Ollier Smurthwaite

Environmental Standards Statement

16 Plots at 816 Stockport Road, Manchester, M12 4QN

10 July 2024

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1 Executive Summary

This Environmental Standards Statement has been prepared by Watt Energy on behalf of Ollier Smurthwaite Architects to support a planning application for the development of an apartment block at 816 Stockport Road, Manchester, M12 4QN. 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

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 SAP 2012 to accurately predict Energy Usage and CO_2 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 not proposed that the development incorporates LZC technologies due to the constraints of the site and the listed status of the existing development.

As a result of the above the predicted site wide reduction in CO_2 over Part L 2013 of the Building Regulations can be summarised as:

- 71.01% with SAP 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) 2021, 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 71.01% 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 development – 816 Stockport Road, Manchester, M.

2.1 The Site and Proposed Development

The Site is located south-east of the centre of Manchester, within Longsight. The site occupies approximately 0.04 hectares of land. A plan, with the site's extents denoted by the red outlined seen in Figure 1 (shown later in the subsection).

The site is bounded by Midway Street to the north, Stockport Road to the east. It is a 25-minute car journey to Manchester City centre and a 29 min bus ride away. The proposal is for a Purpose-Built Residential building consisting of 4 -storey square shaped building (Use Class C3).

The development consists of a total of 16 flats. There will be a total of 130 sqm of 4 retail units on the ground floor. Also provided will be the associated ancillary facilities including bin store, external bike parking, plant room and a post/parcel store.

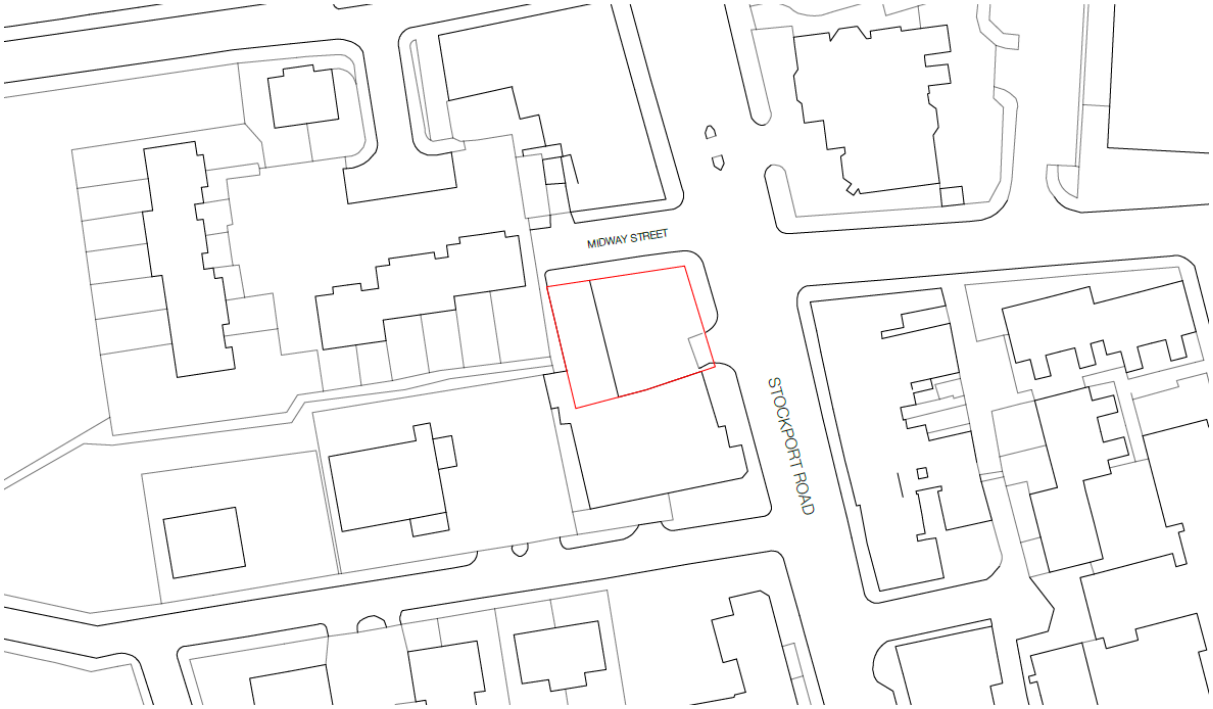


Figure 1: Site Plan

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 LZC 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 into 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 decarbonizing 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 National Planning Policy

The NPPF (revised 2021) 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

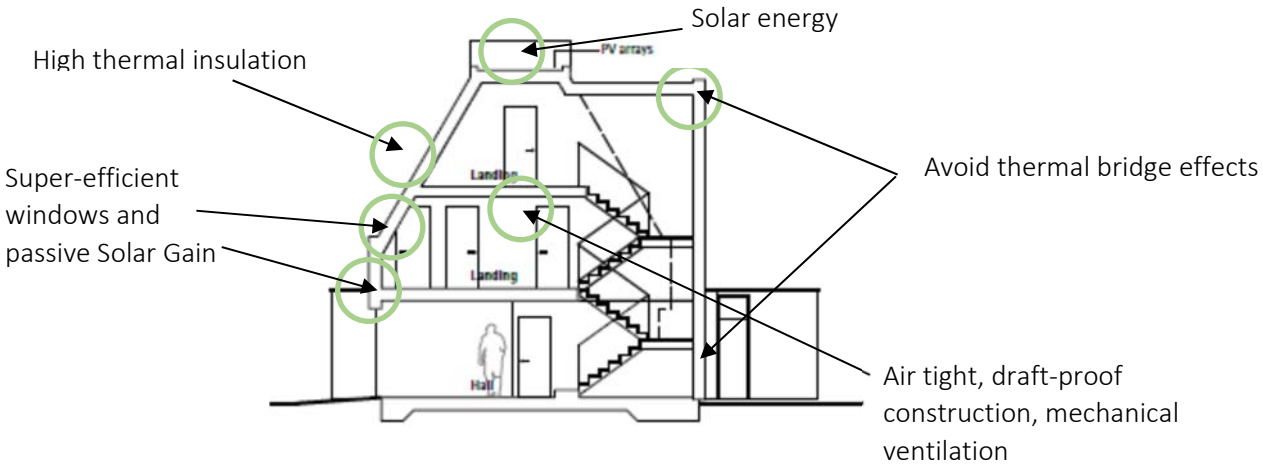


Fig 3. Efficient Design Measure examples

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

Residential Units:

- Ground floor U-values of 0.12 W/m²K
- External Wall U-values of 0.18 W/m²K
- External Roof U-values of 0.12 W/m²K
- Glazed Window U-values of 1.3 W/m^{2}K
- Solid Frame Door U-values of 1.3 W/m^{2}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
- 200L electric immersion cylinders to each flat
- Vent-Axia MVHR units
- Assumed Air Permeability Rate of 3m³/hm² in all flats
- ACD checklist assumed thermal bridging psi values

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 there are no LZC technologies currently proposed; Listed Building Consent would be required to incorporate any external LZC technology instillations, the Manchester Planning target is already being met solely through energy efficiency measures and 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 no LZC technologies are proposed at this stage.

2.3.3 Energy and CO_2 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:

	SAP 10.1
Summary of CO2 Emission Reductions	**Total CO2 emissions (kgCO2/year)**
Carbon Factors (Gas / Electric)	**0.210 / 0.136**
Baseline emissions	10414.0
Improved emissions (after incorporation of renewable energy technology) % CO2 displaced in total	3018.7
% CO2 displaced in total	71.0%
% CO2 displaced by renewable energy	71.01%

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 (%)
Building Regulations Part L compliance ("Baseline" energy demand & emissions)	47243.0		10414.0	
Proposed scheme after on-site renewables	22196.7	53.0%	3018.7	71.0%
Proposed scheme offset for financial contribution or other "allowable solution"			0	0
Total savings on residual emissions				**71.0%**

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)	47243.0
Baseline carbon emissions (kg pa)	10414.0

Be Lean stage

The following table demonstrates how the development achieves the reduction in carbon dioxide emissions from energy efficiency measures.

Energy savings from energy efficiency measures (kWh pa)	--
Emission savings from energy efficiency measures (kg pa)	--
Total regulated emissions after CHP savings and energy efficiency measures (kg pa) ("residual emissions")	3018.7

Be Clean stage

The heating and cooling hierarchy has been applied to the design process of the development. It has resulted in large focus on energy efficiency measures and as can be seen in Figure 1.

