

Full-Scale Structural and Nonstructural Building System Performance during Earthquakes & Post-Earthquake Fire

A Joint Venture between Academe, Industry and Government

Motivation: To date, only a handful of full-scale building experiments have been conducted. Of these, none have evaluated the post-earthquake fire performance of the complete building system and only select (in Japan) have they emphasized evaluating nonstructural component and system (NCS) response during earthquake shaking. This belies the fact that NCSs encompass more than 80% of the total investment in building construction and over the past three decades, the majority of earthquake-induced direct losses in buildings are directly attributed to NCS damage.



Project Scope: This landmark project involves earthquake and post-earthquake fire testing of a five-story building built at full-scale and completely furnished with NCSs, including a functioning passenger elevator, partition walls, cladding and glazing systems, piping, HVAC, ceiling, sprinklers, building contents, as well as passive and active fire systems. The NEES-UCSD and NEES-UCLA equipment sites combine to realize this unique opportunity and hence advance our understanding of the full-scale dynamic response and kinematic interaction of complex structural and nonstructural components and systems. Post-earthquake fire and life safety performance of both the structure and NCSs will be evaluated by conducting non-thermal and live fire testing. In addition, this project will investigate the potential for protecting critical NCS systems using, for example, damping and/or isolation methods. Finally, data from this unique experiment will be used to compare with earthquake performance predictions using available commercial and research computational modeling platforms. Findings from these efforts will be immediately translated to practice.

Project Participants: Core team academic leadership for the project is provided by the University of California San Diego, Howard University, San Diego State University and Worcester Polytechnic Institute. An industry steering committee (ISC) provides technical expertise as well as financial (in-kind, materials, cash) support. An academic/international liaison group (AILG) provides technical perspective and guidance. Finally, technology transfer will be supported by a leading group of engineering regulatory advisors (ERAC). Financial support for the project is provided from the combined contributions of the National Science Foundation and ISC member entities.

