WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

Brian E. Kehoe

Associate Principal

EDUCATION

Northwestern University
Bachelor of Science, Civil Engineering, 1981
University of California, Berkeley
Master of Science, Civil Engineering, 1984

REGISTRATION

Civil Engineer in California
Professional (Civil) Engineer in Oregon
Structural Engineer in California, Hawaii, Oregon, and Utah

PRACTICE AREAS

Earthquake Engineering
Structural Evaluation
Repair and Rehabilitation Design

EXPERIENCE

Brian Kehoe has investigated hundreds of structures experiencing deteriorated or distress conditions, including earthquake damage, corrosion and cracking of concrete structures, fire damage, and collapses. He has designed structural repairs to remediate deterioration of steel, concrete, and wood structures. He has also performed finite element analyses for a variety of structures for wind, earthquake, and other types of loading.

Mr. Kehoe has extensive experience with seismic evaluations and design reviews of buildings. He has evaluated earthquake damage to buildings following several earthquakes and has designed repairs for earthquake damage and seismic retrofits for a number of buildings including unreinforced masonry, wood, concrete and steel buildings. He has designed seismic bracing for a variety of nonstructural building components. Mr. Kehoe has also developed training courses and given numerous presentations for FEMA regarding seismic design and evaluation of buildings and nonstructural components throughout the country.

REPRESENTATIVE PROJECTS

Earthquake Engineering

- AT&T Broadband, Seattle, Washington areas and Salt Lake City, Utah areas: Seismic bracing design for cable trays in telecommunications facilities
- ATC 43, Applied Technology Council: Development of guidelines for evaluation and repair of earthquake-damaged concrete and masonry shear wall buildings,
- Benton County Schools, Benton County, Oregon: Seismic evaluation of fourteen primary and secondary school campuses
- U.S. Department of State Facilities: Seismic evaluation of existing residential buildings in Istanbul, Turkey; Ashgabat, Turkmenistan; Alamty, Kazakhstan; and earthquake damage evaluation of buildings in Algiers, Algeria and Port au Prince, Haiti
- Washington Monument, Washington, D.C.: Condition assessment of post-seismic damage and repair recommendations

Structural Evaluation

- Jacob Javits Convention Center, New York, New York: Nonlinear analysis of space truss roof

Repair and Rehabilitation Design

- Alcatraz Guardhouse, Alcatraz Island, San Francisco, California: Seismic strengthening design for historic unreinforced masonry structure
- Conference Center Parking Garage, Fresno, California: Prestressed concrete damage evaluation and structural and seismic upgrade design
- Giannini Hall, Berkeley, California: Design of exterior wall concrete repairs
- White Wolf Lodge, Yosemite Park, California: Structural evaluation and rehabilitation for an historic wood-framed lodge and cabins

PROFESSIONAL AFFILIATIONS

American Concrete Institute (ACI)
American Society of Civil Engineers (ASCE)
Earthquake Engineering Research Institute (EERI)

TECHNICAL COMMITTEES

ACI 360 - Design of Slabs on Grade
ACI 374 - Performance-Based Seismic Design of Concrete Buildings
ASCE 41 - Seismic Evaluation and Rehabilitation of Existing Buildings (steering committee member)
ASCE 25- Earthquake Actuated Automatic Gas Shutoff Valves

Research Projects

Mr. Kehoe was a member of the project team for ATC-43, which developed guidelines for evaluation and repair of earthquake damage to concrete and masonry shearwall buildings for FEMA. The research project developed the following documents FEMA 306 *Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Basic Procedures Manual*, FEMA 307 *Evaluation of Earthquake Damaged Concrete and Masonry Wall Buildings: Technical Resources*, and FEMA 308 *Repair of Earthquake Damaged Concrete and Masonry Wall Buildings*.

Following the 1994 Northridge Earthquake, the Federal Emergency Management Agency, along with the California Office of Emergency Services and the Building Industry Association, contracted with WJE to prepare a training course for seismic retrofitting single family houses. The course was geared toward teaching proper techniques and limitations to contractors that perform seismic retrofit work on houses. Mr. Kehoe directed the project, which included developing the material for the course and organizing several pilot courses. The resulting course was an eight-hour program that included material on all aspects of typical seismic retrofitting of wood-framed cripple wall houses.

Mr. Kehoe was a co-principal investigator with Jim Mahaney for one task of the CUREE-Caltech Woodframe project, which involved testing the anchorage of wood-framed shear walls. The research was published in 2002 as CUREE Publication No. W-14 *Anchorage of Woodframe Buildings: Laboratory Testing Report*.

