Award

Co-op Live Arena, Manchester

PROJECT TEAM

Architect: **Populous**
Structural Engineer: **Buro Happold**
Steelwork Contractor: **Severfield**
Main Contractor: **BAM Construction**
Client: **Oak View Group**

Co-op Live Arena, which opened in May 2024, is the UK's largest indoor venue, integrating cutting-edge technology, sustainability and multifunctionality. It has an overall capacity of 23,500, houses 41 individual bars and restaurants, and has a seating bowl that brings fans 23m closer to the stage than at any comparable venue.

In accordance with the client's brief, sustainability was at the heart of the venue's plan, designed to support Manchester's Zero Carbon 2038 commitments. It incorporates a suite of cutting-edge sustainability features to create an inclusive, low carbon and low waste venue, with a target of sending zero operational waste to landfill. The building is powered entirely by electricity, with no reliance on fossil fuels. Renewable energy purchased from the National Grid is being supplemented by a large photovoltaic array mounted across the 10,500m^2 of roof.

The project also took a sustainable approach to construction and material sourcing, with many packages and subcontractors being local to the project, minimising transport and creating opportunities for local communities. All temporary steelwork was returned and will be reused on the next project.

Initially, the proposed structural frame was partially concrete, however, due to the known complexities in the ground and the short programme, it was switched to an all steel construction to maximise offsite production and minimise onsite erection.

The building was divided into four quadrants by movement joints, partly in response to the zonal release of the site from the groundworks, to enable sequential construction. This presented several challenging temporary condition states that had to be incorporated in the design.

The complexities associated with supporting the large overhangs of the 'stacked box' appearance, and the requirement for a 100m clear spanning roof over the internal seating and arena floor, was made possible due to the selection of structural steel.

A critical aspect of the design was the structural system for the long-span roof, fabricated primarily from grade S460 steel to minimise the overall weight. The site is constrained on all four sides, and given the requirement for the roof to be erected after the completion of the main bowl superstructure, the steel for the roof had to be sub-assembled on the arena floor and erected from inside the building footprint.

The erection strategy involved just-in-time deliveries due to the limited storage space, the restricted craneage and plant movement across the site. The steel required for the roof trusses was delivered to site in smaller sections, and sub-assembled into larger components at ground level prior to erection. The size of these components was dictated by the craneage that could be rigged safely within the bowl's footprint, combined with the requirement for it to be de-rigged underneath the completed roof structure. This element posed one of the biggest challenges of the steel construction process.

The steel superstructure is stabilised by a series of precast concrete twin-wall cores, which required significant coordination of the steel to concrete interfaces. This was achieved through the digital coordination of embedment plates, connections, and service penetrations, maximising offsite prefabrication using shared BIM models and digital fabrication information.

The roof structure consists of 100m long steel trusses, each capable of supporting approximately 30 tonnes of event rigging in multiple configurations. Parametric design tools were used to optimise the roofs tonnage and ensure compatibility with the fabrication and erection approach, assessing the impacts of different truss depths and cladding options.

The terrace design required complex raker and truss steel to be fabricated and erected with conventional column and beam steel. Interfaces with the precast concrete terrace units and walls were developed within the steel package, enabling these elements to be coordinated and connected to the steel. The erection process, complicated by the building geometry and tolerance requirements, was facilitated by using collaborative working and a skilled off and onsite team.

The short design programme necessitated the need to adopt a strategy of suspending most of the building services beneath the steel floor beams and composite decks. The roof cladding and internal spaces had several strict acoustic requirements because of the arena location being adjacent to residential buildings. Another offsite solution was developed using a series of acoustic 'cassettes' that could be slotted into the main roof steel structure. A metal deck and concrete solution was added over the top of the acoustic liner to carry the waterproofing and photovoltaic units.

The steel frame adopted a fully fire-engineered design approach to minimise the amount of intumescent paint, based on the location and structural function of the steel. This involved the fire design engineer assessing the required fire resistance, the structural engineer supplying element utilisations and the steelwork contractor optimising the required film thicknesses. This significantly reduced the amount of fire protection and intumescent material required when compared with a non-engineered approach.

Judges' comment

A 100m clear spanning roof forms the dramatic focus of this state-of-the-art purpose-built black box performance venue. Skilfully controlled surrounding spaces are defined, but never dominated by, the expressed structure that creates them. Built to exacting standards, this is a holistic and architecturally confident solution of high quality.