

# DRISI

CALTRANS DIVISION OF RESEARCH,  
INNOVATION AND SYSTEM INFORMATION

# Research Notes

Geotechnical/  
Structures

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Project Title:  
Development of Performance-  
Based Multihazard Engineering  
(PBME) Framework with Inclusion  
of Climate Change and Bridge  
Vulnerability

Task Number: 4421

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Task Manager:  
TM Liao  
Senior TE  
David.liao@dot.ca.gov

## Development of Performance-Based Multihazard Engineering (PBME) Framework with Inclusion of Climate Change and Bridge Vulnerability

This research will develop a general Performance-Based Multihazard Engineering (PBME) framework that can be used for any combination of single and/or multiple hazards

### WHAT IS THE NEED?

This research will develop a general PBME approach that can account for climate change and structural aging effects. The newly developed conceptual framework will be specialized for analysis and design of new and existing bridges subject to seismic and scour hazards.

### WHAT ARE WE DOING?

The specific tasks of this research are:

1. Formulation of a new theoretical framework for PBME: The project team will conduct a literature survey to identify the previous research on this topic, with special attention to performance-based engineering approaches to scour and to climate change effects. The project team will develop the theoretical framework for PBME and write a report including the literature review and general methodology.
2. Implementation of the PBME framework for seismic and scour risk analysis: Existing tools for seismic risk analysis and for bridge scour analysis will be identified. Research and data gaps will also be identified. The project team will develop a testing plan using the flume to experimentally assess the scour changes after floods.
3. Investigation of the interaction between seismic and scour hazards: Using numerical modeling in conjunction with the results of the experimental testing to investigate and quantify the influence of the interaction between seismic and scour hazards on the structural performance of bridges.



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California's transportation system



## WHAT IS OUR GOAL?

The main objective of this research is to develop a general Performance-Based Multihazard Engineering (PBME) framework that can be used for any combination of single and/or multiple hazards. A secondary objective is to perform the groundwork necessary to extend PBME and account for the nonstationarity induced by climate change and structural aging.

## WHAT IS THE BENEFIT?

This research will benefit from existing literature on performance-based flood risk analysis (PBFRA) for bridges subject to scour hazard. The newly developed conceptual framework will be specialized for analysis and design of new and existing bridges subject to seismic and scour hazards.

## WHAT IS THE PROGRESS TO DATE?

Contract started April 2024