

Energy & Sustainability Statement

Ref: Z39428

**Proposed 69No. New-Build
Dwellings**

**Silk Street, Newton Heath,
Manchester**

for

Rowlinson Constructions



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Executive Summary

This Energy Statement has been developed to evaluate the technical and economic feasibility of using both passive and low and zero carbon technologies on a proposed new build development of 21No. houses and 48No. apartments which would comprise a split of 1-bed and 2-bed units at Silk Street, Manchester. We will assess the practical levels of CO₂ reduction possible for this development to comply with the following Manchester City Council planning requirements:

- Manchester City Council's Core Strategy 2012 - 2027 (2012) policies EN4 - EN7
- Principles of The Guide to Development in Manchester SPD (2007)
- National Planning Policy Framework (2019)

The following low and zero carbon technologies have been evaluated:

- | | |
|--|-------------------------------|
| • Biomass | • Geothermal |
| • Wind | • Combined Heat & Power (CHP) |
| • Biogas | • Solar Hot Water |
| • Air Source Heat Pumps & Exhaust Air Heat Pumps | • Solar Photovoltaic |

The approach for the Silk Street development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

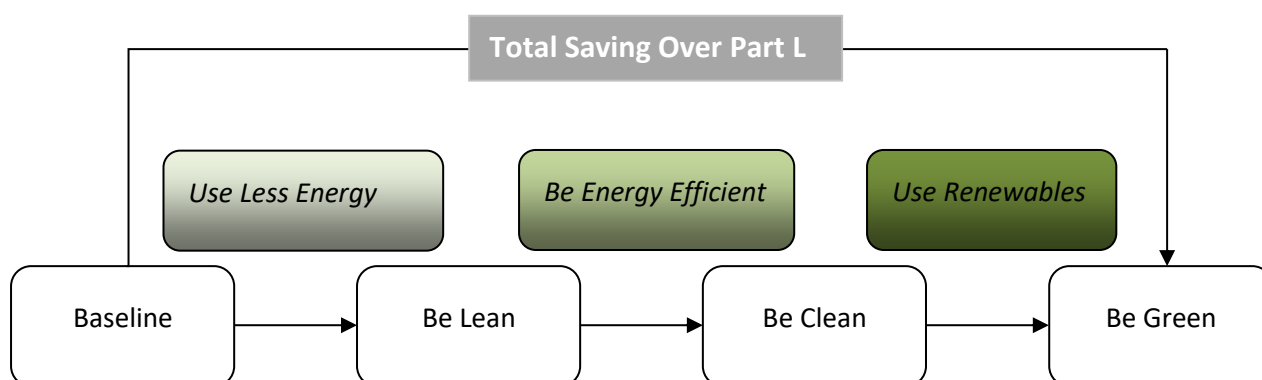
- 1) Enhanced building fabric U values to exceed Building Regulation ADL1A 2016
- 2) Enhanced thermal bridging detailing using specialist junction psi values
- 3) Enhanced air tightness <3m³/m²/hr.
- 4) Efficient System 4 MVHR whole house ventilation system (supply and extract)
- 5) Heating and hot water will be provided a highly efficient ground source shared ambient heat loop with heat pumps located in each dwelling.
- 6) Efficient lighting strategy primarily using CFL or LED type fittings

For the purpose of the assessment we have evaluated a selection of dwelling types in SAP 2012 (Standard Assessment Procedure) to provide an accurate estimate of predicted energy/ CO₂ emissions. We have completed SAP calculations based on a representative dwelling type to provide an estimation of the worst-case total energy/emissions on site.

This report supports the planning application and confirms MCC's Energy policy is met and exceeded.

Summary

The development has been provided with energy savings through the use of passive improvement measures across both the building fabric and system energy efficiency. This passive approach to compliance will complement the integrated approach to the sustainable energy objectives of the national and local policies.



The principles of a Be Lean, Be Clean, Be Green design philosophy have been applied, which results in a 38.9% improvement over Building Regulations Part L1A 2016 through a passive approach, as indicated in Table 1.

A full design specification that confirms inputs used within the SAP calculations is provided within the appendices of this report.

Table 1 - Proposed development CO₂ emissions against Building Regulations Part L1A 2016

	Total Regulated CO ₂ Emissions (kgCO ₂ /yr)	
Baseline Regulated CO ₂ Emissions of Development (pre improvement)	138720	
Be Lean, Be Clean & Be Green (post improvement)	84732	
Total Reduction in Emissions (kgCO ₂ /yr)		53988
Percentage Reduction in CO ₂ Emissions (Improvement over ADL1A 2016)		38.9%
Percentage Reduction in CO ₂ Emissions (Improvement over ADL1A 2010)		44.9%

1. Introduction

This energy and sustainability statement has been produced in support of the planning application for a proposed new build development of 21No. houses and 48No. apartments at Silk Street, Manchester.

The proposed Silk Street development will be new build and is required to achieve compliance under Building Regulations Approved Document Part L1A (2016).

Supporting information is provided within this report for the proposed energy strategy to be considered on site in accordance with the following planning policies:

- Manchester City Council's Core Strategy 2012 - 2027 (2012) policies EN4 - EN7
- Principles of The Guide to Development in Manchester SPD (2007)
- National Planning Policy Framework (2019)

Throughout this report, passive design techniques, energy efficient equipment and appropriate low carbon technologies will be appraised in line with the 'Be Lean, Be Clean, Be Green' philosophy of relevant planning documents and the Energy Hierarchy.

An assessment of CO₂ emissions will be made based on the calculation methodology dictated by the Standard Assessment Procedure (SAP) and in line with the requirements of Manchester City Council planning policy.

1.1. Location

The area for the proposed development at Silk Street, Manchester is highlighted by the red line boundary shown in Figure 1. Manchester city centre is roughly three miles to the south west of the site.

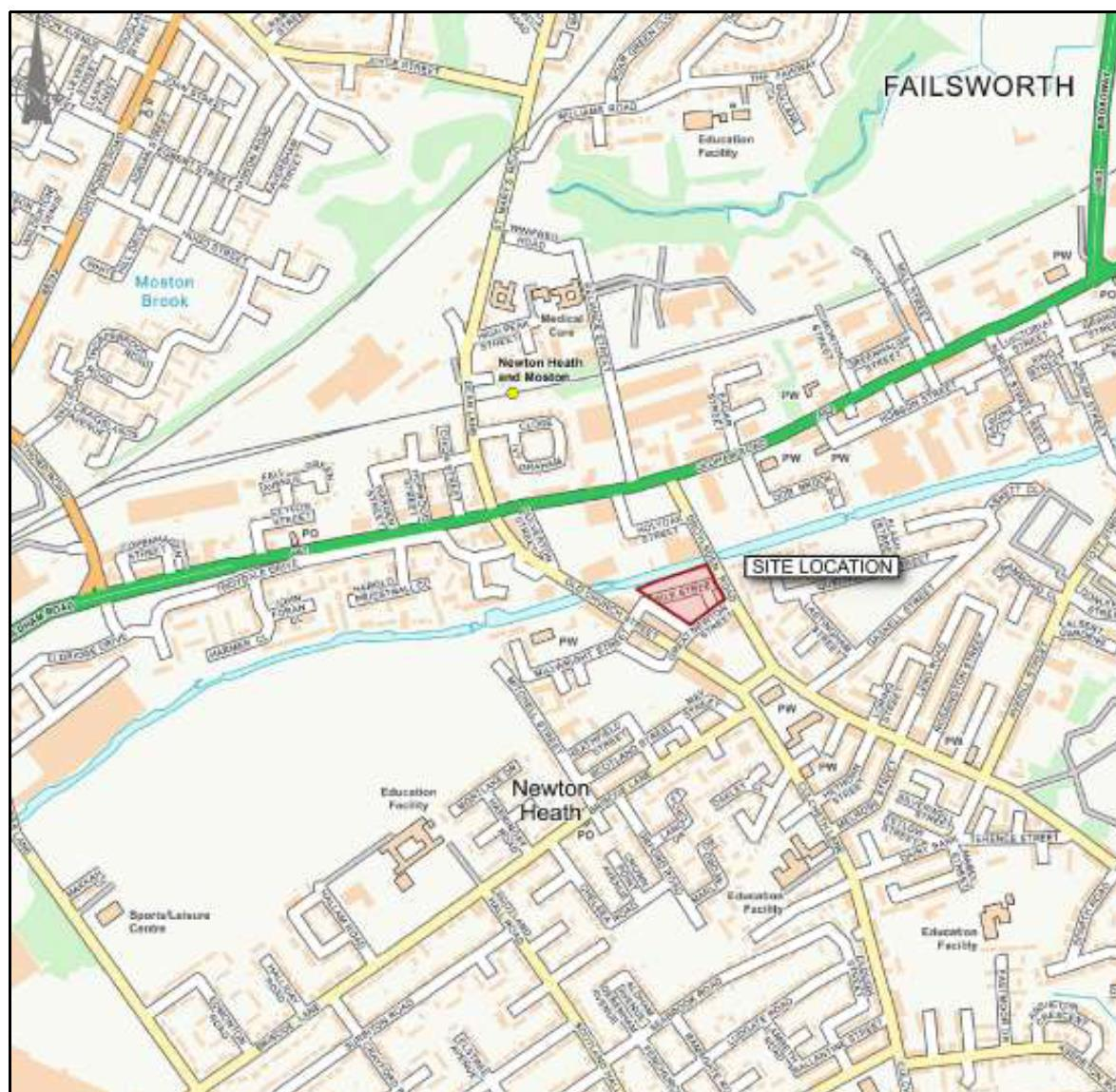


Figure 1 - Location and surrounding area of proposed Silk Street residential development

The site is located to the north and south of Silk Street and to the east of Cowley Street in Newton Heath, Greater Manchester.

