

JP-S2: Carbon and Energy Statement

Introduction

The proposed educational building has been designed with consideration given to reducing operational energy demand, maximising energy efficiency and minimising carbon emissions throughout its intended use.

The building will be manufactured off-site by P McVey Building Systems using Modern Methods of Construction (MMC), before being transported to the site for installation. The use of off-site construction provides a number of sustainability benefits, including a reduced on-site construction period, reduced construction waste, reduced disruption to the operational educational campus and improved quality control within a controlled factory environment.

The modular construction approach also allows the building fabric to be carefully manufactured and controlled, supporting high levels of thermal insulation, airtightness and overall energy efficiency.

The energy strategy for the building is based primarily on reducing the energy required to operate the building and then providing efficient building services to meet the remaining heating, cooling, lighting and hot water requirements.

1. Minimising Energy Demand

The building has been designed to minimise energy demand through an efficient building envelope and appropriate specification of the building fabric.

The walls, floor and roof will incorporate appropriate levels of thermal insulation to reduce heat transfer and minimise heat loss during the heating season. The building envelope will also be designed to limit uncontrolled air leakage, helping to maintain internal temperatures and reduce the energy required for heating.

Energy-efficient windows and doors will be incorporated, including double glazing where appropriate. The specification of the glazing will provide a suitable balance between thermal performance, natural daylight and solar gain.

The use of natural daylight will help reduce the requirement for artificial lighting during daylight hours. The building layout and window arrangement will therefore support the effective use of available daylight while also taking account of solar gain and potential overheating.

2. Heating and Cooling Strategy

The primary heating and cooling system for the proposed building will be an efficient air-conditioning system incorporating heat-pump technology.

Rather than relying on conventional direct electric resistance heating, the system will use heat-pump technology to transfer heat into the building during colder periods. The same system will provide cooling when required during warmer periods.

This approach provides a combined heating and cooling solution and allows the building to respond efficiently to varying internal and external temperatures.

The heating and cooling system will be appropriately sized for the building and will incorporate suitable controls to avoid unnecessary energy consumption. Temperature controls and

programmable thermostats will allow the system to operate in response to the building's occupancy and intended use.

Where appropriate, different areas of the building will be capable of being controlled independently, allowing heating and cooling to be provided only where and when required.

The use of an efficient heat-pump-based system also provides an opportunity to reduce operational carbon emissions compared with conventional electric resistance heating, subject to the final equipment specification and performance.

3. Energy-Efficient Building Services

The proposed building services will be selected with the objective of maximising energy efficiency throughout the operational life of the building.

The air-conditioning/heating system will incorporate modern energy-efficient equipment and appropriate controls. Systems will be configured to avoid simultaneous heating and cooling where this is not necessary and will be capable of responding to changing occupancy and internal temperatures.-+

The hot water system will be appropriately sized to reflect the anticipated use of the educational building, avoiding unnecessary energy consumption associated with excessive hot water storage or distribution.

Energy-efficient LED lighting will be provided throughout the building. Automatic controls, including occupancy sensors and/or daylight controls where appropriate, may be incorporated to ensure that lighting is not unnecessarily operated when spaces are unoccupied or where sufficient natural daylight is available.

Lighting and Electrical Energy

Lighting represents an important element of the building's operational energy demand.

The proposed building will incorporate high-efficiency LED lighting throughout. Lighting controls will be designed to ensure that lighting is provided only when required.

Where appropriate, occupancy sensors, daylight sensors and localised switching will be considered to reduce unnecessary electricity consumption.

Electrical equipment and appliances associated with the building's educational use will also be selected with consideration given to energy efficiency where practicable.

4. Building Fabric and Airtightness

The modular construction method provides an opportunity for the building fabric to be manufactured under controlled factory conditions.

The walls, roof and floor will be designed with appropriate insulation levels to limit heat loss. Particular attention will be given to junctions between modular elements and other building components to reduce thermal bridging and uncontrolled air leakage.

The building will be constructed to achieve an appropriate level of airtightness, with the final performance subject to the requirements of the Building Regulations and the detailed construction specification.

These measures will help reduce heating demand during colder periods and assist in maintaining stable internal temperatures.

5. Modern Methods of Construction and Wider Sustainability Benefits

In addition to the operational energy benefits, the use of Modern Methods of Construction provides wider sustainability advantages.

The proposed building will be manufactured off-site by P McVey Building Systems, allowing materials and components to be produced within a controlled factory environment. This can assist in reducing construction waste and improving material efficiency.

The approach will also significantly reduce the duration of construction activity on the educational campus, thereby reducing disruption to existing school operations.

Factory-based manufacture provides improved quality control and allows the building components to be constructed consistently, supporting the intended levels of insulation, airtightness and overall building performance.

The reduced on-site construction period also has the potential to reduce site-related impacts associated with deliveries, construction activity and waste generation.

6. Compliance with Building Regulations Part L

The proposed building will be designed to comply with the applicable energy efficiency requirements of the Building Regulations, including Approved Document L, Conservation of Fuel and Power (2022).

The design incorporates a combination of:

Efficient thermal insulation to the walls, roof and floor.

Energy-efficient glazing and doors.

Measures to limit uncontrolled air leakage and heat loss.

An efficient air-conditioning and heat-pump-based heating system.

Appropriate heating and cooling controls.

Energy-efficient LED lighting.

Conclusion

The proposed educational building adopts a fabric-first and energy-efficient approach to its operational performance.

Energy demand will be reduced through the use of an appropriately insulated and airtight building envelope, energy-efficient glazing, effective use of natural daylight.

The principal heating and cooling strategy will utilise an efficient air-conditioning system incorporating heat-pump technology. This provides a combined heating and cooling solution while avoiding reliance on conventional direct electric resistance heating. Appropriate controls will ensure that heating and cooling are provided in response to occupancy and actual building requirements.

Further energy savings will be achieved through efficient LED lighting, appropriate lighting controls, efficient hot water provision and the considered operation of the building services.

The use of Modern Methods of Construction also provides wider sustainability benefits through reduced construction waste, improved factory quality control, reduced disruption and a shorter on-site construction period.

Overall, the proposed building has been designed to minimise energy demand, maximise energy efficiency and reduce operational carbon emissions. The detailed design will comply with the applicable requirements of the 2022 Building Regulations, Approved Document L – Conservation of Fuel and Power, providing an appropriate and proportionate carbon and energy strategy for a small modular educational building.