Viaduct over Guadalhorce River and A-92 Highway

Óscar Ramón RAMOS
Head of Structures Division
APIA XXI-Louis Berger DCE
Santander, Spain
oramos@apiaxxi.es

Guillermo ORTEGA
MSc. Civil Engineer
APIA XXI-Louis Berger DCE
Santander, Spain
gortega@apiaxxi.es

Ricardo SOUSA
MSc. Civil Engineer
APIA XXI-Louis Berger DCE
Santander, Spain
rpereira@apiaxxi.es

Cristina GAITE
MSc. Civil Engineer
APIA XXI-Louis Berger DCE
Santander, Spain
cgaite@apiaxxi.es

José M. MARTÍNEZ
MSc. Civil Engineer
APIA XXI-Louis Berger DCE
Kuwait City, Kuwait
j.martinez@nasserroad.com

Marcos J. PANTALEÓN
President
APIA XXI-Louis Berger DCE
Santander, Spain
mjpanta@apiaxxi.es

Summary

The Guadalhorce Viaduct, built as part of the high-speed line Antequera-Peña de los Enamorados (south Spain), has a length of 2525,50 m and consists of 49 spans of 51,25 m length each. It is one of the longest bridges of its type in the country and is situated in a medium risk seismic zone. The superstructure consists of a continuous single-cell post-tensioned box-girder of 3,40 m depth. The main span, which crosses the A-92 Highway, is 90 m long and is reinforced by two steel tied arches. This span, along with its backward and forward spans, was resolved with a steel–concrete composite box-girder with a constant depth of 3,40 m. A point of fixity is materialized in a delta-shaped post-tensioned concrete pier located in an intermediate area of the bridge in order to meet the friction, braking, and seismic longitudinal forces induced by the large length of the viaduct. Hence, expansion joints are placed at both abutments. Span-by-span erection is being followed by means of two self-launching formwork gantries working simultaneously, starting from each abutment, and moving toward the delta-shaped pier. Temporary fixed points were required during the erection process and set at the piers placed just before the gantry. The viaduct is currently under construction.

Keywords: post-tensioned box-girder; steel tied arch; temporary fix point; self-launching gantry; delta-shaped pier.

1. Introduction

The need for the Guadalhorce Viaduct project arises from the necessity to give way to the Antequera–Granada high-speed railway line. The bridge is located in the Guadalhorce River floodplain, and thereby requires such a large length.

The main obstacles for the viaduct to overcome were bridging the A-92 Highway that crosses underneath one of its spans and the effects of the horizontal forces due to the large length. To resolve these issues, a steel tied arch and a post-tensioned concrete delta-shaped pier were designed and incorporated into the structure (Fig. 1).

The bridge has a constant slope of 2,5% in the vertical alignment, whereas the plan view shows that the spans lie inside a 3100-m radius with leftward circular alignment, followed by two clothoid alignments, and ending with a 2200-m radius rightward circular alignment.

The deck houses a double-track railway platform containing 10,10-m width of ballast, service sidewalks, and several devices for the installation of the railway at both sides, resulting in a total deck width of 14 m, that is normal in the high-speed Spanish railways.[1]

Two section types are present in the bridge: a post-tensioned concrete box girder and a steel–concrete composite box-girder, both with a constant depth of 3,40 m. Both sections are continuous throughout the entire viaduct (Fig. 2).

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