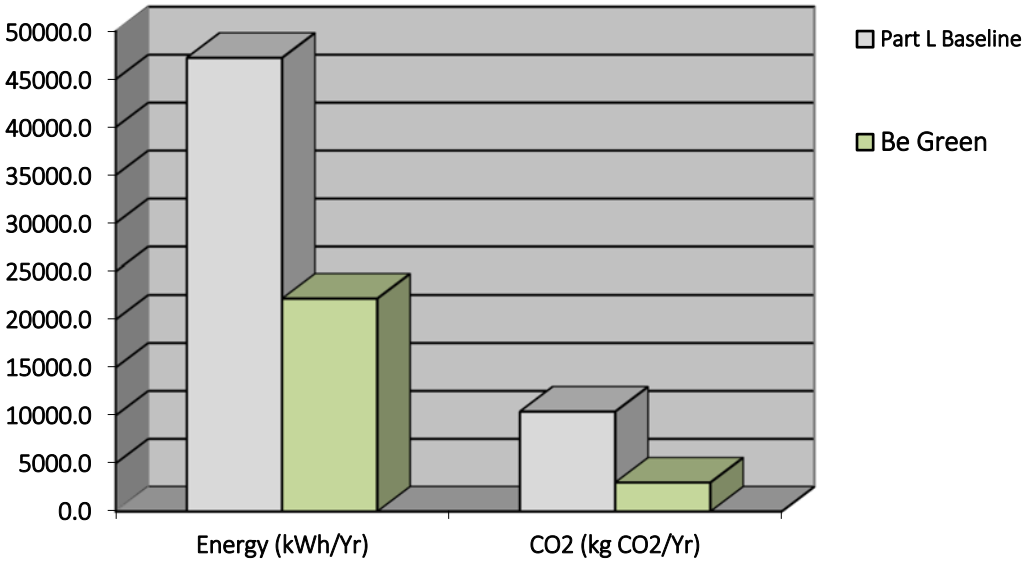
Energy savings from the use of CHP systems (kWh pa)	22196.7
Emission savings from the use of CHP systems (kg pa)	-
Total regulated emissions after CHP savings (kg pa)	3018.7

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)	25046.3
Saving on residual emissions from the use of renewables (kg)	7395.3
Saving on residual emissions from the use of renewables (%)	71.0%

The chart below illustrates the improvements over the Part L Compliant Baseline:



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 **71.01%** 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 **71.01%** 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 **71.01%** 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 16 units at residential dwelling at 816 Stockport Road site achieves a total reduction of **71.01%** in carbon emissions over Part L 2013.

The low carbon classification for Boiler House 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

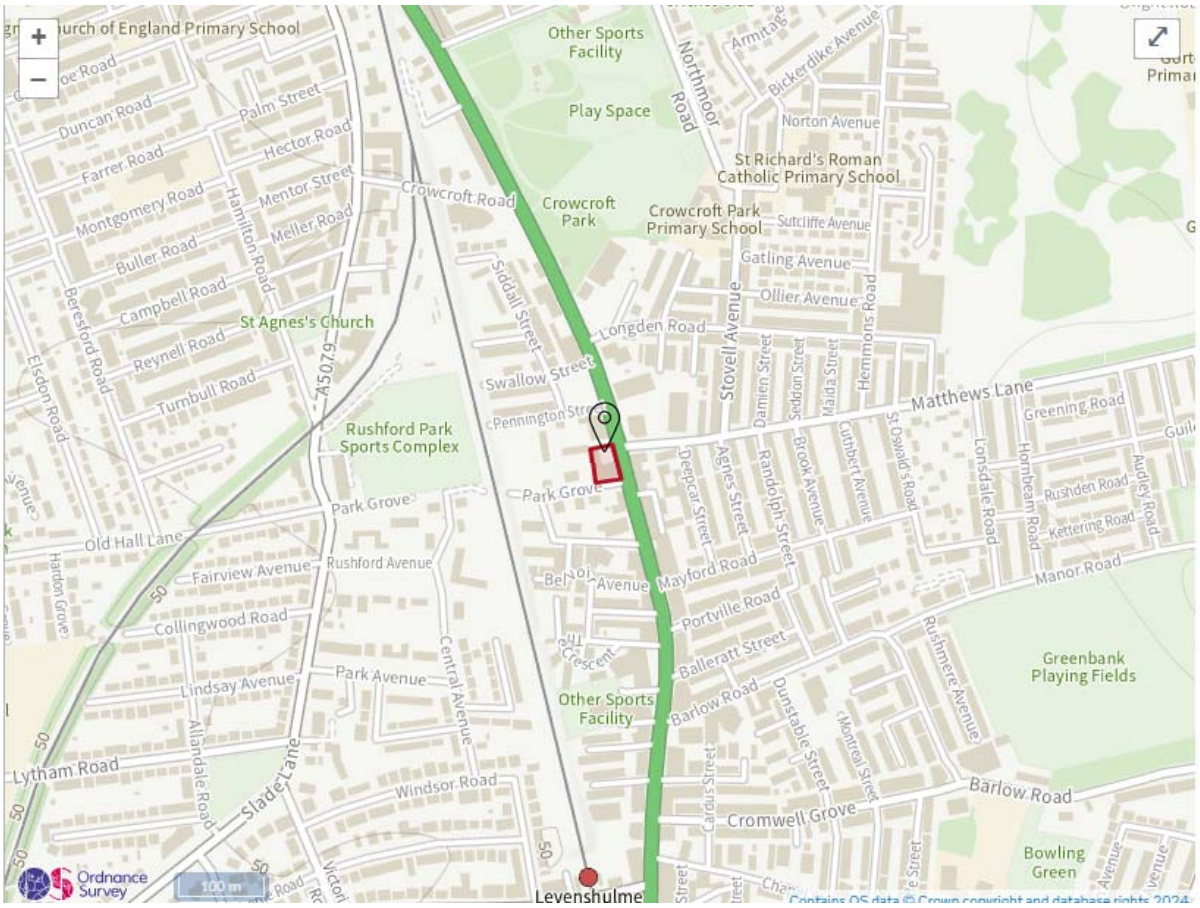


Fig 4: Flood Risk Map

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:

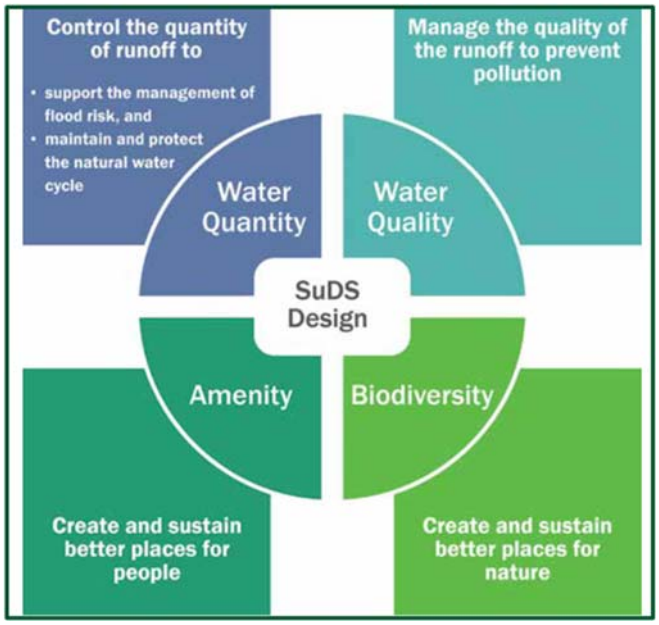


Fig 5. Representation of figure 2.1 of the SUDs Manual

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 large outdoor cycle store, thereby encouraging all residents to commute in a sustainable manner.

Further to providing cycle provision, the site is located within Levenshulme adjacent to both Stockport Road and Moseley Road, which both have multiple bus stops. Also, Levenshulme Train Stop is a 9-minute walk southwest from the site. This proximity to several transport nodes with such a range of travel possibilities further reduces the reliance on cars and the negative environmental impacts associated.

Transport Links

- Train: The closest train station to the site is Levenshulme Train Station, which is located approximately 0.4 miles southwest of the site. This station provides access to additional Manchester stations as well as regional and national destinations.

- Bus: The nearest bus stop is located on Albert Road and is less than 0.3 miles from the site. These will provide frequent services to Stalybridge, Ashton-under-Lyne and Piccadilly Gardens; where further buses can be caught to more regional destinations.

Local Amenities

- The site is an area of Manchester, bordering Fallowfield, Longsight, Gorton, Burnage, Heaton Chapel and Reddish, about halfway between Stockport and Manchester city centre on the A6. Levenshulme is predominantly residential with numerous fast-food shops, public houses and antique stores.
- The site is located next to No. 818 nears its junction with Midway Street. North Ridge Recreation Area is situated 0.3 miles from site; providing a recreational space for residents.
- The site is also within a 24-minute bus ride to the centre of town, where a multitude of shops and amenities can be accessed.
- Due to its proximity to Central Manchester, the site has good access to music, theatre and art venues, places of religion and Manchester's City Library.

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.

A PV array would require Listed Building Consent. Additionally, the Manchester planning target is already being satisfied solely through the use of energy efficiency measures and the development is achieving a low carbon and carbon neutral 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 816 Stockport Road, Manchester, M12 4QN 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 carried out, with all suitable technologies investigated for their suitability to the site and development. Although one LZC technology is proposed in form of ASHP Hot Water units the total carbon reduction is to 71.01%, when using 10.1 carbon factors. In addition to this renewable technology provision, the development can also be defined as carbon neutral because it will have net zero carbon emissions. This is to be achieved by obtaining all the energy used on site from a 100% renewable energy electricity supply 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. Whilst tri-separator refuse shoots will be installed on each floor to promote recycling.

- In addition to targeting Secure by Design accreditation through adoption crime prevention measures, 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 Manchester City Centre to the proposed site is highly sustainable in terms of transport and local amenities as it is near a number of public transport nodes including Levenshulme Train Station, multiple bus stops and additional Metrolink stations, as well as a multitude of shops and other local amenities around the site.
- The development will also include significant cycle storage provision.