Mr. Kehoe was a member of the project team for ATC-50, which developed guidelines for seismic screening of wood-frame houses. The project included case study evaluations of houses in the Los Angeles, California area and oversight of seismic strengthening of several houses.

Mr. Kehoe is currently a member of the Project Management Committee for the ATC-71-4 project to update FEMA 154 *Rapid Visual Screening of Buildings for Potential Seismic Hazards.*

Mr. Kehoe was a member of the ASCE Structural Engineering Institute reconnaissance team tasked to visit Christchurch following the September 2010 Darfield Earthquake to assess the performance of buildings for the purpose of improving procedures for evaluating the seismic performance of existing buildings. During the trip, the team met with professors from University of Canterbury and local structural engineers. Mr. Kehoe was also invited to return to Christchurch for a follow-up reconnaissance visit following the February 2011 Christchurch earthquake to assess the performance of buildings. During the trip, the team accompanied building damage assessment teams conducting follow-up post-earthquake safety evaluations of buildings and attended briefings for local structural engineers at the emergency operations center.

Publications List

Behavior of Open-Wen Steel Joists in Moment-Resisting Frames, Paret, Terrence and Kehoe, Brian, 6th Canadian Conference on Earthquake Engineering, July 1992

Rapid Visual Screening of Buildings in Southern Illinois: A Case Study, 5th US National Conference on Earthquake Engineering, Chicago, Illinois, July 1993

The Capacity Spectrum Method for Evaluating Structural Response During the Loma Prieta Earthquake, 1993 National Earthquake Conference: Earthquake Reduction in the Central and Eastern United States: A Time for Examination and Action, Nashville ,Tennessee, 1993

Performance of Retrofitted Unreinforced Masonry Buildings, 11th World Conference on Earthquake Engineering, Acapulco, Mexico, June 1996

Conflicting Issues in Post-Earthquake Damage Evaluations, 6th US National Conference on Earthquake Engineering, Seattle, Washington, June 1998

A Critique Of Procedures For Calculating Seismic Design Forces For Nonstructural Elements, ATC-29-1 Proceedings of the Seminar on the Seismic Design, Retrofit, and Performance of Nonstructural Components, January 1998

Evaluating Performance of Earthquake Damaged Buildings, 8th Canadian Conference on Earthquake Engineering, Vancouver, British Columbia, May 1999

Considerations of Vertical Acceleration on Structural Response, 12th World Conference on earthquake Engineering, Auckland, New Zealand, February 2000

Improved Performance of Sill Plate-to-Foundation Connections in Shearwall Assemblies, Mahaney, James and Kehoe, Brian, Paper 1435, 2002 Structural Engineers World Congress, Yokohama, Japan

Improved Design Procedures for Nonstructural Components, Kehoe, Brian, 2002 Structural Engineers World Congress, Yokohama, Japan

Procedures for Estimating Floor Accelerations, Kehoe, Brian and Hachem, Mahmoud, 2003, ATC-29-2 Seminar on Seismic Design, Performance, and Retrofit of Nonstructural Components in Critical Facilities, Newport Beach, California

Review of Proposed Design Accelerations for Nonstructural Elements, Freeman, Sigmund and Kehoe, Brian, LA Conference on Tall Buildings, February 2003

Standardizing Seismic Evaluation of Existing Buildings, Kehoe, Brian, Paper 3376, 13th World Conference on Earthquake Engineering, 2004, Vancouver, B.C., Canada

Performance Based Seismic Rehabilitation of Nonstructural Components, Kehoe, Brian, 2005 ASCE Structures Congress, New York, New York

Applying Structural Design Concepts to the Design of Nonstructural Components, Kehoe, Brian, 2007 ASCE Structures Congress, Long Beach, California

Performance-Based Engineering of Constructed Systems, Aktan, A. Emin, Ellingwood, Bruce, and Kehoe, Brian, Journal of Structural Engineering, American Society of Civil Engineers, March 2007

Seismic Bracing of a Distributed Cable tray System, Kehoe, Brian, 14th World Conference on Earthquake Engineering, 2008, Beijing, China

CFRP Seismic Collector for Concrete Diaphragms, Rosenboom, Owen and Kehoe, Brian, 2009, 9th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures, Sydney, Australia

Problems with PMLs, Searer, Gary, Paret, Terrence, Kehoe, Brian, and Hachem, Mahmoud, ATC and SEI Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, San Francisco, December 2009

Seismic Evaluation Methodology Issues, 9th US National Conference on Earthquake Engineering and 10th Canadian Conference on Earthquake Engineering, Toronto, Canada, July 2010

Seismic Evaluation of Concrete Wall Buildings, 15th World Conference on Earthquake Engineering, Lisbon, Portugal, September 2012 (Submitted)

