

Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke
Band: 6 (1982)
Heft: C-21: Recent structures

Artikel: The Sports Hall of Lahti (Finland)
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DOI: <https://doi.org/10.5169/seals-17582>

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3. The Sports Hall of Lahti (Finland)

Owner:	<i>Lahden Urheiluhalliyhdistys r.y.</i>
Architect:	<i>Arkitehtitoimisto Kosti Kuronen Ky</i>
Structural engineer:	<i>Insinööritoimisto Pontek Ky</i>
General contractor:	<i>Rakennustoimisto A. Puolimatka Oy</i>
Construction time:	<i>12 months</i>
Service date:	<i>1981</i>

Introduction

Playing football outdoors in winter time is almost impossible in Finland. The principal aim for building a big sports hall in Lahti is to make football playing possible all year around on a full-size field, thus helping Finnish football closer to the international level. However, for economic reasons, the hall has been planned for multiple use, as it offers already for its site — being situated close to the Salpausselkä winter games center — excellent possibilities for organizing exhibitions, fairs and other events. The hall is in intense use since February 1981.

Choosing the design and material

The design for the contract competition comprised of an arched hall construction with arches in glued laminated wood. The contractor and designers formed a work team which, after examining and analyzing several solutions based on different materials, finally decided on the steel arch construction as the best choice. The proposal was submitted anonymously and, in a tight competition of 12 offerings, it won.

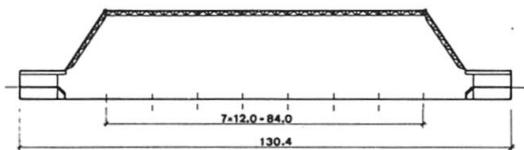
The offerings were evaluated in two stages, firstly, according to the qualifications of the hall in appearance, functionality and technical solutions and secondly, according to the price, that had to be under the preeterminate sum of 20 million FIM.

Foundation

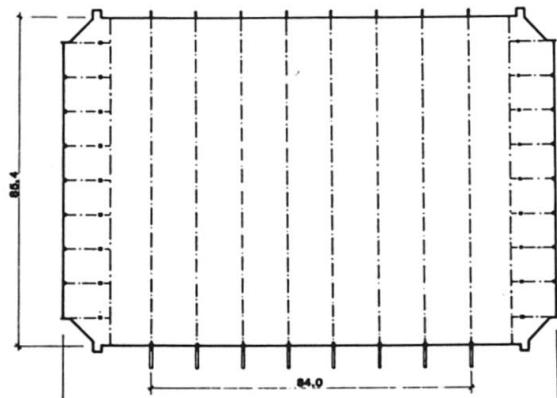
The foundation is of reinforced concrete. Reactions of about 2.1 MN from the arches are transferred to the ground by foundation slabs. The allowable stress for the soil varies between 0.3 MPa and 0.6 MPa.

Steel structure

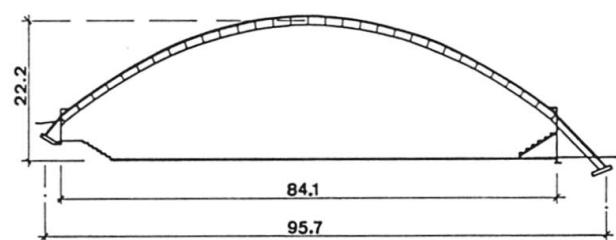
The main structure consists of 8 fixed steel arches. The span of the arches is 84.1 m. The section is a welded I, the height of the web 1,000 mm, the steel quality Raex 384 (yield strength 355 MPa). The secondary structure consists of steel trusses welded from hollow sections, the span 12 m, center space 3 m and height 1,140 mm, steel quality Fe 440, and an arched ceiling of cold-formed folded plate which, supported by the trusses, stiffens them laterally. The folded plate is partly punched with holes for acoustic reasons. The wall structures also are partly in steel.



Section



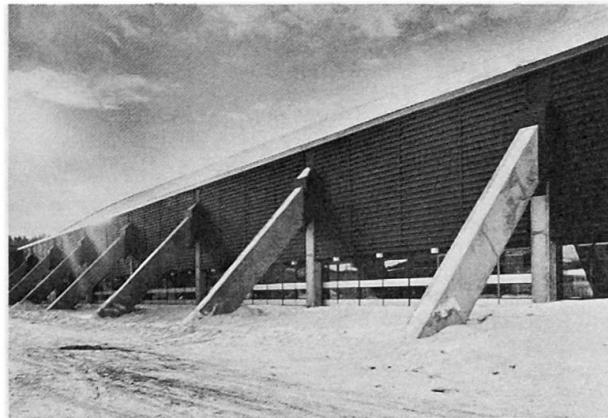
Plan



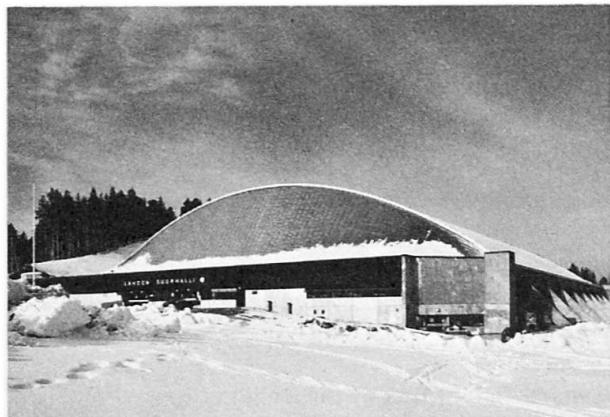
Cross Section

Erection of the steel structure

The steel arches, 92 m of length each, were delivered to the site, each in four parts, two of which were welded together on the ground to a half-arch. Two adjacent arch halves were joined together by the trusses, and plated ready for the erection. The opposite halves were lifted by the cranes, and the top and base joints were adjusted to their places and joined with screws. The secondary trusses and the ceiling plates on the alternate arch spaces as well as all of the heat insulation and the water proofing were installed after erecting the arches.



Facade, from the east side



Facade, from the south side

Technical data

Area of the artificial turf: 7,102 m²
Area of the hall: 11,568 m², volume: 163,100 m³
Free height at its most: 21.7 m, on the field side: 12 m
Maximum attendance: 4,000, when in multiple use: 11,000
Temperature: $20 \pm 1^\circ\text{C}$ year around
Snow load: 1.8 kN/m², partly: 2.7 kN/m²
Steel consumption; arches: 177 t, trusses and wind bracings: 99 t.

(J. Kruus)



Interior view of the hall