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	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	TOTAL (kWh/yr)	SAP 10.1	TOTAL (kgCO2/yr)
Frequency	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16		
BASELINE 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)	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)	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)	2233.8	1849.0	1112.1	671.6	856.3	1053.2	1134.2	1383.0	669.3	856.3	1053.2	1134.2	1283.5	1033.7	1254.8	1290.4	18868.6	0.210	3962.4
Secondary Main Heating Fuel Requirement (TER)																	0.0	0.136	0.0
Secondary Heating Fuel Requirement (TER)																	0.0	0.136	0.0
Water Fuel Requirement (TER)	2306.8	2304.6	2123.5	2023.1	2014.0	2321.4	2325.2	2113.1	2023.2	2014.0	2321.4	2325.2	2182.2	2007.0	2313.3	2318.6	35036.8	0.210	7357.7
Electricity Pumps Fans Requirement (TER)	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	1376.0	0.136	187.1
Electricity Lighting Requirement (TER)	167.5	164.8	123.6	100.8	99.4	163.4	164.8	143.1	100.9	99.4	163.4	164.8	136.8	99.4	163.4	164.8	2220.2	0.136	301.9
PV Energy produced (TER)	-771.1	-760.0	-584.5	-477.0	-474.5	-753.8	-760.0	-584.5	-477.0	-474.5	-753.8	-760.0	-640.1	-474.5	-753.8	-760.0	-10258.7	0.136	-1395.2
TOTAL PER DEVELOPMENT																	47243.0		10414.0
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)	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)	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)	1181.1	854.0	462.2	215.3	443.4	295.4	333.4	695.0	213.2	443.4	295.4	333.4	685.4	701.1	557.8	632.2	8341.5	0.136	1134.4
Secondary Main Heating Fuel Requirement (DER)																	0.0	0.136	0.0
Secondary Heating Fuel Requirement (DER)																	0.0	0.136	0.0
Water Fuel Requirement (DER)	575.1	571.3	513.5	480.0	479.2	569.1	571.3	513.5	480.0	479.2	569.1	571.3	531.9	479.2	569.1	571.3	8524.0	0.136	1159.3
Electricity Pumps Fans Requirement (DER)	264.9	261.1	197.4	161.1	160.2	254.5	261.1	197.4	161.1	160.2	254.5	261.1	193.4	143.4	227.7	229.6	3127.5	0.136	425.3
Electricity Lighting Requirement (DER)	175.1	171.7	118.4	89.1	87.9	169.8	171.7	137.1	89.2	87.9	169.8	171.7	135.4	87.9	169.8	171.7	2203.7	0.136	299.7
TOTAL PER DEVELOPMENT																	22196.7		3018.7

watt

Energy & Consulting Engineers

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 10 Jul 2024 10:18:07

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2024-07-10

Dwelling Details			
Assessment Type	As designed	Total Floor Area	62 m^2
Site Reference	Plot 1	Plot Reference	Plot 1 - Type 2A
Address	Plot 1 816 Stockport Road, Manchester, M12 4QN		

Client Details	
Name	OLLIER SMURTHWAITE
Company	OLLIER SMURTHWAITE
Address	40 king st, Manchester, M3

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	*14.26 kgCO_2/m^2*	
Dwelling carbon dioxide emission rate	5.27 kgCO_2/m^2	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*75.91 kWh$_{PE}$/m^2*	
Dwelling primary energy	54.69 kWh$_{PE}$/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*40.4 kWh/m^2*	
Dwelling fabric energy efficiency	38.5 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**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*	0.12	Ground Floor (0.12)	OK
Roofs	*0.16*	0.12	Roof (1) (0.12)	OK
Windows, doors, and roof windows	*1.6*	1.3	North (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^2K]**
Exposed wall: Walls (1)	52.86	0.18
Party wall: Party Wall (1)	37.03	0 **(!)**
Ground floor: Ground Floor, Ground Floor	64.2	0.12
Exposed roof: Roof (1)	13.9	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
North, Windows	5.7	North	0.7	1.3
South, Windows	1.9	South	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part **1 - Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.3	
External wall	E3: Sill	Calculated by person with suitable expertise	0.04	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.16	
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.09	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0 **(!)**	

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	3 m^3/hm^2, Design value **(!)**	OK
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	GDC Group Ltd
Model	EDL200UK-630
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: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.96 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	HRE 350	
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	Plot 1	**Issued on Date**	10/07/2024
Assessment Reference	Plot 1 - Type 2A	**Prop Type Ref**	Plot 1
Property	Plot 1, 816 Stockport Road, Manchester, M12 4QN		

SAP Rating	82 B	**DER**	5.27	**TER**	14.26
Environmental	96 A	**% DER < TER**			63.04
CO_2 Emissions (t/year)	0.27	**DFEE**	38.49	**TFEE**	40.44
Compliance Check	See BREL	**% DFEE < TFEE**			4.82
% DPER < TPER	27.95	**DPER**	54.69	**TPER**	75.91

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4000	(1b)	x 2.9000	(2b) =	180.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	180.9600	(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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(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) =	0.1388	(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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)

Balanced mechanical ventilation with heat recovery

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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580	(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	
Windows (Uw = 1.30)			7.6000	1.2357	9.3916			(27)
Ground Floor			64.2000	0.1200	7.7040	110.0000	7062.0000	(28a)
External Wall	60.4600	7.6000	52.8600	0.1800	9.5148	150.0000	7929.0000	(29a)
Flat Roof	13.9000		13.9000	0.1200	1.6680	9.0000	125.1000	(30)
Total net area of external elements Aum(A, m2)			138.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.2784			(33)
Party Wall - To Lobby			37.0300	0.0000	0.0000	140.0000	5184.2000	(32)
Party Ceiling 1			48.5000			30.0000	1455.0000	(32b)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 21755.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	348.6426	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6000	0.3000	1.0800
E3 Sill	3.6000	0.0400	0.1440

E4 Jamb	15.2000	0.0500	0.7600	
E5 Ground floor (normal)	33.6200	0.1600	5.3792	
E14 Flat roof	6.9000	0.0800	0.5520	
E16 Corner (normal)	11.6000	0.0900	1.0440	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.7700	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9592 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 37.2376 (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	16.2374	16.0302	15.8231	14.7874	14.5802	13.5445	13.5445	13.3374	13.9588	14.5802	14.9945	15.4088	(38)
Heat transfer coeff	53.4750	53.2679	53.0607	52.0250	51.8179	50.7822	50.7822	50.5750	51.1964	51.8179	52.2322	52.6464	(39)
Average = Sum(39)m / 12 =												51.9732	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8570	0.8537	0.8503	0.8337	0.8304	0.8138	0.8138	0.8105	0.8205	0.8304	0.8371	0.8437	(40)
HLP (average)												0.8329	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0486 (42)
Hot water usage for mixer showers

75.1980	74.0679	72.4212	69.2704	66.9452	64.3522	62.8784	64.5126	66.3041	69.0882	72.3067	74.9099	(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

35.6099	34.3150	33.0201	31.7252	30.4302	29.1353	29.1353	30.4302	31.7252	33.0201	34.3150	35.6099	(42c)

Average daily hot water use (litres/day) 101.7026 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8079	108.3829	105.4412	100.9956	97.3755	93.4876	92.0137	94.9429	98.0293	102.1083	106.6216	110.5198	(44)
Energy conte	175.4926	154.3358	162.0593	138.2579	131.0861	114.9539	111.2826	117.5591	120.8799	138.5600	151.9021	173.0472	(45)
Energy content (annual)										Total = Sum(45)m =		1689.4164	
Distribution loss (46)m = 0.15 x (45)m	26.3239	23.1504	24.3089	20.7387	19.6629	17.2431	16.6924	17.6339	18.1320	20.7840	22.7853	25.9571	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	202.4440	178.6790	189.0107	164.3399	158.0375	141.0359	138.2340	144.5105	146.9619	165.5114	177.9841	199.9986	(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	202.4440	178.6790	189.0107	164.3399	158.0375	141.0359	138.2340	144.5105	146.9619	165.5114	177.9841	199.9986	(64)
										Total per year (kWh/year) = Sum(64)m =		2006.7474	(64)
12Total per year (kWh/year)												2007	(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	58.3513	51.3166	53.8847	45.9708	43.5861	38.2222	37.0015	39.0884	40.1926	46.0712	50.5074	57.5382	(65)

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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	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.8598	110.5591	99.8598	103.1885	99.8598	103.1885	99.8598	99.8598	103.1885	99.8598	103.1885	99.8598	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	178.9567	180.8137	176.1341	166.1717	153.5961	141.7768	133.8807	132.0237	136.7033	146.6656	159.2413	171.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	(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)	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	(71)
Water heating gains (Table 5)	78.4291	76.3641	72.4257	63.8483	58.5835	53.0863	49.7332	52.5382	55.8230	61.9237	70.1492	77.3363	(72)
Total internal gains	410.9748	421.4660	402.1488	386.9377	365.7687	351.7808	337.2029	338.1509	349.4440	362.1783	386.3082	401.9860	(73)

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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	
North	5.7000	10.6334	0.7200	0.7000	0.7700	21.1695	(74)
South	1.9000	46.7521	0.7200	0.7000	0.7700	31.0255	(78)

Solar gains	52.1949	91.2677	133.4697	183.5749	224.9782	232.6003	220.3484	187.5604	150.2663	102.9628	62.8910	44.4568	(83)
Total gains	463.1698	512.7337	535.6185	570.5126	590.7468	584.3811	557.5513	525.7113	499.7103	465.1411	449.1992	446.4427	(84)

