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A Reticulated Shell Roof for a Sports Hall in Hungary

Une toiture en treillis spatial pour une halle de sport en Hongrie

Eine Gitterschalen-Überdeckung für eine Sporthalle in Ungarn

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In 1986, ESZAKTERV, a design institute in Hungary was given the commission to design a sports hall in Nyiregyháza (a town in north-east Hungary).

The structure of the hall, briefly detailed below, covers a $60 \times 30 = 1800 \text{ m}^2$ arena with grandstands in two sides and can house 3000 people.

The hall is covered by three reticulated steel barrel vaults, placed across the arena. The barrel vaults are 48 metres long with overhangs of 8 metres on both sides, spanning 15 metres. Each barrel vault with a circular profile is supported at the four corners of the $48 \times 15 \text{ m}$ area. The barrel vaults are supported by steel box-girders along the curved edges. The lower chords of the barrel vault are constructed in such a way that they act both as the longitudinal straight edge beams and as the starting structure of the barrel vaults.

The barrel vaults have an equilateral triangular network which consists of 2 meter long steel bars. These bars are reticulated structures themselves. The two parallel chords of these plane trusses are 0,5 metre from each other and they are connected by inner cross-bars. According to the stress of state of the barrel vaults, the bars have three different tube cross sections. The outer diameter is 108 mm for all three types and the wall thicknesses are 10, 6.3 and 4 mm, respectively. The idea behind these different cross sections was to achieve a structure as economic as possible. The material of the tubes is easily available standard steel.

The bars in the direction of the generatrix go along the barrel vaults continuously and the other bars only go from nodal point to nodal point. The construction of the nodal points is based on an element, a tube section, which fits for the outer surface of the bars in the direction of the generatrix. This special "tube-on-tube" joint, protected by a patent, makes it possible for the joining bars to enter the joint in whatever angle is needed so the designed shape of the barrel vault can

easily be achieved by using a template. The bars are fixed by welding at the nodal points. The designed load bearing capacity of the joints were checked by tests.

To facilitate easy construction, the barrel vaults are divided into segments, in accordance with the capacity of the derrick used for the construction. These segments are prepared in advance in a construction hall. The edge girders are first put on temporary supports then the barrel vault segments are carefully placed and fixed together. Under the whole process the straight edge girders are connected by temporary steel ties of 25 mm diameter.

The construction of the hall is being carried out by ELEKTERFEM, a small company, dealing with metal structures. The sports hall will be completed by 1988.



Fig. 1 Inner view

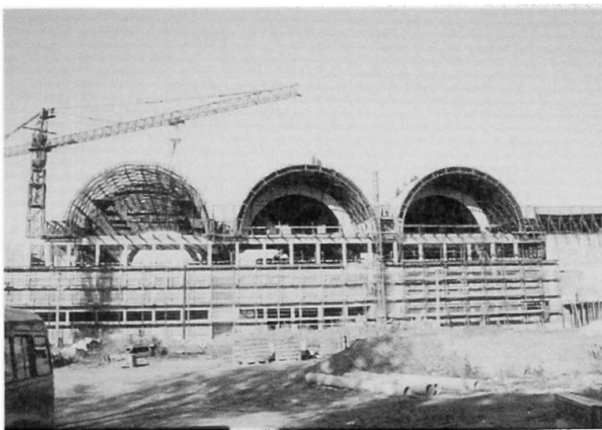


Fig. 2 General view



Fig. 3 Special tube-on-tube joint