



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

PROCEEDINGS OF THE SECOND ATC & SEI CONFERENCE ON
IMPROVING THE SEISMIC PERFORMANCE OF EXISTING BUILDINGS
AND OTHER STRUCTURES

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



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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
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Contents

Case Studies

Seismic Retrofit of a Machine Shop at the Puget Sound Naval Shipyard	1
Scott L. Neuman, John M. Hochwalt, and Gregory L. Varney	
Starbucks Reserve Roastery and Tasting Room, Seattle, Washington	13
Michael A. Wright and Lara Simmons	
Seismic Upgrade of Four-Story Wood-Framed Condominium Buildings	26
John M. Coil	

Concrete Structures and Nonlinear Analysis

Nonlinear Analysis of Squat RC Walls Using Three-Dimensional Continuum Finite Element Models	36
J. Murcia-Delso, R. S. Dunham, D. R. Parker, and R. J. James	
Gravity Load Collapse and Vulnerability of Existing Buildings.....	47
H. Sezen	
Nonlinear Analysis Methods for Flexural Seismic Reinforced Concrete Walls.....	57
D. E. Lehman, L. N. Lowes, J. Pugh, and Z. Whitman	
Nonlinear Truss Modeling Method for the Analysis of Shear Failures in Reinforced Concrete and Masonry Structures	74
Mohammadreza Moharrami, Ioannis Koutromanos, and Marios Panagiotou	

Historic Structures and Emerging Technologies

Seismic Isolation and the Structural Retrofit of Haitian Heritage Cathedrals	86
Amir S. J. Gilani and H. Kit Miyamoto	
Evaluations, Repairs, and Retrofit of the Historic Sherman Building in Washington, DC, following the 2011 Mineral, VA, Earthquake.....	97
Craig D. Swift, Matthew J. Daw, and Laura M. Burke	

New Integrated Knowledge-Based Approaches to the Protection of Cultural Heritage from Earthquake-Induced Risk.....	109
R. Cacciotti, M. Drdácý, C. Modena, and F. da Porto	
Seismic Retrofit of a High-Rise Steel Moment Resisting Frame Using Fluid Viscous Dampers.....	121
Shanshan Wang, Jiun-Wei Lai, Matthew J. Schoettler, and Stephen A. Mahin	
Retrofit of Steel-Frame Buildings Using Enhanced Gravity-Frame Connections	132
J. P. Judd, F. A. Charney, and S. E. Pryor	
An Innovative Method for the Seismic Retrofitting of Existing Steel Moment Frame Structures Using Side Plate Technology	144
Behzad Rafezy, Quang Huynh, Henry Gallart, and Mohammad Kheirollahi	
Modeling the Performance of Rehabilitated Extremely Damaged Concrete Columns and a Masonry Wall for Analysis and Design	159
G. D. Huaco and J. O. Jirsa	
Historic Desmond Building Retrofit—A Case Study of the Seismic Retrofit of a Non-Ductile Concrete Building in the Los Angeles Area	173
Z. Jiang, M. Sarkisian, N. Mathias, R. Garai, and J. Lyrenmann	
Mitigating Seismic Risks in Historical Masonry: An Example Project.....	185
İhsan Engin Bal, Eleni Smyrou, Burcu Güneş, and Alper İlki	
Beneficial Uses and Misuses of the California Historical Building Code	198
G. R. Searer, K. E. Cobeen, and K. A. Sasaki	
Introduction to the California Historical Building Code	208
U. M. Gilmartin and A. R. Dreyfuss	
<i>Implementation Case Studies</i>	
The Shocking Secrets of Rocking Shear Walls	216
B. A. Mohr and S. K. Harris	
Fortifying the Castle on the Hill: Seismic Retrofit of UC Berkeley’s Historic Bowles Hall	226
Karl Telleen, Joe Maffei, Theresa B. Dias, and John A. Baker, Jr.	
Nonlinear Dynamic Evaluation of a Hospital Stair Tower with SSI and Pounding Effects.....	242
Stephen T. Bono, Anindya Dutta, and Kevin S. Moore	