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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	113.0087	113.4481	113.8910	116.1583	116.6227	119.0012	119.0012	119.4886	118.0383	116.6227	115.6977	114.7872	
alpha	8.5339	8.5632	8.5927	8.7439	8.7748	8.9334	8.9334	8.9659	8.8692	8.7748	8.7132	8.6525	
util living area	0.9982	0.9951	0.9860	0.9357	0.7866	0.5548	0.4007	0.4424	0.6970	0.9507	0.9941	0.9987	(86)
MIT	20.4121	20.5256	20.6704	20.8690	20.9764	20.9989	20.9999	20.9999	20.9932	20.8675	20.6174	20.4001	(87)
Th 2	20.2042	20.2071	20.2099	20.2242	20.2271	20.2414	20.2414	20.2442	20.2356	20.2271	20.2213	20.2156	(88)
util rest of house	0.9974	0.9929	0.9799	0.9112	0.7323	0.4898	0.3316	0.3698	0.6248	0.9262	0.9912	0.9981	(89)
MIT 2	19.5238	19.6704	19.8547	20.1024	20.2108	20.2409	20.2414	20.2442	20.2323	20.1074	19.7995	19.5179	(90)
Living area fraction										fLA = Living area / (4) =		0.3292	(91)
MIT	19.8162	19.9519	20.1232	20.3547	20.4628	20.4904	20.4911	20.4930	20.4827	20.3576	20.0688	19.8083	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8162	19.9519	20.1232	20.3547	20.4628	20.4904	20.4911	20.4930	20.4827	20.3576	20.0688	19.8083	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9921	0.9791	0.9158	0.7495	0.5112	0.3544	0.3937	0.6486	0.9310	0.9904	0.9977	(94)
Useful gains	461.7511	508.6579	524.4333	522.4797	442.7680	298.7607	197.5846	206.9718	324.1197	433.0311	444.8980	445.4003	(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	829.7282	801.7813	722.8585	595.9325	454.0695	299.1295	197.5966	207.0013	326.7738	505.6177	677.3864	821.7220	(97)
Space heating kWh	273.7749	196.9789	147.6284	52.8860	8.4084	0.0000	0.0000	0.0000	0.0000	54.0044	167.3916	279.9833	(98a)
Space heating requirement - total per year (kWh/year)												1181.0560	
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	273.7749	196.9789	147.6284	52.8860	8.4084	0.0000	0.0000	0.0000	0.0000	54.0044	167.3916	279.9833	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1181.0560	
Space heating per m2										(98c) / (4) =		18.9272	(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	273.7749	196.9789	147.6284	52.8860	8.4084	0.0000	0.0000	0.0000	0.0000	54.0044	167.3916	279.9833	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	273.7749	196.9789	147.6284	52.8860	8.4084	0.0000	0.0000	0.0000	0.0000	54.0044	167.3916	279.9833	(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	202.4440	178.6790	189.0107	164.3399	158.0375	141.0359	138.2340	144.5105	146.9619	165.5114	177.9841	199.9986	(64)
Efficiency of water heater												348.9342	(216)
(217)m	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	348.9342	(217)
Fuel for water heating, kWh/month	58.0178	51.2071	54.1680	47.0977	45.2915	40.4191	39.6161	41.4148	42.1174	47.4334	51.0079	57.3170	(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	22.5005	20.3230	22.5005	21.7747	22.5005	21.7747	22.5005	22.5005	21.7747	22.5005	21.7747	22.5005	(231)
Lighting	21.6910	17.4014	15.6680	11.4790	8.8667	7.2442	8.0885	10.5138	13.6564	17.9179	20.2382	22.2939	(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	1181.0560	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	348.9342	
Water heating fuel used	575.1078	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.2000)
mechanical ventilation fans (SFP = 1.2000) 264.9254 (230a)

Total electricity for the above, kWh/year	264.9254	(231)
Electricity for lighting (calculated in Appendix L)	175.0591	(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	2196.1483	(238)

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	1181.0560	0.1572	185.6597	(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)	575.1078	0.1411	81.1715	(264)
Space and water heating			266.8312	(265)
Pumps, fans and electric keep-hot	264.9254	0.1387	36.7484	(267)
Energy for lighting	175.0591	0.1443	25.2664	(268)
Total CO2, kg/year			328.8460	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2700	(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	1181.0560	1.5820	1868.3871	(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)	575.1078	1.5219	875.2572	(278)
Space and water heating			2743.6443	(279)
Pumps, fans and electric keep-hot	264.9254	1.5128	400.7792	(281)
Energy for lighting	175.0591	1.5338	268.5115	(282)
Total Primary energy kWh/year			3412.9350	(286)
Dwelling Primary energy Rate (DPER)			54.6900	(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		62.4000	(1b) x	2.9000	(2b) =	180.9600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		180.9600	(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) =	0.1105 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3605 (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) =	0.3335 (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	0.4252	0.4169	0.4085	0.3668	0.3585	0.3168	0.3168	0.3085	0.3335	0.3585	0.3752	0.3918	(22b)
Effective ac	0.5904	0.5869	0.5834	0.5673	0.5643	0.5502	0.5502	0.5476	0.5556	0.5643	0.5704	0.5768	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

		m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)				7.6000	1.1450	8.7023			(27)
Ground Floor				64.2000	0.1300	8.3460			(28a)
External Wall		60.4600	7.6000	52.8600	0.1800	9.5148			(29a)
Flat Roof		13.9000		13.9000	0.1100	1.5290			(30)
Total net area of external elements Aum(A, m2)				138.5600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		28.0921			(33)
Party Wall - To Lobby				37.0300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 356.4151 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	3.6000	0.0500	0.1800
E3 Sill	3.6000	0.0500	0.1800
E4 Jamb	15.2000	0.0500	0.7600
E5 Ground floor (normal)	33.6200	0.1600	5.3792
E14 Flat roof	6.9000	0.0800	0.5520
E16 Corner (normal)	11.6000	0.0900	1.0440
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.7700	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0952 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 36.1873 (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	35.2564	35.0468	34.8413	33.8763	33.6957	32.8552	32.8552	32.6996	33.1790	33.6957	34.0610	34.4429	(38)
Heat transfer coeff	71.4437	71.2341	71.0286	70.0636	69.8830	69.0425	69.0425	68.8869	69.3663	69.8830	70.2483	70.6302	(39)

Average = Sum(39)m / 12 = 70.0627

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1449	1.1416	1.1383	1.1228	1.1199	1.1065	1.1065	1.1040	1.1116	1.1199	1.1258	1.1319	(40)
HLP (average)												1.1228	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0486 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	75.1980	74.0679	72.4212	69.2704	66.9452	64.3522	62.8784	64.5126	66.3041	69.0882	72.3067	74.9099	(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	35.6099	34.3150	33.0201	31.7252	30.4302	29.1353	29.1353	30.4302	31.7252	33.0201	34.3150	35.6099	(42c)

Average daily hot water use (litres/day) 101.7026 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	110.8079	108.3829	105.4412	100.9956	97.3755	93.4876	92.0137	94.9429	98.0293	102.1083	106.6216	110.5198	(44)
Energy conte	175.4926	154.3358	162.0593	138.2579	131.0861	114.9539	111.2826	117.5591	120.8799	138.5600	151.9021	173.0472	(45)
Energy content (annual)										Total = Sum(45)m =		1689.4164	
Distribution loss (46)m = 0.15 x (45)m	26.3239	23.1504	24.3089	20.7387	19.6629	17.2431	16.6924	17.6339	18.1320	20.7840	22.7853	25.9571	(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	222.0875	196.4215	208.6542	183.3497	177.6810	160.0457	157.8775	164.1540	165.9717	185.1549	196.9939	219.6421	(62)
WWHRS	-34.3774	-30.4036	-31.8369	-26.3622	-24.5687	-21.0236	-19.7063	-20.9556	-21.7518	-25.6430	-29.0504	-33.7408	(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	187.7101	166.0179	176.8172	156.9875	153.1124	139.0221	138.1712	143.1984	144.2199	159.5119	167.9435	185.9014	(64)
										Total per year (kWh/year) = Sum(64)m =		1918.6135	(64)
12Total per year (kWh/year)												1919	(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	95.6272	84.9852	91.1606	82.0442	80.8621	74.2956	74.2774	76.3643	76.2660	83.3471	86.5809	94.8141	(65)

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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	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	102.4307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.8598	110.5591	99.8598	103.1885	99.8598	103.1885	99.8598	99.8598	103.1885	99.8598	103.1885	99.8598	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	178.9567	180.8137	176.1341	166.1717	153.5961	141.7768	133.8807	132.0237	136.7033	146.6656	159.2413	171.0606	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	33.2431	(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)	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	-81.9446	(71)
Water heating gains (Table 5)	128.5312	126.4661	122.5277	113.9503	108.6856	103.1884	99.8352	102.6402	105.9251	112.0257	120.2513	127.4383	(72)
Total internal gains	464.0769	474.5681	455.2508	440.0398	418.8707	401.8828	387.3049	388.2530	399.5461	415.2804	439.4102	455.0880	(73)