Presentations

Improved Design Procedures for Nonstructural Components, American Society of Civil Engineers Structures Congress, Seattle, Washington, May 2003

Earthquake Engineering Research - What's Missing, American Concrete Institute Convention, San Francisco, California, October 2004

The Art of Structural Engineering, Student Chapter of American Society of Civil Engineers Chapter, University of Californian, Berkeley, October 2005

Evaluation, Repair and Enhancement of Earthquake-Damaged Shear Wall Buildings, 8th US National Conference on Earthquake Engineering, April 2006

Applying Structural Design Concepts to the Design of Nonstructural Components, American Society of Civil Engineers Structures Congress, Long Beach, California, May 2007

Characterizing Seismic Vulnerabilities Using Rapid Visual Screening, American Society of Civil Engineers Structures Congress, Long Beach, California, May 2007

What the future holds: ASCE 41-13 - Seismic Evaluation and Upgrade of Existing Buildings, American Society of Civil Engineers Structures Congress, Chicago, Illinois, March 2012

SEI Reconnaissance Report on the Christchurch Earthquake, American Society of Civil Engineers Structures Congress, Chicago, Illinois, March 2012

Terrence F. Paret

Senior Principal

EDUCATION

University of Vermont
Bachelor of Science, Civil Engineering, 1981
University of California, Berkeley
Master of Science, Structural Engineering, 1985

PRACTICE AREAS

Structural Performance Evaluation
Earthquake Engineering
Failure Investigation
Repair and Rehabilitation Design
Seismic Risk Assessment
Seismic Repair and Retrofit Design
Structural Analysis / Computer Modeling
Peer Review

EXPERIENCE

Since joining WJE in 1986, Mr. Paret has performed hundreds of engineering investigations in the U.S. and abroad, focusing on the evaluation of structures after earthquakes; on the prediction of the probable performance of new and existing buildings in future earthquakes; and on the design of repairs and rehabilitation to mitigate damage and improve earthquake resistance. He has investigated structures that have been damaged or have collapsed due to natural disasters such as earthquakes and floods, and has evaluated a multitude of fire-damaged structures, defective or deteriorated structural elements, systems, construction materials and installations. These investigations also frequently involved assessment of the effects of thermal loading, wind, restraint-to-shrinkage, ground settlement and dead and live loading.

Mr. Paret's projects have involved high- and low-rise buildings; modern and historic buildings; commercial, residential, industrial, parking, medical, and institutional buildings; and structural systems consisting of steel, concrete, wood, and masonry.

Prior to joining WJE, Mr. Paret was a designer of high-rise reinforced concrete buildings in New York City.

REPRESENTATIVE PROJECTS

Seismic Risk Assessment

- Washington Monument, Washington, D.C: Seismic risk assessment and post-earthquake damage assessment
- United Nations Secretariat: New York City, New York
- U.S. Department of State: Assessments of seismic safety in China, Kazakhstan, Kyrgyzstan, Uzbekistan, Turkey, Algeria, Jordan and Japan
- Federal Emergency Management Agency: Assessment of essential buildings in Hawaii

Post-Earthquake Damage Investigation

- Various buildings in Japan after 2011 M9.0 EQ
- Mauna Kea Beach Resort, Hawaii after 2006 M6.8
- Mission San Miguel, San Miguel, CA after 2003 M6.5
- Various buildings in Athens, Greece after 1999 M6.0
- Various buildings in Turkey after 1999 M7.4
- Los Angeles County Civic Center after 1994 M6.7
- San Francisco Airport Hyatt Regency after 1989 M6.9
- Oakland City Hall, Oakland, CA after 1989 M6.9

Failure Investigation

- I35-W Bridge over the Mississippi River collapse, Minneapolis, Minnesota
- Interstate 5 Tunnel fire, Santa Clarita, CA
- MacArthur Maze I-580/880 collapse, Oakland, CA
- San Quentin Seawall failure, San Quentin, CA
- Columbia Center, Seattle, Washington

Peer Review

- Hayward City Hall, Hayward, CA: Performance-based seismic upgrade
- PG&E Market Street Complex, San Francisco, CA: Performance-based seismic upgrade
- San Francisco City Hall, San Francisco, CA: Earthquake damage assessment/ base-isolation retrofit

Seismic Repair and Retrofit Design

- Sherith Israel, San Francisco, CA: Performance-based seismic strengthening of historic sanctuary
- State Bar of California, San Francisco, CA: Performance-based seismic strengthening of concrete frame
- Clorox Building, Oakland, CA: Performance-based seismic strengthening of steel-framed high-rise
- Bayshore Mall, Eureka, CA: Performance-based seismic strengthening

