermal bridges						(36a) =	0.0000

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Total fabric heat loss (33) + (36) + (36a) = 33.9682 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.4886	30.2906	30.0965	29.1850	29.0144	28.2205	28.2205	28.0735	28.5263	29.0144	29.3595	29.7202 (38)
Average = Sum(39)m / 12 =	64.4568	64.2588	64.0647	63.1532	62.9826	62.1887	62.1887	62.0417	62.4945	62.9826	63.3276	63.6893 (39)
												63.1524
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9425	0.9396	0.9368	0.9234	0.9209	0.9093	0.9093	0.9072	0.9138	0.9209	0.9260	0.9313 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9234 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2064 (42)
Hot water usage for mixer showers												
	78.6081	77.4268	75.7054	72.4117	69.9811	67.2705	65.7298	67.4382	69.3109	72.2213	75.5857	78.3069 (42a)
Hot water usage for baths												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses												
	37.2259	35.8722	34.5185	33.1649	31.8112	30.4575	30.4575	31.8112	33.1649	34.5185	35.8722	37.2259 (42c)
Average daily hot water use (litres/day)												106.3157 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.8340	113.2990	110.2239	105.5766	101.7923	97.7280	96.1873	99.2494	102.4758	106.7398	111.4578	115.5328 (44)
Energy conte	183.4527	161.3362	169.4100	144.5291	137.0320	120.1680	116.3302	122.8915	126.3629	144.8449	158.7921	180.8964 (45)
Energy content (annual)										Total = Sum(45)m =		1766.0460
Distribution loss (46)m = 0.15 x (45)m	27.5179	24.2004	25.4115	21.6794	20.5548	18.0252	17.4495	18.4337	18.9544	21.7267	23.8188	27.1345 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	230.0476	203.4220	216.0049	189.6209	183.6269	165.2598	162.9251	169.4864	171.4547	191.4398	203.8840	227.4913 (62)
PV diverter	-35.9363	-31.7824	-33.2807	-27.5577	-25.6828	-21.9770	-20.5999	-21.9059	-22.7382	-26.8059	-30.3678	-35.2709 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	194.1113	171.6396	182.7242	162.0632	157.9441	143.2829	142.3252	147.5804	148.7165	164.6339	173.5162	192.2205 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1980.7579 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month												
	98.2739	87.3129	93.6047	84.1294	82.8391	76.0293	75.9557	78.1373	78.0891	85.4369	88.8719	97.4240 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	103.6907	114.8004	103.6907	107.1470	103.6907	107.1470	103.6907	103.6907	107.1470	103.6907	107.1470	103.6907 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	193.5106	195.5187	190.4585	179.6859	166.0876	153.3070	144.7688	142.7608	147.8209	158.5935	172.1919	184.9724 (68)
Pumps, fans	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565 (71)
Total internal gains	132.0886	129.9299	125.8128	116.8464	111.3428	105.5963	102.0910	105.0233	108.4571	114.8345	123.4331	130.9462 (72)
	488.3861	499.3451	479.0582	462.7755	440.2172	422.1465	406.6467	407.5709	419.5213	436.2148	461.8682	478.7055 (73)

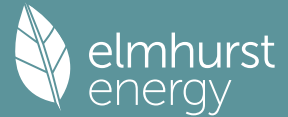
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				1.8200	11.2829		0.6300		0.7000		0.7700		6.2757 (75)
Southwest				8.2000	36.7938		0.6300		0.7000		0.7700		92.2063 (79)
Solar gains	98.4821	169.8360	237.9139	304.0676	349.0521	350.2541	336.1317	302.0015	260.7343	189.1978	118.3384	84.0345	(83)
Total gains	586.8682	669.1810	716.9720	766.8431	789.2693	772.4006	742.7783	709.5724	680.2555	625.4126	580.2066	562.7400	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	39.3852	39.5065	39.6262	40.1982	40.3070	40.8216	40.8216	40.9183	40.6218	40.3070	40.0874	39.8604
alpha	3.6257	3.6338	3.6417	3.6799	3.6871	3.7214	3.7214	3.7279	3.7081	3.6871	3.6725	3.6574

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util living area	0.9463	0.9164	0.8730	0.7849	0.6575	0.4931	0.3627	0.3940	0.5854	0.8045	0.9140	0.9524 (86)
MIT	19.6256	19.8876	20.1993	20.5696	20.8226	20.9544	20.9887	20.9845	20.9123	20.5967	20.0722	19.5866 (87)
Th 2	20.1315	20.1340	20.1364	20.1476	20.1497	20.1596	20.1596	20.1614	20.1558	20.1497	20.1455	20.1410 (88)
util rest of house												
MIT 2	0.9380	0.9041	0.8546	0.7552	0.6133	0.4349	0.2957	0.3254	0.5264	0.7710	0.8994	0.9450 (89)
Living area fraction	18.5409	18.8673	19.2517	19.7011	19.9858	20.1260	20.1537	20.1529	20.0862	19.7434	19.1102	18.4989 (90)
MIT	18.8486	19.1567	19.5205	19.9474	20.2232	20.3610	20.3906	20.3888	20.3205	19.9855	19.3831	18.8074 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	18.8486	19.1567	19.5205	19.9474	20.2232	20.3610	20.3906	20.3888	20.3205	19.9855	19.3831	18.8074 (93)

