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Main Roof-Bearing Structure for the Skating Hall in Maribor

Die Dachkonstruktion für die Eishalle in Maribor

Structure primaire du toit de la patinoire de Maribor

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To cover the skating-rink at the Skating hall, a roof structure was designed, consisting of two externally prestressed primary beams to which a secondary steel structure is attached by hangers.

The main structure is supported by four two-sided reinforced concrete piers; the secondary structure is peripherally supported by prefabricated reinforced concrete piers, spaced at 4.50 m. The whole structure roofs the existing skating - rink and galleries in the size of 67.60 x 67.10 m.

The statical system of the main structure represent two simply supported beams, 67.60 m long. The compression zone of the bearing system consists of reinforced concrete box segments and is elastically supported through reinforced concrete spacers by a polygonal system of prestressing tendons.

Each beam has been prestressed by 6 tendons LH 12 Ø 15.20 mm according to system Gradis - P.H. Outside the concrete section, the tendons are sheathed in galvanized steel pipes $Ø_i$ / $Ø_e$ = 69 / 76 mm; inside the concrete section they are in ribbed pipes $Ø_i$ / $Ø_e$ = 75 / 82 mm. For the needs of maintenance, the design provides the possibility of placing 7 tendons (6 + 1 additional one). The tendons have been prestressed in two steps: in the first step the tendons are prestressed for the case of dead load; the second step prestressing is effected after the erection of the secondary roof structure.

The existing lower structure of the skating-rink was spanned by a special steel structure on which a tower-crane was mounted. The concrete part of the main beam was assembled of segments on a 8 m high scaffolding. After filling the wide joints, placing the cable ducts and pulling in the tendons, the first step prestressing of beams took place.

With regard to the specificity of the statical system, span, construction details, method of construction and erection, the main beams were tested with a test load for the limit state of serviceability.

After test loading, the beams were lifted from the pipe scaffolding to the final position; the weight of beams is 2700 kN. The beams were lifter by two cables 12 Ø 15.20 mm according to system Gradis - P.H. (Fig. 1)

Fig.1: Lifting of main beams

When lifting and placing of beams was completed, the compressed parts of both beams were connected by a plane truss to secure the beams agains buckling.

The statical system of the steel structure is Gerber's beam with hinges in external spans. The beam is a 2.00 m high truss made of steel pipes (Fig. 2).

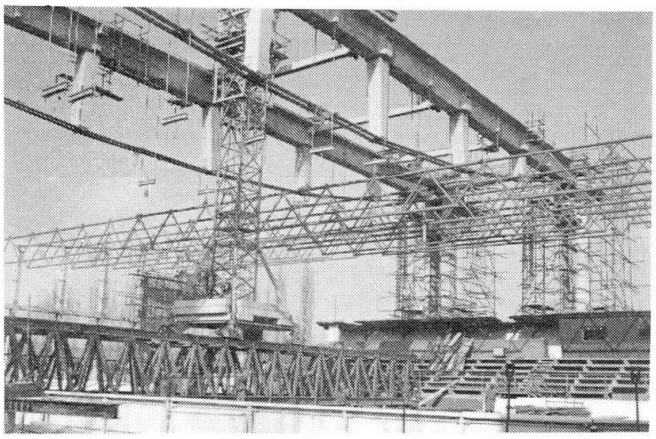

Fig.2: The secondary steel structure

After the erection of the steel structure and placing the roofing, the second-step prestressing was carried out.

The anticorrosive protection has been done by injecting the lithium grease LIP-LEKS-S-2EP (made by INA Zagreb) into the cable ducts, using the lubricators Lincoln.

The object was constructed in the period from July 1, 1987 to Dec. 25, 1987.

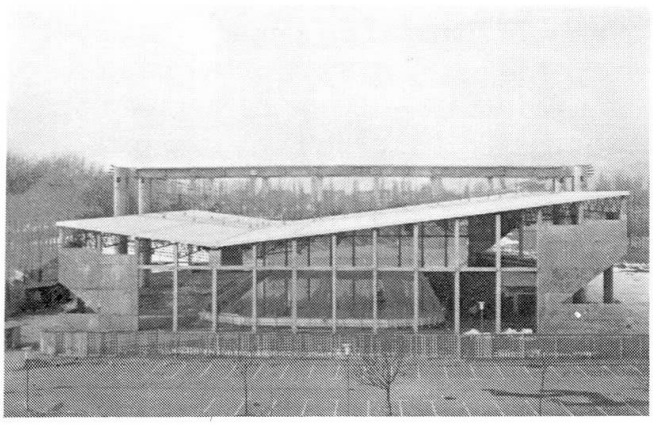

Fig.3: Completed roof structure