Improving the Seismic Performance of Existing Buildings and Other Structures 2015

EDITED BY Roberto T. Leon, Ph.D., P.E.

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IMPROVING THE SEISMIC PERFORMANCE OF EXISTING BUILDINGS AND OTHER STRUCTURES 2015

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Preface

Over the last 25 years, the incidence and consequences of natural disasters have increased. In 2011 alone, the United Nations Office for Disaster Risk Reduction reported that natural disasters resulted in $366 billion in direct damages and 29,782 fatalities worldwide; average annual losses in the United States due to natural disasters amount to about $55 billion. It is clear that most of these losses are coupled to continuous concentrations of population, energy, economic and political power in locations of high risk of natural disasters, along with insufficient resistance in existing infrastructure. The vulnerability of industrialized societies to seismic risk has been recently highlighted by the 2010 Maule (Chile), 2011 Christchurch (New Zealand) and the 2011 Tohoku (Japan) earthquakes. Each year buildings and other structures are designed and built with a continually improving understanding of their performance during earthquakes, yet the vast majority of structures were built with substantially less understanding of seismic actions than we currently possess.

To stem future losses, it is necessary to increase conventional approaches (building codes, land use planning, and emergency response measures) and develop novel methods of design considering interdependent systems operations before and after disasters and public engagement so that buildings, geographically distributed infrastructure, and local communities are more resilient to natural hazards and human threats. It is also important to provide incentives for public and private organizations to reduce societal risk through educational programs, improved planning, and tools for quantification of risk, assessment of losses, and measurement of community resilience.

The challenges to improving the seismic performance of existing buildings and other structures are as broad and varied as the individual structures themselves. How should they be evaluated and strengthened? What plans exist? What materials were used? What assumptions were made? Were they built as designed, and if not, what modifications were made but possibly (probably) not documented? Are there elements other than the existing structure, such as nonstructural components, that can be mitigated to avoid damage in an earthquake?

To begin addressing these and other critical issues, the Applied Technology Council (ATC) and the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE) organized an inaugural conference in 2009 in San Francisco, California. As a follow up, this *2nd Conference on Improving the Seismic Performance of Existing Buildings and Other Structures* was held once again by ATC and SEI in San Francisco on December 10-12, 2015 in San Francisco, California. The program was planned to provide a forum for the presentation and exchange of new information on the seismic evaluation and seismic rehabilitation of existing buildings, including case studies, new discoveries, innovative use of new technologies and

materials, implementation issues, needed improvements to existing standards and methods, and socio-economic issues.

The goal of the Conference, and hence these proceedings, was to provide an invaluable opportunity to advance the profession's understanding of the tools, techniques and innovations available to assist in meeting the challenges of seismic evaluation and rehabilitation. For those new to the profession, these proceedings are an opportunity to get up to speed on core issues surrounding seismic rehabilitation.

Roberto T. Leon
Virginia Tech

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Roberto T. Leon, P.E., Ph.D., F.ACI, F.IABSE, F.SEI, F.ASCE
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