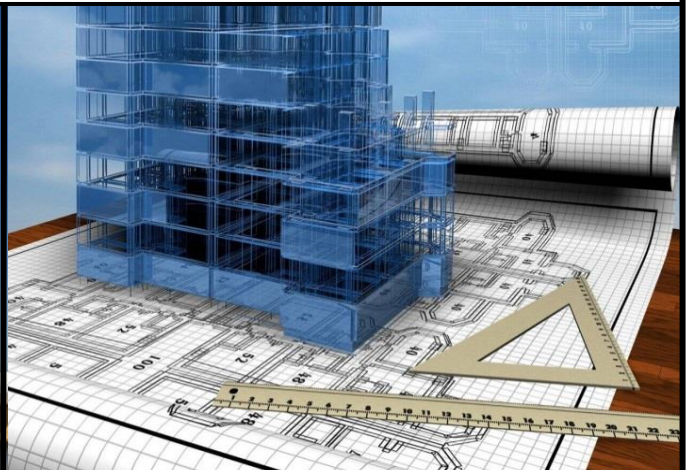


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**Chain Road, Blackley, Manchester, 32no. Residential Dwellings, Energy & Environmental Standards Statement, RevB**



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Aintree Retail & Business Park

Merseyside, L9 5AQ

# Energy & Environmental Standards Statement, RevB 32no. Residential Dwellings Chain Road Blackley, Manchester



## “Reducing CO<sub>2</sub> Emissions In New-Build Developments”

## Energy & Environmental Standards

Statement, RevB:

32no. Residential Dwellings:

Chain Road, Blackley:

Manchester.

### DOCUMENT CONTROL:

Project title: Chain Road, Blackley, Manchester

Report title: Chain Road Energy & Environmental Standards Statement, RevB

Revision: RevA – Text changed from 36no. dwellings to 32no. dwellings

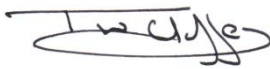
Text changed to included 4no. bed dwellings

Text changed from timber frame to masonry

RevB – heat and domestic hot water strategy changed from gas combination boilers to air source heat pumps

Status: RevB

Control date: 12<sup>th</sup> January 2022

| Issue     | Author                                                                              | Checked by | Date       | Authorised | Date |
|-----------|-------------------------------------------------------------------------------------|------------|------------|------------|------|
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| Contents                                          | Page Nos. |
|---------------------------------------------------|-----------|
| Executive Summary.....                            | 6         |
| Introduction.....                                 | 8         |
| 1.0 Client's Brief.....                           | 8         |
| 2.0 UK Sustainable Development & Legislation..... | 8         |
| 3.0 Sustainable Building Design.....              | 8         |
| 4.0 Construction "A Fabric First Approach".....   | 9         |
| 5.0 Demand for Energy "Chain Road".....           | 11        |
| 6.0 Renewable Energy & Low Carbon Systems.....    | 11        |
| 6.1 Wind Power.....                               | 12        |
| 6.2 Biomass Systems.....                          | 12        |
| 6.2.1 Advantages, Biomass.....                    | 13        |
| 6.2.2 Disadvantages, Biomass.....                 | 13        |
| 6.3 Heat Pumps.....                               | 14        |
| 6.3.1 Advantages, Heat Pumps.....                 | 14        |
| 6.3.2 Disadvantages, Heat Pumps.....              | 15        |
| 6.4 Combined Heat and Power.....                  | 15        |
| 6.5 Solar Energy.....                             | 15        |
| 6.5.1 Solar Thermal.....                          | 16        |
| 6.5.1.1 Advantages, Solar Thermal.....            | 16        |

