



Caltrans Division of Research,
Innovation and System Information

Research

Notes

Geotechnical/
Structures

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Project Title:
Earthquake Ground Motion
Hazard Characterization

Task Number: 2784

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Completion Date: January 31, 2018

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Characterizing Earthquake Hazards in California with Pacific Earthquake Engineering Research Center (PEER)

Pacific Earthquake Engineering Research Center (PEER) - Lifelines partnership 3. A partnership of government agencies and private companies focused on common interest research to better characterize earthquake hazard in California.

WHAT IS THE NEED?

California, located at the margin of the Pacific and North American tectonic plates, is the most seismically active region in the US. The potential for strong shaking varies widely throughout the state, however. Some regions are only moderately threatened while large population centers along the coast face potentially severe shaking.

Past earthquakes have shown that earthquake ground motion is highly variable, even when controlling for distance from the epicenter. Improving our ability to predict ground motion, particularly high levels of motion, allows seismic mitigation spending to be better targeted on the most vulnerable locations.

WHAT ARE WE DOING?

A common-interest earthquake research partnership was created that aims to better predict earthquake ground motion, liquefaction, and ground deformation. Projects were created in a range of topic areas including ground motion estimation, liquefaction, structural analysis, and tsunami hazard.

WHAT IS OUR GOAL?

The primary objective is to develop practical engineering models, methods, design tools, and guidelines that better identify potential hazards and how to mitigate them.

WHAT IS THE BENEFIT?

New or improved design methods and tools were developed that help bridge the gap between best science and practical engineering. The cost of performing this research is shared with other Lifelines providers as we have a



DRISI provides solutions and knowledge that improves California's transportation system

mutual interest in better understanding seismic hazards. The net benefit to California is more reliable infrastructure and cost effective seismic mitigation.

WHAT IS THE PROGRESS TO DATE?

The program will begin November 1, 2014. Numerous tasks have been identified in the topic areas of Ground Motion Prediction, Fault Rupture Hazard, Liquefaction, Tsunami Hazard, and Bridge Vulnerability Assessment. These tasks include the following:

- Develop near-fault adjustment factors
- Update model for generation of synthetic near fault records
- Develop guidance for application of basin amplification models to low hazard levels
- Develop a Ground Motion Prediction Equation (GMPE) for application to subduction earthquakes
- Develop topographic adjustment factors applicable to NGA W2 GMPE's
- Develop empirical model of vertical - horizontal fault displacement ratio for strike slip faults
- Develop estimate of modeling uncertainty for maximum wave height and flow velocity for on-shore wave propagation
- Develop a ground displacement model for slopes underlain by liquefiable deposits.
- Evaluation of the seismic vulnerability of short (100 to 300 feet) non-ductile highway bridges.

Detailed work plans for each task will be developed as part of a PEER administered Request for Proposal process.