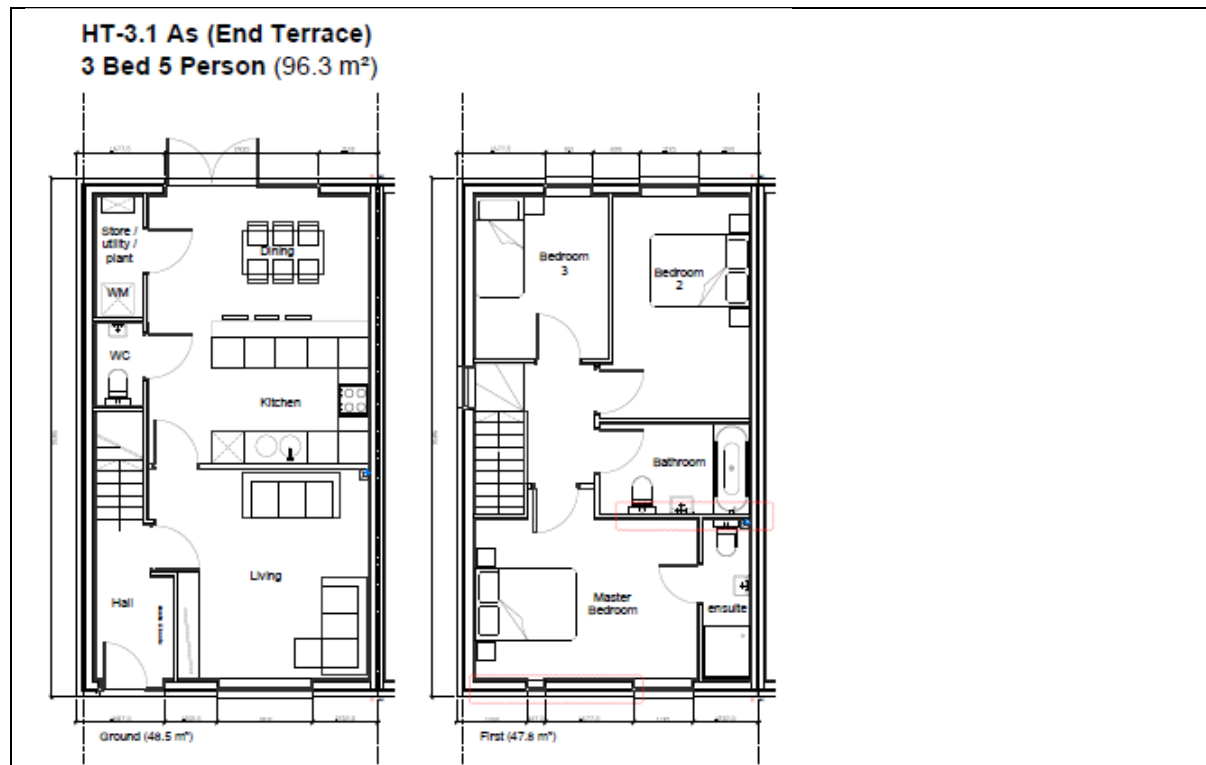
A site plan in Figure 2 shows the arrangement of the proposed dwellings on site. The existing developments around the site are a mix of commercial, industrial and residential types.



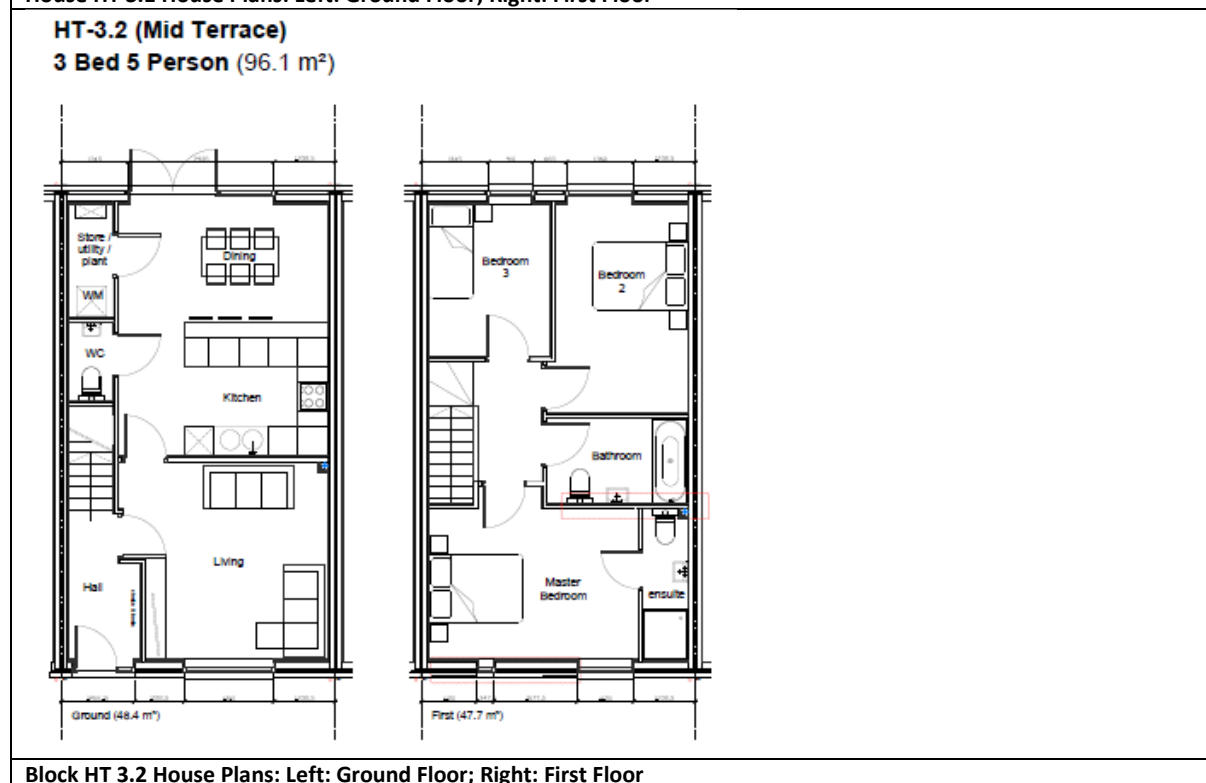
Figure 2 - Site plan for the proposed Silk Street development consisting of 69No. new-build dwellings