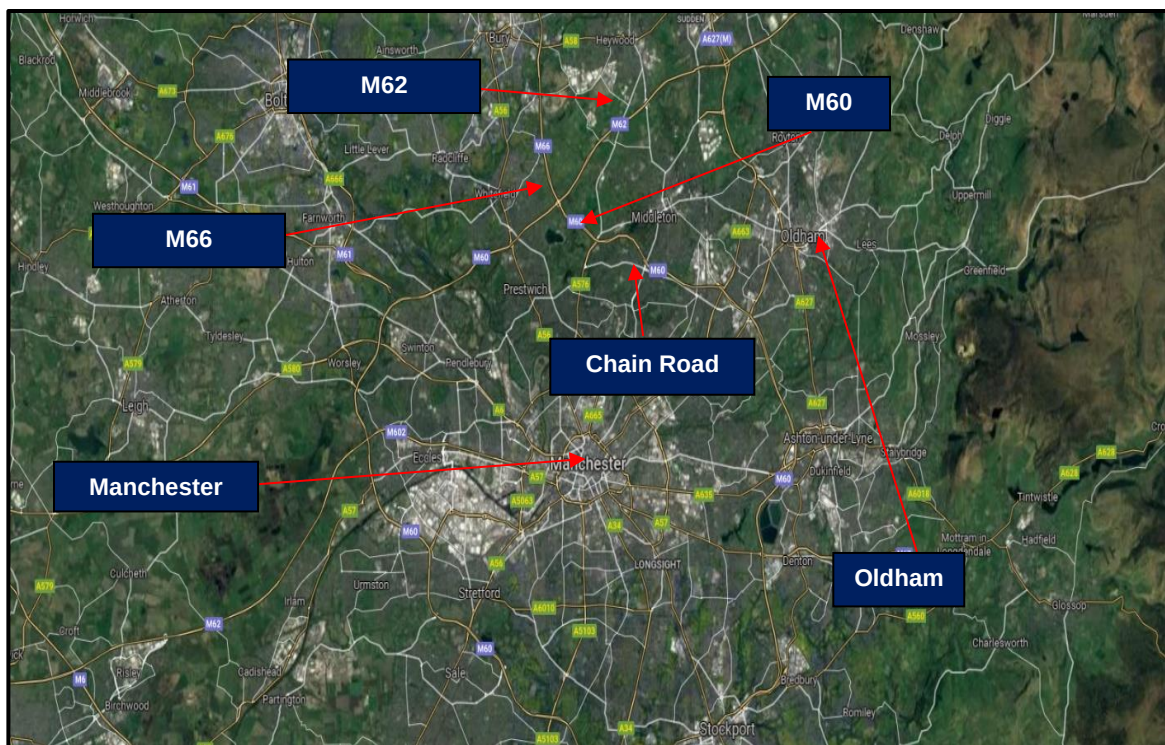
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|                                                |    |
|------------------------------------------------|----|
| 6.5.1.2 Disadvantages, Solar Thermal.....      | 16 |
| 6.5.2 Solar Photovoltaic.....                  | 17 |
| 6.5.2.1 Advantages, Solar Photovoltaic.....    | 17 |
| 6.5.2.2 Disadvantages, Solar Photovoltaic..... | 17 |
| 7.0 Conclusions and Recommendations.....       | 18 |
| Appendix A, Chain Road, SAP Reports.....       | 19 |

## Executive Summary

Chain Road is a proposed new-build residential development to be constructed within the urban district of Blackley, Manchester. The site is located approximately 4no. miles Northeast of Manchester City Centre, and approximately 3.8no. miles West of Oldham Centre. The A567 and A62 provide the primary access routes to and from the site with the M60, M66 and M62 providing nearby motorway links. The proposed development is to construct 32no. residential dwellings consisting of two, three, four bedroom semi-detached and terrace houses [12 units in total], with two 3No. storey apartment blocks [20 units in total].

### Chain Road “Area in General”



To meet the challenging demands associated with sustainable development a “fabric first” approach was considered to be the most cost effective and efficient way of delivering an energy saving development that connects local housing needs whilst reducing CO<sub>2</sub> emissions during the life cycle of each dwelling. The materials specified for construction include a mixture of heavyweight elements and lightweight components that offer greater stability in maintaining internal temperatures at comfortable levels for the residents during occupation. The choice of materials selected for the development ensures the fabric is slower to react to changing thermal conditions by acting as a heat sink during warmer periods and resisting high levels of heat loss during cooler periods.

---

Based on a fabric first approach, the following renewable energy technologies were considered for suitability at the development;

➤ Biomass

Biomass was considered to be a suitable option. However, several issues were identified including a lack of fuel supplies within the local area, excessive transportation costs, high maintenance requirements, excessive storage costs, delivery constraints [via the surrounding roads and intersecting streets] and a low demand for heat-energy given the number of units specified;

➤ Wind power

Wind power was discounted as a realistic option due to associated site constraints and the presence of nearby urban areas, which present significant risks and limitations. An average wind speed of 5.1m/s was confirmed at the site making this technology less viable;

➤ Heat pumps

Heat pumps were considered viable. However, field trials conducted by the Energy Saving Trust have confirmed mixed results with this technology, therefore a cautious approach is recommended. In addition, as each dwelling is likely to be designed with fixed radiators as the primary source of space heating, the specification of heat pumps would require a re-design as they are more effective with under-floor heating systems;

➤ Solar Energy (Solar Photovoltaic & Solar Thermal)

Solar photovoltaics (PV) panels and solar thermal (hot water) were both considered viable options, although roof plans would require a full review to achieve optimum orientation. With regards solar PV this provides the greatest opportunity for the development, as it can deliver the Part L 2012 [SAP] targets, and Manchester City Council's Core Strategy Development Plan 2012, Manchester's Local Development Framework Policy En6".

