St. Catherine's Music and Art Building, Twickenham

Energy Statement

Planning

28/11/2023

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ISSUE HISTORY

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DEMAND REDUCTION (BE LEAN)

The first step in the energy hierarchy is to reduce energy demands compared to the baseline. It is cheaper and easier to implement fundamental measures earlier in the design and it is at this stage that most passive measures can have their greatest effect.

Our aim has been to prioritise robust measures which are less likely to be changed, are easier to build successfully and have the greatest effect on the energy use.

1.1 Architectural Measures

The site layout and building orientation has been carefully considered within the constraints that the site imposes. This has meant that the design of the external fabric and the windows have been particularly important elements.

The building includes music and performance spaces and the ventilation strategy provides comfort to these noisy or noise sensitive spaces when in use. The balance between ventilation, daylighting, and solar gains has been optimised. This has resulted in minimising the need for mechanical ventilation and artificial lighting whilst also minimising overheating risk.

1.2 Building Fabric Measures – Passive Design

U-Values
The thermal performance of the fabric has been proposed to optimise the balance between energy savings and other considerations such as cost, wall thicknesses, and the diminishing returns available from further increasing the thermal performance of a building envelope.

As seen in the table below, the U-values tested are below that of the notional building against which the school was assessed.

Element	2021 Notional Building	Actual Building
Roof U-value (W/(m^{2}K))	0.16	0.11
Wall U-value (W/(m^{2}K))	0.18	0.13
Floor U-value (W/(m^{2}K))	0.18	0.11
Window (W/(m^{2}K))	1.6	1.04
G-value (%)	40	40
Air permeability (m^3/(m^{2}hour))	3	1

Air Tightness
The benefits of improved insulation levels and more energy efficient heating systems can be lost if warm air is able to leak out of a building and cold air able to leak in. Consequently, achieving a reasonable level of air tightness is important for a building's energy efficiency and the comfort of its occupants.

A minimum standard of 1 m3/m2/hr has been specified. Although this is considered a high standard, it is practical and viable. In order to achieve this air tightness, the design should:

- Ensure the continuity of the air barrier;
- Ensure the air barrier is correctly located with the fabric to avoid cold air breaching the insulation layer;
- Avoid complex detailing which is difficult to build, resulting in ad hoc air leakage pathways;
- Specify airtight barrier materials that can be adequately lapped and sealed;
- Mark up details showing how penetrations though the air barrier will be sealed, e.g. structural elements (floor joists, beams etc.) and services (water/gas pipes, ducts, cables etc.).

Thermal Bridging
Thermal bridging details will be developed and assessed during more detailed design development and will achieve the standards required to meet the performance of the notional building.

Glazing Percentage
The amount of glazing, its orientation, and its specification have been carefully considered so that the right balance between heat loss, heat gains, daylighting, and ventilation is struck.

1.3 Efficient Systems Measures – Active Design

Lighting
Lighting energy contributes to a significant portion of a buildings' energy demand. Consequently, it is proposed that the building will utilise high efficiency lighting that exceed the minimum efficacy standards.

Lighting will be specified to offer the best balance of performance and efficiency. In addition to high efficacy fittings, photometric controls will be used for dimming and switching to help reduce lighting energy.

Passive Ventilation
Passive ventilation through openable windows has been utilised as much as possible within the building. This is possible in the west facing classroom on the first floor.

Mechanical Ventilation
Mechanical ventilation is necessary for many spaces within this project. For the music practice spaces and the recital hall this is to ensure that the building is acoustically sealed. This sealing prevents noise outbreak to neighbouring rooms and the outside environment, it also prevents noise break-in from the outside.

The classrooms facing Cross Deep Road are required to have mechanical ventilation to remove noise break-in from the road.

As previously mentioned, the west facing classroom is able to be naturally ventilated.

The proposed MVHR systems will utilise a highly efficient heat exchangers, in winter this will temper the incoming cold fresh air reducing heat losses and increasing user comfort. During the summer these heat exchangers may be bypassed to reduce the risk of overheating if it is hot inside the building.

The resulting energy and carbon savings from the proposed scheme compared to the notional building from the Be Lean measures are as follows:

Stage	Regulated CO2 emissions (kg CO_2/annum)	Regulated CO_2 savings (kg CO_2/annum)	Regulated CO_2 savings (%)
2021 Part L	2344	-	-
Be Lean	2028	316	13%

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2.0 HEATING INFRASTRUCTURE (BE CLEAN)

Following the reduction of energy demand in the Be Lean stage, the London Plan requires the development to demonstrate how the systems will supply energy efficiently and cleanly to reduce CO_2 emissions in the Be Clean stage of the energy hierarchy.

Within the London Plan this relates specifically to connecting the site to a district heat network. As our development is quite small and is expected to have low heat losses and demands, connecting to a district heat network is considered to be unnecessary as this would require additional infrastructure. Instead, the intention is to meet the small demands by way of an electric air source heat pump.

As a result of adopting this methodology, no savings are made during the Be Clean measures when compared to the 2021 notional building.

3.0 RENEWABLE ENERGY (BE GREEN)

Following the reduction of energy demand in the Be Lean stage, and the use of efficient systems, opportunities to use renewable energy on-site were considered as required by the Be Green stage of London Plan energy hierarchy.

Two forms of renewable technology have been considered as suitable for this site.

1. Air Source Heat Pump (ASHP)

ASHPs are a highly efficient method of heating and cooling a building, they are far more efficient than gas boilers. Electrification of heating also ensures that as the national grid decarbonises, so too does the building.

In order to maximise CO_2 savings, the ASHPs should have minimum Coefficient of Performance (COP) and Energy Efficiency Ratio (EER) of 3, and a seasonal COP and EER greater than 3. The ASHPs should also comply with the minimum performance standard set out in the Enhanced Capital Allowances (ECA) product criteria and meet Microgeneration Certification Scheme (MCS) Standards.

2. PV Array

The roof of the building has a shallow pitch with a north-west to south-east orientation. It is proposed that the north-west facing pitch will be used to generate electricity, using todays current PV technology it is expected that a 23m^2 array located here would produce 9.41 kWh/m^2 of internal building floor area. Equating to a total of 4191 kWh/annum.

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4.0 TOTAL CARBON SAVING

The final building, after considering all 3 aspects, Be Lean, Be Clean and Be Green has a resultant carbon saving of 36% when compared to the 2021 notional building. The breakdown of these savings are detailed in the table below.

Stage	Regulated CO2 emissions (kg CO_2/annum)	Regulated CO_2 savings (kg CO_2/annum)	Regulated CO_2 savings (%)
2021 Part L	2344	-	-
Be Lean	2028	316	13%
Be Clean	2028	0	0
Be Green	1498	530	26%
TOTAL	1498	847	36%

Please note, the figures submitted as part of the Energy Statement and Sustainable Construction Checklist are based on the Building Regulations Part L 2021, and not 2013 as indicated in the checklist. The London Plan 2021 methodology has also been used to calculate the baseline and emissions reductions at each stage of the energy hierarchy. This brings these figures in line with the latest building regulations, GLA planning guidance and LBRUT requirements for energy assessments.

It is felt that this is the most appropriate assessment methodology, as the previous (2013) version of Part L uses emissions factors that are now significantly out of date - most notably for electricity. In earlier versions of the London Plan, the baseline against which the building's emissions are compared uses a gas boiler - a strategy that no longer represents a likely or desirable scenario for new buildings in London. The use of either of these superseded assessment methodologies risks influencing the energy strategy negatively.