Design of the Long-Span Roof of the O_2 World in Berlin, Germany

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He worked for Arup in London from 2002 to 2004 and then joined the Berlin office of Leonhardt, Andrä und Partner where he now works as structural engineer and project manager on major national and international projects.

Summary

In September 2008 the O2World, owned and operated by the internationally renowned Anschutz Entertainment Group (AEG), will be opened in Berlin. It is an indoor-arena, which has an ice-rink and seats up to 17,000 spectators. This report covers the design, analysis, optimisation and construction of the long-span roof structure of this arena

Keywords: steel design, steel detailing, software, optimisation, high-strength concrete.

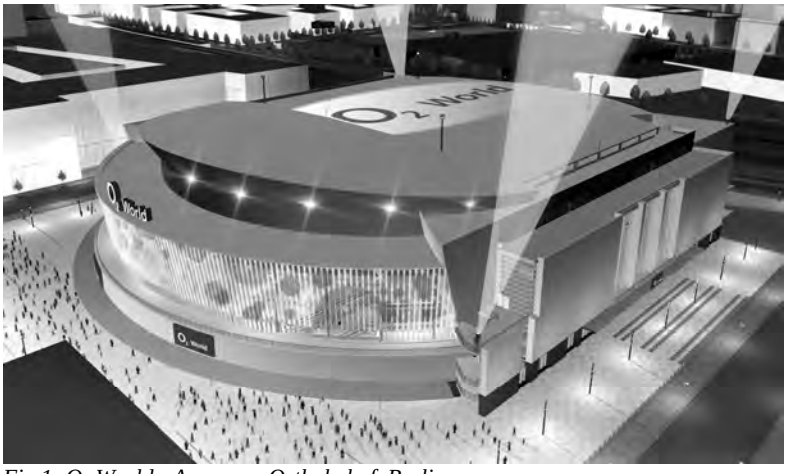

Fig 1: O_2 World - Arena am Ostbahnhof, Berlin

The steel truss roof consists of three parts at different levels, which are separated by two main truss girders. The northern and southern main girders each rest on two so-called “mega columns” at a distance of 70 m. The main girders are made of welded rectangular hollow sections, all other

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members of standard welded sections. All members are made of high-grade steel S 355.

The roof was designed to carry heavy rigging loads with a total of 150 to and a 30 to video score board at the centre of the roof. 600 m of catwalks allow access to the roof structure.

The vertical loadpath is easy to follow, while the roof is connected to the concrete bowl horizontically at several positions. Temperature strains are minimised as the supports are statically determined.

The analysis was carried out using a full 3D FE analysis model. The section sizes were optimised with a purpose made Excel worksheet.

The connections were carefully detailed. The connection of the main roof to the southern main girder and the composite northern roof to the northern main girder are explained in detail in the main text.

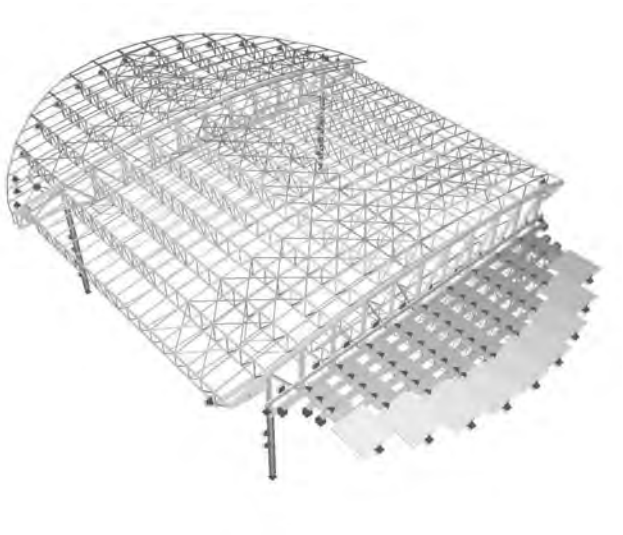

Fig 2: Full analysis model

The four circular reinforced concrete cantilevering columns with a diameter of 1.30 m are made of high-strength concrete C 70/85.

The steelwork contractor produced 2200 shop drawings. The erection of the truss girders took place on site; the girders were lifted in using large mobile cranes.