PROFESSIONAL AFFILIATIONS

American Institute of Steel Construction (AISC)
American Society of Civil Engineers (ASCE)
Earthquake Engineering Research Institute (EERI)
Seismological Society of America (SSA)
Structural Engineers Association of California (SEAOC)
Structural Stability Research Council (SSRC)

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TERRENCE F. PARET
AWARDS AND PUBLICATIONS

AWARDS

Moisseiff Award, presented in 2001 by the Structural Engineering Institute Board of Governors of the American Society of Civil Engineers for the original research described in the papers, *"The W1 Issue. I: Extent of Weld Fracturing During The Northridge Earthquake" and "The W1 Issue. II: UT Reliability for Inspection of T-Joints with Backing."* Journal of Structural Engineering, *January 2000.*

Award of Excellence, 2007, Excellence in Structural Engineering, Structural Engineers Association of Northern California for the State Bar of California Building - Performance-based seismic strengthening.

Certificate of Merit, 2007, Excellence in Engineering Awards Program, Best Retrofit/Alteration - Large Project, Structural Engineers Association of California for the State Bar of California Building - Performance-based seismic strengthening.

Presidential Award of Excellence in Structural Engineering, 2008, American Institute of Steel Construction, Ideas^2 Awards for 180 Howard Street Seismic Strengthening - Performance-based seismic strengthening.

California Preservation Award, 2011, California Preservation Foundation for Seismic Strengthening of Sherith of Israel - Performance-based seismic strengthening.

PUBLICATIONS

Paret, Terrence F. and Brian E. Kehoe (1991), "Behavior of Open-Web Steel Joists in Moment-Resisting Frames," 6th Canadian Conference on Earthquake Engineering, Toronto, Ontario, Canada, June 12-14, 1991.

Mahaney, James A., Sigmund A. Freeman, Terrence F. Paret, and Brian E. Kehoe (1993), "The Capacity Spectrum Method for Evaluating Structural Response During the Loma Prieta Earthquake," Proceedings of the 1993 National Earthquake Conference, Central United States Earthquake Consortium, Memphis, Tennessee, May 3-5, 1993, pp. 501-510.

Paret, Terrence F. and Glenn Borchardt (1995), "Northward Lean of Wood- and Steel-frame Structures as Evidence for the Near-source Directivity Pulse Produced by the 1994 Northridge Earthquake [abs.]," Seismological Research Letters 66 (2):41.

Paret, Terrence F. and Kent K. Sasaki (1995), "Analysis of a 17-Story Steel Moment Frame Building Damaged by the Northridge Earthquake," SAC 95-04, Part 2, Technical Report: Analytical and Field Investigations of Buildings Affected by the Northridge Earthquake of January 17, 1994, SAC Joint Venture, Sacramento, California, December 1995, pp. 10-1 through 10-52.

Paret, Terrence F., Glenn Borchardt, Sigmund A. Freeman, and Mourad R. Attalla (1996), "Damage to Low-Rise and High-Rise Structures as Evidence for a Directed Near-Field Pulse in the M6.7 Northridge Earthquake of January 17, 1994", Technical Report Sponsored by the National Earthquake Hazards Reduction Program of the National Science Foundation under Grant Number CMS-9415736. Chapter B "Northward displacement of buildings", pp. 37-80.

Paret, Terrence F., Kent K. Sasaki, Daniel H. Eilbeck, and Sigmund A. Freeman (1996), "Approximate Inelastic Procedures to Identify Failure Mechanisms from Higher Mode Effects," 11th World Conference on Earthquake Engineering, Acapulco, Mexico, June 23-28, 1996.

Paret, Terrence F., Mourad R. Attalla, Sigmund A. Freeman, and Glenn Borchardt (1997), "Permanent Directed Deformations of Buildings as Evidence for a Directed Near-Field Pulse in the M6.7 Northridge Earthquake of January 17, 1994," Northridge Earthquake Conference, CUREe, Richmond, California.

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Paret, Terrence F. and Sigmund A. Freeman (1997), "Is Steel Frame Damage Being Diagnosed Correctly?," Proceedings from Structures Congress XV, Session No. 6MB, at Portland, Oregon, American Society of Civil Engineers, Washington, D.C., April 13-16, 1997.

Attalla, Mourad R., Terrence F. Paret and Sigmund A. Freeman (1998), "Near-Source Behavior of Buildings under Pulse-Type Earthquakes," Research supported by a grant from the National Earthquake Hazards Reduction Program (NEHRP) of the National Science Foundation, Presented at the 6th NCEE, Seattle, Washington.