1.2. Floor Plans





House HT 3.1 House Plans: Left: Ground Floor; Right: First Floor



Block HT 3.2 House Plans: Left: Ground Floor; Right: First Floor

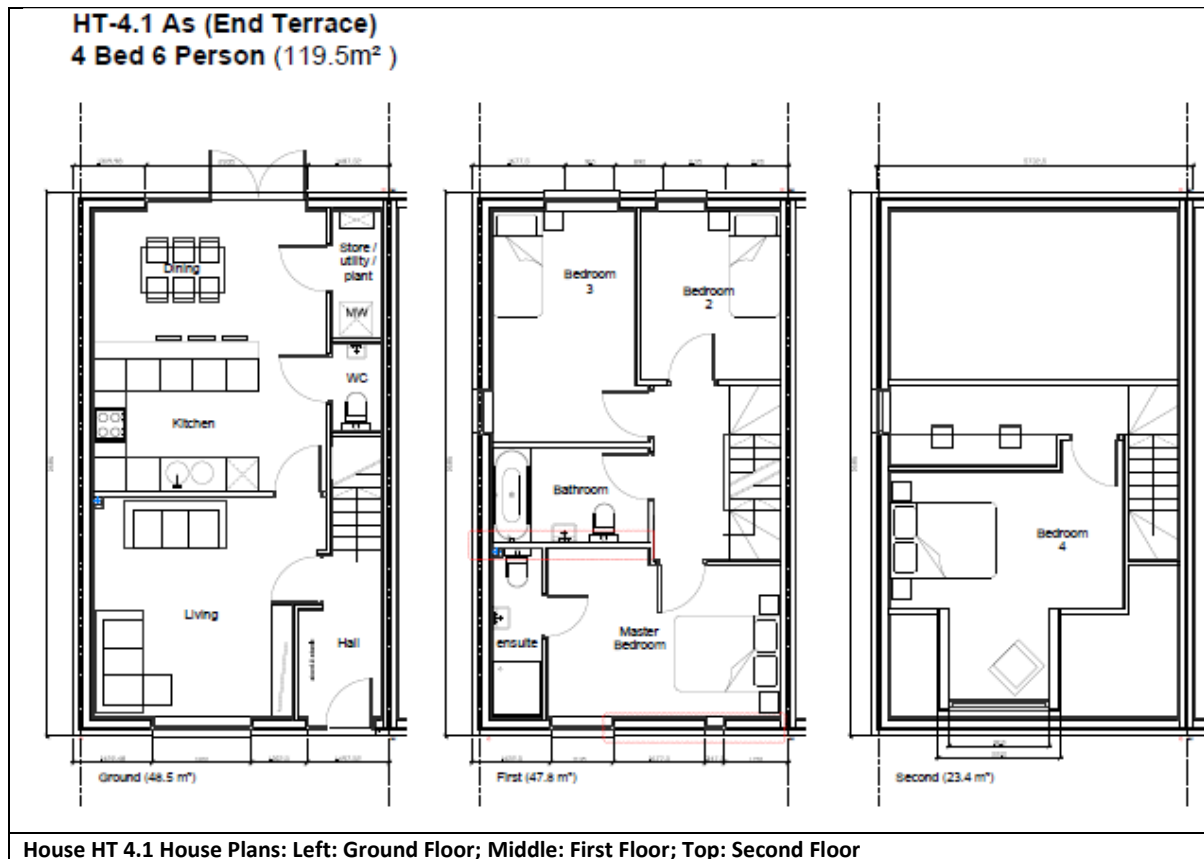


Figure 3 – Proposed floor plans for house types for the Silk Street development

This application is seeking consent for the construction of 69No. new build dwellings, comprising of 21No. houses arranged across five blocks and three identical apartment blocks arranged with 16No. apartments in each.

Plans for all dwelling types are shown above in

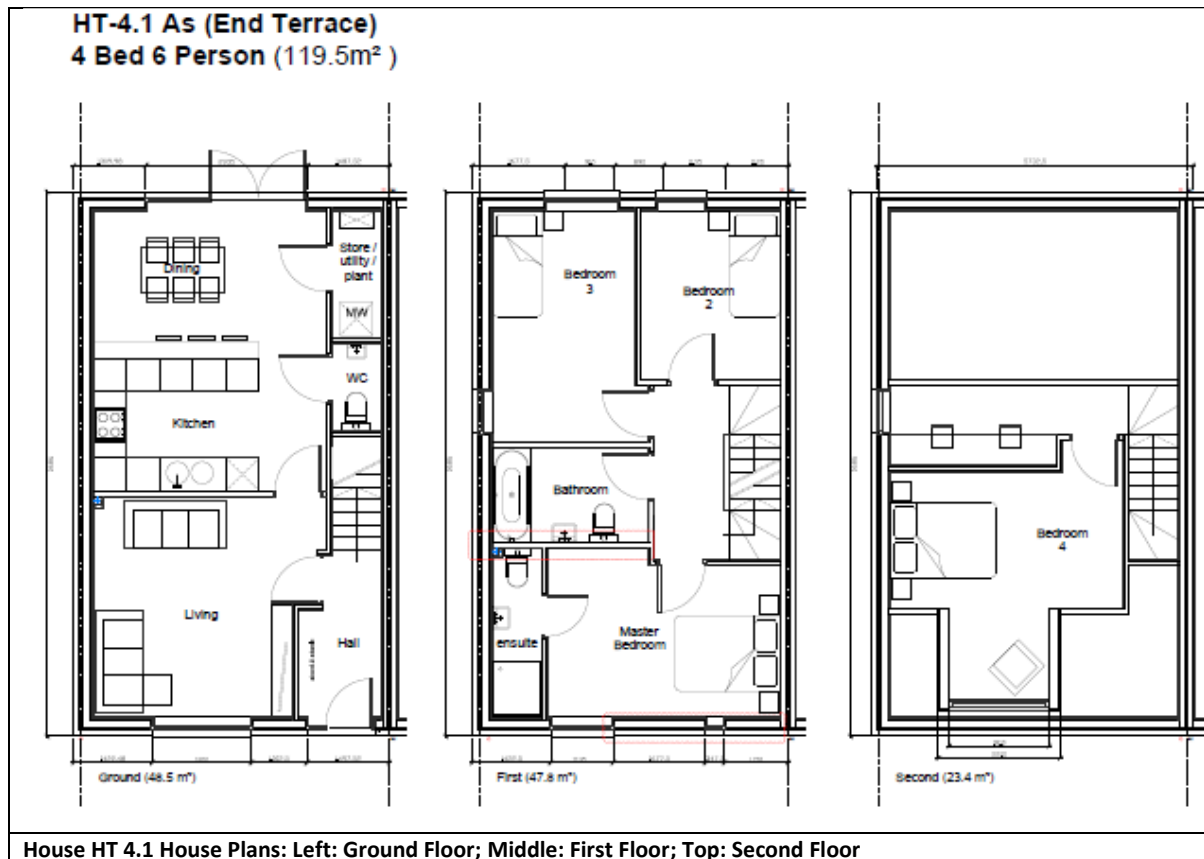


Figure 3.

The following mix of unit types are proposed:

- 3Bed House – 17No.
- 4Bed House – 4No.
- 1Bed Apartments – 38No.
- 2Bed Apartments – 12No.

2. Policy Drivers for Energy Efficiency and Renewable Energy

This section presents a range of planning policy that is applicable to the Silk Street development, at both a national and a local level.

2.1. National Policy

The National Planning Policy Framework, published in February 2019, sets out the government's planning policies for England and they should be applied. Table 2 sets out the relevant energy standards for new developments and provides an indication of the design response to be provided.

Table 2 – Key National Planning Policy Requirements and Design Responses

Section	Policy Requirements	Design Response
14. Meeting the challenge of climate change, flooding and coastal change	The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: Shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.	This development will follow the principles set out in Manchester City Council's Core Strategy 2012 – 2027 (2012), using a 'Be Lean, Be Clean, Be Green' approach in reducing operational carbon emissions. An overview of current decentralised energy schemes around the Manchester area and an assessment on the potential for future schemes in relation to this development is provided in Section 6 of this report. This energy statement appraises site specific information to determine the most appropriate approach to minimise energy consumption.

2.2. Local Policy

The adopted Manchester Core Strategy 2012 – 2027 (2012) and the Supplementary Planning Document and Planning Guidance (2007) provide a set of guidelines for new development. All relevant energy policy within these documents is provided within this section together with a design response.

Table 3 – Key Local Planning Policy Requirements and Design Responses

Manchester Core Strategy 2012 – 2027 (2012)		
Section	Policy Requirements	Design Response
EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development	All development must follow the principle of the Energy Hierarchy, being designed: - to reduce the need for energy through design features that provide passive heating, natural lighting and cooling - to reduce the need for energy through energy efficient features such as improved insulation and glazing - to meet residual energy requirements through the use of low or zero carbon energy generating technologies Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies. Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings. Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes. The use of building materials with low embodied carbon in new development and refurbishment schemes.	The proposed Silk Street development will follow the principles of the Energy Hierarchy by adopting a passive fabric-first approach to design rather than adopting the use of renewable technologies. A full energy strategy is provided in Section 8 of this report, following an appraisal of a range of site specific measures in line with the 'Be Lean, Be Clean, Be Green' approach. A review of district heating opportunities is provided in Section 6 of this report, in line with current local development.
Policy EN 5 – Strategic Areas for low and zero carbon	Within Manchester it is considered that the following strategic areas, indicated on the key diagram, will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:	The proposed Silk Street development does not fall within a Strategic Area for decentralised

decentralised energy infrastructure	• The Regional Centre, which also includes the Oxford Road Corridor and Eastlands • District Centres and associated major development sites • Airport Strategic Site • Strategic housing location • Strategic employment locations Within these areas new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities and other public sector bodies, as appropriate, to bring forward such plans. Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions.	development, as defined within the Manchester City Council Core Strategy 2012 – 2027. The proximity of the site to current decentralised energy networks is illustrated within Section 6 of this report.
Policy EN 6 - Target Framework for CO2 reductions from low or zero carbon energy supplies	Developments smaller than 10 units but involving the erection of a building or substantial improvement to an existing building will be expected to meet the minimum targets for the defined areas below, where viable, but will not be expected to submit an energy statement. The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows: • Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling). • Target 2 Electricity intense areas: Locations where the predominant building type has an all-electric fit-out such as retail units and leisure complexes.	The proposed development consists of 69No. units and is therefore within the threshold of a major development. The site does not sit within an area defined for development of low and zero carbon, decentralised energy. An overview of the site in relation to current decentralised networks

	Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical. <table><tr><th>Target</th><th>% Minimum Requirement</th></tr><tr><td>Target 1: Network development area</td><td>CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.</td></tr><tr><td>Target 2: Electricity intense buildings</td><td>+15% increase on Part L 2010</td></tr><tr><td>Target 3: Micro generation area</td><td>+15% increase on Part L 2010</td></tr></table>	Target	% Minimum Requirement	Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.	Target 2: Electricity intense buildings	+15% increase on Part L 2010	Target 3: Micro generation area	+15% increase on Part L 2010	in the region is provided in Section 6. A fabric first approach is proposed for this development. Renewable technologies have not been specified for this development due to financial viability and ongoing maintenance issues.
Target	% Minimum Requirement									
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.									
Target 2: Electricity intense buildings	+15% increase on Part L 2010									
Target 3: Micro generation area	+15% increase on Part L 2010									
Policy EN 7 – Energy Infrastructure opportunities	There will be a general presumption in favour of low and zero carbon decentralised energy schemes, subject to the following considerations: That any new generating plant capable of producing heat and cooling as well as electricity should be located in a way that facilitates future connection to a local distributed energy system. - That any energy centre, including generating plant, standby/boiler plant and substations, shall be located and designed to a high quality so as to integrate with and contribute to the townscape. - Biofuels should be obtained from sustainable sources and processes and in a way that minimises transport impacts, following a sequential approach in order to minimise CO2 emissions – firstly prioritising local and regional sources, followed by national, European and international. - Consideration should be given to biofuel delivery by rail and waterways where possible. Where large-scale fuel or feedstock delivery is required by road the energy centre must be located in or adjacent to light industrial, industrial or leisure uses with any impact on local residential amenity minimised. - The cumulative impact of energy schemes will be taken into account when considering applications, to include	An overview of the site in relation to current decentralised networks in the region is provided in Section 6. Due to the relatively small scale of the development, the development of an energy centre would not be a feasible design solution.								

	modelled impacts on air quality and landscape character, with reference to Policy EN16. Flood risk, through the Manchester-Salford-Trafford Strategic Flood Risk Assessment. In determining proposals for development, consideration will be given to the need to safeguard strategic energy sites and network routes, both proposed or existing, where these have been identified as having strategic significance for the delivery of low or zero carbon energy infrastructure or, would be required in order to achieve the successful regeneration of an area in line with targets for reducing carbon emissions.	
Supplementary Planning Document and Planning Guidance (2007)		
Section	Policy Requirements	Design Response
4.5 – Energy Efficiency	Part 1 Policy E1.5 encourages high standards of energy efficiency in new development. In the Environmental Standards Statement, developers should show how they have considered the steps necessary to reduce energy demand at the earliest stages of design. Developers should aim to reduce CO2 emissions by at least 25% more than the requirements of the current Building Regulations, which at present are Building Regulations: Approved Document L (2006) – ‘Conservation of Fuel and Power.’ The following design principles will assist developers in achieving energy efficiency targets: - Minimise reliance on energy-using equipment for heating, cooling, lighting and natural ventilation - Position trees and soft landscaping on and around the development and within buildings to provide natural shading, insulation and air conditioning - Integrate energy efficient micro-generation and community heating schemes, such as combined heat and power (CHP) - Site layout and building design principles should maximise the capture and use of daylight and passive solar energy, whilst avoiding excessive solar gain in summer	In line with the principles of the Be Lean, Be Clean, Be Green design philosophy, the Silk Street development seeks to provide a sufficient design solution that provides compliance with Building Regulations Part L1A. An early stage overview of these calculations is provided in Section 8.

	Specify energy and water efficient appliances and systems	
4.6 – Renewable Energy	To reduce energy demand and the harmful impact of using energy from non-renewables, in line with UDP Part 1 Policy E1.5, developers should aim for at least 20% of final site energy demand to be met by on-site renewable energy technologies. Renewable energy targets can be achieved more readily by undertaking the measures suggested above reducing the total energy demand of the building. It is possible to produce developments that use 50% and even 100% energy from renewable sources. To achieve this, developers should: - Assess opportunities for integrating small and large scale renewable energy generation systems to improve the energy security of occupants and the neighbourhood, including siting of energy generation businesses on-site and export of surplus energy - Use a mix of technologies to help generation patterns match demand - Investigate energy generation opportunities before designing building envelopes or fixing their location, to optimise utilisation of wind, solar and geothermal resources - Consider final energy demand rather than building energy consumption in the selection and sizing of generation equipment - Explore opportunities to tackle waste and energy issues collectively through use of anaerobic digesters linked to CHPs (Combined Heat and Power devices) - Consider private wire networks as an alternative to grid connection and availability charges on larger developments.	A full appraisal of low and zero carbon technologies is provided in Section 7 of this report. Achieving compliance with Building Regulations Part L1A will be demonstrated through a passive fabric-first approach. This ensures that the highest standards of fabric efficiency and energy efficiency are achieved, rather than applying renewable technologies to the development.

3. Methodology

The first step of the full energy strategy assessment has been to undertake a baseline energy assessment. The baseline energy assessment consists of calculating the total CO₂ emissions of the development to meet Building Regulations and then compare the proposed improvement measures against this baseline. Building Regulations Part L1A 2016 (SAP) applies to each of the 69No. new build dwellings and provides carbon emissions from regulated energy.

The building can then be benchmarked/ thermally modelled using the energy hierarchy:

1. Be Lean <i>A reduction in energy use as a result of passive design and energy efficiency</i>
Thermal performance of envelope (U values) Glazing design Airtight construction Efficient mechanical ventilation and heat recovery Variable speed fans and pumps Efficient lighting
2. Be Clean <i>A focus on supplying energy to the development through efficient means</i>
Connect to low carbon heat networks Develop site wide heat network from single energy centre On site heat pump
3. Be Green <i>The installation of renewable technologies to meet energy demand where possible</i>
Consider the feasibility of renewable energy technologies Assess the integration of renewable technologies based on the above measures Adopt ground source heat pumps

The development must be provided with energy savings through the use of thermal improvements to fabric (a 'fabric first' approach), followed by other clean energy solutions (energy efficiency

improvements, district heating, etc.) and finally the use of renewable energy technologies, where practical. This hierarchy complements the integrated approach to the sustainable energy objectives of Manchester City Council's Planning Policies.

The planning policies require a full review of the technical and economic feasibility of the following renewable technologies:

- Biomass heating
- Biomass combined heat and power
- Solar hot water
- Solar photovoltaic
- Ground source heat pumps
- Air source heat pumps / exhaust air heat pumps
- Wind power

To achieve the targets set the development must achieve a balance between fabric, heating and control, ventilation and air leakage improvements, the amount of zero or low carbon technology installed and the capital, life cycle and running costs, maintenance and operation, etc.

All feasible renewable energy technologies have been considered during this assessment to ensure the most suitable approach is taken based on the demands of the scheme. The pros and cons of each technology with respect to this site are considered as part of this statement.

4. Baseline Energy Assessment

Energy Council have based the analysis on current Building regulations ADL1A 2016 (SAP 2012), taking into account solutions that must not only be energy efficient but also practical, reliable and user friendly.

Energy Council have carried out preliminary SAP 2012 calculations for the dwellings. To meet compliance with Building Regulations Part L1 2016, the Dwelling Emissions Rate (DER) must be lower than or equal to the Target Emissions Rate (TER). SAP 2012 is the Governments Standard Assessment Procedure (SAP) for calculating the energy aspects of a dwelling. SAP is a measure of fuel costs for heating, hot water and lighting for a dwelling. SAP 2012 can also be used to ascertain the energy requirements of a development.

To assess the baseline emissions, we must make an estimation of the energy demands based on current Building Regulations in order to set a target upon which the actual development can be compared.

We have SAP modelled a number of dwelling types to benchmark to establish a worst-case energy performance for the houses and apartments.

4.1 Predicted Baseline Energy Requirements

The predicted baseline CO₂ emission demands for the development:

Table 4 - Baseline dwelling carbon emissions

Ref	Dwelling Type	Floor Area m2	No. of Type	TER	Regulated Carbon Emissions Per Type (Kg CO ₂ /yr)	Total Carbon Emissions (Kg CO ₂ /yr)
Z39428	3B House End Terrace	96.86	6	24.84	2406	14436
Z39429	3B House End Terrace	96.86	11	22.91	2219	24410
Z39430	4B House	129.4	4	22.48	2909	11636
Z39444.1	Apartment Block 1 Compliance	993.34	3	29.61	29413	88238
Total			69			138720

The baseline carbon emissions are **138,720 KgCO₂/yr**.

5. Passive Design and Energy Efficiency

The approach of the development is to embed sustainability into the heart of the design from the outset of the project design process.

The development will seek to consider all aspects and principles of sustainable development, considering environmental, social and economic impacts in line with the relevant policies and strategies of Manchester City Council.

5.1. Passive Design Measures

The philosophy for the site is to achieve as much of the necessary reduction in carbon emissions through the use of passive design techniques and energy efficient measures as possible, before resorting to the use of LZCs. This ensures that the highest standards of building fabric and energy efficiency are achieved, rather than offsetting a poorer performance with LZC contributions.

This will be undertaken through a fabric first energy efficient design approach with high levels of thermal efficiency and a reduction in energy demand through efficient lighting design.



Figure 4 – Elevations for Block 3 of the proposed Silk Street development

5.2. Energy Efficient Systems

Options have been reviewed for improving the energy efficiency of the development by installing an efficient heating system. The scheme will benefit from high efficiency ground source heat pumps within each dwelling supplied from boreholes connected via an ambient heat loop.