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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	
North	5.7000	10.6334	0.6300	0.7000	0.7700	18.5233	(74)
South	1.9000	46.7521	0.6300	0.7000	0.7700	27.1473	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	45.6706	79.8592	116.7860	160.6280	196.8559	203.5253	192.8049	164.1153	131.4830	90.0924	55.0297	38.8997	(83)
Total gains	509.7475	554.4273	572.0368	600.6678	615.7266	605.4081	580.1098	552.3683	531.0291	505.3728	494.4399	493.9877	(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	86.4717	86.7262	86.9771	88.1751	88.4029	89.4791	89.4791	89.6813	89.0615	88.4029	87.9432	87.4678	
alpha	6.7648	6.7817	6.7985	6.8783	6.8935	6.9653	6.9653	6.9788	6.9374	6.8935	6.8629	6.8312	
util living area													
	0.9982	0.9963	0.9918	0.9708	0.8956	0.7059	0.5209	0.5686	0.8243	0.9736	0.9954	0.9985	(86)
MIT	20.1198	20.2349	20.4044	20.6586	20.8729	20.9813	20.9979	20.9963	20.9471	20.6970	20.3754	20.1066	(87)
Th 2	19.9643	19.9670	19.9697	19.9822	19.9846	19.9956	19.9956	19.9976	19.9913	19.9846	19.9798	19.9749	(88)
util rest of house													
	0.9973	0.9945	0.9876	0.9554	0.8449	0.6071	0.4037	0.4477	0.7366	0.9564	0.9928	0.9978	(89)
MIT 2	18.9563	19.1052	19.3224	19.6468	19.8873	19.9873	19.9951	19.9968	19.9623	19.6989	19.2949	18.9477	(90)
Living area fraction									fLA = Living area / (4) =			0.3292	(91)
MIT	19.3393	19.4771	19.6786	19.9799	20.2117	20.3145	20.3252	20.3258	20.2865	20.0275	19.6505	19.3291	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3393	19.4771	19.6786	19.9799	20.2117	20.3145	20.3252	20.3258	20.2865	20.0275	19.6505	19.3291	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9933	0.9860	0.9553	0.8577	0.6398	0.4425	0.4879	0.7648	0.9573	0.9916	0.9972	(94)
Useful gains	508.0151	550.7335	564.0453	573.8289	528.1296	387.3414	256.7023	269.4870	406.1084	483.7883	490.2948	492.6192	(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	1074.4622	1038.3847	936.0579	776.2952	594.8260	394.5428	257.1990	270.4352	429.1349	658.8188	881.6545	1068.5737	(97)
Space heating kWh	421.4367	327.7016	276.7774	145.7757	49.6221	0.0000	0.0000	0.0000	0.0000	130.2227	281.7790	428.5102	(98a)
Space heating requirement - total per year (kWh/year)												2061.8254	
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	421.4367	327.7016	276.7774	145.7757	49.6221	0.0000	0.0000	0.0000	0.0000	130.2227	281.7790	428.5102	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2061.8254	
Space heating per m2											(98c) / (4) =	33.0421	(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													
	421.4367	327.7016	276.7774	145.7757	49.6221	0.0000	0.0000	0.0000	0.0000	130.2227	281.7790	428.5102	(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)													
	456.5944	355.0397	299.8672	157.9369	53.7617	0.0000	0.0000	0.0000	0.0000	141.0863	305.2860	464.2581	(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													
	187.7101	166.0179	176.8172	156.9875	153.1124	139.0221	138.1712	143.1984	144.2199	159.5119	167.9435	185.9014	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8175	85.5554	85.0604	83.8939	81.8300	79.8000	79.8000	79.8000	79.8000	83.6086	85.2112	85.8698	(217)
Fuel for water heating, kWh/month													
	218.7317	194.0472	207.8725	187.1261	187.1104	174.2132	173.1469	179.4466	180.7267	190.7841	197.0910	216.4922	(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	20.7489	16.6455	14.9875	10.9805	8.4816	6.9296	7.7372	10.0571	13.0632	17.1396	19.3592	21.3256	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-16.8100	-24.9501	-37.7325	-44.7102	-50.2281	-47.6327	-47.0701	-43.4485	-37.3925	-29.5465	-18.9263	-14.3922	(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	-6.0315	-12.9742	-26.3272	-40.3415	-54.1256	-54.6617	-54.0005	-45.3433	-32.7542	-18.7929	-8.1296	-4.7471	(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												2233.8303	(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	2306.7887	(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)	167.4555	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-771.0691	(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	4023.0055	(238)

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	2233.8303	0.2100	469.1044	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2306.7887	0.2100	484.4256	(264)
Space and water heating			953.5300	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	167.4555	0.1443	24.1690	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-412.8398	0.1335	-55.1197	
PV Unit electricity exported	-358.2293	0.1253	-44.8936	
Total			-100.0133	(269)
Total CO2, kg/year			889.6150	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2600	(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	2233.8303	1.1300	2524.2283	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2306.7887	1.1300	2606.6712	(278)
Space and water heating			5130.8995	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	167.4555	1.5338	256.8488	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-412.8398	1.4934	-616.5278	
PV Unit electricity exported	-358.2293	0.4600	-164.7805	
Total			-781.3084	(283)
Total Primary energy kWh/year			4736.5408	(286)
Target Primary Energy Rate (TPER)			75.9100	(287)

Predicted Energy Assessment

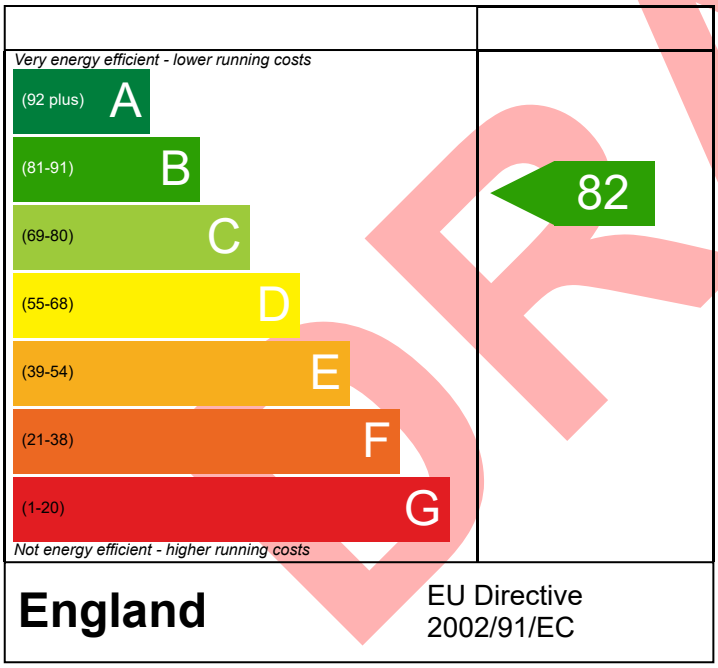
Plot 1, 816 Stockport Road, Manchester, M12 4QN

Dwelling type:	Flat, Semi-Detached
Date of assessment:	10/07/2024
Produced by:	Daniel Watt
Total floor area:	62.4 m²
DRRN:	

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.

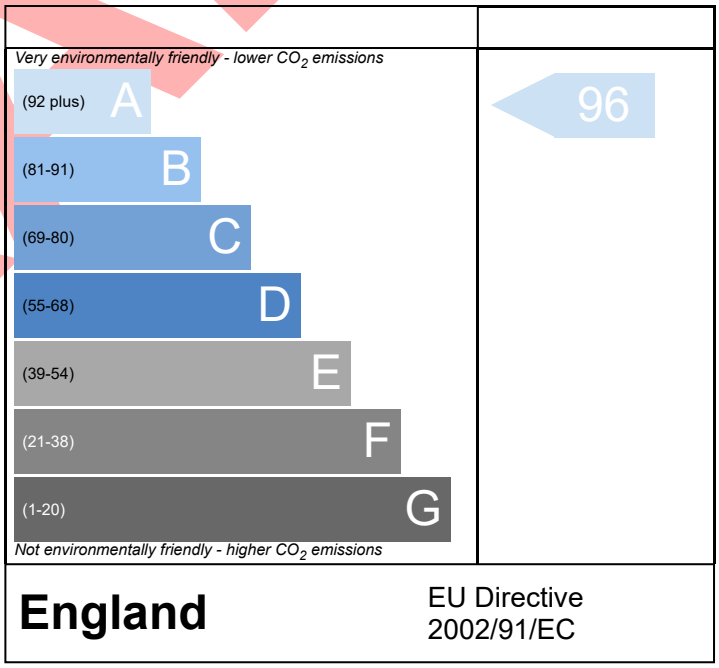
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Building Regulations England Part L (BREL) Compliance Report

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

Date: Wed 10 Jul 2024 10:18:11

Project Information			
Assessed By	Daniel Watt	Building Type	Flat, Semi-detached
OCDEA Registration	EES/027301	Assessment Date	2024-07-10

Dwelling Details			
Assessment Type	As designed	Total Floor Area	38 m^2
Site Reference	Plot 14	Plot Reference	Plot 14 - Type 1C
Address	Plot 1 816 Stockport Road, Manchester, M12 4QN		

Client Details	
Name	OLLIER SMURTHWAITE
Company	OLLIER SMURTHWAITE
Address	40 king st, Manchester, M3

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	*15.71 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	5.5 $kgCO_2/m^2$	**OK**
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*84.09 kWh_{PE}/m^2*	
Dwelling primary energy	57.1 kWh_{PE}/m^2	**OK**
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*35.6 kWh/m^2*	
Dwelling fabric energy efficiency	39.0 kWh/m^2	**FAIL**

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**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*	0.12	Roof (1) (0.12)	**OK**
Windows, doors, and roof windows	*1.6*	1.3	North (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^2K]**
Exposed wall: Walls (1)	24.14	0.18
Party wall: Party Wall (1)	37.81	0 **(!)**
Exposed roof: Roof (1)	38.4	0.12

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
North, Windows	3.8	North	0.7	1.3
East, Windows	7.6	East	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part **1 - Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.3	
External wall	E3: Sill	Calculated by person with suitable expertise	0.04	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.09	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0 **(!)**	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.06	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.07	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.06	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.24	

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	3 m^3/hm^2, Design value **(!)**	OK
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	GDC Group Ltd
Model	EDL200UK-630
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: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.96 W/(l/s)	**OK**
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	**OK**
Manufacturer/Model	HRE 350	
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	Plot 14	**Issued on Date**	10/07/2024
Assessment Reference	Plot 14 - Type 1C	**Prop Type Ref**	Plot 2
Property	Plot 1, 816 Stockport Road, Manchester, M12 4QN		