Paret, Terrence F., Kent K. Sasaki, and Sigmund A. Freeman (1998), "Performance-Based Engineering—Can the Engineering Profession Deliver the Goods?," 6th U.S. National Conference on Earthquake Engineering, Seattle, Washington, May 31-June 4, 1998.

Sasaki, Kent K., Sigmund A. Freeman, and Terrence F. Paret (1998), "Multi-Mode Pushover Procedure (MMP)—A Method to Identify the Effects of Higher Modes in a Pushover Analysis," 6th US Conference on Earthquake Engineering/Earthquake Engineering Research Institute (EERI), Oakland, California, Paper #271, at Seattle, Washington, May 31-June 4, 1998.

Paret, Terrence F. and Mourad R. Attalla (1998), "Changing Perceptions of the Extent of Damage to Welded Steel Moment Frames in the Northridge Earthquake," 1998 SEAOC Convention, Reno, Nevada, October 7-10, 1998.

Paret, Terrence F. (1999), "Evaluating UT as a Tool for Reliability Assessment," Proceedings of Structures Congress 1999, American Society for Civil Engineers (ASCE), Washington, D.C., at New Orleans, Louisiana, April 18-21, 1999.

Paret, Terrence F. and Gary R. Searer (1999), "Reconnaissance in Turkey after the Magnitude 7.4 Kocaeli Earthquake," September 1999.

Paret, Terrence F. (1999), "*Clarifying the Extent of Northridge Induced Weld Fracturing; Examining the Related Issue of UT Reliability*", SAC/BD-99/10, SAC Steel Frame Project, SAC Joint Venture, December 1999.

Paret, Terrence F. and Mourad R. Attalla (2000), "Changing Perceptions of the Extent of Damage to Welded Steel Moment Frames In the Northridge Earthquake," 12WCEE 2000, Auckland, New Zealand, January 30-February 4, 2000.

Sasaki, Kent K. and Terrence F. Paret (2000), "Distinguishing Between Earthquake Damage and Other Conditions," 12WCEE 2000, Auckland, New Zealand, January 30-February 4, 2000.

Paret, Terrence F. (2000), "The W1 Issue I: The Extent of Weld Fracturing During the Northridge EQ," ASCE Journal of Structural Engineering, Special Issue, Vol. 126 No. 1, Reston, Virginia, January, 2000, pp. 10-18.

Paret, Terrence F. (2000), "The W1 Issue II: UT Reliability for Inspection of T-Joints with Backing," ASCE Journal of Structural Engineering, Special Issue, Vol. 126 No. 1, Reston, Virginia, January 2000, pp. 19-23.

Freeman, Sigmund A. and Terrence F. Paret (2000), "Several Case Studies of Performance-Based Seismic Engineering for Evaluation and Upgrading," 9th U.S.-Japan Workshop on the Improvement of Structural Design and Construction Practices, ATC 15-8, Victoria, British Columbia, Canada, August 21-23, 2000.

Paret, Terrence F. (2001), "Discussion of Engineering Process Failure-Hyatt Walkway Collapse," ASCE Journal of Performance of Constructed Facilities, Vol. 15, No. 4, Reston, Virginia, November 2001.

Shotwell, L. Brad and Terrence F. Paret (2001), "Summary of Preliminary Petrographic Studies of Concrete Samples from Turkey," at http://www.anatolianquake.org [an online curated depository of data on the Kocaeli-Gölcük and Düzce-Bolu earthquakes of 1999 maintained by Bogazici University, Middle East Technical University, Notre Dame University, Purdue University, University of Kansas, University of Michigan, and University of Minnesota] under Building Data subpage, or with direct link available at http:\\bridge.ecn.purdue.edu/~anatolia/bldgdata/petro/doc. Source accessed most recently on May 13, 2002. [15 pages in length]

Freeman, Sigmund A., Terrence F. Paret, and Ayhan Irfanoglu (2002), "Structural Implications of the Trinet Instrumental Intensity Scale," Proceedings of the 7th U.S. National Conference on Earthquake Engineering (7NCEE) on Urban Earthquake Risk, Boston, Massachusetts, July 21-25, 2002.

Paret, Terrence F., Sigmund Freeman, and Robert Dameron (2002), "Rethinking the Earthquake Engineering Paradigm: From Response Reduction to Response Suppression," Proceedings of the 7th U.S. National Conference on Earthquake Engineering (7NCEE) on Urban Earthquake Risk, Boston, Massachusetts, July 21-25, 2002.

Freeman, Sigmund A., Ayhan Irfanoglu, and Terrence F. Paret (2002), "Integrating the TriNet System with an Engineering Intensity Scale [abs.]," Seismological Research Letters 73 (2): 256, March/April 2002.

