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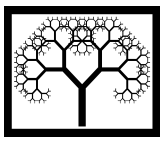

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Strong Ground Motion Variability Effects in the Seismic Response of an Urban Bridge Design

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Abstract

Strong ground motion variability due to rapid changes in subsoil conditions must be assessed when designing linear structures such as strategic bridges. This paper presents the results of a numerical study conducted using a 2-D finite difference model of a section of an overpass, including both the structure comprised by seven supports and the free field, using the program FLAC. The response of the free field was calibrated comparing the results obtained with FLAC, with those obtained with QUAD4M, using equivalent linear properties. Relative displacements of each support were obtained to assess the overall performance of the structure during the design earthquake.

Keywords: soil-structure interaction, seismic, incoherence, soil response, bridge performance.

1 Introduction

Designing linear structures, such as bridges, overpasses or pipelines, requires evaluating the ground motion variability effects in order to quantify the relative displacements of the columns, in both longitudinal and transverse direction and avoid collapse. The dynamic response of a structure during earthquakes depends mostly on the input motion, material properties, geometries of the structure and its foundation, and local site conditions. Since the 1985 Michoacán earthquake, awareness concerning to the seismic response of building and bridges in Mexico City increased. Due to this large subduction zone event (M_w = 8.1) unprecedented damages were caused. Seismic design recommendations were revised and the Mexico City building code [1] was updated. Recently, the 2010 M_w = 8.8 Maule-Chile earthquake occurred. This major seismic event was large enough to cause both transversal and longitudinal damages on bridges as depicted in Figure 1.