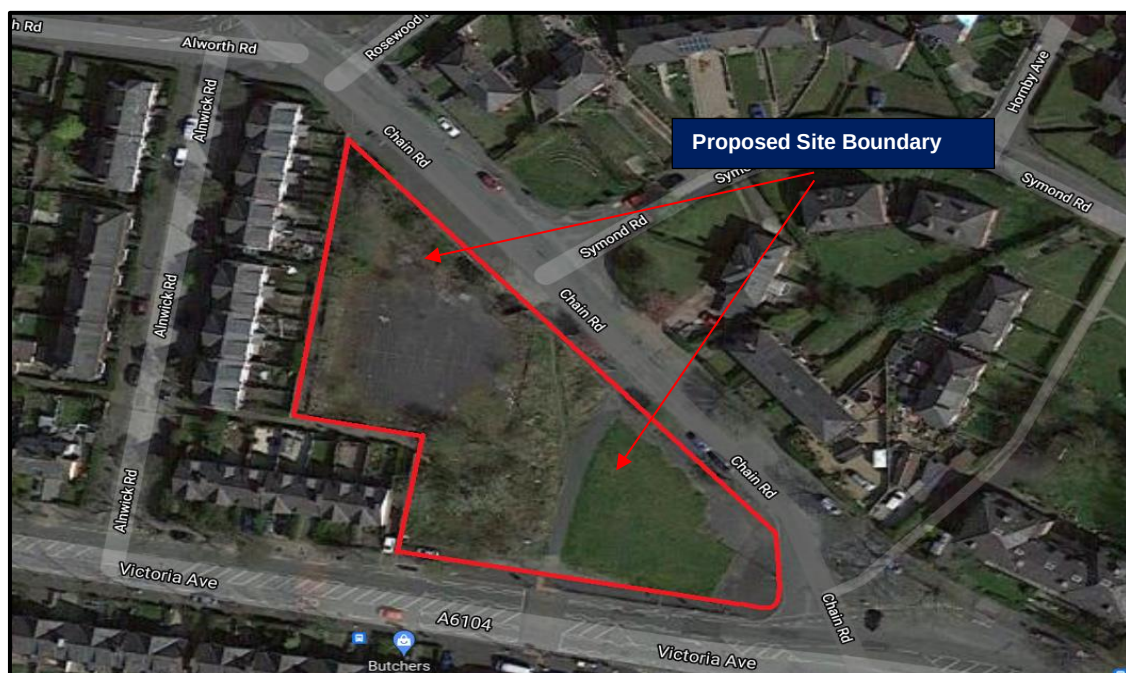
➤ Micro Combined Heat and Power (CHP)

Combined heat and power systems could be used to deliver the building's heat and power requirements, although this technology is relatively new and has yet to reach market maturity. The procurement of micro CHP will bring higher capital costs, which would need to be considered against the available budgets.

## Introduction

This energy and environmental standards statement has assessed the need for sustainable building-design and construction at the Chain Road development based on Manchester City Council's Core Strategy Development Plan 2012, Manchester's Local Development Framework Policy En6 and current Part L Building Regulation requirements 2012. This statement confirms, the use of a fabric-first approach achieves the sustainability standards set by the above policies, with low carbon energy systems available for enhanced levels of sustainability if required. This approach has been established as the most viable option and one that will contribute to the on-going delivery of sustainable dwellings within the local area and wider communities.

### Proposed Site Boundary, Chain Road, Blackley



## 1.0 Client's Brief

Acting upon instruction received from Bowker Sadler Architects via email dated 09<sup>th</sup> September 2021, TWC Consulting Ltd were appointed to conduct a review of the development's sustainability objectives, and assess the potential for low carbon technologies. The study assessed a range of building-design options deemed suitable for the development of which a fabric first approach was judged to be the most appropriate strategy in achieving Manchester City Council's Core Strategy Development Plan 2012, En6 Policy, Manchester's Supplementary Planning Document Adopted, April 2007, and current Building Regulations, Part L 2012.

