IMPROVING THE SEISMIC PERFORMANCE OF EXISTING BUILDINGS AND OTHER STRUCTURES

PROCEEDINGS OF THE 2009 ATC & SEI CONFERENCE ON IMPROVING THE SEISMIC PERFORMANCE OF BUILDINGS AND OTHER STRUCTURES

December 9–11, 2009
San Francisco, California

ORGANIZED BY

Applied Technology Council

The Structural Engineering Institute (SEI)
of the American Society of Civil Engineers

EDITED BY
Barry Goodno, Ph.D., P.E.

Published by the American Society of Civil Engineers

IMPROVING THE SEISMIC PERFORMANCE OF EXISTING BUILDINGS AND OTHER STRUCTURES

PROCEEDINGS OF THE 2009 ATC & SEI CONFERENCE ON IMPROVING THE SEISMIC PERFORMANCE OF BUILDINGS AND OTHER STRUCTURES

December 9–11, 2009
San Francisco, California

ORGANIZED BY

Applied Technology Council

The Structural Engineering Institute (SEI)
of the American Society of Civil Engineers

EDITED BY
Barry Goodno, Ph.D., P.E.

Published by the American Society of Civil Engineers

Copyright and Disclaimer

ISBN: 978-0-7844-1084-4

American Society of Civil Engineers
ASCE International Headquarters
1801 Alexander Bell Drive
Reston, VA 20191-4400 USA

Call Toll-Free in the U.S.: 1-800-548-2723 (ASCE)
Call from anywhere in the world: 1-703-295-6300
Internet: http://www.pubs.asce.org

Foreword

Buildings are the backbone of the world's infrastructure - they house our families and businesses, provide emergency shelter, provide places for education, enable our industries, and bring about an improved standard of living for people throughout the world. Without this backbone, civilization doesn't exist. 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.

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?

To begin addressing these and other critical issues, the Applied Technology Council and the Structural Engineering Institute of ASCE organized this conference held on December 9-11, 2009 in San Francisco, California. This inaugural conference is the first conference dedicated solely to improving the seismic performance of existing buildings and other structures. 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.

Thank you to everyone who participated in making the Conference a tremendous success whether it was attending, presenting, or helping to organize the event.

Barry Goodno, Ph.D., P.E., F.ASCE
Georgia Institute of Technology
Chair, Program Steering Committee

Christopher Rojahn, P.E.
Executive Director, ATC

James A. Rossberg, P.E.
Director, SEI of ASCE

Acknowledgments

Program Steering Committee

Robert Bachman, P.E., M. ASCE
Robert E. Bachman SE

Jerry Hajjar, Ph.D., P.E., F. ASCE
University of Illinois

William Holmes, P.E., M. ASCE
Rutherford & Chekene

Dawn E. Lehman Ph.D
University of Washington

Jack Moehle, Ph.D., P.E., M.ASCE
Pacific Earthquake Engineering Research Center

Chris Poland, M. ASCE
Degenkolb Engineers

Gregory Soules, P.E., S.E., F. ASCE
Chicago Bridge and Iron Company

Michael Valley, P.E., M.ASCE

John W. Wallace, Ph.D., P.E
University of California

Contents

Plenary Papers

Analysis and Rehabilitation Case Studies 1

Case Studies in Seismic Evaluation and Rehabilitation

ASCE 41 Case Studies