UNITED AT WEMBLEY
A stunning ETFE and exposed-steel atrium links together Brent council’s main services, all just a kick away from the national stadium

A DRAWBIDGE FOR THE 21ST CENTURY
Wilkinson Eyre reinvents the bascule bridge as a pair of majestic sails that soar 40m above Poole harbour

THE MEANING OF WHOLE-LIFE
With building regulations getting tough on embodied carbon, designers need to know how to assess this hidden footprint
They’ve got it all covered

Hopkins Architects’ Brent Civic Centre in north London brings together a range of public services in an elegant structure crowned by a stunning ETFE and steel roof.

Text by Pamela Buxton

The main elevation is dominated by a dramatic steel and ETFE roof canopy soaring over a timber-finned “civic drum”.

A REVIEW OF THE STEELWORK

The steelwork has been exposed as a feature of the hall.

“It took a while to come up with but it’s a very simple idea and was needed within the structural solution of tension and compression,” says URS regional director Mike Pauley, adding that the engineering was challenging because it looks elegantly simple when modelled. “At the sixth floor, a compression ring holds the ends of the raking members and supports vertical members. These rise up to the seventh floor and support the raking roof. At top and bottom, the members are bolted into a curved flange plate that is bolted to a casting plate in the concrete columns. The feature flange has a slight curve to match the profile of the canopy.”

The steelwork has been finished in a matt-iron white colour coat and will be exposed as a feature of the hall.

“In association with The British Constructional Steelwork Association and Tata Steel,” says Mike Pauley of URS. “The steelwork is covered by a stainless steel coffered parapet, with the exception of the central feature lantern.”

The atrium acts as the main visitor entrance for the civic centre. All of the climatic steelwork is visible and is an important aesthetic element of the Brent High structure.

The £100 million building brings together 3,500 staff from central, administrative and civic, administrative and community functions. By bringing together different uses within one innovative public space, the architects developed ideas first explored in the Hackney Studios in 2009, according to senior partner Paul Selby.

The 550,000 sq ft building brings together a 250 staff from disparate offices and deliberately seeks to encourage connectivity and openness through its design. This also created an exhibition area where visitors can take a guided tour and visit eight different office areas to see how the organisation works.

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The 30m-diameter community construction method avoided the need for adjusters within the structure.

The exposed nature of the steel created an extra level of difficulty for steelwork contractor Bourne. The slimline structure of the project, the end plate of a 7.7m-high concrete column. The beams are supported through perimeter stairs within the whole site, the practice devoted a feature pin connection to the end plate of a 7.7m-high concrete column.

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Raising the main sails

Wilkinson Eyre’s Poole harbour crossing is a clever twist on the traditional drawbridge, with diagonal bascules that rise up like the masts of a ship.

Text by Pamela Bustin

It takes just two minutes to open the latest Poole harbour crossing to allow the busy maritime traffic to pass, and another two minutes to close it back down and allow road and pedestrian use to resume. Since it opened last year, the Twin Sails bridge at the entrance to Poole Harbour has been opened and closed around 5,000 times a year, taking just two minutes each time. As the two 35m-long bascules rise through 88 degrees to open the bridge, they appear to cross, in a reference to the shapes of sails of the maritime traffic in the harbour.

The triangular sections rise up to twice the height of a conventional bascule bridge. The carbon-fibre masts on either side add an extra 20m. Rising the main sails takes just two minutes to open the latest Poole harbour crossing, with diagonal bascules that rise up like the masts of a ship.

THE ‘SAILS’

The triangular sections rise up to twice the height of a conventional bascule bridge. The carbon-fibre masts on either side add a further 20m. This gives more support and less differential movement, and avoids the need for a mechanical interlock. The hydraulic ram opening mechanisms are housed in the main piers, along with other opening equipment and plant rooms.

THE DECK STRUCTURE

The road and segregated cycle/motorway structure incorporates reinforced concrete deck spans, with cantilevered steel armatures on both sides supporting the aluminium-decked, 2.4m-wide pedestrian walkways. The deck has a maximum depth of 0.8m and is orthotropic, meaning that as it goes up the slope it is lifted, creating the warping form and is underlit with red LEDs to give a soft glow.

THE ‘SAILS’

As the two 35m-long bascules rise through 88 degrees to open the bridge, they appear to cross, in a reference to the shapes of sails of the maritime traffic in the harbour.