Dwellings will also be provided with a metering scheme based on their gas and electricity usage.

A low energy high efficiency whole house ventilation system with heat recovery will serve each dwelling, with an overall specific fan power (SPF) of <0.6W/l/s, and heat recovery of 90+%. Ventilation will also be provided by openable windows in all habitable spaces.

5.3. Sustainable Development

The proposed development has been designed to a high standard. In order to achieve these levels, a number of sustainable design and construction techniques will need to be explored and where feasible incorporated into the design. Potential measures are provided in the list below.

- Water consumption is minimised using flow regulation to reduce internal water usage to under 105l/person/day
- Minimising internal gains through good specification of lighting and low energy consuming equipment.
- Procuring materials sustainably using local suppliers;
- Using materials which are responsibly sourced and have a low embodied impact (BRE Green Guide rating);
- Controlling unwanted ventilation and draughts by minimising air leakage;
- Ensuring building designs make the most of natural systems both within and around the building;
- Managing flood risk to residential buildings, through sustainable drainage systems (SUDS) and flood resilient design for infrastructure and residential properties;
- Ensuring buildings are comfortable and secure for occupants;
- Conserving and enhancing the natural environment, particularly in relation to biodiversity and enabling easy access to open spaces;
- Avoiding creation of adverse local climate conditions;
- Reducing the thermal transmittance of the building envelope by adding high performance insulation and use of medium/high thermal mass;

- Optimising window design through the type of glazing specified, along with the shape, location and functionality of the building.

5.4. Adaption to Climate Change

Much current practice in designing more sustainably relates to mitigating (preventing or slowing) our impact on climate change. However, climate change is still happening and it is expected that temperatures will increasingly rise over time and weather will continue to become more unsettled and more extreme. With this in mind, the development has been designed to adapt to these potential changes in climate. The strategies described below provide a sample of ideas that has been considered in order to future-proof the development from such climatic extremes:

- The apartment block will be considered for thermal comfort/ overheating analysis via CIBSE TM59 methodology.
- Designing buildings to survive extreme winds. This increases the longevity of the building and reduces the frequency of replacing materials. This therefore reduces the embodied impacts of these materials, and in turn, the entire buildings.
- Specifying building materials and designs that can withstand flooding to ensure that, should a significant flood event occur, any damage is minimised.
- In urban and suburban areas, maintaining solar access for buildings.
- Planting native, climatically appropriate trees and other vegetation.
- Plumbing buildings with water-conserving fixtures in mind.
- Designing cooling-load-avoidance measures into buildings.
- Designing for robustness, as increasing the longevity of a building decreases the embodied energy.
- The adoption of a shared ground source ambient heat loop can work in both heating and cooling mode. In heating mode it extracts heat from the ground and supplies this heat into each dwelling for heat and hot water demand. In cooling mode the system has the facility to operate in reverse, extracting heat from the dwelling (thus cooling) and dumping the heat back into the ground. This in turn improves the annual efficiency of the heat pump.

6. District & Communal Heating Networks

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the dwellings in line with the Energy Hierarchy.

6.1. Decentralised Heating Networks

The energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful.

One of priorities for reducing CO₂ emissions is to reduce the city's reliance on centralised power stations. This means increasing the use of local, low-carbon energy supplies through de-centralised energy systems.

Decentralised plant generally means any heating and hot water and/or electricity generation provided on a district wide (DHN) or site wide (CHN) basis. DHN and CHN can typically include Combined Heat and Power equipment (CHP). CHP is an engine which, when running, generates electricity and heats water which can then be distributed around a development.

A number of heat network opportunities across the city region are at various stages of development. Benefits of district heating networks can include:

- Provision of low carbon / lower cost heat to domestic and commercial customers
- Diversification of the energy mix
- Reductions in region-wide carbon emissions
- Targeting and reduction of fuel poverty
- Potential long-term revenue streams for local authorities
- Alignment with regeneration programmes
- Driving the growth of the low carbon services sector

There are currently no existing district heating networks within proximity to the site.

6.2. New Heating Networks – Options

Consideration has been given to adopting a centralised or decentralised energy strategy. A decentralised energy option would typically be an energy centre distributing heat, hot water and electricity to the development from a single source either as a DHN or CHN. This typically would include boilers and a CHP type unit sized to provide the whole development or a shared heating loop.

Sometimes multiple energy centres are used to split the loads, provide resilience and to serve different buildings.

The proposed development is a relatively small scale but the proposed system utilises a shared ground source heat loop whereby there are boreholes filled with glycol. The dwellings tap off the glycol loop and it is distributed to a small ground source heat pump in each dwelling (kensa shoebox unit). The GSHP extracts the heat from the glycol and provides heating and hot water within each dwelling.

7. Renewable Energy Technologies

Energy Council have reviewed options for the use of on-site renewable energy/ Low or Zero Carbon Technology (LZT) in line with Manchester City Council's policy aspirations.

This renewable energy statement/strategy reviews the technical and economic feasibility of the following technologies –

- Solar Photovoltaic
- Solar Hot Water
- Ground Source Heat Pumps
- Air Source Heat Pumps / Exhaust Air Heat Pumps
- Micro Wind Power
- Biomass

7.1. Photovoltaics (PV)

Photovoltaic panels convert sunlight into electricity to run lights and appliances. Photovoltaic panels use cells to convert light into electricity. A PV cell normally consists of 1 or 2 layers of a semi conducting material such as silicon. When light shines on a cell it generates energy causing electricity to flow, the higher the light intensity is, the more electricity flows.

The amount of energy PV cells generate is referred to as Kilowatt Peak (KWp). PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof

tiles to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. Due to the weight of the photovoltaic panels, the roof should be strong enough to take their weight, especially if the panel is placed on top of existing tiles. For flat roofs the panels can be mounted on A-frames to give the optimum angle.

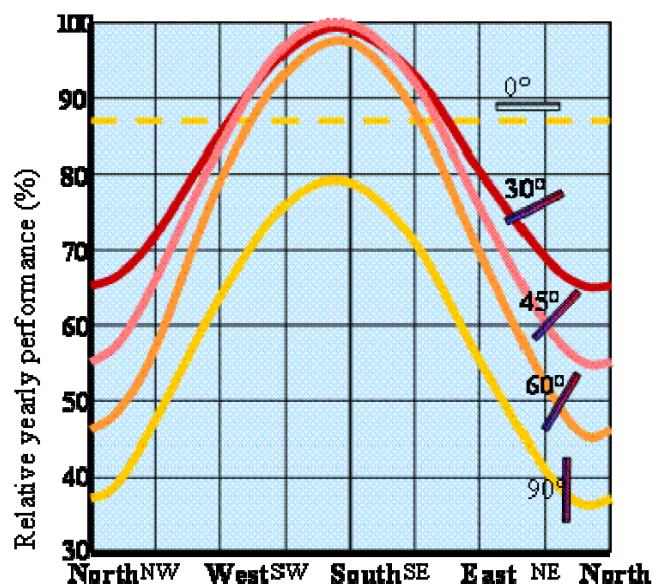


Figure 5 - Performance of photovoltaic panel orientation

The optimum panel inclination for solar collection is 35°, oriented due south; however panels that are inclined between 35° and 45° and oriented south of west or east are generally suitable. If solar collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy. The effect of non-optimal orientation is illustrated by the graph to the right:

The cost to install PV is typically £1500-2,000 per kWp for 'in-roof' panel systems.

In this instance, solar photovoltaic panels have not been specified on this development due to the focus on a fabric first approach.



Figure 6 - Photovoltaic array on a pitched roof

7.2. Solar Thermal HW Panels

Solar panel heating uses the radiant energy from the sun to heat hot water, most commonly for domestic hot water needs. There are two types of collectors used for solar water heating – flat plate collectors and evacuated tubes collectors. The systems function successfully in all parts of the UK, as they can work in diffuse light conditions. The collector should be mounted on a 10-60 degrees pitch facing south, although other variations can be used, south is the most efficient.

The cost of installing the system is dependent on the distance between the solar collector and the hot water storage and therefore costs vary. The closer the collectors are to the hot water storage, the less pipe work is required. Annual maintenance checks are recommended. The solar collectors are connected to a condensing boiler via a HW cylinder with twin coil.

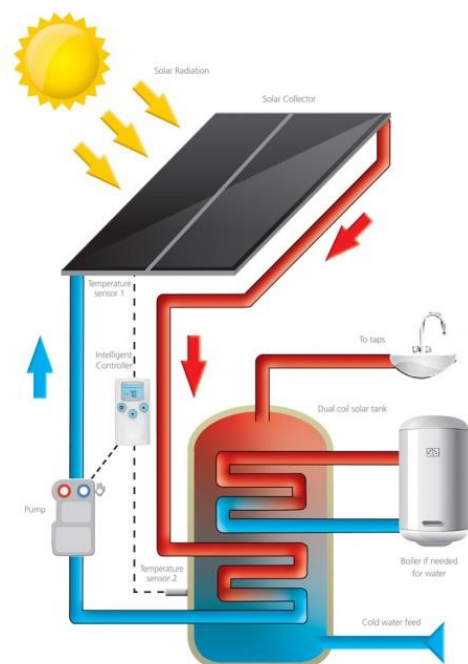


Figure 7 - The principles of a solar thermal system

A typical installation in the UK has a panel size of 3-5m² which is used in conjunction with a HW storage tank of 180-300litres, of which a minimum of 90-150 litres must be dedicated to solar hot water storage.