SAP Rating	85 B	**DER**	5.50	**TER**	15.71
Environmental	97 A	**% DER < TER**			64.99
CO_2 Emissions (t/year)	0.18	**DFEE**	39.05	**TFEE**	35.61
Compliance Check	See BREL	**% DFEE < TFEE**			-9.66
% DPER < TPER	32.10	**DPER**	57.10	**TPER**	84.09

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.4000	(1b)	x 2.5500	(2b) =	97.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		97.9200	(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	0 * 10 =	0.0000	(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) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(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) =	0.1388	(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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630	(22b)

Balanced mechanical ventilation with heat recovery

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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.0000 (23c)

Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580	(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	
Windows (Uw = 1.30)			11.4000	1.2357	14.0875			(27)
External Wall	35.5400	11.4000	24.1400	0.1800	4.3452	150.0000	3621.0000	(29a)
Flat Ceiling	38.4000		38.4000	0.1200	4.6080	9.0000	345.6000	(30)
Total net area of external elements Aum(A, m2)			73.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.0407			(33)
Party Wall			37.8100	0.0000	0.0000	140.0000	5293.4000	(32)
Party Floor			38.4000			40.0000	1536.0000	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10796.0000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		281.1458 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.4000	0.3000	1.6200
E3 Sill	5.4000	0.0400	0.2160
E4 Jamb	25.2000	0.0500	1.2600

E16 Corner (normal)	2.8500	0.0900	0.2565		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.2700	0.0000	0.0000		
E18 Party wall between dwellings	5.7000	0.0600	0.3420		
E7 Party floor between dwellings (in blocks of flats)	12.3000	0.0700	0.8610		
E10 Eaves (insulation at ceiling level)	6.5500	0.0600	0.3930		
E12 Gable (insulation at ceiling level)	5.7800	0.2400	1.3872		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.3357	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	29.3764	(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	8.7863	8.6742	8.5621	8.0017	7.8896	7.3291	7.3291	7.2170	7.5533	7.8896	8.1137	8.3379	(38)
Heat transfer coeff	38.1626	38.0505	37.9384	37.3780	37.2659	36.7055	36.7055	36.5934	36.9297	37.2659	37.4901	37.7143	(39)
Average = Sum(39)m / 12 =												37.3500	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9938	0.9909	0.9880	0.9734	0.9705	0.9559	0.9559	0.9530	0.9617	0.9705	0.9763	0.9821	(40)
HLP (average)												0.9727	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3645	(42)
Hot water usage for mixer showers	60.4135	59.5056	58.1826	55.6513	53.7833	51.7001	50.5160	51.8290	53.2682	55.5050	58.0906	60.1821	(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	28.6037	27.5636	26.5235	25.4833	24.4432	23.4031	23.4031	24.4432	25.4833	26.5235	27.5636	28.6037	(42c)
Average daily hot water use (litres/day)												81.7026	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.0173	87.0692	84.7061	81.1347	78.2265	75.1032	73.9191	76.2722	78.7516	82.0284	85.6542	88.7858	(44)
Energy conte	140.9816	123.9854	130.1901	111.0693	105.3079	92.3481	89.3987	94.4409	97.1086	111.3118	122.0302	139.0171	(45)
Energy content (annual)										Total = Sum(45)m =		1357.1897	
Distribution loss (46)m = 0.15 x (45)m	21.1472	18.5978	19.5285	16.6604	15.7962	13.8522	13.4098	14.1661	14.5663	16.6968	18.3045	20.8526	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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	167.9330	148.3286	157.1415	137.1513	132.2593	118.4301	116.3501	121.3923	123.1906	138.2632	148.1122	165.9685	(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	167.9330	148.3286	157.1415	137.1513	132.2593	118.4301	116.3501	121.3923	123.1906	138.2632	148.1122	165.9685	(64)
										Total per year (kWh/year) = Sum(64)m =		1674.5207	(64)
12Total per year (kWh/year)												1675	(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	46.8764	41.2252	43.2882	36.9305	35.0149	30.7057	29.7251	31.4016	32.2886	37.0112	40.5750	46.2232	(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	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.2811	65.6327	59.2811	61.2572	59.2811	61.2572	59.2811	59.2811	61.2572	59.2811	61.2572	59.2811	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.5315	118.7511	115.6777	109.1349	100.8757	93.1132	87.9274	86.7078	89.7812	96.3241	104.5832	112.3457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	(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)	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	(71)
Water heating gains (Table 5)	63.0059	61.3470	58.1831	51.2924	47.0630	42.6469	39.9531	42.2064	44.8453	49.7462	56.3542	62.1279	(72)
Total internal gains	283.2859	289.1981	276.6093	265.1518	250.6872	240.4846	230.6290	231.6628	239.3510	248.8188	265.6620	277.2221	(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	
North	3.8000	10.6334	0.7200	0.7000	0.7700	14.1130	(74)
East	7.6000	19.6403	0.7200	0.7000	0.7700	52.1344	(76)

Solar gains	66.2474	128.9567	213.7862	318.5688	399.3661	413.4683	391.6840	329.9477	250.4425	153.1200	82.4157	54.6381	(83)
Total gains	349.5333	418.1548	490.3955	583.7206	650.0533	653.9530	622.3130	561.6104	489.7935	401.9388	348.0777	331.8602	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	78.5818	78.8133	79.0462	80.2314	80.4727	81.7014	81.7014	81.9516	81.2054	80.4727	79.9915	79.5160	
alpha	6.2388	6.2542	6.2697	6.3488	6.3648	6.4468	6.4468	6.4634	6.4137	6.3648	6.3328	6.3011	
util living area	0.9892	0.9689	0.9067	0.7340	0.5286	0.3589	0.2595	0.2996	0.5164	0.8480	0.9728	0.9918	(86)
MIT	20.2394	20.4585	20.7246	20.9377	20.9922	20.9995	20.9999	20.9999	20.9951	20.8776	20.5225	20.2042	(87)
Th 2	20.0885	20.0909	20.0934	20.1056	20.1080	20.1203	20.1203	20.1227	20.1154	20.1080	20.1031	20.0982	(88)
util rest of house	0.9857	0.9596	0.8832	0.6905	0.4796	0.3097	0.2076	0.2425	0.4520	0.8042	0.9630	0.9891	(89)
MIT 2	19.2248	19.4989	19.8165	20.0526	20.1028	20.1200	20.1203	20.1227	20.1128	20.0035	19.5918	19.1881	(90)
Living area fraction										fLA = Living area / (4) =		0.4688	(91)
MIT	19.7004	19.9487	20.2422	20.4675	20.5197	20.5323	20.5326	20.5339	20.5264	20.4132	20.0280	19.6644	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7004	19.9487	20.2422	20.4675	20.5197	20.5323	20.5326	20.5339	20.5264	20.4132	20.0280	19.6644	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9579	0.8874	0.7086	0.5023	0.3328	0.2319	0.2693	0.4821	0.8202	0.9620	0.9875	(94)
Useful gains	343.8647	400.5643	435.1671	413.6297	326.5425	217.6253	144.3394	151.2492	236.1454	329.6579	334.8553	327.6959	(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	587.7185	572.6126	521.3577	432.3699	328.6733	217.7464	144.3484	151.2722	237.3239	365.6991	484.6732	583.2270	(97)
Space heating kWh	181.4272	115.6164	64.1258	13.4929	1.5853	0.0000	0.0000	0.0000	0.0000	26.8147	107.8689	190.1151	(98a)
Space heating requirement - total per year (kWh/year)												701.0463	
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	181.4272	115.6164	64.1258	13.4929	1.5853	0.0000	0.0000	0.0000	0.0000	26.8147	107.8689	190.1151	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												701.0463	
Space heating per m2											(98c) / (4) =	18.2564	(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	181.4272	115.6164	64.1258	13.4929	1.5853	0.0000	0.0000	0.0000	0.0000	26.8147	107.8689	190.1151	(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)	181.4272	115.6164	64.1258	13.4929	1.5853	0.0000	0.0000	0.0000	0.0000	26.8147	107.8689	190.1151	(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	167.9330	148.3286	157.1415	137.1513	132.2593	118.4301	116.3501	121.3923	123.1906	138.2632	148.1122	165.9685	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	48.0619	42.4512	44.9734	39.2523	37.8522	33.8943	33.2990	34.7421	35.2567	39.5705	42.3892	47.4996	(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	12.1753	10.9971	12.1753	11.7826	12.1753	11.7826	12.1753	12.1753	11.7826	12.1753	11.7826	12.1753	(231)
Lighting	10.8908	8.7370	7.8667	5.7635	4.4519	3.6372	4.0612	5.2788	6.8567	8.9964	10.1614	11.1935	(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	701.0463 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	349.4100
Water heating fuel used	479.2424 (219)
Space cooling fuel	0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.2000)

mechanical ventilation fans (SFP = 1.2000) 143.3549 (230a)

Total electricity for the above, kWh/year 143.3549 (231)

Electricity for lighting (calculated in Appendix L)	87.8950	(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	1411.5385	(238)

