Ähtärinsalmi bridge

ÄHTÄRINSALMI BRIDGE FINLAND

SUUNNITTELUKORTES OY THE NATIONAL BOARD OF PUBLIC ROADS AND WATERWAYS OF FINLAND

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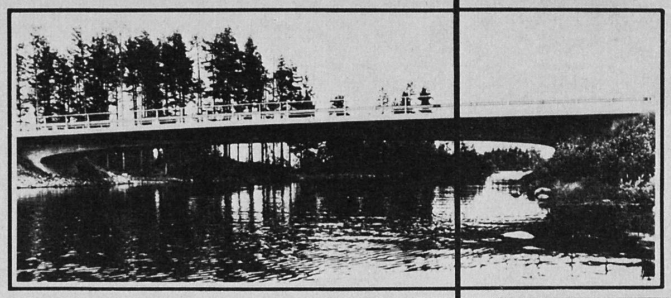

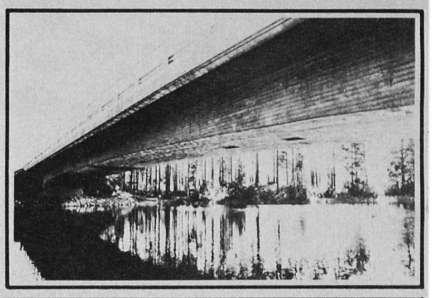

BRIDGING CONDITIONS IN FINLAND

- The most characteristic feature of the 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 337 000 km².
- We have 75 000 km of public roads and 9000 bridges in them
- The total of our railways is 9000 km and 1600 railway bridges
- An average of 200...300 bridges are built in Finland annually
- The average span of our bridges is 15 m
- According to building materials the bridges can be divided as follows:
  - concrete bridges 80 %
  - steel bridges 7 %
  - wooden bridges 13 %
- Conditions for founding are usually good. Most bridges have ground foundations but also different types of pile foundations are commonly used
- The depth of foundation is often decided on the basis of the depth of frost
- The annual mean temperature of the country is + 2°C, the average day temperatures (July, January) varying from + 22°C to —18°C
- The temperatures set their requirements on building materials
- The steel used in bridges must have high impact strength. The general requirement is 27 J at —30°C.
- Melting and freezing speeds up erosion of concrete
- Concreting is mainly carried out during the cold season
- Snow and the scarcity of daylight hours also add further costs

ÄHTÄRINSALMI BRIDGE

Technical solution in beautiful landscape
- The type of bridge is post-tensioned frame bridge
- The water landscape is preserved as intact as possible

- Structure of the bridge:
  - free span 40 m
  - height of structure 2,0...1,2 m
  - frame pierleg and deck post-tensioned
  - stainless steel drum joint
  - founding on ground
- Slim deck makes the overall structure flexible
- Variations of temperature (+ 20°C — —30°C) are controllable as the frame is flexible even though the pier legs are short
- The angle of the pier legs makes the joint force resultant vertical where as horizontal force is only created by varying loads
- Concrete 360 m³
- Tensioned steel 12 000 kg
- Reinforcement steel 33 500 kg

PROBLEMS AND SPECIAL MEASURES CAUSED BY WINTER

Mean temperatures are in Finland bellow 0°C for about half the year during several months they vary from —0°C to —30°C. This period coincides with the busiest building season but it is by no means a hindrance to the realization of most complex technical constructions. An example of this is the Ähtärinsalmi post-tensioned frame bridge which was carried out as a winter project.
As a rule concreting is done in temperatures as low as —15°C; in temperatures lower than this concreting is avoided for economic reasons. Concreting is technically possible even in temperatures of —30°C, nor is it unique to make bridges in Lapland in —20°C.

Low temperatures not only cause special measures during construction time but they also cause special structural requirements, the foremost of which is that the materials are to sustain very low and greatly varying temperatures. Frost penetrations even under the foundation level are to be eliminated.

THE MOST IMPORTANT MEASURES IN WINTER CONCRETING

- all concreting in below + 5°C temperatures is considered winter concreting
- heating of the materials of mass concrete
- protection of mass concrete from cold during transport
- protection of mass concrete in form work and heating as a rule when temperature drops below —1°C
- constant watch over temperatures of concrete, especially in places where freezing would be fatal

The duration of below 0°C mean temperatures in different parts of Finland is shown on enclosed map.

PREVENTION OF FROST DAMAGES

- founding in frostproof depth
- frosting ground to be replaced down to frostproof depth
- use of insulation

Frostproof depths in different parts of the country are shown on enclosed map.