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**Autor:** [s.n.]  
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## 9. Koskikeskus Multi-Use Center, Tampere (Finland)

<b>Owner:</b>	<b>Polar Construction Company</b>
<b>Architect:</b>	<b>Antti Tähtinen</b>
<b>Structural consultants:</b>	<b>Consulting Engineers A-Engineers and TE-EM (Tampere)</b>
<b>Contractor:</b>	<b>Ahti Construction Company</b>
<b>Building time:</b>	<b>30 months</b>
<b>Service date:</b>	<b>March 1988</b>

The Koskikeskus multi-use center is a complete shopping and service center in Tampere with several projected future uses. The floor area is about 25000 m<sup>2</sup> and the total area about 56000 m<sup>2</sup>, which, apart from the floor area, also includes underground car parking, stores, social and technical premises plus arcades and plazas inside the center buildings. The total volume is about 280000 m<sup>3</sup>.

In the Finnish context the Koskikeskus project is on a scale of its own. This is also reflected in the technical details, in materials and finances. The design contains some features of the world's largest shopping centers; however, the building is designed with a special eye on the environment and the exacting Finnish conditions.

The excavation volume was well over 100000 m<sup>3</sup> solid volume. The foundations were laid below the level of the nearby main road, and therefore it was necessary to build high support and retaining walls and bedrock anchoring systems. A large area is founded on piles, part is founded on the subsoil and bedrock. The foundations, basement retaining walls and intermediate floors are made of concrete.

The building is steel-framed. Steel was chosen after careful studies where different concrete and steel frame structures were compared.

