ASSESSMENT OF THE LATERAL DISPLACEMENT CAPACITY OF PIERS OF REINFORCED CONCRETE BRIDGES

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ABSTRACT

Empirical expressions for the calculation of the lateral displacement capacity of reinforced concrete piers, obtained from a parametrically defined bridges family are proposed. These expressions are the result of evaluating the seismic response of continuous reinforced concrete bridges by the non-linear static analysis (Pushover). The characteristics of the family of bridges belong to continuous bridges of three spans with two intermediate piers, composed of columns of the circular cross-section of reinforced concrete. The interest parameters considered were: height of the columns and the vertical and horizontal steel reinforcement ratio of the columns. Complex three-dimensional models were performed, using area elements in the superstructure and bar elements in the infrastructure, with a non-monolithic connection between them. The piers were fixed at the base. Also, it was considered lateral restraints in the abutments and seismic control devices in the intermediate piers that restrict the transverse and longitudinal movement of the bridge superstructure during an important seismic event. From the analysis of the results, it was found that the lateral displacement capacity of the bridge for a certain level of axial load acting on the columns depends mainly on the height instead of the period of vibration of the bridge. Finally, it was observed that the error obtained evaluating the lateral displacements using the empirical expressions did not exceed 10%, which is considered acceptable.

Keywords: Bridges, Performance-based design, Pushover, Seismic design, Displacement capacity.