

# Inkeroinen Bridge

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# INKEROINEN BRIDGE

SUUNNITTELUKORTTES OY

# FINLAND

ROADS AND WATERWAYS ADMINISTRATION OF FINLAND

**CLIENT**

Roads and Waterways Administration, Helsinki, Finland  
 Chief of Bridge Construction Division: Heigo Roos, Chief eng.  
 Chief of Bridge Design Division: Yrjö Puumonen, Chief eng.  
 Chief of Control Division: Jukka Isakkela, Civ. eng.

**CONTRACTOR**

Aesto Oy

**SUBCONTRACTORS**

Steka Oy  
 Jännitetty Betoni Oy

**DESIGNER**

Suunnittelukorttes Oy  
 Consulting Engineers  
 Pääsääntie 13  
 010100 Oulu 10, Finland



The existing bridge was built in 1925. It was 131 m long and 13.5 m wide. Completed 1925.

**REBUILDING OF THE INKEROINEN BRIDGE**

To increase the capacity of the Inkeroinen bridge and improve the level of service Roads and Waterways Administration made a decision to renew it under a tight schedule.

Based on technical and economic studies and further on the central location of the bridge the following design criteria were achieved:

- the bridge was to be built in the same position as the old;
- wherever possible the existing bridge foundations were to be used;
- provision was to be made for the canalization of the Kymi river.

**Solution**

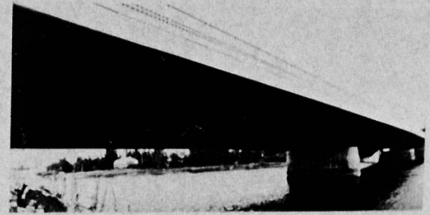
The bridge is a continuous composite girder bridge (steel girdes and reinforced concrete deck).

Beams are of weathering steel with erosion factor of 0.5 mm on each surface. The steel structure is so designed that the side span can be cut and connected to an openable bridge when canalization occurs.

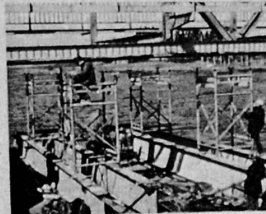
At the intermediate supports the web of the beams is 2450 mm high and 18 mm thick. Height-span ratio is 1/28. The deck was casted without construction joints using retardants.

In existing pillars the old bearing sealings were removed and new heavily reinforced ones casted in their place.

Costs approx.	2170 Fmk/m
Steel Structure	273000 kg 185 kg/m
Deck Concrete	585 m <sup>3</sup> 0.31 m <sup>3</sup> /m
Deck Reinf.	134000 kg 230 kg/m
Foundation Concrete	156 m <sup>3</sup>
Foundation Reinf.	13800 kg



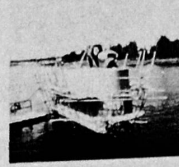
The New Bridge, a composite structure  
 Span: 29 + 46.4 + 26 m  
 Wdm: 2.75 + 7.5 + 2.75 = 13.0 m



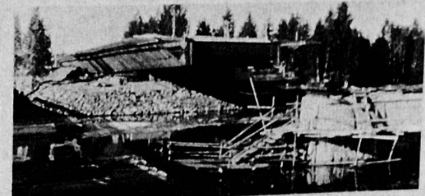
Demolishing of the old steel truss bridge in progress



Two of the old intermediate pillars were removed



Bearing sealings of remaining pillars were strengthened



The steel structure was joined together on the river bank

**BRIDGING CONDITIONS IN FINLAND**

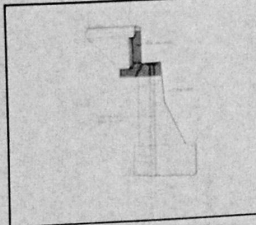
The most characteristic feature of Finnish geography is the multitude of shallow lakes and the natural beauty of the landscape. The area of our waters is 9.3 % of the whole surface of 337000 km<sup>2</sup>.

An average of 200-300 bridges are built in Finland annually, of which 74 % are concrete bridges, 14 % steel bridges, 8 % wooden bridges and 4 % bridges of corrugated pipes.

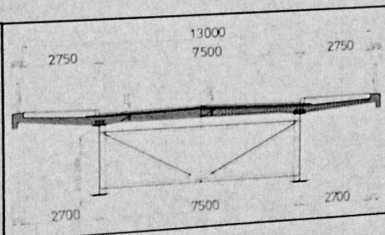
The annual mean temperature of the country is +2 °C, the average day temperatures (July, January) varying from +22 °C to -18 °C.

The steel used in bridges must have high impact strength and the general requirement is 27 J at -30 °C.

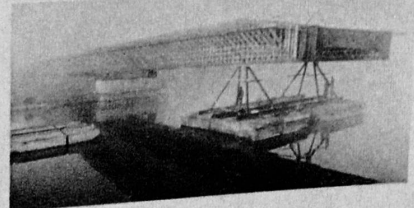
Concreting is mainly carried out during the cold season.



Abutment retaining and girder support on rock



Superstructure cross-section



Bridge construction in progress



## INKEROINEN BRIDGE

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### THE REBUILDING OF THE INKEROINEN BRIDGE

#### 1. GENERAL

To increase the capacity of the Inkeroinen bridge and improve the level of service, RWA made the decision to renew it under a tight schedule. Based on technical and economic studies and further on the central location of the bridge the following design criterions were achieved.

- the bridge was to be built in the same position as the old,
- wherever possible the existing bridge foundations were to be used,
- provision was to be made for the canalization of the Kymi river.

#### 2. SOLUTION

##### 2.1 A Steel beam structure

The bridge is a continuous composite girder bridge (steel girders and reinforced concrete deck). The steel framework is formed of two parallel beams joined together by crossbeams at 6600 mm centres. Beams are of weathering steel with erosion factor of 0,5 mm on each surface. The steel structure is so designed that the side span can be cut when canalization occurs. At the intermediate supports the web of the beams is 2400 mm high and 18 mm thick. Height-span ratio is 1/28. The steel structure was jointed together on the river bank and pulled to its final position.

##### 2.2 The Concrete Deck

Automatically welded bolts,  $\phi$  19 mm, serve to join the concrete to the steel. Thickness of deck slab between the beams is 210 - 340 mm. At the support in the negative moment area the amount of non-prestressed steel is over two percent of the deck cross-section because of crack-width limitations. The deck was casted without construction joints using retardants.

##### 2.3 Foundations

The condition of the existing foundations was checked by core sampling. Two of the intermediate pillars were removed totally and in remaining pillars the old bearing seatings were removed and new heavily reinforced ones casted in their place. The abutments and the fixed bearing pillar were stressed with rock anchors to ensure a sufficient capacity. By using the existing foundations constructing in water was completely eliminated.

#### 3. COSTS AND QUANTITIES

Costs of the project were approx. 4,1 Million Fmk.

Steel Structure	273000 kg	145 kg/m <sup>2</sup>
Deck Concrete	585 m <sup>3</sup>	0,31 m <sup>3</sup> /m <sup>2</sup>
Deck Reinforcement	136000 kg	230 kg/m <sup>3</sup>
Foundation Concrete	188 m <sup>3</sup>	
Foundation Reinforcement	13600 kg	