## 2.0 UK Sustainable Development & Legislation

The UK Climate Change Act 2008, the Sustainable Buildings Act 2004, progressive changes to the Building Regulations, Planning Laws and other legislative provisions continue to drive environmental improvement throughout the UK construction industry. These progressive laws and regulations commit designers and developers to reduce the demand for energy in residential dwellings, whilst at the same time lowering carbon emissions. At the forefront of this evolving process is the tightening of the Building Regulations and various Planning Laws which set energy efficiency standards and instruct renewable energy generation at varying levels.

## 3.0 Sustainable Building-Design

An efficient and cost-effective way of achieving sustainable building-design is through the use and selection of building materials that reduce energy demand during occupation. Sustainable building-design provides a holistic approach on the broader aspects of sustainability, which if implemented as the development progresses can greatly assist with issues such as fuel poverty, rising energy bills and lowering carbon emissions.

Sustainable building-design is at its most effective when considered at the earliest stages of procurement. Factors such as site orientation, solar shading, solar gain, natural ventilation, increased u-values, high levels of thermal mass, dynamic thermal response, admittance factors, green roofs and low energy lighting all have positive impacts on developments and each should be considered within the context of long-term sustainability and environmental objectives.

Manchester City Council's Core Strategy Development Plan 2012, Manchester City Council's Supplementary Planning Document Adopted, April 2007 and current Building Regulations, Part L 2012 direct project teams to obtain the highest levels of sustainability in new-build developments by reducing carbon emissions to a 15% betterment over the targets set by Part L of the Building Regulations 2010. This target can be achieved using innovative building-design specifications and/or a combination of low carbon/renewable technologies where required. SAP software is used to confirm targets have been achieved based on proposed building[s] design[s] and specifications, which are highlighted on the compliance printouts documents as a percentage improvement over the target set by the Building Regulations.

#### 4.0 Construction "A Fabric-First Approach"

All construction materials have properties which define their thermal dynamics. These properties include thermal conductivity (i.e. the amount of heat energy that can flow through a material at a given temperature range), specific heat capacity (the amount of energy required to raise a material element by 10C), and emissivity (the rate at which materials radiate/re-radiate energy). Thermal conductivity and specific heat capacity can be combined to form a single calculation known as thermal diffusivity (the rate at which a material can store heat comparative to the rate it can conduct heat, the greater the temperature range the greater the flow of heat).

Heavyweight materials such as concrete, stone, brick and block all have high thermal diffusivity values, in contrast to other materials such as fibreboard, timber, steel which have lower values. With the demand for sustainable construction continuing to increase, and the significance of thermal dynamics the choice between building materials is a significant factor in building design. Decisions between construction form over aesthetics is challenging designers as the ability of the fabric to react to changing climatic conditions, whilst reducing carbon emissions dominate. Knowing the thermal diffusivity of materials will assist building designers in creating thermally efficient buildings.

Table1: outlines the design specifications and options included as a basis for construction at Chain Road.

**Table1: Chain Road, Construction Materials & Design Details**

| Element         | Specification                                  | Design Details                                                                              |
|-----------------|------------------------------------------------|---------------------------------------------------------------------------------------------|
| External walls  | 0.19Wm <sup>2</sup> /K                         | 102.5mm brick outer leaf, 50mm cavity, 100mm insulation, 100mm blockwork, 12.5mm drylining  |
| Party walls     | 0.00Wm <sup>2</sup> /K                         | Full-fill mineral wool with edge sealing top and bottom of the cavity (i.e. zero heat loss) |
| Roof            | 0.10Wm <sup>2</sup> /K                         | 400mm mineral wool insulation within the roof void                                          |
| Floor           | 0.11Wm <sup>2</sup> /K (varying between plots) | Suspended concrete beam and block, with 150mm of Celotex rigid insulation board, or similar |
| Windows / doors | 1.40Wm <sup>2</sup> /K                         | BFRC DG window units and doors to minimise heat loss                                        |
| Thermal bridges | 0.08Wm <sup>2</sup> /K or less                 | All thermal bridges to be individually measured and insulated to minimise heat loss         |

|                        |                                               |                                                                                                                               |
|------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Pressure test          | Designed q50:                                 | Air tightness of 5m <sup>3</sup> /m <sup>2</sup> @50pa.to prevent air convection                                              |
| Background ventilation | Cross flow ventilation                        | Controlled ventilation rates to Part F standards                                                                              |
| Extract ventilation    | Standard extract fans to all wet rooms        | Standard mechanical extract ventilation fans to be installed within all wet rooms including utilities and en-suite facilities |
| Lighting               | At least 45lumens circuit/Watt                | 100% low energy lighting to be used within all internal areas. External lighting to be fitted with motion sensors             |
| Main heating system    | Air source heat pump<br>Low carbon technology | Ecodan Air Source Heat Pump. Low carbon technology for heating and domestic hot water                                         |
| Water use              | <120litres person, per day                    | Domestic hot water heated via the main heating system                                                                         |

