

Final Project Summary — PEER Lifelines Program

Project Title—ID Number	<i>Feasibility for Large-Scale Testing of Electrical Equipment—410</i>		
Start/End Dates	5/1/00 – 12/31/01	Budget/ Funding Source	\$49,655 / PG&E/CEC
Project Leader (boldface) and Other Team Members	Nigbor (USC)		

1. Project goals and objectives

The objective of this project was to quantitatively compare available methods for large-scale seismic fragility testing of electrical substation components: shake tables, NETi, and mine blasts.

2. Benefits of the results of this project to develop technologies and protocols to mitigate the vulnerability of electric systems and other lifelines to damage directly and indirectly caused by earthquakes. Also, benefits to develop assessment techniques to evaluate damage to electric systems caused by earthquakes and to assess fiscal impacts due to the loss of electric service to the community.

Results of this project will allow more informed specification of large-scale seismic testing methods by researchers studying electric system vulnerability and risk.

3. Brief description of the accomplishments of the project

Real and simulated data from generic and specific seismic testing facilities were assembled and then analyzed uniformly to allow quantitative comparison of the strengths and weaknesses of each method. Unique to this study was the assessment of the NETI facility and large mine blasts for seismic fragility testing.

4. Describe any instances where you are aware that your results have been used in industry

Preliminary results were used by Kajima Corporation to develop large-scale seismic testing for shallow pile foundations for nuclear waste storage in Japan.

5. Methodology employed

A suite of ground motion time histories from various testing methods were passed through standardized linear and nonlinear dynamic analyses, including

6. Other related work conducted within and/or outside PEER

The PI has been using mine blasts to study fragility of nuclear power plant structures in collaboration with researchers in Japan.

7. Recommendations for the future work: what do you think should be done next?

Results of this study are and will be used to select appropriate methods for large-scale seismic testing. No further work is needed on this evaluation study.

8. Author(s), Title, and Date for the final report for this project

Robert L. Nigbor and Elena Kallinikidou, EVALUATION OF LARGE SCALE SEISMIC TESTING METHODS FOR ELECTRICAL SUBSTATION SYSTEMS PEER Lifelines Project 410, Draft submitted May 22, 2002, final report October 12, 2004.

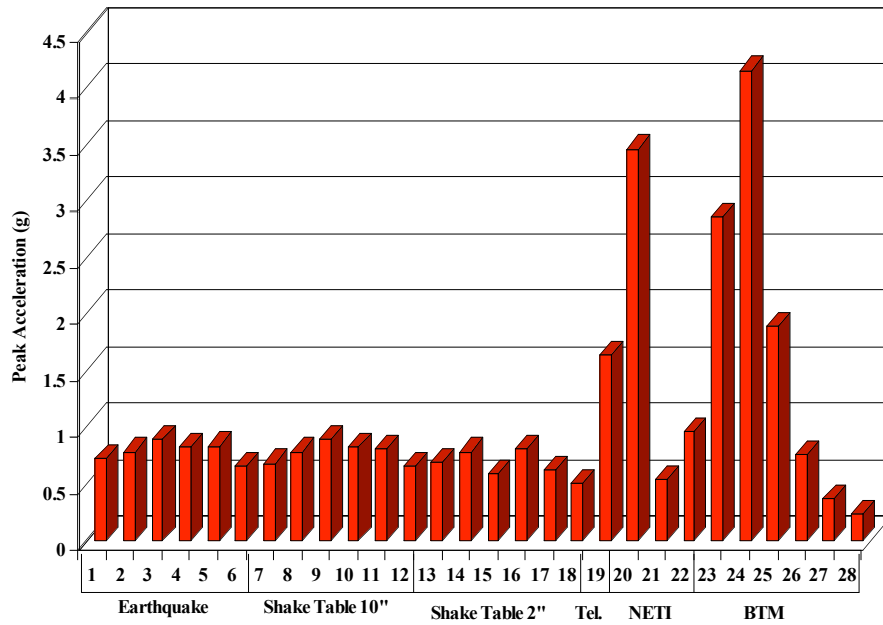


Figure 3-7 Peak acceleration values for the record ensemble

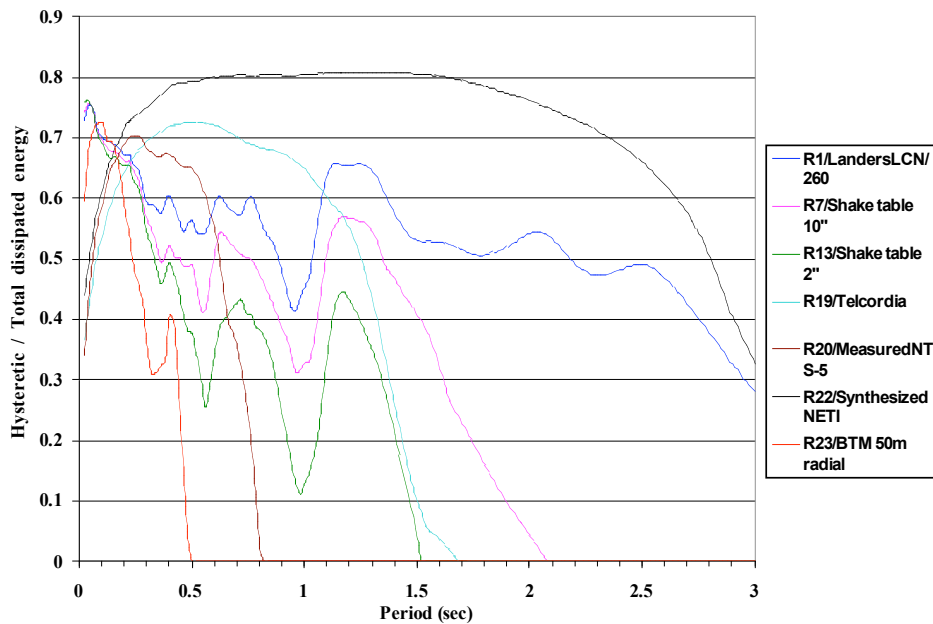


Figure 3-28 Ratio of the hysteretic energy over total dissipated energy at the end of the excitation for a selective group of records.