Repair project of a vehicular bridge damaged during the 2017 Puebla-Morelos earthquake: seismic evaluation

David Cervantes, Hector Guerrero, J. Alberto Escobar, Roberto Gómez

Institute of Engineering, UNAM, México City, México

Contact: RGomezM@iingen.unam.mx

Abstract

This paper shows the results of nonlinear analyses, static and dynamic, conducted on a vehicular bridge located in Mexico City. The main characteristics of the developed numerical model and the results of the analysis, in terms of capacity curves, global and by element, are presented. Two repair cases were studied. The first one considers seismic restrainers, located at the bridge abutments, which can effectively limit the lateral movements. The second case considers reduced lateral restriction. The results show that the former case provides an adequate safety factor for the bridge, while the latter resulted in a marginal safety factor.

Keywords: Bridge seismic evaluation; structural health monitoring, seismic behaviour; nonlinear analysis.

1 Introduction

As a consequence of the M7.1 Puebla-Morelos Earthquake, which occurred in Mexico on September 19, 2017, some activities were developed to evaluate the performance of some constructions that are part of the infrastructure of Mexico City. This is the case of a vehicular bridge located in one of the main communication roads in the eastern part of the city, a 7 km long urban toll road made up of bridges, tunnels, junctions, elevated viaducts and surface roads; this toll road was open to traffic in 2013. Figure 1 shows a photograph of the bridge studied.

In spite of some minor damage produced in the bridge during the earthquake, a review of its structural capacity using the new seismic design criteria of Mexico City, was carried out [7]. It was necessary to develop representative numerical models and evaluate the congruence of their results, as well as with information obtained experimentally through field tests. Furthermore, non-linear analysis, static and dynamic, were conducted as a useful tool to understand better the behavior of the bridge under future possible seismic scenarios.

Figure 1. *Vehicular bridge*

https://doi.org/10.2749/ghent.2021.1437
Distributed by structurae