Freeman, Sigmund A., Gary R. Searer, and Terrence F. Paret (2003), "Performance-Based Seismic Engineering? Not Exactly," Applied Technology Council, Paper Number 5, 10th U.S.-Japan Workshop on the Improvement of Structural Design and Construction Practices, Maui, Hawaii, June 30 - July 2, 2003.

Freeman, Sigmund A., Ayhan Irfanoglu, and Terrence F. Paret (2003), "Improving Emergency Response Using Building Response Data, ShakeMap Data, and the Engineering Intensity Scale," 7th U.S-Japan Workshop on Urban Earthquake Hazard Reduction, Applied Technology Council, March 2003.

Irfanoglu, Ayhan, Sigmund A. Freeman, and Terrence F. Paret (2004), "Earthquake Engineering Intensity Scale: A Template with Many Uses," Paper Number TU2-1 1667, 13th World Conference on Earthquake Engineering, Vancouver, British Columbia, Canada, August 1-6, 2004.

Paret, Terrence F., Ayhan Irfanoglu, and Mahmoud M. Hachem (2004), "Efficient Application of the Secant Method for Capturing the Peak Response of Complex Multi-Story Buildings," Paper Number F1-3 1658, 13th World Conference on Earthquake Engineering, Vancouver, British Columbia, Canada, August 1-August 6, 2004.

Freeman, Sigmund A., Terrence F. Paret, Gary R. Searer, and Ayhan Irfanoglu (2004), "Musings on Recent Developments in Performance-Based Seismic Engineering," 2004 Structures Forensics Congress, Structural Engineering Institute of the American Society of Civil Engineers, May 2004.

Paret, Terrence F. and Gary Searer (2005), "Repercussions of the International Existing Building Code on the Repair of Existing Structures," 2005 Structures Congress: Metropolis and Beyond, Structural Engineering Institute of the American Society of Civil Engineers, April 20-24, 2005.

Searer, Gary R. and Terrence F. Paret (2006), "Repair of Existing Buildings and the International Existing Building Code," Proceedings of the 8th National Conference on Earthquake Engineering/100th Anniversary Earthquake Conference, San Francisco, California, April 18-21, 2006.

Searer, Gary R., Terrence F. Paret, Sigmund A. Freeman and Una M. Gilmartin (2006), "Evaluation of the Effects of Oakland's Earthquake Damage Repair Ordinance," Proceedings of the 8th National Conference on Earthquake Engineering/100th Anniversary Earthquake Conference, San Francisco, California, April 18-21, 2006.

Paret, Terrence F., Sigmund A. Freeman, Gary R. Searer, Mahmoud M. Hachem, and Una M. Gilmartin (2006), "Seismic Evaluation and Strengthening of an Historic Synagogue Using Traditional and Innovative Methods and Materials," Proceedings of the First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, September 3-8, 2006.

Freeman, Sigmund A., Terrence F. Paret, Gary R. Searer, Mahmoud M. Hachem, and Una M. Gilmartin (2007), "Using Historical Data to Aid in the Evaluation of Structural Performance of Buildings," Ninth Canadian Conference on Earthquake Engineering, Toronto, Canada, June 2007.

Searer, Gary R., Terrence F. Paret, and Sigmund A. Freeman, (2007), "Over-reliance on Computers and the Decline of Good Engineering Practice and Common Sense," Ninth Canadian Conference on Earthquake Engineering, Toronto, Canada, June 2007.

Searer, Gary R., Terrence F. Paret, Sigmund A. Freeman, and Joseph Valancius (2007), "Are We Really Learning From Earthquakes? Declining Quality and Increasing Complexity of Modern Building Codes," Ninth Canadian Conference on Earthquake Engineering, Toronto, Canada, June 2007.

Searer, Gary R., Sigmund A. Freeman, and Terrence F. Paret (2007), "Does It Make Sense from Engineering and Economic Perspectives to Design for a 2475-Year Earthquake?," Continental Intraplate Earthquakes: Science, Hazard, and Policy Issues, Chapter 23, Geological Society of America, Boulder, Colorado, August 2007.

Paret, Terrence F. (2007), "Braced for the Big One," Modern Steel Construction, August 2007.

Sigmund A. Freeman, Terrence F. Paret, and Gary R. Searer (2007), "Progressive Failure: Performance-Based Seismic Design and High-Rise Buildings?," 12th U.S.-Japan Workshop on Improvement of Structural Design and Construction Practices, Kauai, Hawaii, September 2007.

Searer, Gary R., Terrence F. Paret, and Sigmund A. Freeman (2008), "ASCE-31 and ASCE-41: What Good Are They?," Proceedings from the ASCE Structures Congress, Vancouver, Canada, April 2008.