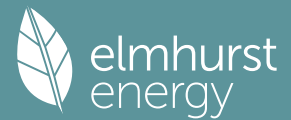
8. Space heating requirement

Utilisation	Jan 0.9228	Feb 0.8877	Mar 0.8396	Apr 0.7477	May 0.6173	Jun 0.4492	Jul 0.3143	Aug 0.3443	Sep 0.5383	Oct 0.7639	Nov 0.8839	Dec 0.9305 (94)
Useful gains	541.5386	594.0403	601.9915	573.3663	487.2159	346.9559	233.4722	244.2734	366.2116	477.7728	512.8531	523.6144 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	937.7542	916.1215	834.1550	697.6796	536.8111	358.2699	235.7295	247.4713	388.7489	591.1204	777.8608	930.3234 (97)
Space heating kWh	294.7844	216.4386	172.7297	89.5056	36.8989	0.0000	0.0000	0.0000	0.0000	84.3306	190.8055	302.5915 (98a)
Space heating requirement - total per year (kWh/year)												1388.0847
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	294.7844	216.4386	172.7297	89.5056	36.8989	0.0000	0.0000	0.0000	0.0000	84.3306	190.8055	302.5915 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.0847
Space heating per m2										(98c) / (4) =		20.2966 (99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan 294.7844	Feb 216.4386	Mar 172.7297	Apr 89.5056	May 36.8989	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 84.3306	Nov 190.8055	Dec 302.5915 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	319.3764	234.4947	187.1394	96.9725	39.9771	0.0000	0.0000	0.0000	0.0000	91.3658	206.7232	327.8348 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	194.1113	171.6396	182.7242	162.0632	157.9441	143.2829	142.3252	147.5804	148.7165	164.6339	173.5162	192.2205 (64)
Efficiency of water heater (217)m	84.9941	84.5810	83.9338	82.7852	81.3616	79.8000	79.8000	79.8000	79.8000	82.6369	84.2733	79.8000 (216)
Fuel for water heating, kWh/month	228.3822	202.9292	217.7004	195.7634	194.1260	179.5525	178.3524	184.9379	186.3615	199.2256	205.8971	85.0727 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	21.5449	17.2841	15.5624	11.4017	8.8070	7.1954	8.0340	10.4429	13.5644	17.7972	20.1019	22.1437 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.3574	-27.2131	-41.1052	-48.6446	-54.5900	-51.7413	-51.1191	-47.2052	-40.6647	-32.1868	-20.6530	-15.7201 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.6767	-14.3517	-29.1038	-44.5715	-59.7811	-60.3727	-59.6537	-50.1101	-36.2157	-20.7928	-9.0001	-5.2565 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1503.8838 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2399.1765 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												173.8795 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-845.0868 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												3317.8530 (238)

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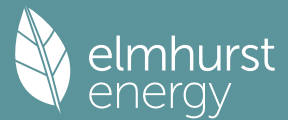
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1503.8838	0.2100	315.8156 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2399.1765	0.2100	503.8271 (264)
Space and water heating			819.6427 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.8795	0.1443	25.0962 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.2003	0.1335	-59.9871
PV Unit electricity exported	-395.8865	0.1253	-49.6174
Total			-109.6045 (269)
Total CO2, kg/year			747.0636 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1503.8838	1.1300	1699.3887 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2399.1765	1.1300	2711.0694 (278)
Space and water heating			4410.4581 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.8795	1.5338	266.7022 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.2003	1.4935	-670.8759
PV Unit electricity exported	-395.8865	0.4600	-182.1194
Total			-852.9953 (283)
Total Primary energy kWh/year			3954.2658 (286)
Target Primary Energy Rate (TPER)			57.8200 (287)

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Property Reference	Apartment No 5				Issued on Date	11/07/2024
Assessment Reference	Apartment No 5		Prop Type Ref	Apartment No 5		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB					
SAP Rating	63 D	DER	10.02	TER	10.92	
Environmental	92 A	% DER < TER				8.24
CO ₂ Emissions (t/year)	0.58	DFEE	54.95	TFEE	26.70	
Compliance Check	See BREL	% DFEE < TFEE				-105.78
% DPER < TPER	-78.30	DPER	103.09	TPER	57.82	
Assessor Details	Mr. Daniel Watt				Assessor ID	AV75-0001
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3900 (1b)	x 2.2500 (2b)	= 153.8775 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.8775 (5)

2. Ventilation rate

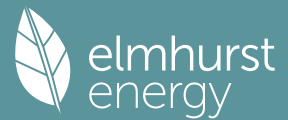
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1300 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8800 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8140 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	1.0378	1.0175	0.9971	0.8954	0.8750	0.7733	0.7733	0.7529	0.8140	0.8750	0.9157	0.9564 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	1.0378	1.0175	0.9971	0.9008	0.8828	0.7990	0.7990	0.7834	0.8313	0.8828	0.9193	0.9574 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Window (Uw = 1.30)			10.0200	1.2357	12.3821			(27)					
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490	60.0000	2883.0000	(29a)					
Flat Ceiling	68.3900		68.3900	0.1500	10.2585	9.0000	615.5100	(30)					
Total net area of external elements Aum(A, m2)			126.4600					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	31.2896		(33)					
Party Wall shared by Apartment			20.7500	0.0000	0.0000	140.0000	2905.0000	(32)					
Party Floor			68.3900			40.0000	2735.6000	(32d)					
Heat capacity Cm = Sum(A x k)					(28)... (30) + (32) + (32a)... (32e) =		9139.1100	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							133.6323	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							25.2920	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		56.5816	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	52.7000	51.6667	50.6335	45.7446	44.8299	40.5718	40.5718	39.7832	42.2119	44.8299	46.6803	48.6149	(38)
Heat transfer coeff													