Conventional bascule opening requires an interlocking bolt to centre with the potential risk of fatigue and damage to the bascule or the other. But a larger, diagonal opening of the Twin Sails’ masts enables the bascule to rise 30m onto a pivot bearing on the other side of the bridge, with a central span of 35m. This gives more support and less differential movement, and avoids the need for a mechanical interlock. The hydraulic ram opening mechanisms are housed in the main piers, along with other opening equipment and plant rooms.

The road and segregated cycle/motorway structure incorporates reinforced concrete deck spans, with cantilevered steel armatures on both sides supporting the aluminium-decked, 2.4m-wide pedestrian walkways. The deck has a maximum depth of 0.8m and is orthotropic, meaning that as it goes up the slope it is lifted, creating the warping form and is underlit with red LEDs to give a soft glow.

When the deep pedestrian zone was first constructed on the bridge, there was a lot of traffic congestion, with the bascules taking up to 20 minutes to open and close. Wilkinson Eyre maximised the bridge’s height, avoiding the need for a mechanical interlock, but also ensuring it to be the catalyst for regeneration and to integrate with the Poole landscape. Wilkinson Eyre maximised the bridge’s height, avoiding the need for a mechanical interlock, but also ensuring it to be the catalyst for regeneration and to integrate with the Poole landscape.

As the leaves rise, they separate and reveal the triangular, sail-like forms. Raising the main sails takes just two minutes, taking just two minutes each time. As the two 35m-long bascules rise through 88 degrees to open the bridge, they appear to cross, in a reference to the shapes of sails of the maritime traffic in the harbour.

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The embodied carbon in buildings is a critical aspect to consider when making decisions about the best way to construct and build for the future. As regulations are placing the embodied carbon of different structural solutions under the spotlight, understanding how to minimize its impact is becoming increasingly important. This is especially true in light of the growing awareness of the environmental impact of buildings. Overcoming changes to both Bream and the building regulations are placing the embodied carbon of different structural solutions under the spotlight.

CASE STUDY 1: TYPICAL CITY-CENTRE OFFICE BUILDING

Peter Brett Associates (PBA) carried out embodied carbon analysis of steel and concrete structural solutions for a hypothetical office building as part of Steel Insight research by Gardiner & Theobald, commissioned by the BCSA and Tata Steel. This found that embodied carbon was significantly lower for steel (30-50%) than for the concrete frame for that particular building scenario. In the research, the base building is conceived as a typical eight-storey speculative city-centre office building with a gross internal area of about 16,500 sq m. The building is a curtain wall system in 1.5m-wide, storey-height panels with solar control. The building envelope is a curtainwall system in 1.5m-wide, storey-height panels, with solar control.

CASE STUDY 2: OXFORD UNIVERSITY BIOCHEMISTRY BUILDING

The steel-framed version and has 60 minutes fire resistance. The concrete uses post-tensioned band beams and composite slab and shafts with shafts in shafts. The overall floor-to-height is 3.5m for the steel option and 3.2m for the concrete option. The steel option was selected based on benchmark information. Transport emissions are based on statistics from the Department for Transport on the average length of haul per commodity and on data from the Concrete Centre. Construction and demolition emissions are estimated using construction programming information from Maan, UK Environment Agency, and a simple parallel beam system supporting a composite slab. The other two gave similar results, with calculations assuming that 85% of the steel would be recycled after demolition. The research found that the use of steel would produce 184 kg CO2/m2 for steel and 21,760 kg CO2 for concrete. The final solution used the steel-framed version as part of Steel Insight research by Gardiner & Theobald for a hypothetical office building as part of Steel Insight research by Gardiner & Theobald commissioned by the BCSA and Tata Steel. This found that embodied carbon was significantly lower for steel than for the concrete option.

New LEASES OF LIFE

Steel’s ability to be re-used without loss of performance has been a key characteristic of the material. Steel can be recycled and re-used without loss of properties. Each year, an estimated 90% of structural steelwork is recycled, according to Wrap, and 90% of all steel frames are recycled. This means that 90% of the steel used for a building will be recycled. The steel will be re-used in another construction project, which makes the embodied carbon of steel much lower than for other materials. This is because steel can be recycled multiple times, whereas concrete can only be recycled once.

Embodied carbon in steel is also being given more attention in the current draft of Bream assessments. A new embodied carbon in steel building regulations are proposed, which will place a greater emphasis on reducing the environmental impact of buildings. This will help to ensure that the embodied carbon is being accurately measured and accounted for, leading to a more sustainable future for the construction industry.