



PROPOSED RESIDENTIAL DEVELOPMENT

Bennett Street, Manchester

ENERGY REPORT



KELLEN
HOMES

Draft v1.5

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Introduction

This Energy Report has been prepared by Award Energy Consultants on behalf of Kellen Homes in relation to a development of 272 new build dwellings, associated access, drainage, and the provision of public open space and landscaping at Bennett Street, Manchester. The Community Centre will be addressed as an Addendum at a later date when additional calculations have been carried out.

This report considers the issues surrounding sustainable construction and, in particular, it considers and evaluates the measures incorporated into the design of the development to reduce the predicted energy usage and carbon emissions of the site.

It should be noted that due to the scale of the development, delivery of individual plots will be subject to the Future Homes Standard programme of changes to Part L of the Building Regulations which have exceeded Manchester City Council's Core Strategy Policy EN6 from June 2022. Part L 2021 will result in carbon reductions at least 31% over Part L 2013 along with significantly improved fabric performance.

As the SAP software used to calculate the required metrics for Policy EN6 is not fully functional and should not be relied on for compliance, this Report is founded in Part L1a 2013, though significantly higher carbon reductions will be achieved.

Policy Context

The following documents were considered:

Building Regulations Part L - as new build dwellings, Part L1A is of particular note. Part L1 sets minimum standards for fabric and energy efficiency for new build dwellings. Due to the changes in Part L which came into force in June 2022, the dwellings are anticipated to result in carbon reductions at least 31% over Part L 2013 with a betterment in Primary Energy of approximately 35% over Part L1a 2013. However, the software used to calculate these metrics is only not yet fully functional and should not be relied on for compliance, therefore this Report is founded in Part L1a 2013

National Planning Policy Framework 2021 - strengthens the emphasis on sustainable development and requires new developments to secure the highest viable resource and energy efficiency and reduction in emissions by considering Governments and other national standards

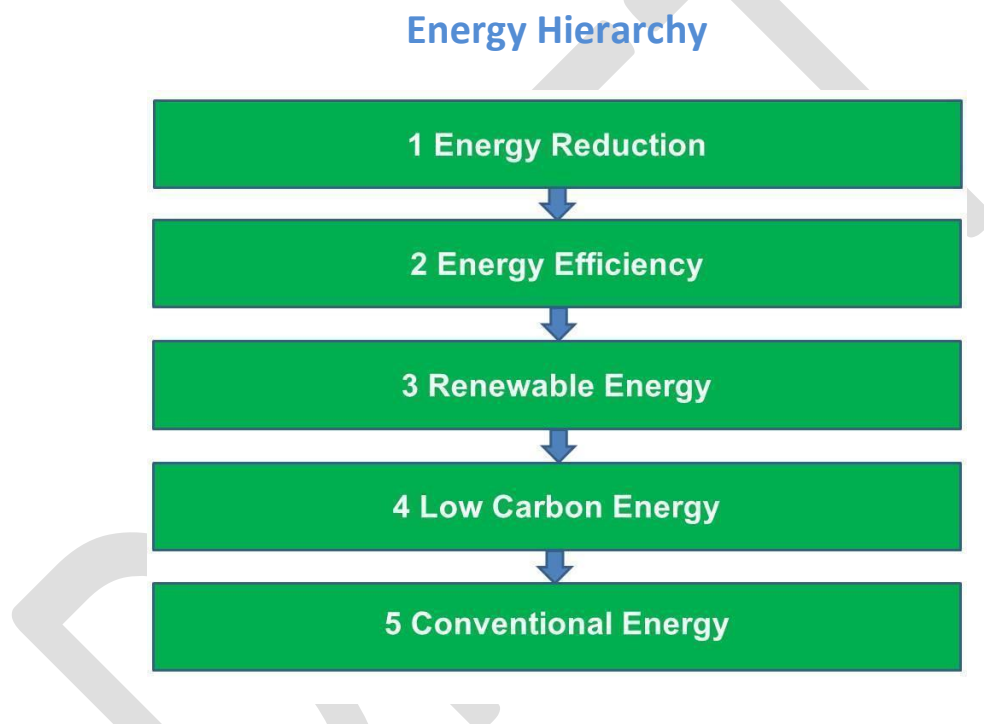
Manchester City Council's Guide to Development in Manchester Supplementary Planning Document and Planning Guidance Adopted April 2007 - encourages high quality design and sustainable construction and utilising renewable technology to meet 20% of the Energy Demand of the development

Manchester City Council's Policy EN6 - Target Framework for CO2 reductions from low or zero carbon energy supplies – requires a 15% reduction in carbon emissions over Part L1a 2010 (i.e. 9% above Part L1a 2013) for Target Area 3, which is the designation for the site at Bennett Street. Following The Deregulation Act 2015, the Code For Sustainable Homes is no longer applied at LPA level.