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Average = Sum(39)m / 12 =	109.2816	108.2483	107.2152	102.3262	101.4115	97.1534	97.1534	96.3649	98.7936	101.4115	103.2620	105.1965 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.5979	1.5828	1.5677	1.4962	1.4828	1.4206	1.4206	1.4090	1.4446	1.4828	1.5099	1.5382 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2064 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	26.4472	26.0544	25.5013	24.4815	23.7178	22.8711	22.4137	22.9629	23.5610	24.4670	25.5079	26.3578 (42b)
Hot water usage for other uses	37.2259	35.8722	34.5185	33.1649	31.8112	30.4575	30.4575	31.8112	33.1649	34.5185	35.8722	37.2259 (42c)
Average daily hot water use (litres/day)												58.3624 (43)
Daily hot water use	63.6731	61.9266	60.0198	57.6463	55.5290	53.3286	52.8712	54.7741	56.7258	58.9855	61.3801	63.5837 (44)
Energy conte	100.8426	88.1827	92.2483	78.9149	74.7527	65.5737	63.9431	67.8218	69.9486	80.0428	87.4471	99.5566 (45)
Energy content (annual)										Total = Sum(45)m =		969.2750
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	85.7162	74.9553	78.4110	67.0777	63.5398	55.7377	54.3517	57.6485	59.4563	68.0364	74.3301	84.6231 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	85.7162	74.9553	78.4110	67.0777	63.5398	55.7377	54.3517	57.6485	59.4563	68.0364	74.3301	84.6231 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				823.8838 (64)
Electric shower(s)	49.0221	43.6791	47.6959	45.5156	46.3697	44.2322	45.7066	46.3697	45.5156	47.6959	46.7991	49.0221 (64a)
Heat gains from water heating, kWh/month	33.6846	29.6586	31.5267	28.1483	27.4774	24.9925	25.0146	26.0046	26.2430	28.9331	30.2823	33.4113 (65)
												824 (64)
												557.6239 (64a)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.6907	114.8004	103.6907	107.1470	103.6907	107.1470	103.6907	103.6907	107.1470	103.6907	107.1470	103.6907 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.5106	195.5187	190.4585	179.6859	166.0876	153.3070	144.7688	142.7608	147.8209	158.5935	172.1919	184.9724 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565 (71)
Water heating gains (Table 5)	45.2750	44.1348	42.3746	39.0949	36.9320	34.7118	33.6217	34.9524	36.4486	38.8886	42.0587	44.9077 (72)
Total internal gains	398.5724	410.5500	392.6200	382.0241	362.8064	351.2620	338.1774	337.5000	347.5127	357.2689	377.4938	389.6670 (73)

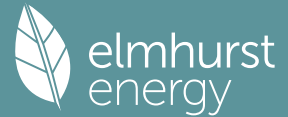
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W	
Northeast				1.8200	11.2829	0.7200	0.7000				0.7700	7.1723 (75)	
Southwest				8.2000	36.7938	0.7200	0.7000				0.7700	105.3787 (79)	
Solar gains	112.5509	194.0982	271.9016	347.5058	398.9167	400.2904	384.1505	345.1446	297.9820	216.2261	135.2439	96.0394 (83)	
Total gains	511.1234	604.6483	664.5216	729.5299	761.7231	751.5523	722.3278	682.6446	645.4948	573.4949	512.7377	485.7064 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	23.2303	23.4520	23.6780	24.8093	25.0331	26.1302	26.1302	26.3441	25.6964	25.0331	24.5845	24.1324
alpha	2.5487	2.5635	2.5785	2.6540	2.6689	2.7420	2.7420	2.7563	2.7131	2.6689	2.6390	2.6088
util living area	0.9716	0.9557	0.9328	0.8820	0.7998	0.6601	0.5251	0.5630	0.7503	0.8995	0.9565	0.9748 (86)
MIT	18.0822	18.4313	18.9309	19.6590	20.2444	20.7109	20.8892	20.8640	20.5488	19.7807	18.8768	18.1141 (87)
Th 2	19.6149	19.6260	19.6371	19.6903	19.7004	19.7476	19.7476	19.7564	19.7293	19.7004	19.6801	19.6590 (88)
util rest of house	0.9657	0.9466	0.9183	0.8552	0.7500	0.5723	0.3993	0.4399	0.6742	0.8712	0.9461	0.9696 (89)
MIT 2	17.0229	17.3731	17.8701	18.6074	19.1571	19.5865	19.7076	19.7031	19.4529	18.7425	17.8512	17.0822 (90)
Living area fraction										FLA = Living area / (4) =		0.2837 (91)
MIT	17.3234	17.6733	18.1710	18.9057	19.4656	19.9055	20.0427	20.0324	19.7638	19.0370	18.1421	17.3749 (92)