At Appendix A (see below) a SAP calculation report has been attached which confirms the construction strategy listed at Table 1: meets the carbon reduction target set by Manchester's Local Development Framework Policy En6. The En6 6% requirement is confirmed at the top of page1, Annex A, as "DER<TER" (i.e. Dwelling Emission Rate has a betterment over the Target Emission Rate by 30.86%)<sup>1</sup>. To support this statement further several additional calculations were completed on a range of house types, in varying orientations across the development to ensure each dwelling achieves the carbon reduction requirements.

## 5.0 Demand for Energy "Chain Road"

The demand for energy at the Chain Road, is yet to be confirmed. However, it is anticipated that consumption levels will range between 6,000kWh – 9,000kWh of regulated energy per dwelling, per annum, based on the design proposals and the specifications listed above. This will assist in meeting the carbon emission targets set by Part L of the Building Regulations 2012. Further dwelling specific data can be confirmed as the development progresses using industry recognised software such as Standard Assessment Procedure (SAP), daylight factor measurements, water consumption calculators and pollution mitigation control measures.

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<sup>1</sup> Manchester's Local Development Framework Policy En6 requires a 15% betterment in Dwelling Emission Rates over the Target Emission Rate set by Building Regulations 2010. As Chain Road have been calculated using SAP 2012 a 6% improvement is required as the software includes an inherent 9% uplift over Building Regulations 2010.

## 6.0 Renewable Energy & Low Carbon Systems

The potential for renewable and low carbon energy systems were considered for Chain Road including; wind power, combined heat & power, biomass (wood), ground/air source heat pumps and solar energy – with several other renewables energy systems deemed unsuitable at this stage<sup>2</sup>. A summary of each system is outlined in the sections below along with their respective advantages and disadvantages.

### 6.1 Wind Power

Two types of wind power system were considered including large-scale wind turbines and small scale domestic (micro-generation) turbines. Both systems were considered unviable at this stage due to surrounding urban areas and the predicted average wind speeds at the site (confirmed at 5.1m/s). It is anticipated the following restrictions would also impact wind power<sup>3</sup>;

- Planning consent could be problematic given the sites location
- Objections from local resident's due to aesthetics and noise generation factors;
- A full noise level assessment would be required in order to support a Planning application;
- A life cycle maintenance plan would need to be costed (i.e. the costs of maintaining the turbine(s) and/or associated moving parts over the life cycle of the system);
- Life cycle costs are relatively high (depending on the quality of the system);
- Damage to local birds and wildlife would need to be considered;
- Visual impact is difficult to define without conducting further feasibility studies;
- The system is less durable than other renewable energy systems;
- Energy is only generated when the wind strength is sufficient;
- Payback (in some cases) cannot be guaranteed.

### 6.2 Biomass Systems

The market for biomass “wood” has grown significantly during the past 3no. years with Scotland seeing a 300% increase in its use. Biomass boilers are being installed throughout the UK, although in some urban locations there is a reluctance to use them due to problems associated with pollution<sup>4</sup>. Biomass systems can

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<sup>2</sup> Tidal power, Hydro, Geothermal, Biogas and Biowaste were not assessed during the study due to site limitations and the unlikelihood of their inclusion.

<sup>3</sup> The BWEA suggests wind speeds of 7m/s or more are required for large scale wind turbines (50kW). The average wind speed at Openshaw, Manchester is 4.6m/s at a height of 10m, obtained from the <http://www.rensmart.com/Weather/BERR> website.

<sup>4</sup> See <http://www.building.co.uk/report-highlights-biomass-pollution-fears/3105974.article> for details.

operate on a variety of fuel sources, which are governed by the specified boiler/plant. Power outputs range from small-scale systems at 4kW to large-scale district heating systems in excess of 1250kW (i.e. decentralised plant). There are several well-established manufacturers producing biomass boilers including Broag, Hoval and Baxi. Capital costs can vary widely from £1,500 per dwelling for wood stoves to approximately £8,000 per dwelling for district heating network systems.

The following sections outline the advantages and disadvantages of using biomass boilers for Chain Road

#### 6.2.1 Advantages, Biomass

- Chips/pellets can be used to power a wide range of biomass boilers including combined heat and power systems (CHP) and individual wood stoves;
- Biomass generates a financial return via the Renewable Heat Incentive;
- Fuel sources can be locally grown and supplied;
- The payback period can be difficult to define, however 5 – 8 years is often used as a benchmark used, depending on the type of system and the availability of the Renewable Heat Incentive, see [www.energysavingtrust.co.uk](http://www.energysavingtrust.co.uk) for further details.