They are a 'simple' and guaranteed technology which will act as a pre-heat for the Hot Water and Heating usage. Payback between capital cost and energy saving can normally be achieved within 12 – 20 years, subject to usage and dwelling type.

The use of solar thermal panels, work best in conjunction with individual heating systems for each dwelling. The orientation of the development is fine for the utilisation of solar water heating to provide domestic hot water however it will not achieve significant carbon savings. Carbon savings of approximately 4-5% are achievable with this technology. The dwellings are unlikely to require sufficient hot water storage to deem solar thermal a feasible technology for this site. For the reasons aforementioned this is not an appropriate option for this scheme.

7.3. Ground Source Heat Pump (GSHP)

GSHPs have been developed specifically for the housing market and are now considered to be an established reliable technology. The GSHP would be sized to cater for the heating and domestic hot water requirements. Typically, they are more suited to apartments as a centralised system would be installed with multiple bore holes to a depth of up to 300 metres depending on the ground conditions.

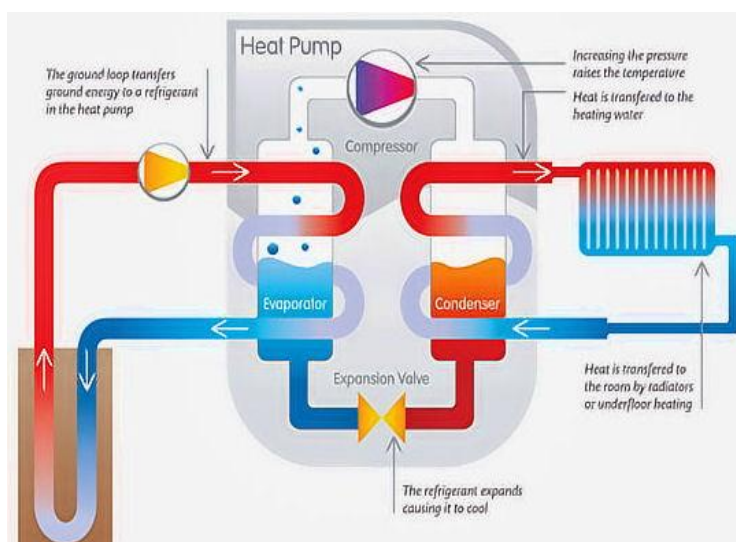


Figure 8 - Principles of a GSHP system

GSHPs use a heat exchanger to extract heat from the earth.

The efficiency of ground source heat pumps is measured by Co-efficient of Performance (CoP), this is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency. This means that for every unit of

electricity used to pump the heat, 2-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then there is the opportunity to

consider a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.

GSHPs are considered an appropriate design solution for this development and have been adopted as the chosen LZC due to flexibility of the solution and low landlords OPEX.

7.4. Air Source Heat Pump/Exhaust Air Heat Pump

Air source heat pumps (ASHP) and exhaust air heat pumps (EAHP) work in a similar way to GSHP. Air source heat pumps can be fitted on the external façade or in the roof space. An air source heat pump uses small amounts of electricity to take in large quantities of air and extract heat. The efficiency of ASHP is measured by Coefficient of Performance (CoP); this is the ratio of units of heat output for each unit of electricity used to drive the system. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency.

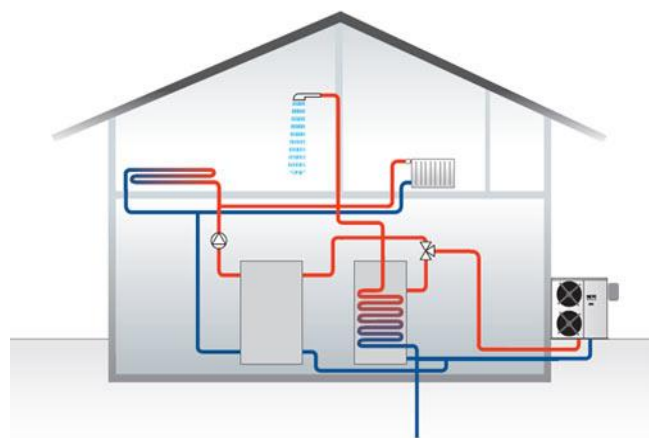


Figure 9 - Principles of an ASHP system

Exhaust air heat pumps such as the NIBE F370 work in a similar manner to ASHP units but have only indoor units (no outdoor compressors) and in addition they also recover heat from their integral exhaust air ventilation system. These units work well on apartment blocks and dwellings where mains gas is unavailable or unsuitable for a development. They are expensive in terms of capital cost of the equipment, installation and the enhanced structural requirements.

ASHPs are not considered appropriate for this scheme but are viable.

7.5. Micro Wind Power

Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is unfeasible due to the fact the development is in an urban area and local wind conditions would not be sufficient to provide enough power. Most small wind turbines generate Direct Current (DC) electricity. Systems that are not connected to the national grid require battery storage and an inverter to convert DC electricity into Alternating Current (AC) which is mains electricity.

There are two types of wind turbine available:

- Roof mounted – These are mounted on the roof of houses
- Mast mounted – Which are free standing

Important issues to consider when using wind turbines are:

- Wind speed increases with height so it's best to have the turbine high on a mast or tower.
- The ideal site is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, houses or other buildings.
- Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical.
- Where the local annual average wind speed is 6 m/s or more.
- Where there are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence



Figure 10 - Mounted wind turbine

As this development is in an urban area there will be obstacles which reduce wind speed. The average wind speed in this area is 4.5 m/s at a height of 10 metres, which is less than the 6 m/s required. Therefore, micro wind is not a viable technology for this development.

7.6. Biomass

Biomass is a generic name for any fuel produced from organic sources and falls into mainly two categories:

- Woody biomass- forest products, untreated wood products, energy crops and wood pellets
- Non-wood biomass – liquid biofuels (such as biodiesel, bioethanol) or animal waste industrial municipal products and high energy crops such as rape seed, sugar cane and maize.

For domestic properties the fuel used is normally wood pellets, wood chips or wood logs. For larger applications, biomass boilers replace conventional fossil fuel boilers and come with an automated feed by screw drives from hoppers.

Biomass systems require more cleaning than gas or oil boilers and they must be capable of being taken out of service for cooling and cleaning whilst maintaining the building heating supply particularly in communal heating systems. Centralised gas boilers are therefore still required to support the biomass boiler, which would be the lead boiler. The size of the dedicated plant rooms is substantial. Fuel availability, delivery and storage are also important issues to consider.

Air quality issues are also an important factor when looking to install biomass, especially in the Manchester area. The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another

organisation. The cost of wood pellets is currently a little more expensive than mains gas, and woodchip is approx. 30% cheaper, however prices are fluctuating rapidly in the bio-fuel market at the present time creating uncertainty over their take up.



Figure 11 - Biomass boiler and hopper

Biomass CHP is still relatively new to the UK market and is more suitable to large developments where energy demand does not require significant modulation. There are technical issues with small scale Biomass CHP and until these can be resolved and proven the take up of these systems in the UK and Europe has been slow.

Overall carbon savings of 40%+ are achievable with biomass technology. Biomass is more suited to a communal heating system; there is insufficient space to accommodate the equipment and fuel storage to facilitate a biomass boiler. Furthermore, there are noise and air quality issues associated with this type of technology. For this reason, biomass is discounted.

8. Energy Assessment of Proposed Scheme

The Silk Street development has adopted the principles of the 'Be Lean, Be Clean, Be Green' approach.

The most practical and economically feasible solution for the development is a good quality thermally insulated fabric, air tight envelope, passive improvements and the use of highly efficient ground source ambient heat loop supported with efficient MVHR

Table 5 - Proposed carbon emissions for the Silk Street development

Ref	Dwelling Type	No. of Type	TER	DER	Dwelling Improv. Factor (%)	Regulated Carbon Emissions Per Type (Kg CO ₂ /yr)	Total Carbon Emissions (Kg CO ₂ /yr)
Z39428	3B House End Terrace	6	24.84	16.54	33.4	1602	9612
Z39429	3B House End Terrace	11	22.91	15.40	32.8	1492	16412
Z39430	4B House	4	22.48	15.32	31.8	1982	7928
Z39444.1	Apartment Block 1 Compliance (16 flats)	3	29.61	17.04	42.5	16926	50780
Total		69					84732

The carbon emissions are 84732 Kg/CO₂/yr. This is a total carbon reduction of 53988 Kg/CO₂/yr from the baseline emissions of 138720 Kg/CO₂/yr this equates to a 38.9% carbon reduction against ADL1A 2016.

The development proposal provides enhanced fabric U values, specialist thermal bridging and energy efficiency through the use of energy efficient lighting, efficient ventilation, a highly efficient ground source heat pump for heating and water heating at 280+% efficiency.

