



Viaduct over River Almonte. Design and Analysis

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Abstract

The High Speed Railway (HSR) link Madrid - Extremadura crosses over River Almonte with a great arch viaduct of high - performance concrete. The main span of this structure is 384 meters.

This paper explains the exceptional techniques and structural analysis outside the usual engineering work that have been developed to reach its design and construction. These studies include the selection of the antifunicular arch axis taking into account construction process and train loads, geometric and material nonlinear analysis, dynamic analysis and aerolastic behaviour.

Keywords: arch bridge, high speed railway, high performance concrete, cantilever, instrumentation.

1 Introduction

The Viaduct over River Almonte at the Alcántara Reservoir is an arch bridge with a main span of 384 m and a total length of 996 m. It will become, once completed, the longest span in a high-speed railway and the third longest arch in concrete in the world.

Its design and construction includes many special features and demand complex analysis methods that are unusual, but in this case become crucial.

Almonte Viaduct has been designed by Arenas & Asociados within the JV constituted with IDOM to draw up the whole Reservoir of Alcántara - Garrovillas section project, among the HSR link Madrid - Extremadura (with mixed traffic and a maximum speed of 300 km/h for passengers and 100 km/h for freights).

The bridge, property of Spanish Rail Administrator Adif, is being constructed by contractors FCC - Conduiril, and is due for completion in July 2016.

2 Special Features of the Structure

The specifications on a bridge for high speed rail are greater than those of a road bridge. For example, bigger dynamic effects by passing convoys, significant horizontal loads or fatigue. All these facts cannot be disregarded.

All these specifications must be combined with strict functional considerations, in order to obtain a service level of the structure that shall not be limited at any time: small deflections and accelerations and a length between expansion joints limited for technological reasons. Given these characteristics and limitations, the spans above 100 m have been unusual in HSR bridges, but this structure falls within an exceptional span for the topographic features of the site.