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Temperature adjustment
adjusted MIT 17.3234 17.6733 18.1710 18.9057 19.4656 19.9055 20.0427 20.0324 19.7638 19.0370 18.1421 0.0000
17.3749 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9516	0.9287	0.8977	0.8353	0.7394	0.5845	0.4312	0.4696	0.6766	0.8527	0.9294	0.9569	(94)
Useful gains	486.3833	561.5623	596.5197	609.4049	563.2440	439.2972	311.4332	320.5800	436.7433	489.0202	476.5216	464.7662	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1423.2179	1382.6870	1251.3104	1023.8430	787.5171	515.4436	334.4745	350.0347	559.5435	855.6112	1140.2310	1385.9524	(97)
Space heating kWh	697.0050	551.7958	487.1643	298.3954	166.8592	0.0000	0.0000	0.0000	0.0000	272.7437	477.8708	685.3625	(98a)
Space heating requirement - total per year (kWh/year)												3637.1968	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	697.0050	551.7958	487.1643	298.3954	166.8592	0.0000	0.0000	0.0000	0.0000	272.7437	477.8708	685.3625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3637.1968	
Space heating per m2										(98c) / (4) =		53.1832	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	913.2421	718.9353	732.3731	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6992	0.7719	0.7466	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	638.5186	554.9500	546.8090	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	835.0457	803.0779	758.7596	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	141.4994	184.6071	157.6912	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =				(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.3749	46.1518	39.4228	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												120.9495	(107)
Energy for space heating												53.1832	(99)
Energy for space cooling												1.7685	(108)
Total												54.9517	(109)
Fabric Energy Efficiency (DFEE)												55.0	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

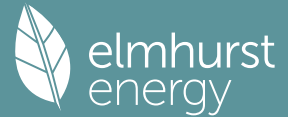
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	68.3900 (1b)	x 2.2500 (2b)	= 153.8775 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	153.8775 (5)	

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1300 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3800 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3515 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4481	0.4393	0.4306	0.3866	0.3778	0.3339	0.3339	0.3251	0.3515	0.3778	0.3954	0.4130	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)

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Effective ac 0.6004 0.5965 0.5927 0.5747 0.5714 0.5557 0.5557 0.5528 0.5618 0.5714 0.5782 0.5853 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.20)			10.0200	1.1450	11.4733			(27)					
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490			(29a)					
Flat Ceiling	68.3900		68.3900	0.1100	7.5229			(30)					
Total net area of external elements Aum(A, m2)			126.4600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	27.6452			(33)					
Party Wall shared by Apartment			20.7500	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								133.6323 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)								6.3230 (36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	33.9682	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 30.4886	Feb 30.2906	Mar 30.0965	Apr 29.1850	May 29.0144	Jun 28.2205	Jul 28.2205	Aug 28.0735	Sep 28.5263	Oct 29.0144	Nov 29.3595	Dec 29.7202	(38)
Heat transfer coeff	64.4568	64.2588	64.0647	63.1532	62.9826	62.1887	62.1887	62.0417	62.4945	62.9826	63.3276	63.6883	(39)
Average = Sum(39)m / 12 =													63.1524
HLP	Jan 0.9425	Feb 0.9396	Mar 0.9368	Apr 0.9234	May 0.9209	Jun 0.9093	Jul 0.9093	Aug 0.9072	Sep 0.9138	Oct 0.9209	Nov 0.9260	Dec 0.9313	(40)
HLP (average)													0.9234
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2064 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	26.4472	26.0544	25.5013	24.4815	23.7178	22.8711	22.4137	22.9629	23.5610	24.4670	25.5079	26.3578	(42b)
Hot water usage for other uses	37.2259	35.8722	34.5185	33.1649	31.8112	30.4575	30.4575	31.8112	33.1649	34.5185	35.8722	37.2259	(42c)
Average daily hot water use (litres/day)													58.3624 (43)
Daily hot water use	Jan 63.6731	Feb 61.9266	Mar 60.0198	Apr 57.6463	May 55.5290	Jun 53.3286	Jul 52.8712	Aug 54.7741	Sep 56.7258	Oct 58.9855	Nov 61.3801	Dec 63.5837	(44)
Energy conte	100.8426	88.1827	92.2483	78.9149	74.7527	65.5737	63.9431	67.8218	69.9486	80.0428	87.4471	99.5566	(45)
Energy content (annual)													969.2750
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	85.7162	74.9553	78.4110	67.0777	63.5398	55.7377	54.3517	57.6485	59.4563	68.0364	74.3301	84.6231	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	85.7162	74.9553	78.4110	67.0777	63.5398	55.7377	54.3517	57.6485	59.4563	68.0364	74.3301	84.6231	(64)
12Total per year (kWh/year)													823.8838 (64)
Electric shower(s)	49.0221	43.6791	47.6959	45.5156	46.3697	44.2322	45.7066	46.3697	45.5156	47.6959	46.7991	49.0221	(64a)
Heat gains from water heating, kWh/month	33.6846	29.6586	31.5267	28.1483	27.4774	24.9925	25.0146	26.0046	26.2430	28.9331	30.2823	33.4113	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 110.3206	Feb 110.3206	Mar 110.3206	Apr 110.3206	May 110.3206	Jun 110.3206	Jul 110.3206	Aug 110.3206	Sep 110.3206	Oct 110.3206	Nov 110.3206	Dec 110.3206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.6907	114.8004	103.6907	107.1470	103.6907	107.1470	103.6907	103.6907	107.1470	103.6907	107.1470	103.6907	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	193.5106	195.5187	190.4585	179.6859	166.0876	153.3070	144.7688	142.7608	147.8209	158.5935	172.1919	184.9724	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	(71)
Water heating gains (Table 5)	45.2750	44.1348	42.3746	39.0949	36.9320	34.7118	33.6217	34.9524	36.4486	38.8886	42.0587	44.9077	(72)
Total internal gains	398.5724	410.5500	392.6200	382.0241	362.8064	351.2620	338.1774	337.5000	347.5127	357.2689	377.4938	389.6670	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	1.8200	11.2829	0.6300	0.7000	0.7700	6.2757 (75)