Proposal

Kellen Homes have appointed Award Energy to use SAP 2012 to analyse the potential energy efficiencies that can be achieved through an enhanced fabric specification and the application of renewable technology in the form of photovoltaic panels, in line with Manchester City Council's planning policies.

Kellen Homes considers that the proposed development maximises site characteristics, visual amenity and recognises the surrounding built form, providing a high-quality development. Referencing the Energy Hierarchy, Kellen Homes has developed a fabric-first energy demand and carbon emission reduction strategy for the site at Bennett Street before the application of photovoltaic panels on the most appropriate roof spaces.



This “fabric-first” energy reduction strategy accords with the Government’s Energy Hierarchy and provides an enhanced fabric and M&E specification for all dwellings to be built on site and is anticipated to achieve a **20.22%** reduction in site-wide energy demand through renewable technology and a **10.57%** average reduction in carbon emissions over and above the 2013 Building Regulations.

Technology Suitability Review

Technologies

The following technologies will be assessed for the appropriateness in the development.

- Combined Heat and Power (CHP)
- Air Source Heat Pumps (ASHP)
- Ground Source Heat Pumps (GSHP)
- Wind Power
- Biomass Technology
- Solar Hot Water (SHW) Technology
- Photovoltaic (PV) Technology
- Flue Gas Heat Recovery System (FGHRS)
- Waste Water Heat Recovery System (WWHRS)

Combined Heat and Power (CHP)

District Heating Networks (DHN) comprise a centralised heat generator, typically a gas fired Combined Heat and Power (CHP) engine. CHP systems generate electricity and waste heat which can be fed into a network of insulated pipes which deliver low carbon heat to buildings to provide heating and hot water via individual heat transfer units.

DHNs and CHP are suited to development with high thermal demand, typically provided by sufficient density or a large anchor load, i.e., high-density flats, leisure centres and industrial process with different heat demand profiles. There are no DHN's around the proposed development.

For a development of highly insulated, low density and high efficiency homes such as those proposed limits the heating demand of development and therefore the feasibility and viability of the installation of CHP and district heating.

For these reasons, CHP & DHN are considered **not suitable** for this development.

Air Source Heat Pump (ASHP)

ASHP technology extract heat from the external air and condense this energy to heat a smaller space within a dwelling or non-domestic building. A pump circulates a refrigerant through a coil to absorb energy from the air. This refrigerant is then compressed to raise its temperature which can then be used for space heating and domestic hot water.

Advantages

- Mature technology
- Can assist in cooling
- Approx. 250% efficient using electricity

Disadvantages

- Hot water cylinder required
- Either oversized radiators or underfloor heating is required
- Can be noisy

Conclusion

ASHP has been deemed **suitable for this development**.

Ground Source Heat Pump (GSHP)

GSHP technology exploits seasonal temperature differences between the ground and air. Fluid is pumped through pipes laid in the ground, taking up heat which is then extracted by the heat pump and released at a higher temperature to drive a space heating system. The pipework is placed either horizontally or vertically in the ground.

Advantages

- More efficient than ASHP
- Mature technology
- Can assist in cooling
- Approx. 320% efficient using electricity

Disadvantages

- Costly to install
- Hot water cylinder required
- Either oversized radiators or underfloor heating is required

Conclusion

Due to the cost, GSHP has been deemed **not suitable for this development.**

Wind Power

Wind turbines are available in various sizes from large rotors able to supply whole communities, small roof or wall-mounted units for individual dwellings.

Advantages

- Generation of clean energy

Disadvantages

- Costly to install
- Maintenance costs
- Can be noisy (hum of generator)

Conclusion

Wind power has been deemed **not suitable for this development.**

Biomass Technology

Biomass boilers work on the principle that the combustion of wood chip or pellets can create heat for space heating and hot water.

Advantages

- Considerable reduction in CO₂ emissions

Disadvantages

- Can be costly to run compared to a gas boiler
- Space for a plant room to store fuel and plant
- Regular maintenance may be required
- A local source of fuel (reduce transport emissions)

Conclusion

Due to the cost and the requirement of space for plant and fuel storage, Biomass has been deemed **not suitable for this development.**

Solar Hot Water (SHW) Technology

Solar thermal technology harnesses solar energy to generate heated water.