Searer, Gary R. and Terrence F. Paret (2008), "Is the International Existing Building Code Morally Defensible?," Proceedings from the ASCE Structures Congress, Vancouver, Canada, April 2008.

Searer, Gary R. and Terrence F. Paret (2008), "Are the Structural Upgrade Triggers in the IBC and IEBC Morally Defensible?," Structural Engineer Magazine, August 2008.

Paret, Terrence F., Sigmund A. Freeman, Gary R. Searer, Mahmoud M. Hachem, and Una M. Gilmartin, (2008), "Using Traditional and Innovative Approaches in the Seismic Evaluation and Strengthening of a Historic Unreinforced Masonry Synagogue," Special Issue on "Seismic Reliability, Analysis and Protection of Historic Buildings and Heritage Sites." Journal of Engineering Structures, Elsevier Ltd., Amsterdam, The Netherlands, Volume 30, Issue 8, August 2008.

Searer, Gary R., Terrence F. Paret, and Sigmund A. Freeman (2008), "In Name Only: Peer Review of Performance-Based Engineering Projects," Paper Number 11-0011, 14th World Conference on Earthquake Engineering, Beijing, China, October 12 - 17, 2008.

Hachem, Mahmoud M., Terrence F. Paret, Gary R. Searer, and Sigmund A. Freeman (2008), "The Evaluation and Retrofit of a Historic Unreinforced Masonry Building Using Nonlinear Adaptive Pushover and Dynamic Analysis Methods," Paper Number 05-04-0110, 14th World Conference on Earthquake Engineering, Beijing, China, October 12 - 17, 2008.

Sasaki, Kent K., Terrence F. Paret, and Tom Pyle (2008), "Assessment of Fire-Affected Highway Structures After the MacArthur Maze Fire and Collapse and the I-5 Tunnel Fire in California," Technical Session on "Recent Advances in the Fire Design of Concrete Structures" 2008 Fall Convention, American Concrete Institute, St. Louis, Missouri, November 2-6, 2008.

Paret, Terrence F. and Bernie Wonneberger, AIA, NCARB (2008), "Earthquakes and Pending Charges in the Building Code," Building Owners & Managers Association (BOMA), Hawaii, December 10, 2008.

Searer, Gary R., Terrence F. Paret, Joseph Valancius, and James C. Pan (2009), "Cracking in Concrete Fill on Metal Decks, Cracking in Flat Plate Concrete Slabs, and Cracking in Concrete Walls," American Society of Civil Engineers (ASCE), 2009 Structures Congress, Austin, Texas, April 30 - May 2, 2009.

Paret, Terrence F., Daniel H. Eilbeck, Sigmund A. Freeman and Gary R. Searer (2009), "Seismic Assessment and Strengthening of Historic Unreinforced Stone Masonry Structures: Technical and Philosophical Considerations," International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage (Iscarsah), Mostar, Bosnia, July 12, 2009.

Freeman, Sigmund A., Terrence F. Paret, and Gary R. Searer (2009), "Improving the Seismic Performance of Buildings Using First Principles," Applied Technology Council (ATC) and the Structural Engineering Institute (SEI) of ASCE, Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, December 8-11, 2009.

Cobeen, Kelly E., Gary R. Searer, Terrence F. Paret, and Sigmund A. Freeman (2009), "Recommended Directions for IEBC Appendix Chapter A4: Earthquake Hazard Reduction in Existing Wood-Frame Residential Buildings with Soft, Weak, or Open-Front Walls," ATC and the SEI of ASCE, Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, San Francisco, California, December 8-11, 2009.

Searer, Gary R., Terrence F. Paret, Brian E. Kehoe, and Mahmoud Hachem (2009), "The Problems with PMLS," ATC and the SEI of ASCE, Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, San Francisco, California, December 8-11, 2009.

Hachem, Mahmound M., Terrence F. Paret, and Gary R. Searer (2009), "A Definition Undone: Explicit Estimation of PMLs in the Age of Reliance on Design Ground Motion Records," ATC and the SEI of ASCE, Conference on Improving the Seismic Performance of Existing Buildings and Other Structures, San Francisco, California, December 8-11, 2009.

Paret, Terrence F., Gary R. Searer, Owen A. Rosenboom, Kaustubh P. Pandya (2010), "Radial Cracking in Reinforced Concrete Flat Plate Slabs," ASCE Structures Congress, Orlando, Florida, May 2010.