#### 6.2.2 Disadvantages, Biomass

- The supply of fuel can restrict the choice of system (i.e. chips or pellets);
- Pollution needs consideration (at Chain Road, this would require further on-site clarification);
- Noise levels generated by the system(s) must be assessed and managed accordingly;
- Maintenance requirements including cleaning, monitoring and running a biomass system are high;
- Substantial storage space is required to accommodate the plant and fuel supplies;
- The cost of transporting the fuel from source to the site can outweigh the benefits of using the system.

#### 6.3 Heat Pumps

Heat pumps are an essential part of the UK's renewable energy mix. Several variations exist which can deliver heat energy to a building as and when it is required<sup>5</sup>. With regards to the Chain Road development heat pumps were considered viable either as standalone system(s), and/or as part of a site-wide energy strategy. However, high-end capital costs, design constraints and maintenance requirements during cold snaps would need further studies. Capital costs can vary widely, with quotes ranging as high as £12,000 per dwelling/unit.

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<sup>5</sup> Heat pumps utilize a system of compression, expansion, latent heat and heat exchangers to generate heat energy. They function in a similar way to a fridge. A coefficient of performance is normally used to confirm the efficiency standards.

A summary of each heat pump variation is listed as follows;

- Water to Water Heat Pumps

Heat is extracted from a nearby watercourse, which is transferred to a looped pipework system and then used to generate heat energy for space heating and domestic hot water;

- Air to Water Heat Pumps

Heat is extracted from the outside ambient air temperature and transferred to a storage water supply via a heat exchanger where it is used as a source of heat energy supply when it is required;

- Ground Source Heat Pumps

Heat is taken from below ground level and transferred to a fluid mix (glycol etc.), and thereafter upgraded to provide a suitable source of heat energy.

#### 6.3.1 Advantages, Heat Pumps

- Heat pumps can provide a sustainable and renewable source of heat energy supply;
- Heat pumps can generate constant supplies of heat and/or cooling;
- Heat pumps are particularly beneficial when used in conjunction with under-floor heating systems and low surface temperature heat emitters;
- Certain heat pumps receive an income from the Renewable Heat Incentive, see [www.energysavingtrust.co.uk](http://www.energysavingtrust.co.uk) for further details;
- Payback periods average between 5 – 7 years depending on the type of system and the availability of the Renewable Heat Incentive.

#### 6.3.2 Disadvantages, Heat Pumps

- Horizontal ground source systems require large areas to generate required levels of heat;
- Vertical ground source heat systems can be expensive to procure and install;
- Efficiency levels are reduced as outside temperatures decrease (i.e. heat pumps need to work harder during colder periods to maintain internal temperatures at comfortable levels)<sup>6</sup>.

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<sup>6</sup> Although, not a disadvantage, it is possible for some air source heat pumps to ice/frost up when temperatures drop to between 0°C and 3°C. Therefore, the reliability of recognised units should to be considered prior to specification.

#### 6.4 Combined Heat and Power (CHP)

CHP is the simultaneous generation of heat and power contained within the same energy system. Products range from small-scale domestic engines which run on simple gas turbines, to large-scale tri-generation systems which provide heating, cooling and power. The heat produced during the generation cycle is recovered and then used as a source of heat-energy within the building. CHP systems can deliver efficiency levels up to 90% efficient in contrast to separate systems which can range as low as 30% to 50%. CHP systems are usually specified on large-scale projects where there is a constant and high demand for power (i.e. hospitals and large office buildings).

Although CHP is fast becoming an available option to designers its inclusion at Chain Road could not be confirmed as suitable due to the low demand for heat and power, and periods of occupation which could not be established. The advantages and disadvantages of specifying a CHP system remain outside the scope of this report.

#### 6.5 Solar Energy

Solar energy is an increasingly popular choice of renewable energy system that is expanding exponentially due to the rising demand for sustainable building-design, the availability of the Feed in Tariff, the Renewable Heat Incentive, and Planning Conditions. Solar energy is considered to be a common choice of renewable due to its simplicity in installation, its nominal maintenance requirements, it is source of renewable energy during daylight hours and it can offer an income/investment as a result of the Feed in Tariff and/or Renewable Heat Incentive.

Solar energy has 2no. variations which are usually termed Solar Thermal (hot water), and Solar Photovoltaic (PV).

