

Structural analysis of a historical masonry arch railway bridge in Gata de Gorgos, using a generic finite element analysis software

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Abstract

The rehabilitation and deck widening of the masonry viaduct over the river Gorgos, built on 1913, is included in the renewal of the historical Alicante railway net. The primary aim of the rehabilitation work was to repair the bridge's deficiencies caused by the deterioration of the structure, upgrade its capacity to resist the loads included in modern codes and fulfil the railway safety requirements defined by the owner. A bidimensional FE model was carried out in order to assess the structural behaviour of the viaduct, confirming that no global failure occur under the current design loads.

Keywords: viaduct, arch, masonry, railway, rehabilitation, widening, FEM

1 Introduction

During the last five years, several projects have been developed to the renewal of the historical Spanish railway net in Alicante province. These lines, which were constructed at the beginning of the twentieth century, are now owned by FGV (Ferrocarrils de la Generalitat Valenciana), the Regional Railway Department. Most of the projects have been already completed, and it is expected that the whole renewal of the line is finished on the early ages of the next decades. One of the latest sections to be renewed is located between the towns of Teulada and Gata de Gorgos. At the end of this section, the Viaduct over the river Gorgos is located.

This viaduct, a set of masonry arches designed by the mining engineer José Carbonell and completed in 1913, is divided in four approach spans composed of 10-meter rounded arches and the section over the river itself, composed of two 20-meter rounded arches flanked by 8-meter rounded vaults. The whole length of the viaduct, considering

the abutments and the retaining walls, is around 165 m. See elevation of the viaduct at fig. 1.



Figure 1. Elevation of the viaduct over river Gorgos in the middle XX's (left) and nowadays (right)

The primary aim of the rehabilitation work was to repair the bridge's deficiencies caused by the deterioration of the structure, upgrade its capacity to resist the loads included in modern codes and fulfil the railway safety requirements defined by FGV, by widening the existing deck.