Advantages

- Mature Technology
- Approx. 50% of hot water demand can be met
- Low maintenance

Disadvantages

- Not always aesthetically pleasing
- The benefit of installation is limited to the water heating demand
- A Large hot water cylinder is required
- If system oversized can contribute to overheating
- Access for maintenance
- Not as many installers as previously
- Benefits not as good as similar technologies

Conclusion

Due to the number of disadvantages, SHW has been deemed **not suitable for this development**.

Photovoltaic (PV) Technology

Photovoltaic (PV) technology involves the conversion of the sun's energy into electricity.

Advantages

- Mature Technology
- Low maintenance
- Easily integrated

Disadvantages

- Not always aesthetically pleasing
- Poor design can lead to lower-than-expected yields
- Access for maintenance

Conclusion

Due to the benefits gained from this technology, for appropriate plots with suitable roof orientations, PV has been deemed **suitable for this development**.

Flue Gas Heat Recovery System (FGHRS)

Flue Gas Heat Recovery (FGHRS) technology helps improve the efficiency of your heating system by recovering heat from flue gases.

Advantages

- Helps improve the efficiency of your heating system by recovering heat from flue gases.
- Use less gas for the same temperature.
- Fit and forget technology, very little maintenance required.

Disadvantages

- Not always aesthetically pleasing.
- Access for maintenance

Conclusion

Due to the benefits gained from this technology, for appropriate plots, FGHRS has been deemed **suitable for this development**.

Waste Water Heat Recovery System (WWHRS)

Waste Water Heat Recovery System (WWHRS) technology uses the residual heat from the waste shower water to preheat the incoming cold feed that refills the system. Therefore, less energy is used to heat that water to the required temperature.

Advantages

- Helps improve the efficiency of your heating system by technology that uses the residual heat from the waste shower water to preheat the incoming cold feed that refills the system.
- Use less gas for the same temperature.
- Fit and forget technology, very little maintenance required.

Disadvantages

- Access for maintenance

Conclusion

Due to the benefits gained from this technology, for appropriate plots, WWHRS has been deemed **suitable for this development.**

Conclusion

The following technologies have been deemed suitable for this development.

- Air Source Heat Pump (ASHP)
- Photovoltaic (PV) Technology
- Flue Gas Heat Recovery System (FGHRS)
- Waste Water Heat Recovery System (WWHRS)

Reducing Energy Demand and Carbon Emissions

In order to evaluate the proposed sustainability strategy, it is important to determine firstly the base line. This is the level of carbon emissions and energy demand against which any strategy must be judged using a selection of proposed typical house types and the standard specification that shows a compliance with the Building Regulations. Whilst the dwellings at Bennett Street will be built to the requirements of Part L 2021 and beyond, the software used to calculate these metrics is not fully functional and should not be relied on for compliance. The detailed future specification for the properties has not been finalised, however it is anticipated that each dwelling will benefit from Photovoltaic panels, high levels of insulation, high specification glazing and, for the houses, flue gas heat recovery on highly efficient gas boilers at minimum.

Table 1

Element	Part L1a 2013 Requirements* (u-value)	Kellen Homes enhanced specification (u-value)
Walls (w/m ² k)	0.30	0.19
Roofs (w/m ² k)	0.20	0.11
Floors (w/m ² k)	0.25	0.12/0.13
Windows (w/m ² k)	2.0	1.4
Doors (w/m ² k)	2.0	1.2
Thermal Bridging	ACD	Thermally Modelled
Design air pressure test (m ³ /h/m ²)	10	5.01
Renewable Technology (Photovoltaic Panels)	-	130.72 kWp

* For U-values: See Approved Document L1a 2013 Building Regulations

Carbon Reduction Calculations

Award Energy have compared the specification that will achieve minimum compliance with Part L1a 2013 with the intended enhanced specification (plus PV) as shown in Table 1. Table 2 below shows the predicted Carbon Emissions for the proposed house types

Table 2

House Type	Carbon Emissions (KgCO ₂ /Year/m ²) Baseline specification	Carbon Emissions (KgCO ₂ /Year/m ²) Enhanced specification + PV	% reduction in Carbon Emissions
Apartment (Ground Floor)	20.14	17.79	11.67%
Mid Terrace House	17.58	15.23	13.37%
Semi-Detached House	17.30	15.76	8.90%

Carbon Reduction Calculations cont.

