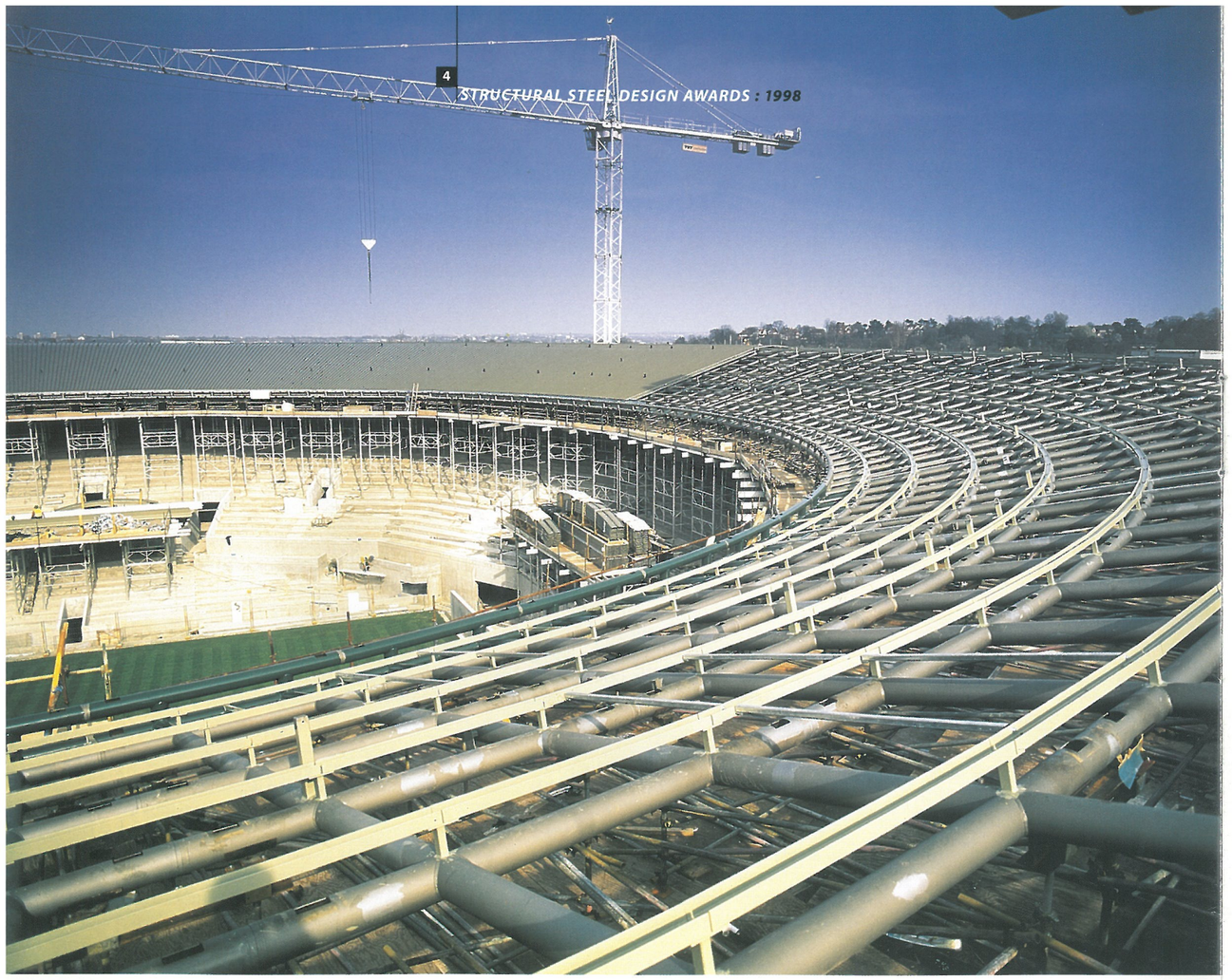
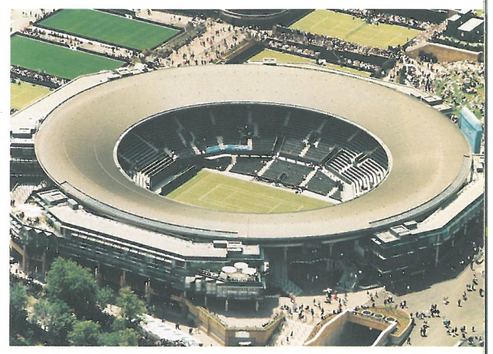


Award

Architect: Building Design Partnership Ltd
Structural Engineer: Building Design Partnership Ltd
Steelwork Contractor: J N Rowen Ltd
Main Contractor: Try Construction Ltd
Owner: The All England Lawn Tennis & Croquet Club



New No 1 Court Roof, All England Lawn Tennis & Croquet Club, Wimbledon

In the early 1990s it became clear that the All England Lawn Tennis & Croquet Club needed a major expansion to its facilities if it was to cope with the increasing scale and complexity of the Wimbledon Championships.
A masterplan was developed for a fully equipped modern sports complex around the theme of "Tennis in an English Garden".

In addition to facilities for new public restaurants, corporate hospitality, a broadcast centre, and a private road tunnel link to reduce traffic congestion, the brief called for a new 11,000 seat stadium to replace the old No. 1 Court.

The stadium's most striking and distinctive feature is its lightweight steel roof, which was subject to physical and planning constraints such as the overall height of the building and the desire to recreate the intimate atmosphere of the world-renowned Centre Court.

The stadium geometry was dictated by capacity, sight lines, sun angles and the maximum desirable distance of spectators from the court, and tubular steelwork was chosen for both visual and structural reasons.

An unusual downward sloping geometry was made possible by a state of the art vacuum drainage system to take away rainwater. This in turn allowed the lightweight steel grid shell structure to be created and prestressed by its own weight, with the inner circumference in tension and the outer circumference in compression.

The final roof structure is a circular double curved shell of 105m external diameter and 70m internal diameter. Support is provided by 72 double inclined Vee tubular steel columns founded on the outside perimeter of the stadium in order to provide the crucial clear view for spectators.

The structural analyses for both static and dynamic conditions were carried out with advanced finite element computer design techniques and the results were confirmed using wind tunnel testing. A value engineering optimisation analysis balanced the number of fully welded joints with the tube diameter and wall thickness to produce the most cost effective design.

The resultant grid shell structure consists of 144 identical curved radial members of 219mm and 193mm diameter grade 50 circular hollow sections with wall thicknesses varying between 12.5mm and 10mm. Circumferential members are 219mm and 193mm diameter with wall thicknesses of 12.5mm and 8mm.

The most efficient erection procedure was to fabricate 72 identical ladder units for both the upper curved roof and section and the straight lower roof section with spigots left projecting. As a result, the only on-site welding was to join the upper and lower radial members and connect them to the Vee columns.

To achieve the 1mm tolerance required for the bolted connections, a full-scale jig was used to fabricate the units and a trial erection of a section of the roof was carried out to check both the steelwork tolerances and the fixings for the raised seam roof sheeting. A temporary continuous deck was built on site to support the roof sections until erection, painting and roofing had been completed.