Research Project Highlight

Caltrans-PEER Workshop on Characterizing Uncertainty in Bridge-Component Capacity Limit-States

Project Lifelines Task 2

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Start-End Dates:
4/1/2017 - 12/31/2018

Abstract
The goal of the workshop is to leverage and extend an ongoing Caltrans-funded project on developing component capacity limit state (CCLS) models for performance-critical bridge columns. The emphasis will be on the synthesis, discussion, refinement, and publication of expert opinions focused on characterizing uncertainty in the full distribution of Engineering Demand Parameter (EDP) values (e.g. 10th, 50th, 90th percentile) which may be assigned to CCLS models. The workshop aims to use data from expert opinions to capture quantitative CCLS uncertainty for a range of component designs (e.g. brittle, strength-degrading, and ductile columns having both regular and wide sections) over a range of damage states. It will also qualitatively explore possible additional factors (e.g. scale and shape effects) which may influence CCLS-value selections.

Deliverables/Milestones
Tasks/milestones for this project include: synthesizing available experimental data on column testing; development of an initial survey to solicit expert opinions; organize and conduct the workshop; revise the survey based on input from panelists at the workshop; publish final findings as an online report. The workshop will provide a forum to discuss the issue of developing CCLS models and to enable development of consensus opinions on the CCLS model values as a benchmark for consideration in comparable studies.

Research Impact
The broad topic of seismic fragility-model development is an active research pursuit with contributions involving various methodologies, scales and applications. However, no current work or documented references is available which systematically capture community perspectives regarding optimal CCLS models or the uncertainty associated with differing perspectives. Thus, the proposed survey and workshop documentation is expected to serve as a central community resource. In terms of downstream application, there is growing adoption of the ShakeCast platform as a primary means for implementing

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organization-specific earthquake-damage alerting and loss estimation strategies for both live emergency situations and for pre-event planning. Multiple state DOT's have already adopted ShakeCast and others are committing to a Transportation Pooled Fund project (http://www.pooledfund.org/Details/Solicitation/1406). Fragility models developed for state DOT's may vary due to differences in the composition of the local bridge inventory, thus affecting the PSDM's for local classes. However, establishing a benchmark framework for characterizing uncertainty in CCLS models will serve each of these model-development efforts.

The results of the workshop will have both immediate and long-term impact on practice. Immediately, the expert views and consensus results will be used as guidance for the specification of CCLS models being incorporated into Caltrans emerging fragility models to be deployed within ShakeCast. Over the longer term, workshop documentation will serve as a benchmark of expert views that can be referenced in comparable studies and used to characterize and communicate this critical source of fragility-model uncertainty.

Project Images
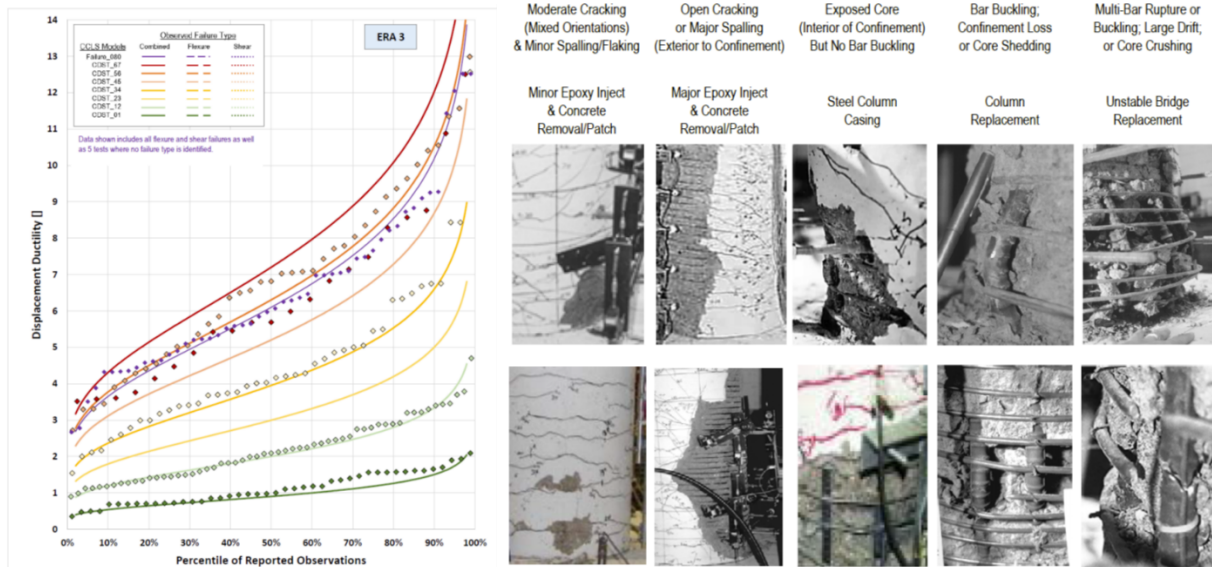
(a) Sample CCLS model for one class   (b) Visual representation of damage states