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Artikel: Repair and rehabilitation of Roma-Viterbo railway bridges (Italy)
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10. Repair and Rehabilitation of Roma-Viterbo Railway Bridges (Italy)

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Design: *Prof. Ing. Giorgio Croci*
Contractor: *NICIS S.P.A. – Roma*

The railway line Roma – Viterbo (Italy) has been realized between 1906 and 1913.

The original execution had a narrow gauge of 1.00 meter.

Later works for a complete structural remaking were executed; they involved modifications of lay out, the adoption of the normal gauge and the suppression of those parts in curve with a radius of curvation lower than 120 meters. These variations have modified the loads and their manners of application, provoking several damages in the structures, pointed out during the ordinary maintenance; the cracking observed on both, on the hanging and on the arcades, suggested, in the sixties, the insertion of cross chains with still visible relative anchor shapes.

Phenomena of ruins and decay of materials have necessitad the consolidation of the viaducts.

The main cracking manifestations are located in correspondence of the connection zone between the external hanging and the arcades involving the almost longitudinal development of viaducts.

These crackings are located almost exclusively on the external side of the curves because of centrifugal actions (see fig. 1).

The decay of masonry structures shows an erosion of tuff ashlars and a deterioration of mechanical characteristics of the mortar that near external surfaces is completely lacking.

The above-mentioned decay conditions are due to effects of atmospheric agents and, in some cases, to the defective drainage system.

Measures for improvement of the static behaviour and of the contrast decay phenomena have been adopted for the restore of safety conditions and for the complete functional recovery of the viaducts.

The structural consolidation interventions consist in the realization of a reinforced concrete structure adherent on the existing masonry, after removing the internal filling (see fig. 2).

The slab on the extrados of the arcades has a thickness variable between 15 and 25 cm; the internal walls are 15 cm thick and follow the internal configuration of existing structures.

In correspondence with the bridge, piers have been realized with 2 transversal stiffening walls to resist to centrifugal actions.

The above-mentioned structures have been jointed with the existing masonry by means of injections of reinforced concrete both on the walls and on the vaults.

Relating with the requirement of non-interruptions of railway traffic, a different intervention of consolidation, which foresees the insertion of a prestress cables system, arranged according with the schemes in fig. 4, 5, has been studied.

The cables included in the vertical walls with an appropriate inclination supply a bending moment which compensates the moment due to centrifugal actions.

The horizontal cables arranged along the arcades tend to equilibrate the radial translation.

The anchor zones, realized with reinforced concrete curbs supply moreover an effective longitudinal connection.

Relating to the phenomena of decay for improvement of the physical-mechanical characteristics of masonry it is forecast to inject cement mixture along the cracking development and in correspondence of visible lacking between stones after a complete removal of mortar.

(G. Croci)