Proposed Changes to Steel Column Evaluation Criteria for Existing Buildings	255
Daniel Bech, Bill Tremayne, and Jonas Houston	

UCSF Clinical Sciences Building: Seismic Rehabilitation Case Study	273
Mason Walters, Steve Marusich, Carlos Sempere, and Ryan Cooke	

Evaluation and Remediation of Pre-Northridge Steel Moment Frame Column Splices	287
Allen Nudel, Steve Marusich, Masume Dana, and Ali Roufegarinejad	

Seismic Evaluation and Retrofit of a 1970s High-Rise Welded Moment Frame Structure—A Performance-Based Approach	303
Leo Panian, Mike Korolyk, and Nick Bucci	

Innovative Solutions for Retrofit

Seismic Evaluation and Retrofit of Older Concentrically-Braced Frames	317
A. D. Sen, R. Ballard, D. Sloat, M. Johnson, C. W. Roeder, D. E. Lehman, and J. W. Berman	

Out-of-Plane Seismic Performance of URM Walls with Retrofitted Parapets and Flexible Diaphragms	328
J. Aleman, G. Mosqueda, and A. Whittaker	

Design Decision Support for Steel Frame Buildings through an Earthquake-Induced Loss Assessment	340
Seong-Hoon Hwang, Ahmed Elkady, and Dimitrios Lignos	

Collapses of Masonry Structures under Non-Extreme Loads	353
Dan Eschenasy	

Managing Risk

Damage and Loss Assessment of Pre-70 RC Frame Buildings with FEMA P-58: A Case Study	363
D. Cardone and G. Perrone	

Precedential Consequences of the Recent <i>Myrick</i> Lawsuit: Using ASCE 7-10 and ASCE 41-13 Performance Targets to Manage Seismic Risk in the Legal Arena	376
Mark N. White, John D. Osteraas, and Cynthia L. Perry	

Precedential Consequences of the Recent <i>Beacon</i> Lawsuit: Foreseeing Harm to Third Parties Caused by the Unsatisfactory Seismic Performance of a Flawed Design	394
Mark N. White, John D. Osteraas, Eduard A. Fierro, and Cynthia L. Perry	
Performance-Based Engineering and the Evaluation of Existing Buildings—Potential Legal Ramifications	403
David R. Ojala, and John D. Osteraas	
Evaluation of the Retrofitting Effect of a Building Based on FEMA P-58's Quantitative Method and EPRS Rating Criteria	416
Yili Huo, Rakesh Pathak, and Bulent Alemdar	
Professional Negligence of Engineers Providing Seismic Retrofit Design Services	430
J. B. Kardon, and M. K. Gilligan	
A Move toward Improved Portfolio Seismic Risk Assessment Methods for the Practicing Engineer	435
D. Jared DeBock and Abbie B. Liel	
A Seismic Loss Assessment Procedure for Masonry Buildings	447
Daria Ottonelli, Serena Cattari, and Sergio Lagomarsino	
<i>Nonstructural and Wood Soft Story</i>	
An Assessment of Seismic Floor Accelerations in Wood Shear Wall Buildings	459
J. R. Jayamon, P. Line, and F. A. Charney	
Seismic Evaluation of Drywall Suspended Ceilings Using Shake Table Testing and the Finite Element Analysis	471
Amir S. J. Gilani, Shakhzod M. Takhirov, and Yelena Straight	
Seismic Evaluation of Lay-In Panel Suspended Ceilings Using Static and Dynamic and an Assessment of the U.S. Building Code Requirements	483
Shakhzod M. Takhirov, Amir S. J. Gilani, and Yelena Straight	
Discussion of FEMA P-807 for the Retrofit of Soft-Story Buildings	497
Bruce Maison, Brian McDonald, David McCormick, Marko Schotanus, and Jonathan Buckalew	
Experimental Developments in Isolation/Energy Dissipation Platforms for the Seismic Protection of Equipment in Multistory Facilities	509
Claudia Marin-Artieda and Xing Han	