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	701.0463	0.1583	110.9450	(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)	479.2424	0.1411	67.5975	(264)
Space and water heating			178.5425	(265)
Pumps, fans and electric keep-hot	143.3549	0.1387	19.8851	(267)
Energy for lighting	87.8950	0.1443	12.6860	(268)
Total CO2, kg/year			211.1136	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.5000	(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	701.0463	1.5858	1111.7077	(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)	479.2424	1.5216	729.1970	(278)
Space and water heating			1840.9047	(279)
Pumps, fans and electric keep-hot	143.3549	1.5128	216.8673	(281)
Energy for lighting	87.8950	1.5338	134.8162	(282)
Total Primary energy kWh/year			2192.5882	(286)
Dwelling Primary energy Rate (DPER)			57.1000	(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		38.4000 (1b)	x	2.5500 (2b)	=	97.9200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	97.9200	(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) =	0.2042	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4542	(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) =	0.4202	(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	0.5357	0.5252	0.5147	0.4622	0.4517	0.3992	0.3992	0.3887	0.4202	0.4517	0.4727	0.4937	(22b)
Effective ac	0.6435	0.6379	0.6325	0.6068	0.6020	0.5797	0.5797	0.5755	0.5883	0.6020	0.6117	0.6219	(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)			9.6000	1.1450	10.9924			(27)
External Wall	35.5400	9.6000	25.9400	0.1800	4.6692			(29a)
Flat Ceiling	38.4000		38.4000	0.1100	4.2240			(30)
Total net area of external elements Aum(A, m2)			73.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.8856			(33)
Party Wall			37.8100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 281.1458 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	5.4000	0.0500	0.2700
E3 Sill	5.4000	0.0500	0.2700
E4 Jamb	25.2000	0.0500	1.2600
E16 Corner (normal)	2.8500	0.0900	0.2565
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.2700	0.0000	0.0000
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E7 Party floor between dwellings (in blocks of flats)	12.3000	0.0700	0.8610
E10 Eaves (insulation at ceiling level)	6.5500	0.0600	0.3930
E12 Gable (insulation at ceiling level)	5.7800	0.0600	0.3468

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.9993 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 23.8849 (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	20.7939	20.6138	20.4373	19.6083	19.4532	18.7312	18.7312	18.5975	19.0093	19.4532	19.7670	20.0950	(38)
Heat transfer coeff	44.6788	44.4987	44.3222	43.4932	43.3381	42.6160	42.6160	42.4823	42.8942	43.3381	43.6519	43.9799	(39)
Average = Sum(39)m / 12 =												43.4924	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1635	1.1588	1.1542	1.1326	1.1286	1.1098	1.1098	1.1063	1.1170	1.1286	1.1368	1.1453	(40)
HLP (average)												1.1326	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3645 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	60.4135	59.5056	58.1826	55.6513	53.7833	51.7001	50.5160	51.8290	53.2682	55.5050	58.0906	60.1821	(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	28.6037	27.5636	26.5235	25.4833	24.4432	23.4031	23.4031	24.4432	25.4833	26.5235	27.5636	28.6037	(42c)
Average daily hot water use (litres/day)												81.7026	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	89.0173	87.0692	84.7061	81.1347	78.2265	75.1032	73.9191	76.2722	78.7516	82.0284	85.6542	88.7858	(44)
Energy conte	140.9816	123.9854	130.1901	111.0693	105.3079	92.3481	89.3987	94.4409	97.1086	111.3118	122.0302	139.0171	(45)
Energy content (annual)										Total = Sum(45)m =		1357.1897	
Distribution loss (46)m = 0.15 x (45)m	21.1472	18.5978	19.5285	16.6604	15.7962	13.8522	13.4098	14.1661	14.5663	16.6968	18.3045	20.8526	(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	187.5765	166.0711	176.7850	156.1612	151.9028	137.4399	135.9936	141.0358	142.2004	157.9067	167.1220	185.6120	(62)
WWHRS	-27.6185	-24.4261	-25.5776	-21.1792	-19.7383	-16.8902	-15.8319	-16.8356	-17.4752	-20.6014	-23.3389	-27.1071	(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	159.9579	141.6451	151.2075	134.9819	132.1645	120.5498	120.1617	124.2002	124.7252	137.3053	143.7831	158.5049	(64)
										Total per year (kWh/year) = Sum(64)m =		1649.1872	(64)
12Total per year (kWh/year)												1649	(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	84.1523	74.8937	80.5641	73.0040	72.2908	66.7792	67.0010	68.6775	68.3621	74.2871	76.6485	83.4991	(65)

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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	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	68.2245	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	59.2811	65.6327	59.2811	61.2572	59.2811	61.2572	59.2811	59.2811	61.2572	59.2811	61.2572	59.2811	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	117.5315	118.7511	115.6777	109.1349	100.8757	93.1132	87.9274	86.7078	89.7812	96.3241	104.5832	112.3457	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	29.8225	(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)	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	-54.5796	(71)
Water heating gains (Table 5)	113.1079	111.4490	108.2851	101.3945	97.1651	92.7489	90.0551	92.3085	94.9473	99.8483	106.4563	112.2300	(72)
Total internal gains	336.3879	342.3001	329.7113	318.2539	303.7892	290.5867	280.7310	281.7648	289.4530	301.9208	318.7640	330.3242	(73)

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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	
North	3.2000	10.6334	0.6300	0.7000	0.7700	10.3990	(74)
East	6.4000	19.6403	0.6300	0.7000	0.7700	38.4148	(76)

Solar gains	48.8139	95.0207	157.5267	234.7349	294.2698	304.6609	288.6093	243.1193	184.5366	112.8253	60.7274	40.2597	(83)
Total gains	385.2018	437.3208	487.2380	552.9888	598.0590	595.2475	569.3403	524.8841	473.9896	414.7461	379.4914	370.5838	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.1211	67.3927	67.6611	68.9508	69.1975	70.3699	70.3699	70.5914	69.9137	69.1975	68.7001	68.1877	
alpha	5.4747	5.4928	5.5107	5.5967	5.6132	5.6913	5.6913	5.7061	5.6609	5.6132	5.5800	5.5458	
util living area	0.9869	0.9730	0.9370	0.8266	0.6480	0.4553	0.3289	0.3715	0.6074	0.8817	0.9714	0.9890	(86)
MIT	20.0720	20.2618	20.5274	20.8238	20.9605	20.9955	20.9994	20.9989	20.9794	20.7832	20.3935	20.0530	(87)
Th 2	19.9493	19.9531	19.9568	19.9743	19.9775	19.9928	19.9928	19.9957	19.9869	19.9775	19.9709	19.9640	(88)
util rest of house	0.9825	0.9644	0.9179	0.7843	0.5857	0.3850	0.2539	0.2908	0.5256	0.8400	0.9607	0.9853	(89)
MIT 2	18.9057	19.1452	19.4706	19.8174	19.9499	19.9908	19.9927	19.9954	19.9758	19.7877	19.3262	18.8931	(90)
Living area fraction										fLA = Living area / (4) =		0.4688	(91)
MIT	19.4524	19.6686	19.9660	20.2891	20.4237	20.4618	20.4646	20.4658	20.4462	20.2543	19.8265	19.4368	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4524	19.6686	19.9660	20.2891	20.4237	20.4618	20.4646	20.4658	20.4462	20.2543	19.8265	19.4368	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9798	0.9616	0.9181	0.7981	0.6135	0.4179	0.2891	0.3287	0.5635	0.8525	0.9589	0.9829	(94)
Useful gains	377.4238	420.5075	447.3423	441.3325	366.9319	248.7663	164.5934	172.5191	267.0700	353.5645	363.8792	364.2520	(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	676.9899	657.1847	596.8418	495.3492	378.0663	249.8048	164.6940	172.7233	272.2162	418.4004	555.5362	670.1129	(97)
Space heating kWh	222.8772	159.0471	111.2276	38.8920	8.2840	0.0000	0.0000	0.0000	0.0000	48.2379	137.9930	227.5605	(98a)
Space heating requirement - total per year (kWh/year)												954.1193	
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	222.8772	159.0471	111.2276	38.8920	8.2840	0.0000	0.0000	0.0000	0.0000	48.2379	137.9930	227.5605	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												954.1193	
Space heating per m2											(98c) / (4) =	24.8469	(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	222.8772	159.0471	111.2276	38.8920	8.2840	0.0000	0.0000	0.0000	0.0000	48.2379	137.9930	227.5605	(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)	241.4704	172.3154	120.5066	42.1365	8.9751	0.0000	0.0000	0.0000	0.0000	52.2621	149.5049	246.5444	(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	159.9579	141.6451	151.2075	134.9819	132.1645	120.5498	120.1617	124.2002	124.7252	137.3053	143.7831	158.5049	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.8038	84.3203	83.3817	81.6510	80.2799	79.8000	79.8000	79.8000	79.8000	81.9596	83.9677	84.8701	(217)
Fuel for water heating, kWh/month	188.6212	167.9846	181.3437	165.3156	164.6297	151.0649	150.5786	155.6393	156.2972	167.5281	171.2363	186.7617	(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	12.3174	9.8815	8.8972	6.5185	5.0351	4.1137	4.5931	5.9703	7.7549	10.1748	11.4925	12.6598	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-10.4999	-15.6724	-23.8463	-28.4528	-32.1631	-30.6008	-30.2597	-27.8407	-23.8166	-18.6573	-11.8583	-8.9814	(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	-3.5564	-7.6656	-15.5750	-23.8867	-32.0546	-32.3496	-31.9377	-26.8004	-19.3506	-11.0900	-4.7915	-2.7967	(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	1033.7153	(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	2007.0009	(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)	99.4089	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-474.5041	(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	2751.6210	(238)

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	1033.7153	0.2100	217.0802	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2007.0009	0.2100	421.4702	(264)
Space and water heating			638.5504	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	99.4089	0.1443	14.3478	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-262.6493	0.1334	-35.0285	
PV Unit electricity exported	-211.8547	0.1253	-26.5483	
Total			-61.5768	(269)
Total CO2, kg/year			603.2506	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7100	(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	1033.7153	1.1300	1168.0983	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2007.0009	1.1300	2267.9110	(278)
Space and water heating			3436.0093	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	99.4089	1.5338	152.4767	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-262.6493	1.4928	-392.0904	
PV Unit electricity exported	-211.8547	0.4600	-97.4451	
Total			-489.5355	(283)
Total Primary energy kWh/year			3229.0513	(286)
Target Primary Energy Rate (TPER)			84.0900	(287)

