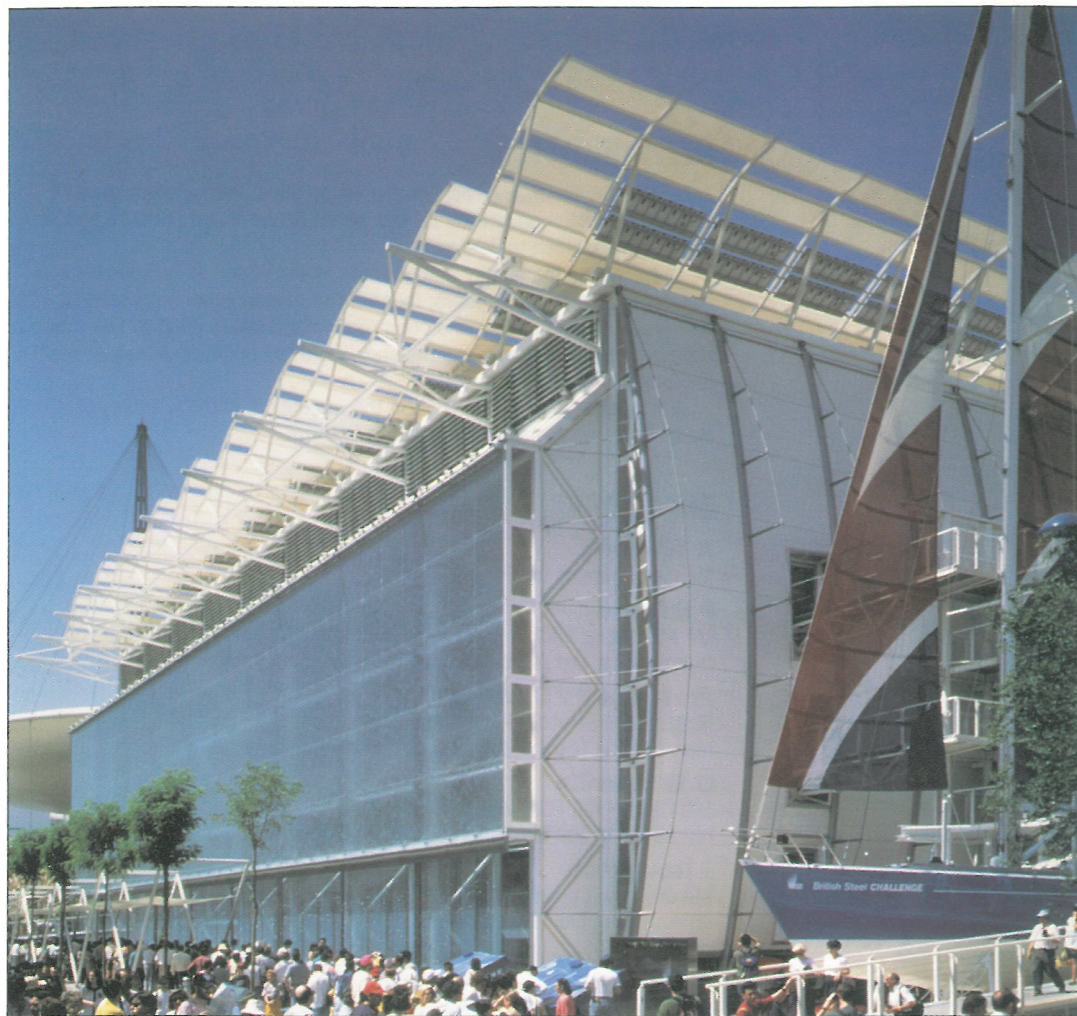


The UK Pavilion Expo '92, Seville, Spain

For: The Department of Trade & Industry



The Department of Trade and Industry's brief for the UK Pavilion called for the creation of a first-class exhibition space and a demonstration of excellence in British design. The building itself became the principal exhibit of Britain's participation in Expo '92.

Structural steelwork was chosen to allow the structure to be accurately manufactured in the UK in large pre-fabricated elements, transported hundreds of miles and assembled there as simply as possible.

The architectural style was one of clear expression of the structure. Exposed tubular steel lattice members were used extensively. Most member connections were made with single pins, clearly defining their structural actions.

