

E2 Consultants

Energy Statement

10 Moxley Road, Crumpsal, Manchester



Introduction

This is a proposed new build housing development at 10 Moxley Road, Crumpsal, Manchester consisting of 1 new property attached to an existing block of terrace properties.



Fabric Efficiency and U Values

Implementing low and zero carbon technologies is not the only way to make reduction to the carbon emissions of a dwelling. Improvements can also be made to achieve a higher standard of fabric efficiency by exceeding the standard limiting U Values set out in L1 of the building regulations.

The following is the current specification of the building:

Walls

Walls will be improved above and beyond the current Building Regulations Part L1 to have an average U-value of **0.22** against a permitted limit of **0.3**.

Roof

The Roof areas will be improved above and beyond the current Building Regulations Part L1 to have an average U-value of **0.16** against a permitted limit of **0.2**.

Floor

The floor areas will be improved above and beyond the current Building Regulations Part L1 to have an average U-value of **0.14** against a permitted limit of **0.2**.



Windows and doors

Windows will be improved above and beyond the current Building Regulations Part L1 to have an average U-value of **1.4(ASSUMED)** against a permitted limit of **1.8**.

Thermal Bridging

Thermal bridging details must be included as part of the building specification and will improve the energy efficiency of the house by limiting the effect of thermal bridging through the junctions of the building. These details have been used on all of the applicable junctions. These will be highlighted in the design calculations.

Adding these measures has improved the Domestic Fabric Energy Efficiency of the property.

It has been assumed that these details have been used for the purpose of the as design calculations



Results Without Proposed Technologies:

Below is the results achieved before applying any of the below technologies:

Dwelling	DER	TER	Percent Improvement
10 Moxley Road, Crumpsal, Manchester - BASE SAP	16.77	17.01	1.4%

As can be seen by the above table, the SAP Calculation key results report. The SAP Calculations only just meet the requirement to achieve a pass based on a Standard Condensing Gas System boiler.



Proposed Technologies:

Solar Photovoltaics

A solar photovoltaic (PV) cell consists of two or more thin layers of semi-conducting material, most commonly silicon. When silicon is exposed to light, electrical charges are generated, which are conducted away by metal contacts in the form of direct current (DC). The electrical output from a single cell is small so multiple cells are connected together and encapsulated to form a photovoltaic module, often referred to as a “PV panel”. These are often mounted to a roof and electricity can be used in the building and/or exported to the national grid.

Advantages:

- Very low maintenance costs, only to make sure the panels are free from debris such as fallen leaves
- Often has a good payback period for smaller systems in Great Britain (i.e. up to 10 kW) due to the feed-in tariff and the export tariff (for any excess electricity the system generates) and falling installation costs.
- PV panels have a lifetime in excess of 25 years.
- Short installation time of 1 to 3 days for small to medium roof mounted systems.

Disadvantages:

- Ideally the roof should be unshaded roof space that is oriented between West and East in a Southerly direction (South facing is best). - Although payback is good, up-front installation costs can be relatively high.

For this development a **2kW*** solar PV system is suggested to the dwelling to achieve energy and CO₂ emissions. This would result, in combination with the fabric energy efficiency measures in a saving of **36.6%** can be achieved as can be seen below.

Dwelling	DER	TER	Percent Improvement
10 Moxley Road, Crumpsal, Manchester - PV SAP	10.79	17.01	36.6%



Air Source Heat Pump

Air Source Heat Pumps operate under the condensing premise as Ground Source, but tend to be less efficient than GSHPs because the air temperature is less stable than the ground temperature, and is typically cold when heating is required and warm during the cooling season. This can be mitigated by using exhaust air from mechanical ventilation systems, rather than ambient air, as the source.

However, the exhaust air flow rate is usually relatively low, so the heating and cooling capacity is limited. It is therefore best suited to buildings with low heating and cooling demand, such as highly insulated dwellings. However, as in the case of ASHPs, the use of ASHPs results in an reduction in carbon emissions for the dwelling. Moreover, the external mounting of the units has limited aesthetic value and the inbuilt fans system can cause noise disturbance in excess of 40db.

For this development an ASHP system is viable as the systems required would be able to supply the property with enough energy for both hot water and heating.