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Southwest	8.2000		36.7938		0.6300		0.7000		0.7700		92.2063 (79)	
Solar gains	98.4821	169.8360	237.9139	304.0676	349.0521	350.2541	336.1317	302.0015	260.7343	189.1978	118.3384	84.0345 (83)
Total gains	497.0545	580.3860	630.5339	686.0917	711.8585	701.5160	674.3090	639.5015	608.2470	546.4667	495.8322	473.7014 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.3852	39.5065	39.6262	40.1982	40.3070	40.8216	40.8216	40.9183	40.6218	40.3070	40.0874	39.8604	
alpha	3.6257	3.6338	3.6417	3.6799	3.6871	3.7214	3.7214	3.7279	3.7081	3.6871	3.6725	3.6574	
util living area	0.9664	0.9423	0.9061	0.8265	0.7043	0.5354	0.3973	0.4338	0.6371	0.8515	0.9430	0.9710 (86)	
MIT	19.4277	19.7125	20.0551	20.4771	20.7759	20.9402	20.9847	20.9787	20.8837	20.4963	19.9060	19.3855 (87)	
Th 2	20.1315	20.1340	20.1364	20.1476	20.1497	20.1596	20.1596	20.1614	20.1558	20.1497	20.1455	20.1410 (88)	
util rest of house	0.9608	0.9332	0.8912	0.7997	0.6609	0.4742	0.3248	0.3595	0.5769	0.8227	0.9325	0.9662 (89)	
MIT 2	18.6995	18.9794	19.3128	19.7188	19.9858	20.1248	20.1533	20.1521	20.0824	19.7464	19.1810	18.6652 (90)	
Living area fraction	fLA = Living area / (4) =												0.2837 (91)
MIT	18.9061	19.1873	19.5233	19.9339	20.2099	20.3561	20.3891	20.3866	20.3097	19.9591	19.3866	18.8695 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.9061	19.1873	19.5233	19.9339	20.2099	20.3561	20.3891	20.3866	20.3097	19.9591	19.3866	18.8695 (93)	

8. Space heating requirement

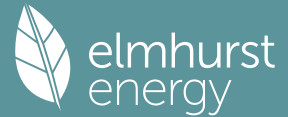
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9509	0.9211	0.8789	0.7924	0.6641	0.4889	0.3449	0.3798	0.5884	0.8154	0.9211	0.9571 (94)
Useful gains	472.6280	534.5852	554.1845	543.6452	472.7465	343.0043	232.5546	242.8898	357.8961	445.5774	456.6876	453.3648 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	941.4618	918.0878	834.3361	696.8257	535.9760	357.9634	235.6401	247.3345	388.0737	589.4607	778.0841	934.2776 (97)
Space heating kWh	348.8124	257.7138	208.4328	110.2899	47.0428	0.0000	0.0000	0.0000	0.0000	107.0492	231.4055	357.7991 (98a)
Space heating requirement - total per year (kWh/year)												1668.5454
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	348.8124	257.7138	208.4328	110.2899	47.0428	0.0000	0.0000	0.0000	0.0000	107.0492	231.4055	357.7991 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1668.5454
Space heating per m2												(98c) / (4) = 24.3975 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	584.5737	460.1963	471.5166	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8836	0.9295	0.9141	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	516.5487	427.7710	431.0263	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.5617	746.9520	708.3326	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	187.2093	237.4707	206.3159	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
	0.0000	0.0000	0.0000	0.0000	0.0000	46.8023	59.3677	51.5790	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												157.7490 (107)
Energy for space heating												24.3975 (99)
Energy for space cooling												2.3066 (108)
Total												26.7041 (109)
Fabric Energy Efficiency (TFEE)												26.7 (109)

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Property Reference	Apartment No 5			Issued on Date	11/07/2024
Assessment Reference	Apartment No 5	Prop Type Ref	Apartment No 5		
Property	36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB				
SAP Rating	63 D	DER	10.02	TER	10.92
Environmental	92 A	% DER < TER			8.24
CO ₂ Emissions (t/year)	0.58	DFEE	54.95	TFEE	26.70
Compliance Check	See BREL	% DFEE < TFEE			-105.78
% DPER < TPER	-78.30	DPER	103.09	TPER	57.82
Assessor Details	Mr. Daniel Watt			Assessor ID	AV75-0001
Client					

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3900 (1b)	2.2500 (2b)	153.8775 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		153.8775 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	153.8775 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.6938 (21)

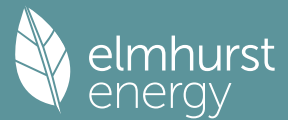
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.8845	0.8672	0.8498	0.7631	0.7458	0.6591	0.6591	0.6417	0.6938	0.7458	0.7805	0.8152 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	1.1345	1.1172	1.0998	1.0131	0.9958	0.9091	0.9091	0.8917	0.9438	0.9958	1.0305	1.0652 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.30)			10.0200	1.2357	12.3821		(27)
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490	60.0000	2883.0000 (29a)
Flat Ceiling	68.3900		68.3900	0.1500	10.2585	9.0000	615.5100 (30)
Total net area of external elements Aum(A, m ²)			126.4600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.2896	(33)
Party Wall shared by Apartment			20.7500	0.0000	0.0000	140.0000	2905.0000 (32)
Party Floor			68.3900			40.0000	2735.6000 (32a)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9139.1100 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							133.6323 (35)
Thermal bridges (Default value 0.200 * total exposed area)							25.2920 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		56.5816 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	57.6110	56.7303	55.8496	51.4461	50.5653	46.1618	46.1618	45.2811	47.9232	50.5653	52.3268	54.0882 (38)
Heat transfer coeff	114.1926	113.3119	112.4312	108.0277	107.1470	102.7434	102.7434	101.8627	104.5049	107.1470	108.9084	110.6698 (39)
Average = Sum(39)m / 12 =												107.8075

