

Development of Fragility Curves for Karachi Bridges

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Bridges are essential part of a road network as they connect areas separated by water, human and/or geological obstructions. The performance of the road network during a major natural calamity such as an earthquake becomes more critical due to the relief operations and rehabilitation activities but also showcases the country's development, economic strength and technological advancements. Owing to this essential nature, bridges are regarded as lifeline structures.

Collapse and severe damages to the bridges and the seismic performance of bridges in the past earthquakes around the world, reveals that the bridges in the roadway network are quite vulnerable. Therefore, a seismic risk evaluation system is needed for the estimation of seismic vulnerability of existing bridges. The seismic risk assessment of bridge network systems for Pakistan is relatively new, and only a few studies have been conducted to address it. As a widely practiced approach, the vulnerability information is expressed in the form of fragility curve to account for a multitude of uncertain sources involved.

This proposed research will develop fragility curves for bridges in Karachi which in turn will help in prioritizing bridge retrofits and post-earthquake emergency responses.

Objectives and Scope

The objective of the study is to develop fragility curves, an assessing tool for the seismic vulnerability of highway bridges of Karachi. Moreover, the proposed method can also be adopted or modified for other cities of Pakistan. The specific objectives of this study can be identified as follows:

1. Development of Bridge Inspection System.
2. Development of Bridge Inventory for Database Management System (Figure 1).
3. Development of GIS based Information for Bridge Inventory System.
4. Evaluation of sampled bridges for current Condition Assessment.
5. Evaluate the Maintenance Urgency indices for sampled bridges.
6. Obtain the damage indices of the structure in each excitation level using damage state.
7. Construction of the fragility curves (Figure 2).



Figure 1: Bridge Database Management System

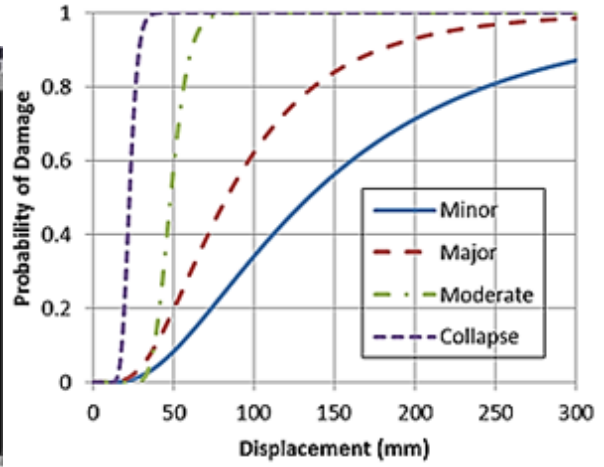


Figure 2: Example of fragility curves for a bridge