9. Conclusion

Following the 'Be Lean, Be Clean, Be Green' hierarchy, the proposed design solutions are predicted to reduce the total carbon emissions by 53988Kg/CO₂/yr from the baseline emissions of 138720Kg/CO₂/yr. This equates to a 38.9% carbon reduction from the calculated baseline regulated energy emissions.

The approach for the Silk Street development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

- 1) Enhanced building fabric to meet Building Regulation ADL1A 2016
- 2) Enhanced air tightness and specialist thermal bridging
- 3) Efficient System 4 MVHR extract ventilation system
- 4) Heating and hot water will be provided a highly efficient gas combi boiler & controls
- 5) Efficient lighting strategy primarily using CFL or LED type fittings

A summary of the main improvements are shown below:

Element	Part L Max Allowable U Value	Part L Proposed
External Wall	0.3	0.15-0.18
Party Walls	0.0	0.0
Cold & Warm Roof	0.2	0.11-0.15
Ground Floor	0.25	0.11-0.12
Windows U _w	2.0	1.4
Doors U _d	2.0	1.0
Air Tightness	10	3
Thermal Bridging	-	ACD + Enhanced
Ventilation	System 1 Intermittent	System 4 MVHR
Heating and Hot Water	-	Kensa Ground Source Ambient Heat Loop with Shoebox unit
Heating Controls	Programmer, room stat & TRVs	Programmer & room stat

By focussing on enhanced passive improvements incl. fabric thermal U values and the associated detailing at the junctions using specialist thermal bridging elements, the dwellings have reduced their heat losses. Coupled with a low air leakage rates, good quality ventilation and an efficient heating and hot water systems provided by a ground source heat pump ambient heat loop. A detailed specification is listed in item 10.2.

9.1. Low/ Zero Carbon Technologies (LZT) Discounted

- Solar Thermal Hot Water is a viable option as the dwellings will have a HW cylinder but are not proposed as the hot water is being supplied from a ground source heat pump.
- PV – Photovoltaic solar panels have not been specified for this development but are a viable option. A fabric first approach is preferred in this instance.
- Biomass has been discounted as it poses problems in terms of air quality, delivery of fuel, storage and transportation for deliveries etc. It would require a centralised larger plant space for storing fuel, which on this constrained site is not viable.
- Micro-wind turbines do not work on this type of development due to problems with wind turbulence and mounting of the units. The wind speeds in the area are not conducive to wind power electricity generation and there would be issues with turbulence, wind shading, noise and air traffic.
- ASHP and/or NIBE units have been considered and are a viable option but GSHP are considered to be more suitable to a shared heat loop

A more detailed overview of LZT technologies is provided in the appendices of this report.

9.2. Summary Headlines

- A passive fabric-first approach is considered to be the most appropriate design solution.
- GSHPs are viable for site and are proposed. GSHP vertical bore holes will be installed in an ambient heat loop which will allow each dwelling to 'tap into' the heat loop to gain the benefits. There is no associated communal plant room as the shoebox units are located in each dwelling.
- Site constraints and viability for District Heating Network (DHN) and Communal Heating Network (CHN) have been reviewed. Existing DHN is not sufficiently close to connect into. The scheme's heating and hot water (HW) demand will be supplied from a new ambient heating loop.
- Table 6 confirms that an overall 38.9% improvement in CO₂ emissions above the current Building Regulations L1A 2016 baseline is proposed through passive means and GSHP to support our application. This equates to a 44.9% improvement on 2010 building regulations as required by MCC policy.
- In line with the energy hierarchy, improvements are provided through fabric and thermal bridging enhancement and energy efficiency measures alone, rather than offsetting technologies against high energy use. The proposal exceeds MCC's energy policy.

Table 6– Summary of Carbon Emissions

	Total Regulated CO₂ Emissions (kgCO₂/yr)	
Baseline Regulated CO₂ Emissions of Development (pre improvement)	138720	
Be Lean, Be Clean & Be Green (post improvement)	84732	
Total Reduction in Emissions (kgCO₂/yr)		53988
Percentage Reduction in CO₂ Emissions (Improvement over ADL1A 2016)		38.9%
Percentage Reduction in CO₂ Emissions (Improvement over ADL1A 2010)		44.9%

10. Appendices

10.1. LZT Feasibility Table

Technology	Technical Feasibility	Carbon Savings	Estimated Costs	Financial Viability
Solar photovoltaics	Solar photovoltaic panels have not been specified for this developed due to financial viability and potential maintenance issues.	A site-wide 4kWp system could save around 1,787 kg of CO ₂ / year.	Average cost for such a system is around £2K per dwelling.	Current potential income generation is around £230 minimum per annum per dwelling with a fuel cost saving of around £60 / year per dwelling.
Wind	Average wind speeds on the site according to the <u>NOABL</u> Wind Speed Database are 4.5m/s. To be technically feasible a minimum of 5m/s is required, therefore this site is not considered feasible.	N/A	N/A	N/A
Micro Hydro	There is no capacity for micro hydro on this site since there are no local water courses available.	N/A	N/A	N/A
District Heating	Manchester City Council documents suggest no existing or planned district heating networks to facilitate connection at this stage.	N/A	N/A	N/A
Solar Hot Water	This technology has been discounted as the level of hot water usage in each dwelling does not merit a storage system, which poses space issues.	Around 270 kg of CO ₂ / year per dwelling.	£3-5K per dwelling	Income generation from RHI in a 4-person household would be in the region of £340 / year (per dwelling) with a fuel saving of around £65 / year per dwelling
Heat Pumps	GSHP: Ground conditions on site are unknown, and installation of coils are likely not economically viable for this project. ASHP: A gas system is preferred due to the lower fuel emissions. There are also vandalism concerns for any external condensing units.	GSHP: 2,100 to 3,300 kg CO ₂ / year per dwelling ASHP: 1,700 to 2,700 kg CO ₂ / year per dwelling.	GSHP @ £6-11K per dwelling ASHP: £7-11K / dwelling	GSHP: £2,590 minimum annual RHI income generation per dwelling with fuel saving of £440 / year minimum per dwelling ASHP: £920 minimum annual RHI income generation per dwelling with fuel saving of £335 / year minimum per dwelling
Biomass	The small scale of this development would not facilitate the installation of biomass boilers due to the space required for pellet storage.	N/A	N/A	N/A

10.2. Specification for ADL1A (SAP) Calculations



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Appendix I – Preliminary Design Stage

To meet Part L1A 2013

Energy Evaluation Ref: Z39428A

48No. Apartments & 21 Houses @ Silk Street

Thermal Fabric & M&E Specification

Item	Brief description	Notes.	Confirm
	The following information is required for the design submission (as per requirements of approved doc L1A).	Please note submission is now in two stages. A) Design , B) As installed	
1. Dwelling & Compliance Details			
1.1	Building Regulations Part L1A 2013 apply.		
1.2	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.	Assumed Standard tariff	
1.3	Apartments - SFS system Dwellings have a low thermal mass parameter.	Lightweight Construction	
1.4	Houses – timber frame system. Dwellings have a low thermal mass parameter.	Lightweight Construction	
1.5	Plot numbers for the apartments and houses		
1.6	Planning to meet Manchester Energy policy and aim for zero carbon where practical		
2. Floor Construction Details			
2.1	Apartments and Houses -Ground floor is 65mm screed 150mm concrete slab / B&B floor and 150mm PIR achieving the U-value stated opposite	U-Value range= 0.11-0.12 W/m²K P/A ratio PIR Conductivity= 0.022 W/mK	
2.2	Apartments - Upper heat loss floors above unheated space (plantrooms or bin stores etc) to achieve U value opposite	U-Value = 0.18 W/m²K	
3. Wall Construction Details			
3.1	Apartments - Main external wall is SFS construction and is insulated to achieve the U value indicated opposite.	U-Value = 0.18 W/m²K	
3.1A	Houses - Main external wall is timber frame construction 140mm stud fully filled with dritherm 32 or equivalent, reflective VCL, 25mm PIR with service void and to achieve the U value indicated opposite.	U-Value = 0.15 W/m²K	
3.2	Apartments - Walls to unheated spaces corridors, stairwell, plantrooms/ bin stores etc are insulated to achieve the U-value indicated opposite. This will be 89mm timber stud x2 with 50mm fully filled cavity and plasterboard both sides.	U-Value = 0.16 W/m²K Cavity batt Conductivity= 0.032 W/mK As EC calc. Fully filled solution	
3.3	Apartment walls to lifts and M&E risers are different construction TBC	U-Value = 0.21 W/m²K	
3.4	House Type 4 – Internal walls on top floor are partitions only, sloping warm roof as item 4.2 extends to eaves and as such these internal walls do not require insulating		
3.5	House Type 4 – Dormer cheek walls to achieve U value opp	U-Value = 0.25 W/m²K	
3.6	There is no curtain walling present		
4. Roof Construction Details			
4.1	Houses - Conventional lofts are insulated to achieve the U value opposite Typically, 400mm MW Quilt or equivalent	U-Value = 0.11 W/m²K	
4.2	House Type 4 - Warm Roofs is present and insulated with 100mm PIR between and 50mm across rafters to achieve the U value opposite	U-Value = 0.15 W/m²K	
4.3	House Type 4 – Dormer flat Roofs is present and insulated to achieve the U value opposite	U-Value = 0.15 W/m²K	
4.4	Apartments - Top floor Flat Roofs are insulated to achieve the U value opposite	U-Value = 0.12 W/m²K	
5. Openings			
5.1	Apartments - Doors to apartments are to achieve U value opp	U-Value = 1.2 W/m²K	
5.2	Houses - External doors to houses are installed to achieve the U-value opposite.	U-Value = 1.2 W/m²K average glass and frame U-Value	
5.3	Apartments - All double-glazed windows and patio type doors/windows with Low-e glass hard coating with argon fill to achieve the U value opposite. Al frame	Uw=1.4 W/m²K average glass and frame G values – 0.6 NE & NW, 0.4 SW & SE	
5.4	Houses - All double-glazed windows and patio type doors/windows with Low-e glass hard coating with argon fill to achieve the U value opposite. UPVC frame	Uw=1.4 W/m²K average glass and frame G values – 0.63	
6. Ventilation & Air Tightness			
6.1	Design stage SAP and SBEM calculations assumes an air permeability of 3m³/m²/hr at 50Pa	All plots to be tested to avoid +2 safety margin on plots not tested	
6.2	Mechanical ventilation with heat recovery in all apartments and houses. No trickle vents required.	Houses – Zehnder Comfoair Q 450 Apartments - Zehnder Comfoair Q 250	



