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3. Côa Bridge, IP5-Guarda (Portugal)

Owner: Junta Autónoma de Estradas
(Highway State Administration)

Engineers: Enarco Lda

Contractor: Zagope SA

Works duration: 24 months

Service date: 1987

Quantities of materials:

concrete	15 000 m ³
reinforcing steel	1190 t
prestressing steel	90 t

General

The bridge over the river Côa is placed on the main road IP5 and is located between Guarda and Vilar Formoso. It is 604 m long between the abutments and consists of 15 spans ranging from 35.5 m to 42.5 m. The bridge deck width is 14.46 m.

In plan the bridge fits into straight alignment about 456 m long, associated with a transition curve 600 m in radius and about 148 m long. Its side elevation shows a horizontal intermediate zone about 285 m long and two lateral stretches about 201 m and 118 m long, fitting into curves with 4500 m radius.

Design and construction

Taken into account the high clearance over the river and the bridge length, the structural solution adopted basically consists of a deck composed of precast girders of prestressed reinforced concrete, which were launched from the abutments by means of a special metallic launching girder. At each span the deck is formed of 6 longitudinal T beams, 35.5 m long, 2.0 m high and about 700 kN of dead weight.

During construction the deck is simply supported by the pier caps. In the following stages the deck continuity in transversal and longitudinal directions was ensured by transversal girders and slabs between the longitudinal beams cast in situ.

Due to the high number of precast girders it was necessary to have an industrial plant able to produce the girders in due time. In order to produce one girder every two days using just one special designed metallic mould, the following construction technique was used: precast the extremities of the girders in the anchorage zones; prefabricate the reinforcement including the prestressed cables; cast the remaining part of the girder against the precast extremities, accelerating the concrete hardening with temperature and humidity strictly controlled. This manufacturing technique allowed the un moulding of the girders 18 hours after casting and after applying about 60% of the final prestress; the girders were then removed to a stocking area where the remaining portion of the prestress was applied.

The ten central piers, whose height varies between 38 m and 93 m, have hollow octagonal cross-sections, maximum transverse and longitudinal dimensions respectively of 7.35 m and 3.50 m. Their headings present variable cross-sections with the maximum dimensions in plan of 14.16 m and 9.20 m, respectively in transverse and longitudinal directions.

The four lateral piers are geminated with solid square cross-section and heading is designed as a horizontal beam with variable cross-section.

The deck is fixed to both abutments and is provided with only two intermediate expansion joints, arranged in such a way that the central part of the bridge between the joints was symmetric with reference to the river centerline. Thus, three continuous deck stretches are obtained, the central one with the length of 297.5 m whereas the others are 153.25 m long.

The abutments and piers have direct foundations built in the granite formations.

(V. Monteiro, A. Vale e Azevedo)



Fig. 1 General view

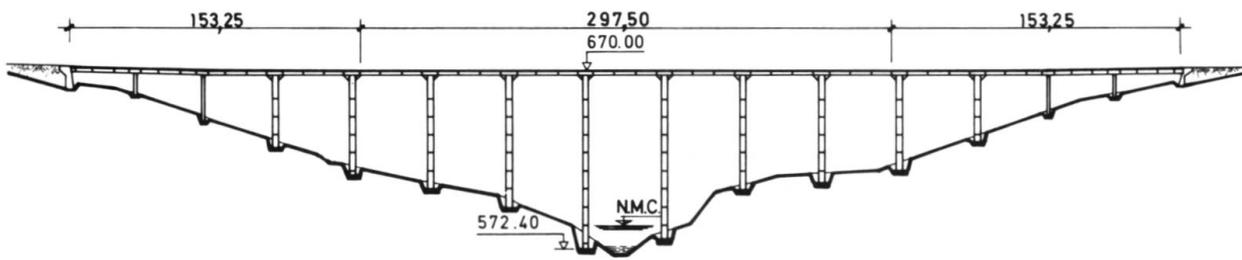


Fig. 2 Longitudinal section

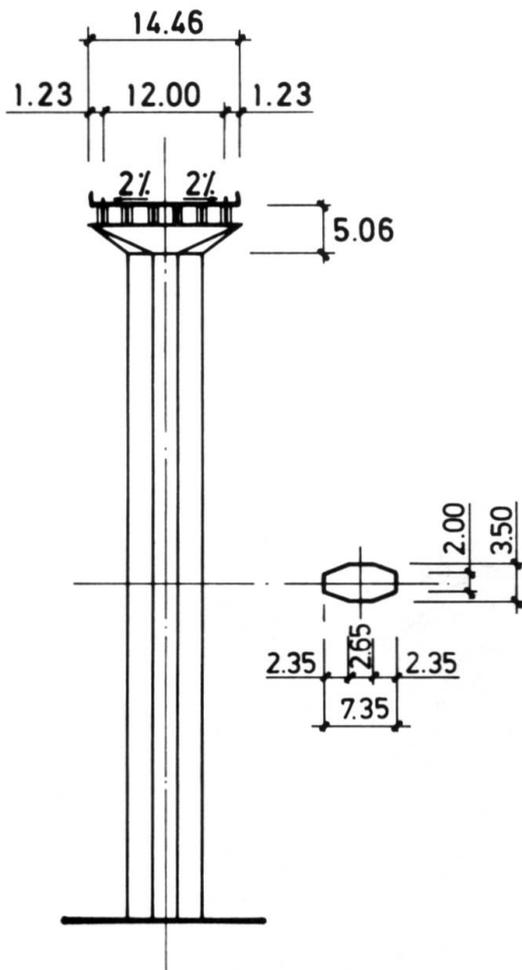


Fig. 3 Transversal section

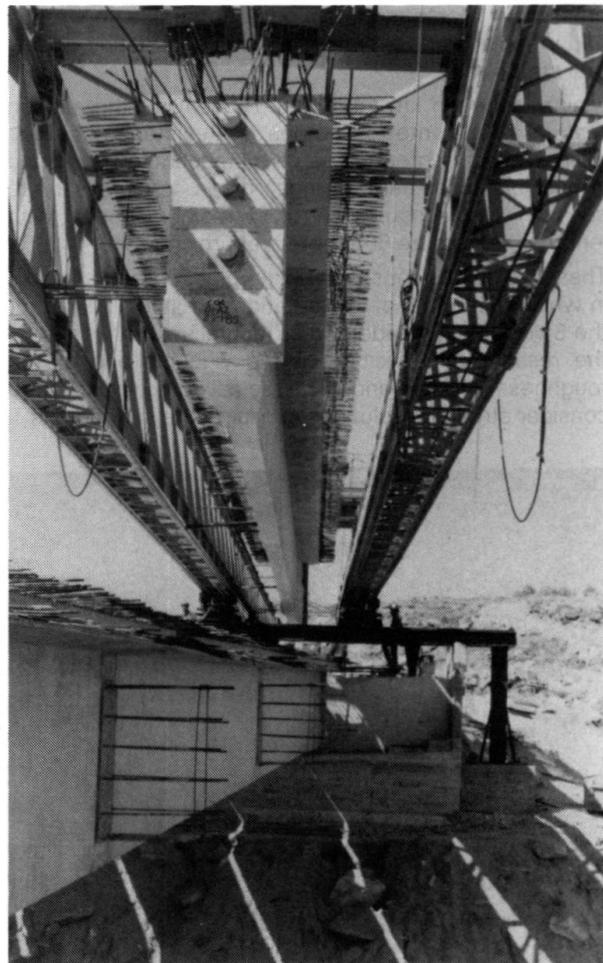


Fig. 4 Girders launching system