The main structure consisted of an outer envelope 65m long, 38m wide and 25m high enclosing three similar 'pods' which provided

the principal exhibition space. The long east wall, the main public face of the building, was fully glazed with water pouring down the outside. Stacked water-filled steel containers on the west face gave protection from the effects of the intense sun.

The internal pods were erected before the envelope and each provided two decks 14m x 20m in plan. The decks were formed by concrete slabs with composite steel decking supported on the bottom flanges of universal beams. These beams were carried at each level by two parallel tubular Warren trusses spanning 20m between a pair of columns. The deck trusses passed between the two column tubes and splitting the columns in this way reduced the visual bulk of equivalent single columns.

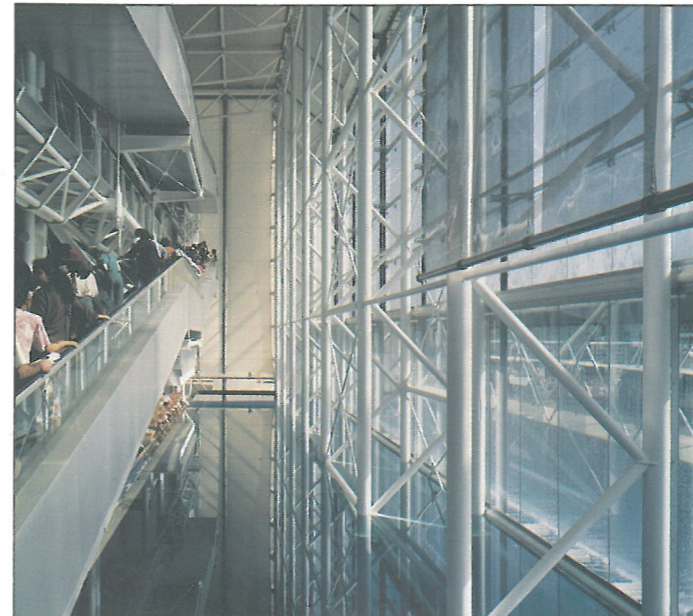
The upper deck trusses carried the walkways and travelators which gave visitors access to the pods. These

upper deck trusses at 24m long weighing 7.5 tonnes were the largest single structural element.

Longitudinal lateral stability for the pods was provided by vertical cross-bracing between the columns of the central pod. Outer pods were linked to this stability system by interconnecting walkway bridges. Transversely the pods were stabilised by pinned connections at high level to the west wall of the outer envelopes.

The external envelope structure consists of ten identical tubular steel frames, each comprising two vertical wall trusses 21.7m high supporting a roof truss with 32m clear span.

Each frame acted as a pair of vertical cantilevers linked by the roof member. Transverse forces on the envelope, including those from the internal pods, were therefore resisted by bending in the wall trusses. The



structure was stabilised longitudinally in the central bay of the envelope by cross-bracing in the walls and across the roof.

The design concept for the Pavilion end walls was fabric membranes tensioned between vertical masts to

provide a maritime image. These walls, 25m high and 35m wide, were formed from polyester textile in 4m wide bays and nine curved steel masts spanning from ground to roof level.

Each mast consisted of a central tubular spine

stiffened by stays held off the spine on two sides by tapered steel spreaders. Spine, stays and spreaders formed a vertically spanning cable truss able to resist wind loads by changing the pre-stress in the stays.

Pressed steel tapered V-frames supported curved steel channel section rails to which fabric shades and photovoltaic panels were fixed. These frames were stabilised by moment connections to the roof structure and defined the striking profile of the building along its main elevations.

Expo '92 rules required that the structure was designed for seismic action as well as gravity and wind loads. In the transverse direction dynamics analysis of a finite element model of the structure was carried out to determine modes of vibration and seismic member forces.



Judges' Comments:

This magnificent pavilion integrates successfully the very best of British engineering and architectural innovation. The steel used in its many forms for the main frame, internal pods, link bridges, water filled tank walls and solar roof shades made it possible to create this landmark high-tech structure.



AWARD

Architects:

Nicholas Grimshaw & Partners

Structural Engineers:

Ove Arup & Partners

Main Contractor:

Trafalgar House Construction Management Ltd