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.6697	1.6568	1.6440	1.5796	1.5667	1.5023	1.5023	1.4894	1.5281	1.5667	1.5925	1.6182 (40)
HLP (average)												1.5764
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2064 (42)
Hot water usage for mixer showers												
78.6081	77.4268	75.7054	72.4117	69.9811	67.2705	65.7298	67.4382	69.3109	72.2213	75.5857	78.3069	(42a)
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses												
37.2259	35.8722	34.5185	33.1649	31.8112	30.4575	30.4575	31.8112	33.1649	34.5185	35.8722	37.2259	(42c)
Average daily hot water use (litres/day)												106.3157 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	115.8340	113.2990	110.2239	105.5766	101.7923	97.7280	96.1873	99.2494	102.4758	106.7398	111.4578	115.5328 (44)
Energy conte	183.4527	161.3362	169.4100	144.5291	137.0320	120.1680	116.3302	122.8915	126.3629	144.8449	158.7921	180.8964 (45)
Energy content (annual)												Total = Sum(45)m = 1766.0460
Distribution loss (46)m = 0.15 x (45)m												
27.5179	24.2004	25.4115	21.6794	20.5548	18.0252	17.4495	18.4337	18.9544	21.7267	23.8188	27.1345	(46)
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(56)
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372	(64)
Total per year (kWh/year)												2144.4780 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
60.9980	53.6443	56.3288	48.0559	45.5631	39.9559	38.6798	40.8614	42.0157	48.1609	52.7984	60.1481	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	110.3206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
103.6907	114.8004	103.6907	107.1470	103.6907	107.1470	103.6907	103.6907	107.1470	103.6907	107.1470	103.6907	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
193.5106	195.5187	190.4585	179.6859	166.0876	153.3070	144.7688	142.7608	147.8209	158.5935	172.1919	184.9724	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	34.0321	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	-88.2565	(71)
Water heating gains (Table 5)												
81.9866	79.8278	75.7108	66.7443	61.2408	55.4943	51.9890	54.9212	58.3551	64.7324	73.3311	80.8442	(72)
Total internal gains												
435.2841	446.2430	425.9561	409.6735	387.1152	372.0445	356.5446	357.4689	369.4192	383.1128	408.7662	425.6034	(73)

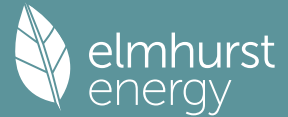
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				1.8200	11.2829	0.7200	0.7000	0.7700	7.1723 (75)			
Southwest				8.2000	36.7938	0.7200	0.7000	0.7700	105.3787 (79)			
Solar gains	112.5509	194.0982	271.9016	347.5058	398.9167	400.2904	384.1505	345.1446	297.9820	216.2261	135.2439	96.0394 (83)
Total gains	547.8350	640.3413	697.8577	757.1793	786.0319	772.3348	740.6951	702.6135	667.4012	599.3388	544.0101	521.6429 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
22.2312	22.4040	22.5795	23.4999	23.6931	24.7086	24.7086	24.9222	24.2921	23.6931	23.3099	22.9389	
2.4821	2.4936	2.5053	2.5667	2.5795	2.6472	2.6472	2.6615	2.6195	2.5795	2.5540	2.5293	
util living area												
0.9673	0.9510	0.9281	0.8792	0.7999	0.6652	0.5332	0.5691	0.7511	0.8953	0.9518	0.9708 (86)	
MIT												
18.0297	18.3701	18.8668	19.5844	20.1857	20.6763	20.8714	20.8448	20.5084	19.7208	18.8092	18.0438 (87)	

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Th 2	19.5626	19.5719	19.5812	19.6283	19.6378	19.6858	19.6858	19.6954	19.6665	19.6378	19.6189	19.6000 (88)
util rest of house	0.9605	0.9409	0.9124	0.8511	0.7484	0.5741	0.4009	0.4403	0.6724	0.8653	0.9402	0.9647 (89)
MIT 2	16.1951	16.6286	17.2579	18.1714	18.8928	19.4573	19.6277	19.6192	19.2849	18.3599	17.2144	16.2322 (90)
Living area fraction									FLA = Living area / (4) =			0.2837 (91)
MIT	16.7155	17.1226	17.7143	18.5722	19.2596	19.8030	19.9805	19.9669	19.6320	18.7460	17.6667	16.7461 (92)
Temperature adjustment												0.0000
adjusted MIT	16.7155	17.1226	17.7143	18.5722	19.2596	19.8030	19.9805	19.9669	19.6320	18.7460	17.6667	16.7461 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9399	0.9158	0.8840	0.8236	0.7314	0.5832	0.4331	0.4697	0.6700	0.8393	0.9164	0.9458	(94)
Useful gains	514.8981	586.4086	616.8783	623.6105	574.8743	450.4634	320.8076	330.0231	447.1464	503.0529	498.5123	493.3708	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1417.7640	1384.9694	1260.8360	1044.8675	809.9841	534.5792	347.3261	363.3294	578.1179	872.8164	1150.8075	1388.4741	(97)
Space heating kWh	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568	(98a)
Space heating requirement - total per year (kWh/year)												3576.4098	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3576.4098	
Space heating per m2											(98c) / (4) =	52.2943	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	671.7323	536.6328	479.1046	303.3051	174.9217	0.0000	0.0000	0.0000	0.0000	275.1040	469.6526	665.9568 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	215.5935	190.3666	201.5508	175.6331	169.1728	151.2720	148.4710	155.0323	157.4669	176.9857	189.8961	213.0372 (64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	71.1635	62.8366	66.5283	57.9733	55.8409	49.9322	49.0076	51.1734	51.9770	58.4198	62.6813	70.3198 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	4.2412	3.8307	4.2412	4.1044	4.2412	4.1044	4.2412	4.2412	4.1044	4.2412	4.1044	4.2412 (231)
Lighting	22.4418	18.0036	16.2103	11.8764	9.1736	7.4949	8.3685	10.8777	14.1290	18.5381	20.9387	23.0655 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3576.4098 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.9550
Water heating fuel used												707.8536 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.4000, SFP = 0.2660)												
mechanical ventilation fans (SFP = 0.2660)												49.9363 (230a)
Total electricity for the above, kWh/year												49.9363 (231)
Electricity for lighting (calculated in Appendix L)												181.1182 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energv for all uses												4515.3179 (238)