##### 6.5.1 Solar Thermal

Solar thermal is a renewable heat energy system also known as “solar hot water”. The system can be confused with solar photovoltaic in that it is similar in appearance and is normally installed on roof areas, however that is where the similarity ends. Solar thermal systems produce heat energy via the absorption of the Sun’s shortwave radiation and external temperatures which it then transfers to a heat carrying fluid, where-after it is used to deliver space heating and domestic hot water. The panels/collectors are located within close proximity to a thermal store (i.e. a hot water cylinder) to reduce heat losses within the associated pipework. The stored heat energy is used to increase temperatures of the incoming mains

water before it reaches the boiler system. There are 2no. variations of solar thermal systems known as “evacuated tubes and flat plate collectors”. Evacuated tubes are more efficient, however they are also more expensive. Capital costs can range between £4000 – £6,000 per dwelling.

#### 6.5.1.1 Advantages, Solar Thermal

- Solar thermal systems provide a constant source of free heat energy which can be used to reduce the amount of mains energy needed for space heating and domestic hot water;
- The cost of installation is becoming increasingly competitive as the market reaches maturity;
- Solar thermal is likely to produce a return on investment from the Renewable Heat Incentive, although the specific details are still to be confirmed;
- The payback period can range between 6 – 12 years depending on site variables and the qualifying financial incentive.

#### 6.5.1.2 Disadvantages, Solar Thermal

- Roof mounted systems can increase structural loadings which can lead to additional costs and expensive strengthening works;
- Energy generation is dependent on diurnal temperatures and weather conditions;
- At Chain Road, there are several design limitations due to internal layouts, associated pipe runs and distances from the panels to the locations where the heat energy is required.

#### 6.5.2 Solar Photovoltaic

- Solar Photovoltaic (PV) panels produce electricity when stimulated by direct and diffuse daylight. The panels absorb the available light from which an electrical charge is generated between the protons and neutrons located within the systems silicon. PV panels are usually located on roof areas (as with solar thermal listed above). The wiring located within the panels is fixed to an isolation switch, an inverter and a generation meter for use at source or export to the grid. The price of the panels is declining as the market reaches maturity (approximately £5,500 per dwelling);

##### 6.5.2.1 Advantages, Solar Photovoltaic, (PV)

- PV arrays provide a free source of electricity that can be used at source or export to the grid;
- PV arrays are simplistic to install and wiring is minimal;
- Minimal maintenance requirements exist with the majority of PV panels;

- The payback periods range between 8 – 10 years depending on the site parameters;
- The Feed in Tariff provides a return of approximately 4p per unit of energy generated (higher rate).

#### 6.5.2.2 Disadvantages, Solar Photovoltaic, (PV)

- Energy generation can be limited by the site's orientation and efficiencies of the installed panels;
- Energy generation is dependent on diurnal weather conditions and temperatures;
- An increase in structural roof loadings can be expected. This can lead to additional and expensive strengthening works;
- PV panels do not produce energy during hours of darkness.

## 7.0 Conclusions and Recommendations

It is conclusion and recommendation of this report the design and specifications outlined above meet the requirements for sustainability as required by Manchester's Local Development Framework Policy En6, and current Building Regulation requirements, Part L 2012. A mixture of sustainable building-design, a fabric first approach and renewable/low carbon energy systems [where required] will deliver thermally efficient accommodation that will reduce demand for energy, resist heat-loss through conduction and maintain internal temperatures at comfortable levels for the occupants.

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)

|                      |                               |                |                   |
|----------------------|-------------------------------|----------------|-------------------|
| Property Reference   | Chain Rd, Energy Statement, B | Issued on Date | 12/01/2022        |
| Assessment Reference | Chain Rd, Energy Statement, B | Prop Type Ref  | Typical Apartment |
| Property             |                               |                |                   |

|                                    |      |             |       |      |       |
|------------------------------------|------|-------------|-------|------|-------|
| SAP Rating                         | 89 B | DER         | 18.25 | TER  | 26.40 |
| Environmental                      | 90 B | % DER<TER   | 30.86 |      |       |
| CO <sub>2</sub> Emissions (t/year) | 0.64 | DFEE        | 28.87 | TFEE | 34.08 |
| General Requirements Compliance    | Pass | % DFEE<TFEE | 15.30 |      |       |

|                  |                                                                                                                       |             |           |
|------------------|-----------------------------------------------------------------------------------------------------------------------|-------------|-----------|
| Assessor Details | Mr. Thomas Claffey, TWC Consulting (Sustainable Prop. Consultants) Ltd, Tel: 01455883250, t.claffey@twcconsulting.com | Assessor ID | e623-0001 |
| 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        |                                   |      |
| Fuel factor                                 | 1.55 (electricity) |                                   |      |
| Target Carbon Dioxide Emission Rate (TER)   | 26.40              | kgCO <sub>2</sub> /m <sup>2</sup> |      |
| Dwelling Carbon Dioxide Emission Rate (DER) | 18.25              | kgCO <sub>2</sub> /m <sup>2</sup> | Pass |
|                                             | -8.15 (-30.9%)     | kgCO <sub>2</sub> /m <sup>2</sup> |      |

