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Seismic Analysis, Design, and Installation of Nonstructural Components and Systems – Background and Recommendations for Future Work

Applied Technology Council

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Cover image – Top: Attachment failure of hung architectural, mechanical, electrical and plumbing systems within the Santiago airport terminal in the 2010 Chile earthquake (Photo Credit: Eduardo Miranda, Stanford University). Middle: Failure of compressor mounted on vibration isolators in the 1994 Northridge earthquake (Photo Credit: Wiss, Janney, Elstner Associates). Bottom: Severe damage to exterior curtain wall in the 2014 South Napa earthquake (Photo Credit: Maryann Phipps, Estructure).

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U.S. Department of Commerce
Engineering Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899

By
Applied Technology Council
201 Redwood Shores Parkway, Suite 240
Redwood City, CA 94065

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U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
Kent Rochford, Acting NIST Director and Under Secretary of Commerce for Standards and Technology

Participants

National Institute of Standards and Technology

Steven L. McCabe (Program Manager)
Matthew Hoehler (Project Manager and Technical Point of Contact)
Earthquake Engineering Group
Materials and Structural Systems Division, Engineering Laboratory
www.NEHRP.gov

Applied Technology Council

201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065
www.ATCouncil.org

Program Management

Jon A. Heintz (Program Manager)
Scott D. Schiff (Project Manager)

Program Committee on Seismic Engineering

Jon A. Heintz (Chair)
Michael Cochran
James R. Harris
James Jirsa
Roberto Leon
Stephen Mahin
James O. Malley
Donald Scott
Andrew Whittaker

Project Technical Committee

Maryann Phipps (Project Director)
Saeed Fathali
John Gillengerten
Tara Hutchinson
Ricardo Medina

Technical Contributors

William T. Holmes
Robert Pekelnicky
Roy Lobo
John Silva

Project Review Panel

Robert Bachman (Chair)
Doug Honegger
Michael Mahoney (ex officio)
Eduardo Miranda
Keri Ryan
William Staehlin
Derrick Watkins

Working Group Members

John Kunz
Xiang Wang

Preface

In 2013, the National Institute of Standards and Technology (NIST) awarded the Applied Technology Council (ATC), a National Earthquake Hazards Reduction Program (NEHRP) "Earthquake Structural and Engineering Research" task order contract (SB1341-13-CQ-0009) to conduct a variety of tacks. In 2014, NIST initiated Task Order 14-491, entitled "Seismic Analysis and Design of Nonstructural Components and Systems." The objective of this task order was to improve the seismic design of nonstructural systems and components in the areas that will have the largest impact to public safety and economic welfare, with an emphasis on construction regulated by building codes.

This project was conceived in direct response to recommendations provided in the NIST GCR 13-917-23, *Development of NIST Measurement Science R&D Roadmap: Earthquake Risk Reduction in Buildings* (NIST, 2013). In particular, the GCR 13-917-23 report identified nonstructural issues as a top priority, calling for problem-focused studies in critical areas related to nonstructural design criteria. This report provides a summary of the first phase of work, which included background knowledge investigations, a workshop to identify current challenges faced with nonstructural code provisions, and development of recommendations for future studies and research.

The Applied Technology Council is indebted to the leadership of Maryann Phipps, Project Director, and to members of the Project Technical Committee consisting of Saeed Fathali, John Gillengerten, Tara Hutchinson, and Ricardo Medina, for their contributions in developing this report and the resulting recommendations. Background information and technical assistance was provided to the project by Bill Holmes, Bob Pekelnicky, Roy Lobo, John Silva, and Xiang Wang. The Project Review Panel, consisting of Bob Bachman (chair), Doug Honegger, Mike Mahoney (ex officio member), Eduardo Miranda, Keri Ryan and Derrick Watkins, provided technical review and comment at key developmental stages of the project. An invited workshop consisting of industry experts involved in the design, manufacture, installation, and code enforcement of nonstructural components and systems was convened to obtain input on the application of nonstructural seismic design provisions in current design and construction practice. The names and affiliations of those who participated in the workshop and all who contributed to this report are provided in the list of Project Participants at the end of this report.

The Applied Technology Council also gratefully acknowledges Steven L. McCabe (NIST Program Manager and Contracting Officer's Representative) and Matthew Hoehler (NIST Project Manager and Technical Point of Contact) for their input and guidance in the preparation of this report, John Kunz for workshop facilitation services, and Carrie Perna for ATC report production services.

Jon A. Heintz
Program Manager

Scott D. Schiff
Associate Program Manager

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