Research Project Highlight

Statistical Variation of Seismic Damage Index (DI) of California Bridges

PEER-Bridge TO3

Principal Investigator
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Start-End Dates:
2/1/2021-2/28/2023

Abstract
Practical implementation of the Probabilistic Damage Control Approach (PDCA) method for designing Ordinary Standard Bridges (OSBs) requires additional data and execution guidelines ranging from a realistic method for representing ground motion hazards to reliability-based seismic design guidelines for proportioning bridge components. In line with these needs, this research project will quantify the variability in nonlinear structural response and its variation to bridge geometry and/or regional factors and establish the level of variability necessary for the practical implementation of the PDCA method by bridge engineers. In addition, the project provides a critical evaluation of the currently available column fragility curves and addresses the peculiarities in demand and capacity estimation in the near-fault regime. The research work is conducted with close interaction between Caltrans bridge engineers to assure deliverables are applied and ready for deployment to the design floor.

Deliverables
We will deliver a PEER report and several conference and journal papers describing the research accomplishments made in this project. Namely, we provide a contour map of nonlinear structural response variation in California and detail examples and auxiliary tools for implementing PDCA for the design and assessment of OSBs in California.

Research Impact
The main impact of this research project is to streamline the implementation of the Probabilistic Damage Control Approach (PDCA) method for the design of Ordinary Standard Bridges (OSBs). Implementing PDCA has been a goal of Caltrans for several years since bridges designed by this method can be expected to have a uniform seismic performance regardless of where they are built. Uniform seismic performance will enhance transportation network reliability and reduce overall costs. In addition, the project will resolve one of the most pressing endeavors herein, quantifying variability in nonlinear structural response and determining whether the level of variability is influenced by bridge geometry and/or regional factors. Establishing the level of variability in seismic demand, practical methods for its

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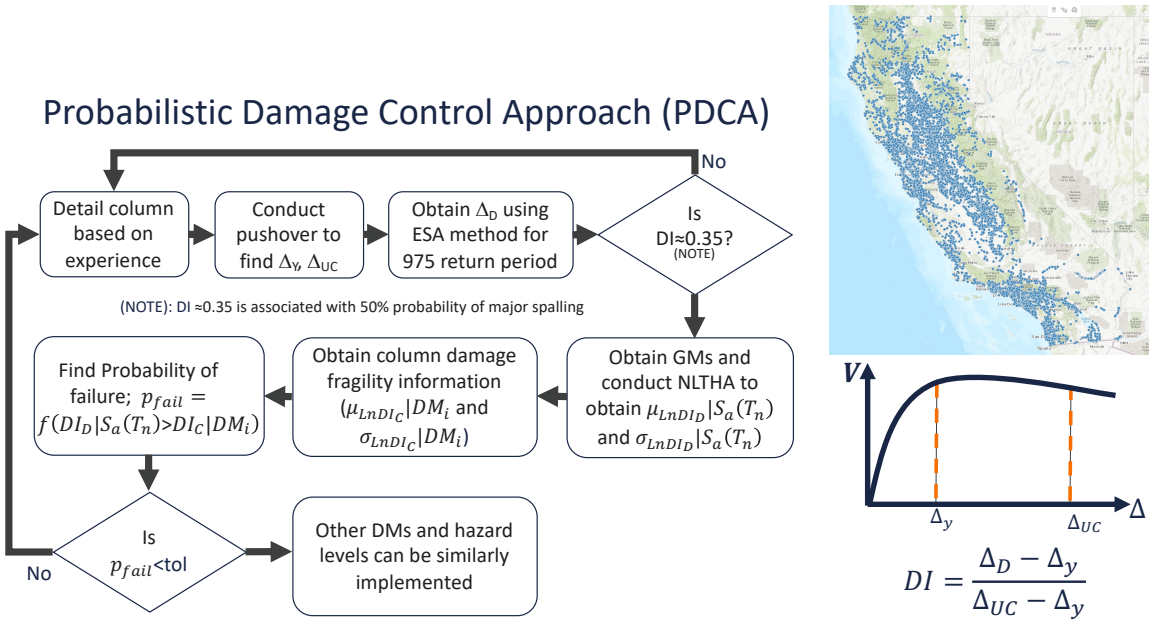
estimation, and providing input on how to handle peculiarities in demand and capacity estimation in the near-fault regime are among the main research impacts of the project and necessary for the practical implementation of the PDCA method on the design floor.

Project Image



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