Appendix I
Phase I Research Projects

The following 25 research projects were carried out during the initial phase of the PG&E/PEER Research Program in 1997 and 1998. The projects are listed by topic. Topic numbers and headings in the main report now follow the new naming and numbering format listed in Table 1.

Principal Investigator	Project Description
TOPIC 1: BUILDING VULNERABILITY	
W. Iwan, California Institute of Technology	Examine methods for estimating maximum displacement with an emphasis on high-velocity pulses from near source ground motions. Provided recommendations for estimating maximum displacement during an earthquake.
C.W. Roeder, University of Washington	Develop a simplified model for out-of-plane behavior of concrete infill panels on substation buildings; examine performance of mill-type buildings to near source ground motions. Provide a simplified model that can be used in retrofit design.
J. Wallace, UC Los Angeles	Study mill-type substation buildings, focusing on three-dimensional behavior and soil structure interaction. Provide recommendations on modeling for retrofit and guidance on effects of soil-structure interaction for short-period buildings.
J. Hall, California Institute of Technology	Conduct detailed nonlinear analysis of tilt-up buildings with flexible timber roof diaphragms. Assess the deformation demands on the diaphragm and anchorages.
G. Pardoen, UC San Diego	Perform laboratory testing of timber diaphragm roof components. Develop database of cyclic force versus deformation relationship for retrofit design.
TOPIC 2: SUBSTATION VULNERABILITY	
P. Somerville, Woodward-Clyde Federal Services	Develop ground motion estimates at substation locations for historical earthquakes. Information used for developing equipment fragility relationships.
T. Anagnos, San Jose State University	Develop equipment fragility relationships from historical data on damage and ground motion estimates using statistical techniques.
A. Der Kiureghian, UC Berkeley	Improve methodology for equipment fragility based on Bayesian statistics. Used to integrate observed and model data in fragility models.
A. Der Kiureghian, UC Berkeley	Develop new methodology for accounting for dynamic interaction between interconnected substation equipment. Provide design guidance on amplification factors due to interaction.
N. Makris, UC Berkeley	Identify overturning potential of large electrical equipment due to large velocity pulse near-source ground motion.
G. Fenves, UC Berkeley	Perform shaking table testing of porcelain transformer bushing to determine qualification and fragility. Model identified major modes of deformation and failure.
G. Fenves, UC Berkeley	Perform shaking table testing of disconnect switches to determine qualification and fragility. Model identified major modes of deformation and failure.

Principal Investigator	Project Description
TOPIC 3: CHARACTERIZATION OF SITE RESPONSE	
J. Bray, UC Berkeley	Improve site classification scheme based on engineering properties of soil to represent site response effects.
Y. Zeng, University of Nevada, Reno	Develop simplified categories for basin effects using ray-tracing procedures.
I.M. Idriss, UC Davis	Develop alternative classification scheme for geotechnical classification of soils for site response.
S. Chang, University Washington	Analyze whether variability of ground motion is due to site response or source mechanisms.
S. Glaser, UC Berkeley	Evaluate use of downhole arrays to characterize site response effects.
TOPIC 4: EARTHQUAKE-INDUCED GROUND DEFORMATION AND FAILURE	
R. Seed, UC Berkeley	Develop probabilistic procedure for predicting onset of liquefaction.
J-P Bardet, University of Southern California	Create GIS database of liquefaction and ground deformation measurements from past earthquakes.
N. Sitar, UC Berkeley	Develop new methods for probabilistic assessment of landslide potential in natural slopes.
J. Stewart, UC Los Angeles	Develop ground deformation estimates at boundary between fills and natural soil based on measurements in past earthquakes.
TOPIC 5: GAS AND ELECTRIC FIRES FOLLOWING EARTHQUAKES	
R. Williamson, UC Berkeley	Identify ignition sources for fires after earthquakes and examine role of natural gas service as a cause.
TOPIC 6: STRONG GROUND MOTION DATA SET	
W. Silva, Pacific Engineering and Analysis	Develop database of strong ground motion records using consistent processing procedures.
Y. Zeng, University of Nevada, Reno	Recover strong motion data from reverse fault earthquake in China.
TOPIC 7: COOPERATIVE EARTHQUAKE RESEARCH AT SOUTHERN CALIFORNIA EARTHQUAKE CENTER	
T. Henyey, University of Southern California	Develop improved simulation models for strong ground motion; improve hazard estimate of San Andreas fault and faults in Eastern California Shear Zone; expand ROSRINE program for characterizing recording sites of Northridge earthquake strong motions
MANAGEMENT	
J. Moehle & G. Fenves, UC Berkeley	Manage PEER contract for research program through the JMC, coordination meetings, workshops, and project administration.