This would result, in combination with the fabric energy efficiency measures in a saving of **25.2%** can be achieved as can be seen below. **A NIBE Fighter has been assumed for the assessment**

Dwelling	DER	TER	Percent Improvement
10 Moxley Road, Crumpsal, Manchester - ASHP SAP	18.86	25.22	25.2%

Other Technologies

Solar Thermal

Solar water heaters generate hot water directly from sunlight, and work even when it is cloudy. The 'collector' heats water or another fluid pumped gently through a panel on the roof. The fluid then circulates through a secondary coil inside a hot water tank. This works to heat water in exactly the same way as a coil from a regular boiler. The end result is a reduction in demand for hot water from the existing system. A modern, well-insulated hot water tank will keep this water warm for at least twenty four hours, until it is needed.

Solar water heaters are generally specified in square metres, which is the area of the collector, and determines how much sunlight the system can catch. The heating power of a system will also depend on where in the country it is sited and the direction it faces. A common size of collector for domestic use is about 3-4m² (flat plate). This will heat just over half the annual hot water demand of a typical household of 3-4 persons. Most of this will occur during the summer months. For this reason, systems are usually sized to meet all of the summer hot water needs for a property: making the system bigger will not help in the summer and make only a marginal difference in the winter.

Advantages:

Disadvantages:

- Ideally the roof should be unshaded roof space that is oriented between West and East in a Southerly direction (South facing is best).
- Payback can be longer than the lifetime of the system, especially for smaller systems.

Solar thermal is not suitable for this development because the saving in CO₂ emissions and energy demand from reducing the water heating requirement, even by 50% would not be sufficient to meet the planning requirement.

Wind Turbine

Wind turbines use the power of the wind to generate electricity. They usually have a life in excess of 20 years before requiring a major overhaul. Some larger turbines require an annual inspection survey where the turbine will need to be lowered to the ground.

They can be installed on buildings or on masts. It must be noted that surrounding features such as tall trees and buildings and even the building itself that the wind turbine is mounted on can disrupt the wind flow to such an extent that the amount of electricity generated is significantly reduced. Wind turbines have a cut-off wind speed of around 3m/s (this varies depending on the model), below which it will not generate any electricity.

Advantages:

- In the right location, an exposed windy site, the payback periods can be very good.
- It is a well-established renewable technology.

Disadvantages:

Wind Turbines are not appropriate for this development because the size of turbine that would be required to achieve the reductions would not be suitable for use in an urban environment, nor would there be sufficient wind speed in the location.



Hydroelectricity

Hydroelectric turbines come in many shapes and sizes, but all have the same fundamental concept: they rotate with the force of water flowing past them and the rotation is used to power a generator that produces electricity. Micro hydroelectric systems are classified as less than 100 kW in capacity. They are not very common in the UK due to the difficulties of finding a suitable site and funding the installations.

Advantages

- The generation of electricity will be relatively consistent if the water source has a year round flow.
- The systems utilise established technologies which are relatively easy both to operate and maintain.

Disadvantages:

- Finding a suitable site to install a hydroelectric turbine can be very difficult. The development must be close to a river and the flow must be sufficiently high.
- Unless there are existing civil works (e.g. old water mill), there may be considerable and costly ground works to install hydroelectric turbines.
- An abstraction licence is required from the Environment Agency to divert the flow of a watercourse. Provisions must be made for wildlife and fish swimming upstream.
- Installation costs can be prohibitive.

Hydroelectric turbines are not appropriate for this development because there are no nearby watercourses.



Summary

All of the above technologies have been taken into consideration to help achieve the 10% reduction required to satisfy the planning policy. It has been deemed that the above (Other Technologies) are not viable due to either cost or not providing enough of an improvement to be able to achieve the reduction.

The following have been deemed the most viable options.

ASHP

The predicted savings achieved by the selected low carbon/renewable technology system after energy efficiency measures are implemented is **29.4% saving in CO2 emissions**. Based on this information, this development would meet the 10% reduction requirement of this policy. The previous sections go into more detail about the selected energy efficiency measures, and the selected low carbon/renewable technology system. However this is the most feasible system to achieve the required reduction in carbon emissions as the heating demand of all flats can be met using this system

Solar Photovoltaic

The predicted savings achieved by the selected low carbon/renewable technology system after energy efficiency measures are implemented is **55.8% saving in CO2 emissions**. Based on this information, this development would meet the 10% reduction requirement of this policy. The previous sections go into more detail about the selected energy efficiency measures, and the selected low carbon/renewable technology system.