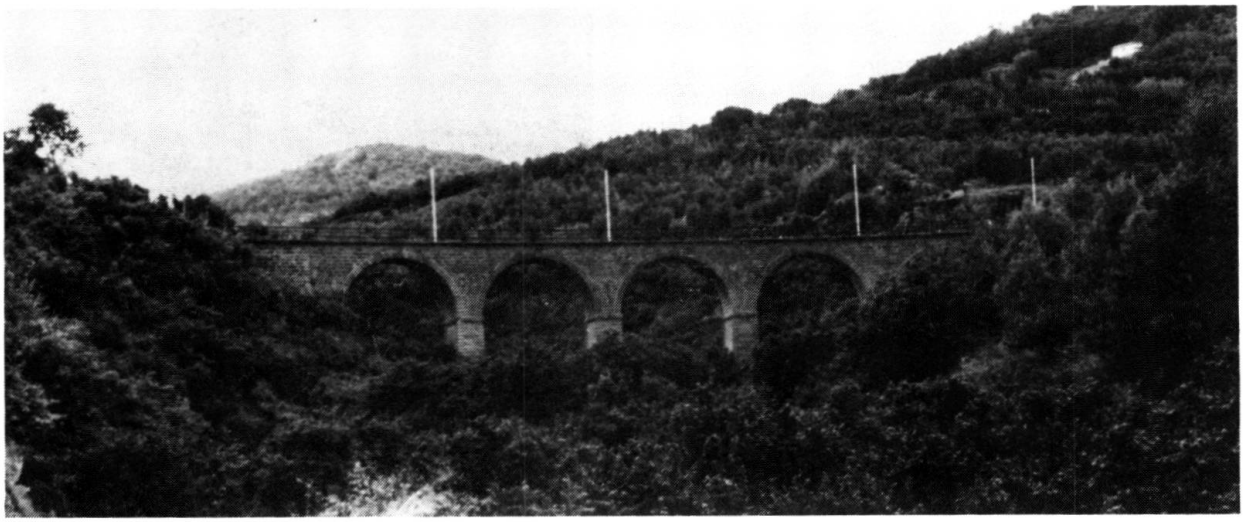

Fig. 1 Global view of the viaduct

Fig. 2 A view of the inside of viaduct after removing of filling

Fig. 3 Arrangement of steel-bars

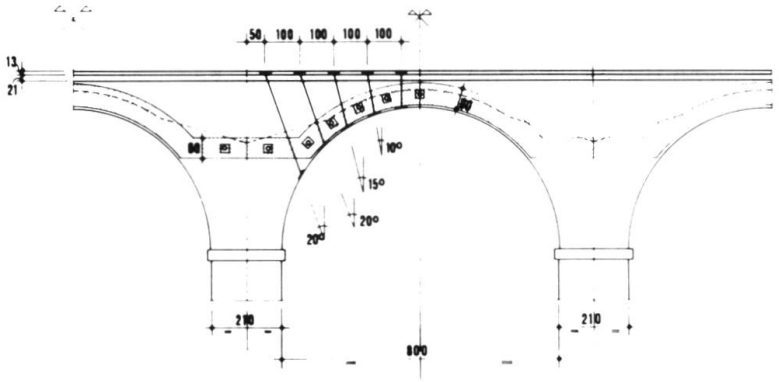

Fig. 4 Arrangement of prestressing cables

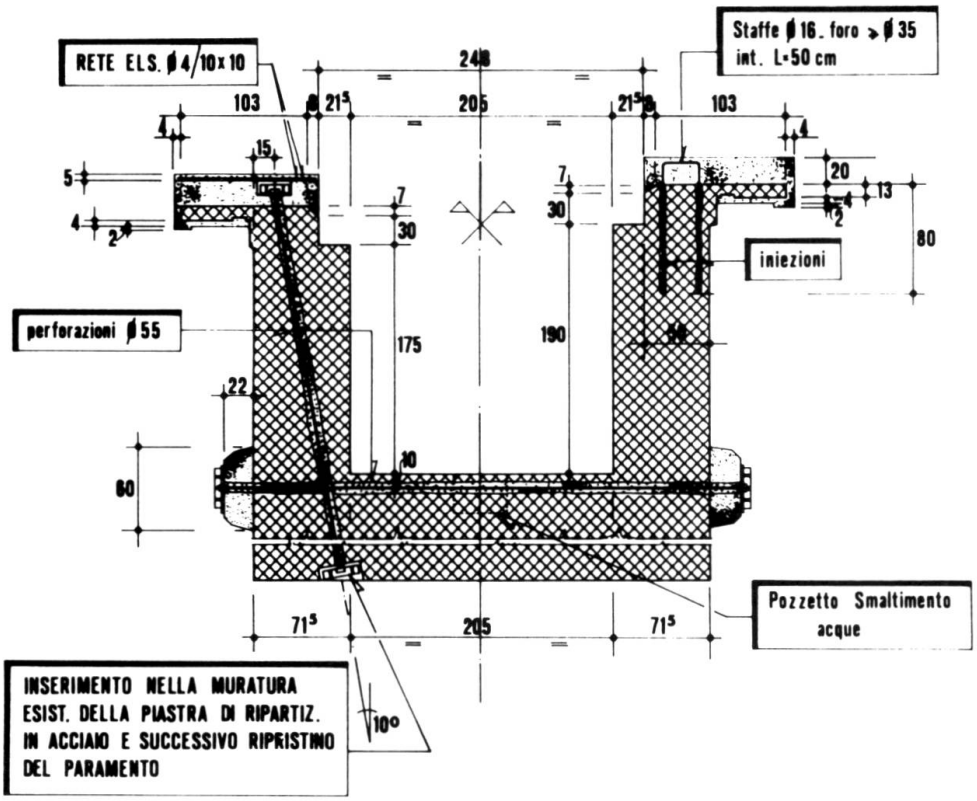

Fig. 5 Cross section on bridge-pier