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Appendix I – Preliminary Design Stage

To meet Part L1A 2013

Energy Evaluation Ref: Z39428A

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Thermal Fabric & M&E Specification

7. Space Heating			
7.1	Dwellings: Heating and hot water to dwellings via ambient heat loop to be provided by a communal Ground source heat pump system which preheats the glycol and then supplies a GSHP shoebox interface unit within each flat	GSHP Efficiency = assume 319% taken from MCS certificate. (SCOP @ 45°C) (Modelled as per BRE Technical Note – No: 1 – V1.0 – 13.05.2019 and email from Elmhurst Energy Ltd)	
7.2	Heating controls – The GSHP unit supplies radiators with TRVs within each apartment / house via programmer and room stat		
7.3	Corridors and other communal space are to be unheated.	All walls and floors to the unheated area are heat loss. SAP conventions.	
8. Water Heating			
8.1	Water usage per person per day is ≤125 Litres.		
8.2	Hot water storage is present in the apartments and houses	1 Bed = 150 litre cylinder, 0.96 kWh/day heat loss 2 bed = 150 litre cylinder, 0.96 kWh/day heat loss 3-4 bed = 200 litre cylinder, 1.39 kWh/day heat loss From kensa	
9. LZCT/ Renewables			
9.1	No photovoltaics		
10. Lighting			
10.1	Dwellings - 100% Low energy (LE) lights are installed throughout with a min. efficacy of 60 lumens/circuit watt		
10.2	Non-Dwelling areas – LED lighting is installed with a min. efficacy of 140 lumens/circuit watt and controlled via presence detection PIR where applicable	MCC Low Carbon Standard	
10.3	Non-dwelling: PIR presence detection lighting controls will be provided to the Storage and WC areas. All other light fittings are controlled manually.		
10.4	Non-dwelling: Light fitting energy use is metered but the system does not warn of out of range values.		
11. Thermal Bridging			
11.1	Apartments - Accredited Construction Details (ACD) for limiting thermal bridging are installed at every junction in the main fabric.	Refer to ACD details. Any balconies to have thermal breaks	
11.2	Houses – Specialist Timber Frame Thermal Bridging are installed at every junction in the main fabric. Refer to Timber Tight details		

Signed by.....On behalf of Rowlinson Constructions Dated.....

10.3. SAP Calculation Outputs

Apartment Block -

BLOCK COMPLIANCE

Calculation Type: New Build (As Designed)



Design SAP
elmhurst energy

Block Reference	Z39428.1	Issued on Date	25/05/2021
Block Name	Silk Street		
Assessor Details	Mr. Matthew Gibson, Energy Council, Tel: 01617621055, matthew.gibson@energycouncil.co.uk	Assessor ID	H176-0001
Client			

Block Compliance Report - DER

Block Reference: Z39428.1		Block Name: Silk Street			
Property-Assessment Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
Z39444.1-Z39444.1	1	79.37	17.02	28.44	40.15 %
Z39445.1-Z39445.1	1	54.55	20.07	34.33	41.54 %
Z39446.1-Z39446.1	1	54.55	1.68	31.28	94.63 %
Z39447.1-Z39447.1	1	52.65	18.75	30.14	37.79 %
Z39448.1-Z39448.1	1	79.37	15.61	25.21	38.09 %
Z39449.1-Z39449.1	1	59.36	17.84	29.56	39.65 %
Z39450.1-Z39450.1	1	59.36	16.76	26.32	36.31 %
Z39451.1-Z39451.1	1	52.65	17.09	26.60	35.75 %
Z39452.1-Z39452.1	1	79.37	15.61	25.21	38.09 %
Z39453.1-Z39453.1	1	59.36	17.84	29.56	39.65 %
Z39454.1-Z39454.1	1	59.36	16.76	26.32	36.31 %
Z39455.1-Z39455.1	1	52.65	17.09	26.60	35.75 %
Z39456.1-Z39456.1	1	79.37	18.51	31.72	41.65 %
Z39457.1-Z39457.1	1	59.36	21.33	37.55	43.20 %
Z39458.1-Z39458.1	1	59.36	20.24	34.05	40.56 %
Z39459.1-Z39459.1	1	52.65	20.48	33.91	39.61 %
Totals:	16	993.34	272.68	476.81	
Average DER = 17.04 kgCO ₂ /m ²		% DER/TER	PASS		
Average TER = 29.61 kgCO ₂ /m ²		42.45 %			

House Type 3.1 (End) -

BASIC COMPLIANCE REPORT Calculation Type: New Build (As Designed)


Design SAP
elmhurst energy

Property Reference	Z39486			Issued on Date	25/05/2021
Assessment Reference	Z39486	Prop Type Ref	3B5P End		
Property	Plot 59, Silk Street, Manchester				
SAP Rating	81 B	DER	16.54	TER	24.84
Environmental	86 B	% DER<TER	33.41		
CO ₂ Emissions (t/year)	1.56	DFEE	45.85	TFEE	51.85
General Requirements Compliance	Pass	% DFEE<TFEE	11.56		
Assessor Details	Mr. Matthew Gibson, Energy Council, Tel: 01617621055, matthew.gibson@energycouncil.co.uk			Assessor ID	H176-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity (c)		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.84	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.54	kgCO ₂ /m ²	Pass
	-8.30 (-33.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.85	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.85	kWh/m ² /yr	
	-5.9 (-11.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Community heating scheme	-
Secondary heating system	None	

5 Cylinder insulation

House Type 3.1 (Mid) -

BASIC COMPLIANCE REPORT Calculation Type: New Build (As Designed)


Design SAP
elmhurst energy

Property Reference	Z39487				Issued on Date	25/05/2021
Assessment Reference	Z39487	Prop Type Ref	3B5P Mid			
Property	Plot 60, Silk Street, Manchester					
SAP Rating	82 B	DER	15.40	TER	22.91	
Environmental	87 B	% DER<TER	32.78			
CO ₂ Emissions (t/year)	1.45	DFEE	40.42	TFEE	45.12	
General Requirements Compliance	Pass	% DFEE<TFEE	10.42			
Assessor Details	Mr. Matthew Gibson, Energy Council, Tel: 01617621055, matthew.gibson@energycouncil.co.uk				Assessor ID	H176-0001
Client						

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity (c)		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.91	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.40	kgCO ₂ /m ²	Pass
	-7.51 (-32.8%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.12	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.42	kWh/m ² /yr	
	-4.7 (-10.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Community heating scheme	-
Secondary heating system	None	

5 Cylinder insulation



House Type 4.1 (End) -

BASIC COMPLIANCE REPORT Calculation Type: New Build (As Designed)


Design SAP
elmhurst energy

Property Reference	Z39493			Issued on Date	25/05/2021
Assessment Reference	Z39493	Prop Type Ref	4B End Dormer 2kW		
Property	Plot 66, Silk Street, Manchester				
SAP Rating	82 B	DER	15.32	TER	22.48
Environmental	86 B	% DER<TER	31.84		
CO ₂ Emissions (t/year)	1.95	DFEE	45.29	TFEE	50.46
General Requirements Compliance	Pass	% DFEE<TFEE	10.24		
Assessor Details	Mr. Matthew Gibson, Energy Council, Tel: 01617621055, matthew.gibson@energycouncil.co.uk			Assessor ID	H176-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity (c)		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.48	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.32	kgCO ₂ /m ²	Pass
	-7.16 (-31.9%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.46	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	45.29	kWh/m ² /yr	
	-5.2 (-10.3%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	10.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Community heating scheme	-
Secondary heating system	None	

5 Cylinder insulation



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