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12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3576.4098	0.1543	552.0015 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	707.8536	0.1411	99.8699 (264)
Space and water heating			651.8715 (265)
Pumps, fans and electric keep-hot	49.9363	0.1387	6.9268 (267)
Energy for lighting	181.1182	0.1443	26.1410 (268)
Total CO ₂ , kg/year			684.9392 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.0200 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3576.4098	1.5714	5620.0423 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	707.8536	1.5217	1077.1430 (278)
Space and water heating			6697.1853 (279)
Pumps, fans and electric keep-hot	49.9363	1.5128	75.5437 (281)
Energy for lighting	181.1182	1.5338	277.8051 (282)
Total Primary energy kWh/year			7050.5341 (286)
Dwelling Primary energy Rate (DPER)			103.0900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.3900 (1b)	x 2.2500 (2b)	= 153.8775 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.3900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.8775 (5)

2. Ventilation rate

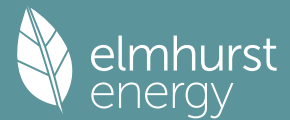
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1300 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3800 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3515 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4481	0.4393	0.4306	0.3866	0.3778	0.3339	0.3339	0.3251	0.3515	0.3778	0.3954	0.4130 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5618	0.5714	0.5782	0.5853 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opening Type (U _w = 1.20)			10.0200	1.1450	11.4733		(27)
External Walls	58.0700	10.0200	48.0500	0.1800	8.6490		(29a)
Flat Ceiling	68.3900		68.3900	0.1100	7.5229		(30)
Total net area of external elements A _{um} (A, m ²)			126.4600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6452		(33)
Party Wall shared by Apartment			20.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							133.6323 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.3230 (36)
Point Thermal bridges						(36a) =	0.0000

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util living area	0.9463	0.9164	0.8730	0.7849	0.6575	0.4931	0.3627	0.3940	0.5854	0.8045	0.9140	0.9524 (86)
MIT	19.6256	19.8876	20.1993	20.5696	20.8226	20.9544	20.9887	20.9845	20.9123	20.5967	20.0722	19.5866 (87)
Th 2	20.1315	20.1340	20.1364	20.1476	20.1497	20.1596	20.1596	20.1614	20.1558	20.1497	20.1455	20.1410 (88)
util rest of house												
MIT 2	0.9380	0.9041	0.8546	0.7552	0.6133	0.4349	0.2957	0.3254	0.5264	0.7710	0.8994	0.9450 (89)
Living area fraction	18.5409	18.8673	19.2517	19.7011	19.9858	20.1260	20.1537	20.1529	20.0862	19.7434	19.1102	18.4989 (90)
MIT	18.8486	19.1567	19.5205	19.9474	20.2232	20.3610	20.3906	20.3888	20.3205	19.9855	19.3831	18.8074 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	18.8486	19.1567	19.5205	19.9474	20.2232	20.3610	20.3906	20.3888	20.3205	19.9855	19.3831	18.8074 (93)

