



# Performance of Buildings and Nonstructural Components in the 2014 South Napa Earthquake

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## **Notice**

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# Preface

California is subject to frequent damaging earthquakes, and each one presents an opportunity to study the impacts, improve our understanding of how buildings perform when subjected to strong ground shaking, and update building codes and standards for improved building performance. The Federal Emergency Management Agency (FEMA) established the Mitigation Assessment Team (MAT) program to investigate post-disaster building performance and develop recommendations that address improvements in building design and construction, code development, enforcement, and mitigation activities that will lead to greater resistance to hazard events. The FEMA MAT program, however, is not currently set up to investigate the performance of buildings after earthquakes.

On August 24, 2014, a magnitude-6.0 earthquake occurred in Napa, California. In response to this earthquake, the Special Projects task of the National Earthquake Technical Assistance Program (NETAP) under FEMA Contract HSFE60-12-D-024 with the Applied Technology Council (ATC) was used to fund an investigation. At the time, this event had not yet been declared a federal disaster, and disaster funds were therefore not available. Because of limitations to this funding, some issues, such as performance of lifelines or building investigations in additional areas, could not be investigated.

Past earthquakes in California have resulted in significant improvements to national and local building codes, including the 1933 Long Beach earthquake (which affected schools and unreinforced masonry structures), the 1971 San Fernando earthquake (which affected hospitals and non-ductile concrete structures), the 1989 Loma Prieta earthquake (which affected soft story wood light-frame construction), and the 1994 Northridge earthquake (which affected steel moment frame structures). For the 2014 South Napa earthquake, work was focused on documenting the observed performance of buildings and nonstructural components in order to lead into future improvements in future building codes, and to do so within six months.

ATC is indebted to the vision of Michael Mahoney (FEMA Project Officer), and leadership of John Gillengerten and Maryann Phipps who served as Co-Project Technical Directors and principal authors for this work. Contributing

authors Kelly Cobeen, Bret Lizundia, Joseph Maffei, Joshua Marrow, and Bill Tremayne assisted in the development of postearthquake observations and conclusions. Veronica Crothers, Sarah Durphy, Jonas Houston, Alix Kottke, Chiara McKenney, Karl Telleen, and Noelle Yuen were instrumental in the completion of field investigative work within the limited time available. The Project Review Panel, consisting of Dan Kavarian, Roy Lobo, Khalid Mosalam, Marko Schotanus, and Fred Turner, provided technical review of the report. The names and affiliations of all who participated on the project team are provided in the list of Project Participants at the end of this publication.

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