



Preliminary Estimation of Seismic Vulnerability of a Database of Bridges Located at the Mexican Pacific Coast

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Summary

The Mexican Secretary for Communications and Transports (SCT) periodically applies an evaluation procedure to define maintenance politics of highway bridges, named SIPUMEX. This is a very general method which does not consider some important parameters needed to characterize the seismic behavior in bridges. A modification of the SIPUMEX process is presented in this paper, considering the addition of new evaluation parameters, based on the results of surveys made with Mexican experts in this theme, or by eliminating some parameters used in the original methodology that do not provide information about the bridges seismic vulnerability. The proposed procedure was applied to a database of 79 highway bridges located next to the Mexican Pacific Coast. The obtained results were compared with the ones calculated with a procedure available in the literature.

Keywords: Bridge seismic behavior; seismic vulnerability; maintenance procedure; RC bridges; preliminary evaluations.

1. Introduction

Bridges are essential facilities in the highway systems, thus its correct and continued behavior is an important aspect, specially after a mayor earthquake. The bridge collapse or its bad performance could cause vehicular jamming, interruption of diverse economical activities, human lives decease, or important economic lost. Because of these aspects, the maintenance procedures of bridges are a topic considered in many researches in the last years.

The necessity of adequate maintenance and rehabilitation procedures was evident after the Northridge (1994) and Kobe (1995) earthquakes. Due to the action of these earthquakes, between 3% and 5% of the affected bridges suffer some degree of damage. In addition, the partial and total collapse of some structures produce direct and indirect millionaire economic lost [1, 2, 3, and 4]. Some of the failures reported after these earthquakes were due to seismic resistant erroneous configurations, deficiencies of design codes and structures with reduced capacity. With periodic and reliable maintenance procedures, these possible failures can be detected before earthquakes and strategies to reduce damage and economic lost could be defined.

The maintenance or rehabilitation procedures of bridges consider three principal aspects: (1) preliminary evaluations, (2) detailed evaluations, and (3) definition of the actions to be realized. The objective of the preliminary evaluation is to detect, between a numerous group of systems, the structures with important reduction of its capacity. In the detailed or secondary evaluation, meticulous analyses are realized to define the degradation degree of the elements characterized in the preliminary evaluation. With the information defined in the above steps, decision tools are available to propose specific maintenance, rehabilitation or reposition procedures.