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Long Span Composite Bridges in Nordic Conditions

Ponts mixtes de grandes portées dans les pays nordiques

Weitgespannte Verbundbrücken unter nordischen Bedingungen

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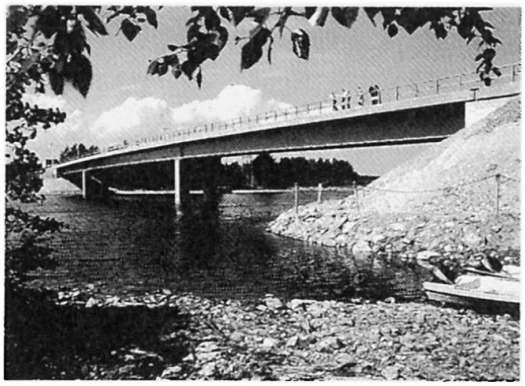
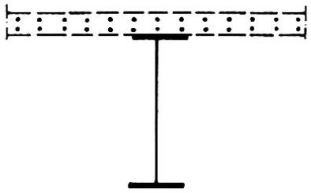
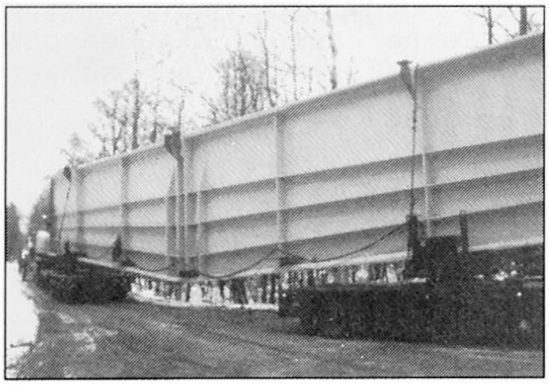
NORDIC LONG SPAN STEEL-CONCRETE COMPOSITE BRIDGES.
The use of steel-concrete composite bridges has increased rapidly in the years since 1976 in Finland. This form of construction is particularly suited to the prevailing harsh winter conditions, as it makes it possible to prefabricate the steel main beams in the workshop. These can then be erected on site, normally during the winter when rivers are frozen. The concrete deck can then be completed during more favourable weather. This form of winter construction sets extremely high demands on dimensional accuracy and material quality. In particular, this is especially true of the steel used, which must retain high toughness and weldability in temperatures as low as −40°C. Due to the development, at the end of the 1970's, of automatic beam and stud welding techniques and of special steels such as CORTEN B and RAEX 385 (Fe 355 E) by Rautaruukki Oy it has been possible to produce this kind of composite waterway bridge competitively, to cover the span range of 25 m – 120 m for multi span, and, in type series form, from 16 – 38 m for single span bridges.



JYVÄSJÄRVI BRIDGE.
This bridge, the largest single bridge contract awarded in Finland, will be the longest steel-concrete composite bridge in the country. Its design was selected in a competition in which external appearance, in addition to technical and financial aspects, was considered. The deck, which has a horizontal clearance of 15.5 m including a 7 m traffic lane, is carried on two main steel beams which are angled in the inner opening. The beam height varies from 2.5 – 4.65 m. The main beams are connected to each other by cross-trusses and by horizontal trusses between the beams. The broad reinforced deck slab, which is supported by the beams, is prestressed



Cross-section of composite beam intermediate support area showing only the reinforcing steel.



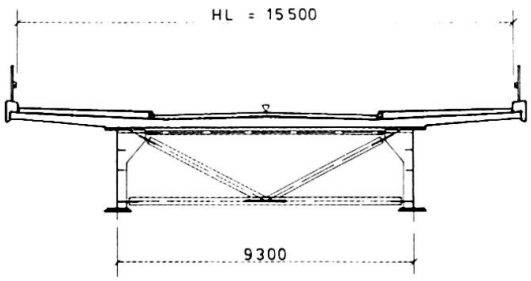
Main Beam Sections prior to installation.

Typical series type bridge.

in the lateral direction. A total of 1510 tonnes of RAEX 385 special steel is used in the superstructure.

The bridge is founded on a very soft silty clay, which demands piles to as deep as 50 m, where they are bedded in a 5 m moraine layer. The piles used are steel tube piles with a diameter of 1220 mm and the six intermediate support pillars need a total of 2200 m of these.

Fabrication of the steel structures is currently underway and they will be launched from both banks by the incremental launching method, to be joined at the middle of the central span.



Jyväsjärvi bridge. Cross-section of deck structure. Due to lateral prestressing it has been possible to use only two main beams.

TECHNICAL DETAILS

Client: Jyväskylä Town Design: Juola & Rantakokko Ky
Main Contractor: Insinöörityö Oy
Steel Fabrication: Rautaruukki Oy
Span Widht: 50 + 67 + 78 + 90 + 78 + 67 + 50 = 480 m
Clearance: 10 – 14 m
Quantities: Total steel 2860 tonnes, of which 780 tonnes piling and 1510 tonnes RAEX 385 superstructure.
Concrete – 4850 cu.m.