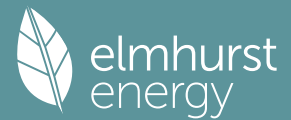
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9228	0.8877	0.8396	0.7477	0.6173	0.4492	0.3143	0.3443	0.5383	0.7639	0.8839	0.9305	(94)
Useful gains	541.5386	594.0403	601.9915	573.3663	487.2159	346.9559	233.4722	244.2734	366.2116	477.7728	512.8531	523.6144	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	937.7542	916.1215	834.1550	697.6796	536.8111	358.2699	235.7295	247.4713	388.7489	591.1204	777.8608	930.3234	(97)
Space heating kWh	294.7844	216.4386	172.7297	89.5056	36.8989	0.0000	0.0000	0.0000	0.0000	84.3306	190.8055	302.5915	(98a)
Space heating requirement - total per year (kWh/year)												1388.0847	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	294.7844	216.4386	172.7297	89.5056	36.8989	0.0000	0.0000	0.0000	0.0000	84.3306	190.8055	302.5915	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1388.0847	
Space heating per m2										(98c) / (4) =		20.2966	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	294.7844	216.4386	172.7297	89.5056	36.8989	0.0000	0.0000	0.0000	0.0000	84.3306	190.8055	302.5915	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	319.3764	234.4947	187.1394	96.9725	39.9771	0.0000	0.0000	0.0000	0.0000	91.3658	206.7232	327.8348	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	194.1113	171.6396	182.7242	162.0632	157.9441	143.2829	142.3252	147.5804	148.7165	164.6339	173.5162	192.2205	(64)
Efficiency of water heater (217)m	84.9941	84.5810	83.9338	82.7852	81.3616	79.8000	79.8000	79.8000	79.8000	82.6369	84.2733	85.0727	(216)
Fuel for water heating, kWh/month	228.3822	202.9292	217.7004	195.7634	194.1260	179.5525	178.3524	184.9379	186.3615	199.2256	205.8971	225.9484	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	21.5449	17.2841	15.5624	11.4017	8.8070	7.1954	8.0340	10.4429	13.5644	17.7972	20.1019	22.1437	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.3574	-27.2131	-41.1052	-48.6446	-54.5900	-51.7413	-51.1191	-47.2052	-40.6647	-32.1868	-20.6530	-15.7201	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.6767	-14.3517	-29.1038	-44.5715	-59.7811	-60.3727	-59.6537	-50.1101	-36.2157	-20.7928	-9.0001	-5.2565	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1503.8838	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2399.1765	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												173.8795	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-845.0868	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												3317.8530	(238)

Full SAP Calculation Printout



12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1503.8838	0.2100	315.8156 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2399.1765	0.2100	503.8271 (264)
Space and water heating			819.6427 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	173.8795	0.1443	25.0962 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.2003	0.1335	-59.9871
PV Unit electricity exported	-395.8865	0.1253	-49.6174
Total			-109.6045 (269)
Total CO2, kg/year			747.0636 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9200 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1503.8838	1.1300	1699.3887 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2399.1765	1.1300	2711.0694 (278)
Space and water heating			4410.4581 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	173.8795	1.5338	266.7022 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-449.2003	1.4935	-670.8759
PV Unit electricity exported	-395.8865	0.4600	-182.1194
Total			-852.9953 (283)
Total Primary energy kWh/year			3954.2658 (286)
Target Primary Energy Rate (TPER)			57.8200 (287)

Predicted Energy Assessment



36-436a, BarlowMoor road, Manchester , United Kingdom, M21 0AB

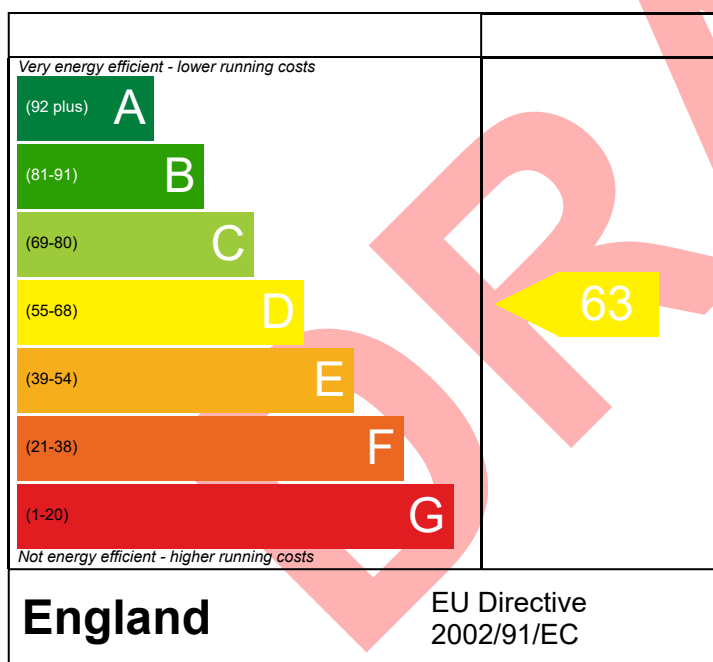
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Mid-Terrace
11/07/2024
Daniel Watt
68.39 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

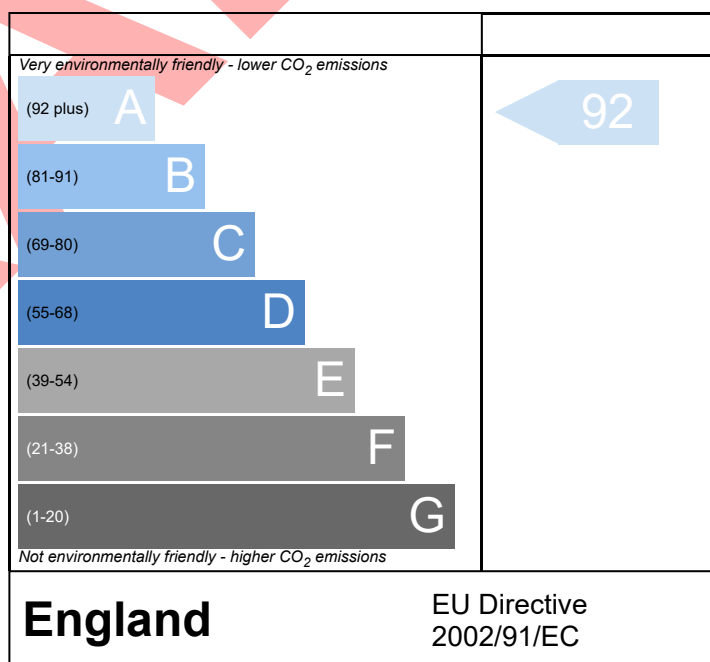
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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