##### 1b TFEE and DFEE

|                                          |               |                        |      |
|------------------------------------------|---------------|------------------------|------|
| Target Fabric Energy Efficiency (TFEE)   | 34.08         | kWh/m <sup>2</sup> /yr |      |
| Dwelling Fabric Energy Efficiency (DFEE) | 28.87         | kWh/m <sup>2</sup> /yr |      |
|                                          | -5.2 (-15.2%) | kWh/m <sup>2</sup> /yr | Pass |

#### Criterion 2 – Limits on design flexibility

##### Limiting Fabric Standards

##### 2 Fabric U-values

| Element       | Average          | Highest          |      |
|---------------|------------------|------------------|------|
| External wall | 0.22 (max. 0.30) | 0.22 (max. 0.70) | Pass |
| Party wall    | 0.00 (max. 0.20) | -                | Pass |
| Roof          | 0.11 (max. 0.20) | 0.11 (max. 0.35) | Pass |
| Openings      | 1.30 (max. 2.00) | 1.30 (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 | 3.00 (design value) |      |
| Maximum                        | 10.0                | Pass |

##### Limiting System Efficiencies

##### 4 Heating efficiency

|                          |                                                                                                    |  |
|--------------------------|----------------------------------------------------------------------------------------------------|--|
| Main heating system      | Heat pump with radiators or underfloor - Electric<br>Mitsubishi Electric Ecodan 6.0 kW PUZ-WM60VAA |  |
| Secondary heating system | None                                                                                               |  |

##### 5 Cylinder insulation

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)

|                            |                                                                 |      |
|----------------------------|-----------------------------------------------------------------|------|
| Hot water storage          | Measured cylinder loss: 1.52 kWh/day<br>Permitted by DBSCG 2.30 | Pass |
| Primary pipework insulated | Yes                                                             | Pass |

### 6 Controls

|                        |                                   |      |
|------------------------|-----------------------------------|------|
| Space heating controls | Time and temperature zone control | Pass |
| Hot water controls     | Cylinderstat                      | Pass |
|                        | Independent timer for DHW         | Pass |

### 7 Low energy lights

|                                                     |     |   |      |
|-----------------------------------------------------|-----|---|------|
| Percentage of fixed lights with low-energy fittings | 100 | % |      |
| Minimum                                             | 75  | % | Pass |

### 8 Mechanical ventilation

Not applicable

## Criterion 3 – Limiting the effects of heat gains in summer

### 9 Summertime temperature

|                                            |                                   |      |
|--------------------------------------------|-----------------------------------|------|
| Overheating risk (West Pennines (England)) | Slight                            | Pass |
| Based on:                                  |                                   |      |
| Overshading                                | Average                           |      |
| Windows facing North East                  | 6.34 m <sup>2</sup> , No overhang |      |
| Air change rate                            | 3.00 ach                          |      |
| Blinds/curtains                            | None                              |      |

## Criterion 4 – Building performance consistent with DER and DFEE rate

### Party Walls

| Type                            | U-value |                    |      |
|---------------------------------|---------|--------------------|------|
| Filled Cavity with Edge Sealing | 0.00    | W/m <sup>2</sup> K | Pass |
| Filled Cavity with Edge Sealing | 0.00    | W/m <sup>2</sup> K | Pass |

### Air permeability and pressure testing

#### 3 Air permeability

|                                |                     |      |
|--------------------------------|---------------------|------|
| Air permeability at 50 pascals | 3.00 (design value) |      |
| Maximum                        | 10.0                | Pass |

### 10 Key features

|                    |      |                                  |
|--------------------|------|----------------------------------|
| Party wall U-value | 0.00 | W/m <sup>2</sup> K               |
| Party wall U-value | 0.00 | W/m <sup>2</sup> K               |
| Roof U-value       | 0.11 | W/m <sup>2</sup> K               |
| Air permeability   | 3.0  | m <sup>3</sup> /m <sup>2</sup> h |

*This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.*