Seismic Vulnerability Assessment and Loss Estimation for Concrete Structures

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This talk will discuss about a methodology to assess seismic vulnerability of concrete structures and to estimate direct losses related to structural damage due to future seismic event. This study contains several important components including development of more detailed demand models to enhance accuracy of fragility relationships and development of a damage in the Mid-America region where a substantial seismic risk exists with potential high intensity earthquakes in this geographic region.

The most common types of concrete structures in this area are identified based on the building inventory data and reinforced concrete (RC) frame buildings and tilt-up concrete buildings are selected as case study buildings for further analysis.

Using synthetic ground motion records, the structural Behavior of the representative case study buildings is analyzed through nonlinear time history analyses.

The seismic performance of the case study buildings is evaluated to describe the structural behavior under ground motions. Using more detailed demand models and the corresponding capacity limits, analytical fragility curves are developed based on appropriate failure mechanisms for different structural parameters including different RC frame building heights and different aspect ratios for tilt-up concrete structures.

A probabilistic methodology is used to estimate the seismic vulnerability of the case study buildings reflecting the uncertainties in the structural demand and capacity, analytical modeling, and the information used for structural loss estimation. To estimate structural losses, a set of damage states and the corresponding probabilistic framework to map the fragility and the damage state are proposed. Finally, scenario-based assessments are conducted to demonstrate the proposed methodology. Results show that the proposed methodology is successful to evaluate seismic vulnerability of concrete structures and effective in quantifying the uncertainties in the loss estimation process.

School of Urban & Environmental Engineering

- **When :** 2019.09.26. (Thu) 16:00
- **Where:** Bldg.110 (EB4), Room.1007
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