Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 55 (1987)

Artikel: Reinforcement of the Marghera-Venice overbridge
Autor: Vento, Salvatore / Guadagnini, Luigi
DOI: https://doi.org/10.5169/seals-42810

Reinforcement of the Marghera -Venice Overbridge

Renforcement statique de la structure en béton armé du viaduc de Marghera-Venise

Verstärkung des Viadukts Marghera-Venedig

Salvatore VENTO
Venice, Italy

Luigi GUADAGNINI
SACAIM S.p.A.
Venice, Italy

INTRODUCTION

The works of improvement and adjustment to suit the new Italian Highways and Bridges Standards here described, refer to the Marghera (Venice) Overbridge.

The structure, built in 1930, is 800 mt long and 20 mt wide. The frame, entirely built in reinf concrete, comprises longitudinal girders (30 cm x 80 cm) 8.00 mt long spaced c/c 1,50 mt and an overhanging 17 cm thick reinf.conc. slab. The girders rest on traverse beams (25 cm x 105 cm) spaced c/c 8.00 mt supported by R.C. columns (40 cm x 45) spaced c/c 3.00 mt, having traverse foundation beams. The static scheme is that of a continuous five spans footing.

STATE OF CONSERVATION

The general conditions of the structure were very precarious.

Corrosion of the reinforced concrete was particularly evident in the joint connections and in the R.C. slab mainly caused by the absence of an adeguate draining system avoiding filtering of acid water.

Formation of cracks and shrinkage due to lack of the reinforcement steel in the slab were another cause of corrosion and rusting of the steel.

The longitudinal beams, on the contrary, had a better conservation (considering the aggressive character of the environment in which the structure is located) which permitted the improvement operations further related.

The internal columns and the foundation beams resulted fit to the new standards.

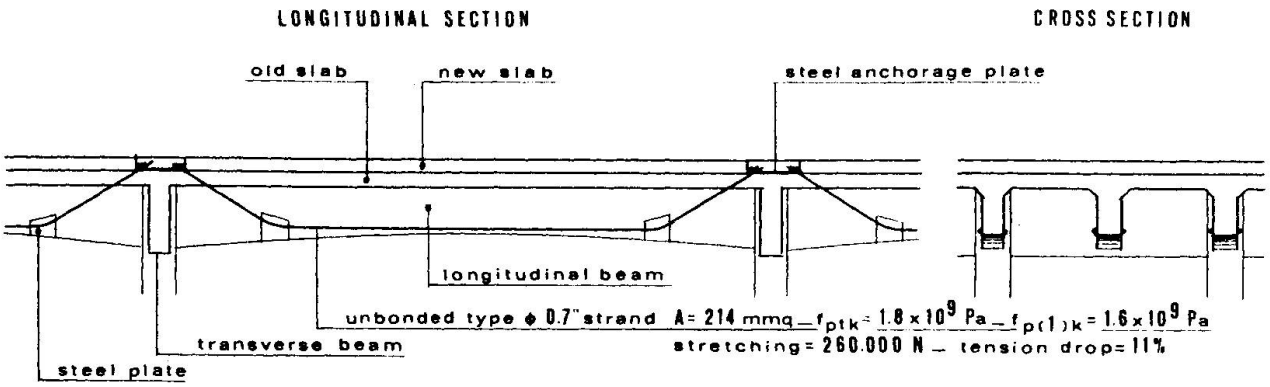
IMPROVEMENT AND ADJUSTMENT OPERATIONS

In consideration of the general state of conservation of the overbridge and of the necessity to adjust it to suit the new Italian Highways and Bridges Standards, the following actions have been taken.

The reinforced concrete slab has been rebuilt by casting a new slab on top of the existing one.

In correspondence of the expansion jonts new columns have been erected alongside the existing ones.

The longitudinal girders (completely unfit to shearing stresses and scarcely fit to bending)have been improved by partially prestressing the structure.



DESCRIPTION OF THE OPERATIONS

Each longitudinal girder is supported by two UNBONDED TYPE O 0,7" strands (greased and sheathed with a high density polypropylene sheath)running along each side of the lower ledge of the beam. At the end of the beam the strands are shunted 30° upward by means of a u-shaped steel plate.

The anchorage consists in a steel plate positioned on the existing slab where the longitudinal beam connects with the traverse beam. This anchorage plate is supplied with a series of frustum shaped clamps having a threaded inside hole holding the strands.

The single wires of the strands are greased and protected by a polypropylene sheath and this one is protected by a second polypropylene sheath.

The stretching of both the strands of a beam is done simultaneously by means of an hydraulic jack from one side of the beam, in two periods with a 260.000 N force. Losses due to friction resulted nil.

Strands were tested according to Italian specifications (tensile tests, stress, stretching 1% etc).

The frustum shaped clamps were tested with repeated loadings for a total of 2 milion N.

The anchorage plate and the deflection U - shaped plates have been tested by stretching the strands to breaking point.

The strand protecting sheath were also verified in the same test.

Test results were all positive.

VALIDITY OF THE METHODOLOGY EMPLOYED

In connection with the theme of the Meeting, the operations here briefly related represent a valid methodology to be applied in future improvement of large reinforced concrete structures which mai result decayed or not fit to new load-carring capacities.

This metodology not only permits to avoid demolition and rebuilding operations (wich often represent serious problems especially when the structure has to be maintained functional during maintenance works) but also results to be a valid way of money and time saving.

The total maintenance cost of the Marghera Overbridge (16.000 sq.m. surface treated), using this methodology, has been approximately 3.1 million U.S. D. Money saving was estimated around 20% (compared with rebuilding costs) and time-saving around 25%).