Table 3 below demonstrates the minimum amount of photovoltaics in kWp required to achieve the required carbon targets.

Table 3

House Type	Number	Minimum PV Amount Per Plot kWp
Apartment (Ground Floor)	100	0.31*
Mid-Terrace	36	0.47
Semi-Detached	136	0.60
Total	272	129.52

*260 kWh per apartment. KWp amount dependent on orientation, angle and overshadowing

Table 4 below shows the predicted Carbon Emissions for each house type, weighted to represent fairly the mix on site. The predicted baseline weighted carbon emissions for the site are 18.38 KgCO₂/Year/m². The predicted average weighted carbon emissions with Kellen Homes' enhanced specification and Photovoltaics on the most suitable roofs are 16.44 KgCO₂/Year/m², representing a **10.58%** reduction in site-wide carbon emissions over Part L1a 2013. This exceeds the 9% carbon reduction requirement contained in Policy EN6.

Table 4

House Type	Number	Weighted Average Carbon Emissions (KgCO ₂ /Year/m ²) Baseline specification	Weighted Average Carbon Emissions (KgCO ₂ /Year/m ²) Enhanced specification + PV
Ground Floor Apartment	100	7.40	6.54
Mid Terrace House	36	2.33	2.02
Semi-Detached House	136	8.65	7.88
Total	272	18.38	16.44
Weighted Average Carbon Emission Reduction = 10.58%			

Renewable Technology and Energy Demand

The site-wide energy demand was calculated from SAP 2012 for each house type, both with the enhanced specification then with the addition of the PV amounts on the most suitable roof spaces, as outlined in Table 3.

Table 5

House Type	Energy Demand per House type Enhanced Specification (kWh/Year)	Energy Demand per House type Enhanced specification + PV (kWh/Year)	Reduction in Energy Demand through Renewables
Ground Floor Apartment	3968.03	3169.83	20.12%
Mid Terrace House	5754.31	4581.06	20.39%
Semi-Detached House	7406.54	5908.77	20.22%

Once weighted to reflect the house type mix on site (Table 6 below), the Energy Demand with Kellen Homes' enhanced specification is predicted to be 5923.70 kWh per year. Once 129.52 kWp of photovoltaics are applied to the most suitable roofs, the site-wide Energy Demand is predicted to reduce to 4726.08 kWh per year, a **20.22%** energy contribution from renewable technology, exceeding the 20% preference within Manchester City Council's Guide to Development SPD.

Table 6

House Type	Number	Weighted Energy Demand Enhanced Specification (kWh/Year)	Weighted Energy Demand Enhanced specification + PV (kWh/Year)
Ground Floor Apartment	100	1458.83	1165.38
Mid Terrace House	36	761.60	606.32
Semi-Detached House	136	3703.27	2954.39
Total	272	5923.70	4726.08
Site-wide Energy Demand Reduction Through Renewables = 20.22%			

Passive Design

Consideration has been given to the orientation and layout of the buildings to help maximise energy efficiency as part of the development.

- The layout has also been designed to maximise a north-south orientation to allow for passive design whereby dual aspect dwellings enable views, good daylighting and cross ventilation to mitigate overheating risk
- Sufficient glazing will be provided to the principal living rooms of each dwelling to ensure sufficient natural lighting, thus reducing the energy consumed in artificially lighting the room. In addition, it is well known that developments which are orientated to ensure that the principal glazed elevations are within 30 degrees of due south are most effective at utilising solar gain, thus reducing energy consumption. Where practicable and feasible this has been incorporated into the site design
- Ventilation will be supplied by high performance Positive Input Ventilation systems
- Hard landscaping has been minimized as much as possible to maximize soft landscaping thus providing natural and localized infiltration
- The site has been designed to promote sustainable travel making connections to established local transport links, cycle and pedestrian routes
- Highly efficient space and hot water heating systems will be accompanied by thermostatic controls, zoned heating and programmers where possible to ensure that heating is optimally controlled to use the least amount of energy
- Energy efficient lamps will be installed in every light fitting. Each entrance will be illuminated with an energy efficient external light or provision will be made for a purchaser to install such a fixture
- All houses will benefit from a garden or private space for recreation, where possible, thus allowing external space for recreation and clothes drying
- Each property will also have a designated space for refuse and recycling
- Mitigation of flooding risk is incorporated in the site design and is addressed in a full Flood Risk Assessment issued separately
- Any white goods installed in each property or offered to purchasers will be energy efficient with an A+/A rating.

