

Seismic Assessment and Retrofit of the Caronte Viaduct (A55 Highway, Martigues)

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Abstract

Because of advanced disorders, the Caronte emblematic viaduct of Martigues in the South of France (A55 Highway) was submitted to a repair and strengthening operation, which also included seismic assessment and retrofit. After having compared different possible seismic retrofitting strategies, the performed studies led to a solution consisting in replacing and softening the bearing system of the bridge, adding lateral shear keys at each abutment and pier and installing high capacity prestressed seismic dampers in the longitudinal direction at each abutment. Specific geotechnical tests were also carried out that enabled to avert soil liquefaction hazard on this very sensitive site. The proposed solution leads to justify a level of performance close to 70% of what is required for new bridges according to current French seismic rules, for an estimated cost of about 15% of the global repair cost and a repair to rebuild ratio barely higher than 1%.

Keywords: viaduct; seismic assessment; time-history analysis; soil liquefaction; seismic retrofitting; antiseismic devices.

1 Introduction

The Caronte emblematic viaduct of Martigues (Figure 1) enables the A55 Highway to cross the canal joining the Berre Bay and Mediterranean Sea in the South of France (Figure 2). It is composed of a main 300 meters steel strut frame bridge and four prestressed concrete access viaducts of about 300 meters each.

The viaduct was design between 1967 and 1968 and its construction ended in 1972. At this period protection against seismic actions was achieved through applying ancient French seismic rules PS69 [1], which results in far lower seismic performance compared to what is nowadays required by Eurocode 8 [2] [3] [4] and new national seismic rules prescriptions [5] [6] [7]. Moreover seismic dynamic blockers that were

initially installed between the different parts of the structures suffered early damage under service live loads.



Figure 1. Caronte Viaduct general view