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Low Maintenance Cable-Supported Structures - A New Concept

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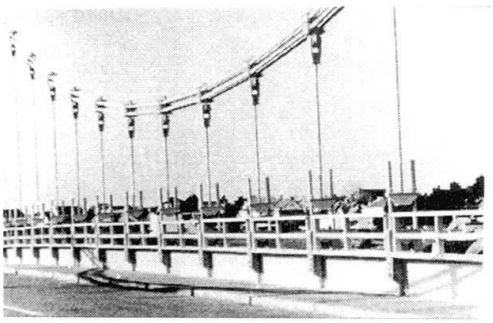
Summary

Replacement of cables had to be carried out recently on bridges in Argentina (General Belgrano and Zarate - Brazo Largo bridges) and in France (Tancarville bridge). A huge programme has been undertaken in the United States. Was the cable technology used on these structures meeting this requirement ? Will the Williamsburg suspension cable be replaced one day ?

This paper reviews the problems encountered which had to be solved to replace the cables and proposes a new concept of structural cables together with a new layout and installation methods for cable-supported bridges, providing excellent corrosion and fatigue resistance associated to a low-maintenance cost.



The Lorois bridge

1. Cable replacement

The replacement of suspension cables will require a sequence of delicate operations in order to ensure the stability of the structure at all times and to maintain the traffic as much as possible during the works. As an example is the sequence of the Lorois suspension bridge (France).

Very often the pipes were injected with cement group to fill the voids between wires and jacket. It is highly uncertain whether this fill material completely fills all voids and prevents moisture from the curing cement grout, from natural condensation or penetrating into the pipe jacket through external cracks from attacking the wires. The effectiveness of grout protection

is further questioned because of its shrinkage-induced cracking and the differential movement between steel wires and cement grout due to vibration and stress and temperature-induced length changes. Several failures have been observed such as :

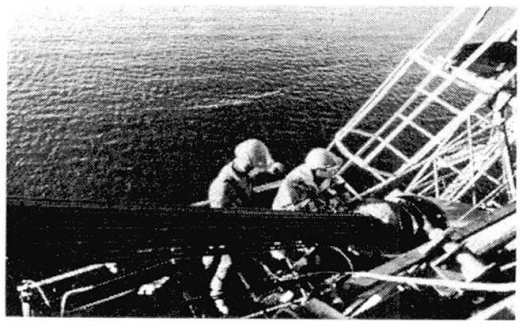
- General Belgrano bridge (Argentina) : 80 locked coil strands 78 to 116 m long.

- Zarate – Brazo Largo bridges : Cables Hi-Am type are made of 7 mm parallel wires encased in a polyethylene duct and cement grouted.

2. New cable technology

The new cable technology meets the following requirements which are of the greatest importance for building durable structures :
- high fatigue resistance, high stiffness and mechanical strength
- excellent corrosion protection
- simplicity of installation
- easy maintenance and replacement without any traffic disruption.

The strands are individually protected as follows :
- hot dip galvanisation before wire drawing ;
- extrusion around the strand of a high density polyethylene sheath (i.e. 1.5 mm thick minimum) after coating the wires with wax.



Cable installation

The modern technology which is used on all the major cable-stayed bridges (Normandie, Vasco de Gama, Ting Kau and Øresund) provides the facilities for maintenance which are requested by the owners :
- the system is a perfectly reversible assembly ;
- placement and arrangement allow for easy inspection ;
- monitoring of the cable force is always possible ;
- detensioning, dismantling and replacement are done without any traffic disruption.