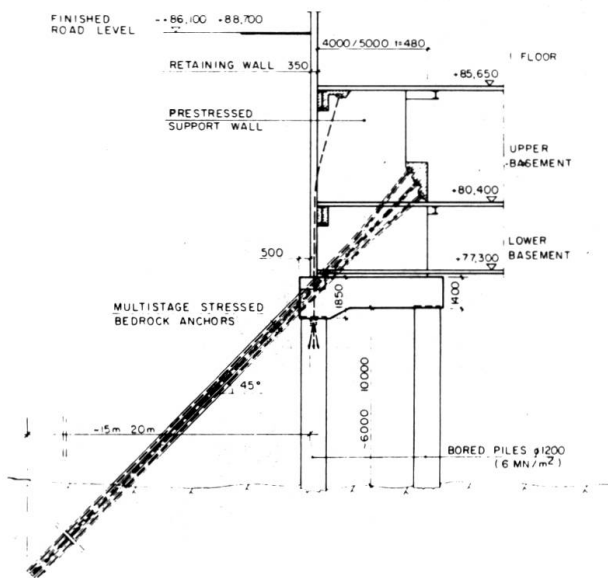


Fig. 1 The support system of the retaining wall

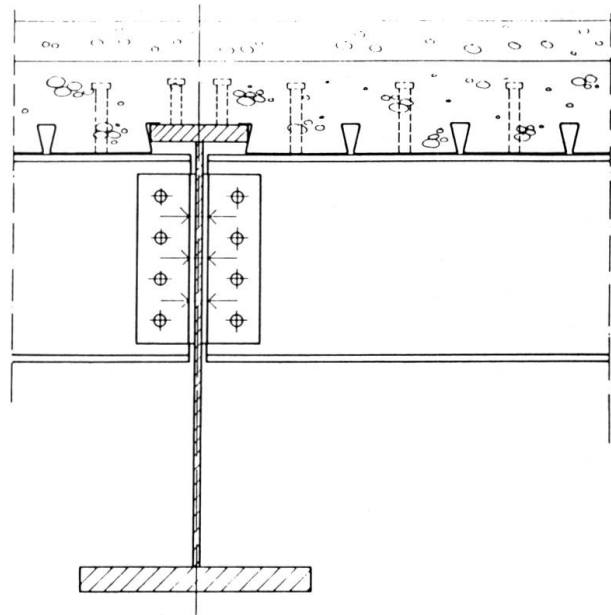


Fig. 2 The joint of primary and secondary beams

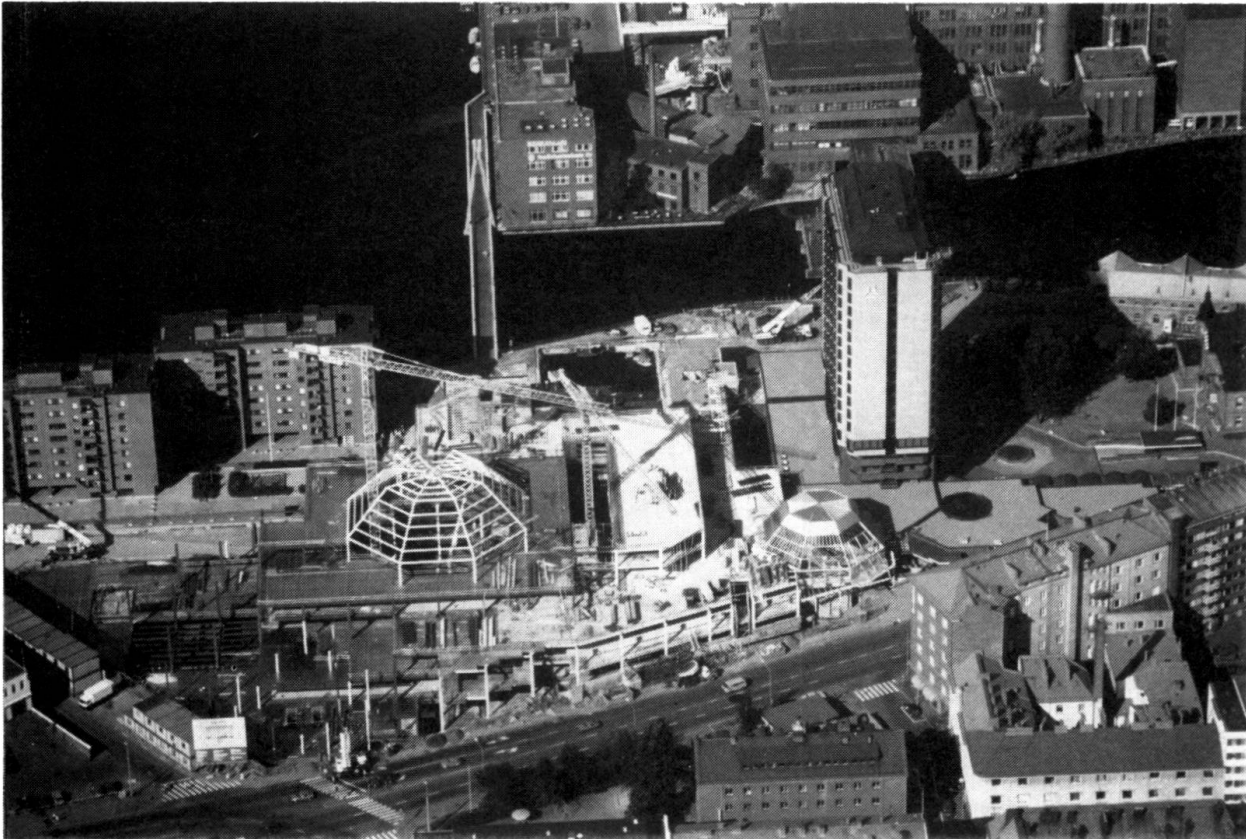
With the exception of industrial buildings, steel has thus far not been a very commonly used frame material in Finland. The choice of steel was a rather radical and unconventional decision, considering that the construction would need more than 4000 tonnes of steel plus more than 50000 m<sup>2</sup> of corrugated steel sheet. Besides, about 60000 m<sup>2</sup> of the frame would have to be fire-protected. This is one of the largest commercial buildings ever built in Finland and definitely the largest steel-framed.

The structural design agrees with the Finnish regulations, for instance, the loads on the floor are 19 kN/m<sup>2</sup> and 4 kN/m<sup>2</sup>. The frame grid size is 8.4 m × 14.4 m and the columns of the frame are welded plate columns or structural hollow sections. The main girders are welded plate and the secondary beams hot rolled I-beam sections. The intermediate floor design is based on a composite structure consisting of steel girders, corrugated steel sheet and concrete. The spacing of the lateral girders has been selected to eliminate the need to support the steel sheet formwork during casting. The floor girders act as single-span beams, and all joints are bolted. Column extensions are made by welding.

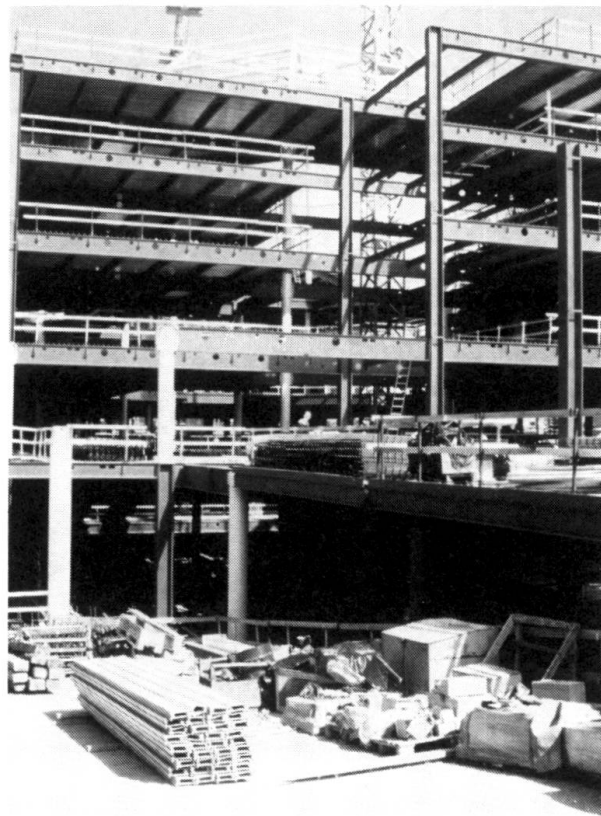
The frame is fire-protected to grade A 120. The fire protection is applied by spraying and the columns exposed to external damage will be concreted.

Technically the Tampere Koskikeskus is a rather intricate building. To make the project profitable despite this difficulty we have chosen construction techniques and structural details that do not go too hard on the production. Our experiences of the project and the economic calculations show that we have succeeded and the decisions have been right.

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*Fig. 3 Air photograph*



*Fig. 4 Steel frame*