Pollution

The dwellings will be constructed with insulating materials that have a Global Warming Potential of less than 5. All houses will be heated by highly efficient gas boilers, with those that have NOx emissions of less than 40 mg/kWh being considered.

Energy Efficient Fabric Specification

- High levels of air tightness to be achieved within the construction of the dwelling to reduce unnecessary heat loss. As part of its design and build strategy, Kellen Homes is committed to robust monitoring of the standard of construction on site and pre-completion air testing
- Addressing Thermal Bridging limits heat loss across junctions; Kellen Homes have looked at the standard details for thermal bridging and, in consultation with the Aircrete Products Association, the Concrete Block Association and the Energy Savings Trust, have modelled and proven enhancements from ACD standard details
- Windows and doors will be a minimum of 30% more efficient than minimum standards with the Building Regulations
- The construction specification of every home will include high levels of insulation to the ground floor, external walls and roof spaces
- Thermal blocks are proposed for this development as they are made of a sustainable material which has a high recycled content and excellent insulation and acoustic absorption properties
- Party Wall u-values to be 0 w/m²k

Material Selection

Significant amounts of energy and natural resources are consumed in the production, transportation and disposal of building materials. Two issues are significant in the specification of building materials; the environmental impact of materials and the responsible sourcing of materials. Kellen Homes is dedicated to taking pro-active measures to address these issues and commit to obtaining responsible sourcing certification for at least 90% of the building elements of each dwelling.

Waste

Kellen Homes has company-wide policies to promote the reduction and effective management of construction related waste. Robust procedures are in place to share materials such as soil and aggregate between sites and to sort waste on and off site to divert waste from landfill.

All construction activities will be carried out to minimise dust, fumes, discharges and any other form of pollution on site, in line with best practice policies.

The dwellings will be provided with adequate external space for storing household waste that caters for the widest range of users. Manchester City Council provides refuse and recycling collection services, including garden waste, and external space at the development will accommodate the Council's storage provision.

Water Efficiency

The Approved Document G (2010) restricts new build dwellings to a maximum consumption of 125 litres per person per day. It is proposed that eco-sanitary ware and restricted flow rates will be introduced into the design of each development to obtain the appropriate level of water efficiency.

The following table has been extracted from the Water Efficiency Calculator, demonstrating that a higher level of efficiency than that required by the Building Regulations will be achieved.

Water Consumption

Installation Type	Unit of Measurement	Capacity/Flow Rate	Use Factor	Fixed Use	Litres Per Person per day
WC (Dual Flush)	Full Flush (litres)	6	1.46	0.00	8.76
	Part Flush (litres)	4	2.96	0.00	11.84
Taps (excluding kitchen tap)	Flow rate (litres/minute)	6	1.58	1.58	11.06
Baths (where shower present)	Capacity to overflow (litres)	195	0.11	0.00	21.45
Showers (where bath present)	Flow rate (litres/minute)	10	4.37	0.00	43.7
Kitchen sink tap	Flow rate (litres/minute)	3.8	0.44	10.36	12.03
Washing Machine	Litres/kg dry load	8.17	2.1	0.00	17.16
Dishwasher	Litres/place setting	1.25	3.60	0.00	4.50
	TOTAL				130.50
Total Internal Water Consumption		130.50			
Normalisation Factor (x 0.91)		118.75			
External Use		5.00			
Part G Water Consumption		123.75			

Conclusion

In accordance with Manchester City Council's sustainability requirements, this Energy Report demonstrates that the enhanced fabric specification of the housing proposed for Bennett Street plus the application of 129.52 kWp of photovoltaic panels to the most suitable plots reduces average carbon emissions on the site by **10.58%** and **20.22%** of the predicted site-wide energy demand comes from renewable technology in the form of photovoltaic panels.

The sustainable measures proposed are in line with Manchester City Council's Core Strategy Policy EN6, the Guide to Development in Manchester SPD and the National Planning Policy Framework 2021, which all emphasise sustainable development, energy efficiency and reduction in carbon emissions. The energy strategy places a great importance on the efficiency of a property's thermal envelope and internal building service before considering bolt-on technology and therefore ensures that each dwelling on the development benefits from built-in energy reduction measures and that the development meets the needs of the present without compromising the ability of future generations to meet their needs.

Caveat

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