Predicted Energy Assessment

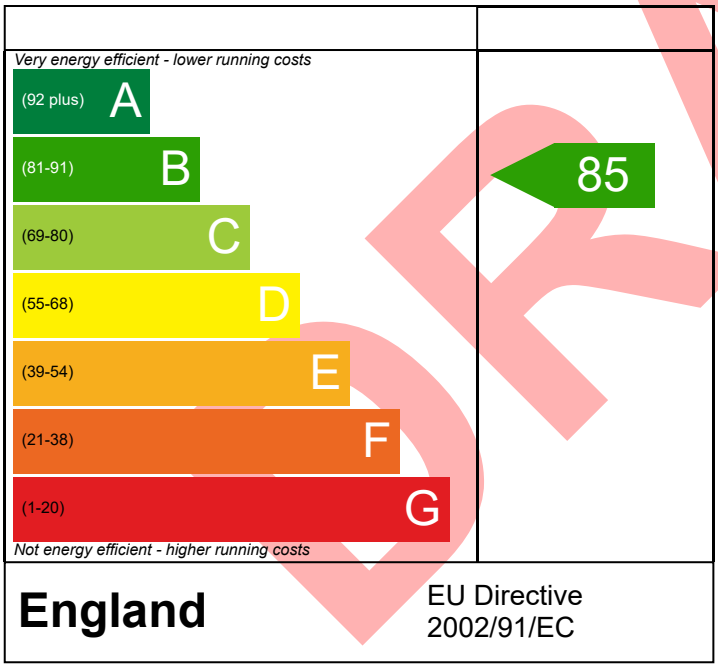
Plot 1, 816 Stockport Road, Manchester, M12 4QN

Dwelling type:	Flat, Semi-Detached
Date of assessment:	10/07/2024
Produced by:	Daniel Watt
Total floor area:	38.4 m²
DRRN:	

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.

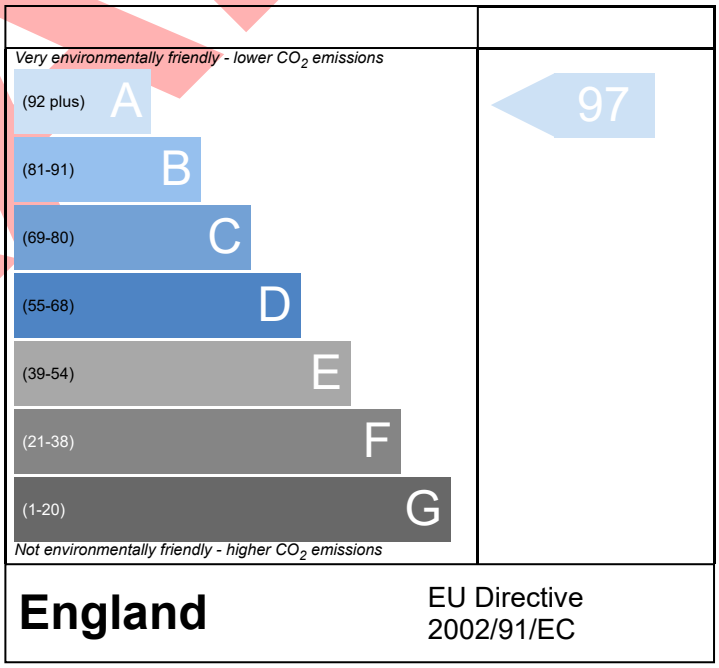
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Block Compliance

Block Reference	816 Stockport Road	**Issued on Date**	10/07/2024
Block Name	816 Stockport Road		
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Daniel Watt	**Assessor ID**	AV75-0001
Client	OLLIER SMURTHWAITE, OLLIER SMURTHWAITE, 40 king st, Manchester, M3		

Block Compliance Report - DER

Block Reference: 816 Stockport Road	Block Name: 816 Stockport Road			
Property-Assessment Reference	**Floor area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
Plot 1 - Plot 1 - Type 2A	62.40	5.27	14.26	63.04 %
Plot 2 - Plot 2 - Type 2B	61.50	4.50	13.16	65.81 %
Plot 3 - Plot 3 - Type 1A	47.30	4.02	13.39	69.98 %
Plot 4 - Plot 4 - Type 1B	38.60	3.56	13.74	74.09 %
Plot 5 - Plot 5 - Type 1C	38.40	4.51	14.78	69.49 %
Plot 6 - Plot 6 - Type 2C	61.00	3.07	10.60	71.04 %
Plot 7 - Plot 7 - Type 2B	61.50	3.17	10.79	70.62 %
Plot 8 - Plot 8 - Type 1A	47.30	4.83	14.61	66.94 %
Plot 9 - Plot 9 - Type 1B	38.60	3.55	13.73	74.14 %
Plot 10 - Plot 10 - Type 1C	38.40	4.51	14.78	69.49 %
Plot 11 - Plot 11 - Type 2C	61.00	3.07	10.60	71.04 %
Plot 12 - Plot 12 - Type 2B	61.50	3.17	10.79	70.62 %
Plot 13 - Plot 13 - Type 1D	51.80	4.43	13.06	66.08 %
Plot 14 - Plot 14 - Type 1C	38.40	5.50	15.71	64.99 %
Plot 15 - Plot 15 - Type 2C	61.00	3.69	11.26	67.23 %
Plot 16 - Plot 16 - Type 2B	61.50	3.86	11.30	65.84 %
Totals:	830.20	64.71	206.56	
Average DER = 3.99 $kgCO_2/m^2$	**% DER/TER**	PASS		
Average TER = 12.65 $kgCO_2/m^2$	68.45 %			

Block Compliance Report - DFEE

Block Reference: 816 Stockport Road	Block Name: 816 Stockport Road			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**

Block Compliance

Plot 1 - Plot 1 - Type 2A	62.40	38.49	40.44	4.82 %
Plot 2 - Plot 2 - Type 2B	61.50	33.31	35.29	5.61 %
Plot 3 - Plot 3 - Type 1A	47.30	29.06	30.18	3.71 %
Plot 4 - Plot 4 - Type 1B	38.60	25.68	25.93	0.94 %
Plot 5 - Plot 5 - Type 1C	38.40	33.02	31.43	-5.07 %
Plot 6 - Plot 6 - Type 2C	61.00	22.09	23.16	4.60 %
Plot 7 - Plot 7 - Type 2B	61.50	23.11	24.23	4.63 %
Plot 8 - Plot 8 - Type 1A	47.30	34.67	35.24	1.62 %
Plot 9 - Plot 9 - Type 1B	38.60	25.61	25.86	0.97 %
Plot 10 - Plot 10 - Type 1C	38.40	33.02	31.43	-5.07 %
Plot 11 - Plot 11 - Type 2C	61.00	22.09	23.16	4.60 %
Plot 12 - Plot 12 - Type 2B	61.50	23.11	24.23	4.63 %
Plot 13 - Plot 13 - Type 1D	51.80	31.77	31.00	-2.50 %
Plot 14 - Plot 14 - Type 1C	38.40	39.05	35.61	-9.66 %
Plot 15 - Plot 15 - Type 2C	61.00	26.00	26.11	0.42 %
Plot 16 - Plot 16 - Type 2B	61.50	27.22	26.38	-3.15 %
Totals:	830.20	467.31	469.68	
Average DFEE = 28.82 $kgCO_2/m^2$	**% DFEE/TFEE**	PASS		
Average TFEE = 29.14 $kgCO_2/m^2$	1.12 %			

Block Compliance Report - DPER

Block Reference: 816 Stockport Road	**Block Name: 816 Stockport Road**			
Property-Assessment Reference	**Floor area (m^2)**	**DPER ($kWh/m^2/yr$)**	**TPER ($kWh/m^2/yr$)**	**% DPER/TPER**
Plot 1 - Plot 1 - Type 2A	62.40	54.69	75.91	27.95 %
Plot 2 - Plot 2 - Type 2B	61.50	46.87	70.02	33.06 %
Plot 3 - Plot 3 - Type 1A	47.30	42.19	71.42	40.93 %
Plot 4 - Plot 4 - Type 1B	38.60	37.65	73.52	48.79 %
Plot 5 - Plot 5 - Type 1C	38.40	47.17	79.08	40.35 %

Block Compliance

Plot 6 - Plot 6 - Type 2C	61.00	32.49	56.22	42.21 %
Plot 7 - Plot 7 - Type 2B	61.50	33.47	57.26	41.55 %
Plot 8 - Plot 8 - Type 1A	47.30	50.51	78.26	35.46 %
Plot 9 - Plot 9 - Type 1B	38.60	37.57	73.45	48.85 %
Plot 10 - Plot 10 - Type 1C	38.40	47.17	79.08	40.35 %
Plot 11 - Plot 11 - Type 2C	61.00	32.49	56.22	42.21 %
Plot 12 - Plot 12 - Type 2B	61.50	33.47	57.26	41.55 %
Plot 13 - Plot 13 - Type 1D	51.80	46.25	69.57	33.52 %
Plot 14 - Plot 14 - Type 1C	38.40	57.10	84.09	32.10 %
Plot 15 - Plot 15 - Type 2C	61.00	38.63	59.81	35.41 %
Plot 16 - Plot 16 - Type 2B	61.50	40.37	60.01	32.73 %
Totals:	830.20	678.09	1101.18	
Average DPER = 41.81 $kgCO_2/m^2$	**% DPER/TPER**	PASS		
Average TPER = 67.38 $kgCO_2/m^2$	37.95 %			