Sasaki, Kent K., Terrence Paret, Juan C. Araiza, and Peder Hals (2010), "Failure of Concrete T-beam and Box-girder Highway Bridges Subjected to Cyclic Loading From Traffic" Journal of Engineering Structures, Elsevier Ltd., Amsterdam, The Netherlands, Vol. 32, No. 7, July 2010

Paret, Terrence F., John D. Osteraas, Kelly E. Cobeen, Gary R. Searer, Sigmund A. Freeman, and Owen A. Rosenboom (2010), "Evaluation of Earthquake Damage in Wood-Framed Structures," 9th U.S. National and 10th Canadian Conference on Earthquake Engineering, Toronto, Canada, July 2010.

Searer, Gary R., Sigmund A. Freeman, and Terrence F. Paret (2010). "Repair of Damaged Buildings -- A Dilemma," 9th U.S. National and 10th Canadian Conference on Earthquake Engineering, Toronto, Canada, July 2010.

Hill, Howard J., Gary R. Searer, Richard A. Dethlefs, Jonathan E. Lewis, and Terrence F. Paret (2010), "Certifying That Existing Suspended Scaffold Structural Support Elements and Lifeline Anchorages Comply with Federal OSHA Requirements," Practice Periodical on Structural Design and Construction, Vol. 15, No. 3, American Society of Civil Engineers, Reston, Virginia, August 2010.

Hill, Howard J., Gary R. Searer, Richard A. Dethlefs, Jonathan E. Lewis, and Terrence F. Paret, (2010), "Designing Suspended Scaffold Structural Support Elements and Lifeline Anchorages in Conformance with Federal OSHA Requirements," Practice Periodical on Structural Design and Construction, Vol. 15, No. 3, American Society of Civil Engineers, Reston, Virginia, August 2010.

Cobeen, Kelly, Kent Sasaki, Terrence Paret, and Gita Dombrowski (2010), "A Case Study in Application of California Building Code Existing Building Provisions to Repair of a Damaged Building," 2010 SEAOC Convention, Indian Wells, California, September 2010.

Paret, Terrence F., Gary R. Searer, Kelly E. Cobeen, and Richard J. Kristie (2011), "Strengths and Weaknesses of Wood-Framed Structures," ASCE Architectural Engineering Institute Conference, Oakland, California, April, 2011.

Paret, Terrence F., Gary R. Searer, and Sigmund A. Freeman (2011), "ASCE 31 and 41: Apocalypse Now," ASCE Structures Congress, Las Vegas, Nevada, April 2011.

Searer, Gary R., Terrence F. Paret, and Richard J. Kristie, (2011), "Contexualizing the Load Duration-dependent Strength of Wood Members," ASCE Structures Congress, Las Vegas, Nevada, April 2011.

Lewis, Jon E., Howard J. Hill, Gary R. Searer, and Terrence F. Paret, (2012), "Design, Certification, and Load Testing of Façade Access Equipment," ASCE Structures Congress, Chicago, Illinois, March 2012.

Paret, Terrence F., Kelly E. Cobeen, Owen A. Rosenboom and Kari T. Nasi (2012), "Probabilistic Seismic Assessment of a Nonconforming Structure Using Scenario Spectra," 15th World Conference on Earthquake Engineering, Lisbon, Portugal, September, 2012. [Submitted]

Paret, Terrence F., Owen A. Rosenboom, Jeff M. Rautenberg and Gary R. Searer (2012), "Calibration of Various Nonlinear Analysis Procedures with Earthquake damage in a Reinforced Concrete Shear Wall Building," 15th World Conference on Earthquake Engineering, Lisbon, Portugal, September, 2012. [Submitted]

Owen A. Rosenboom, Terrence F. Paret and Gary R. Searer (2012), "Chronological Construction Sequence, Creep, Shrinkage and Pushover Analysis of an Iconic 1960's Reinforced Concrete Building ," 15th World Conference on Earthquake Engineering, Lisbon, Portugal, September, 2012. [Submitted]

Paret, Terrence F. (2012), "Engineering for Preservation", APT Bulletin, The Journal of Preservation Technology, Mount Ida Press, Albany, New York [Submitted]

Sasaki, Kent K. and Terrence F. Paret (2012), "Failure of reinforced Concrete Bridges in California," 2012 ASCE Forensic Engineering Conference, San Francisco, California, October 2012. [Submitted]

Paret, Terrence F. and Gary R. Searer (2012), "The Risks of Making It Up," 2012 ASCE Forensic Engineering Conference, San Francisco, California, October 2012. [Submitted]

Searer, Gary R., Terrence F. Paret, and Rich A. Dethlefs (2012), "Engineers with Impunity," 2012 ASCE Forensic Engineering Conference, San Francisco, California, October 2012. [Submitted]

WJE | ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

Conrad Paulson

Principal

EDUCATION

Illinois Institute of Technology
Bachelor of Science, Civil Engineering, 1979
University of Texas, Austin
Master of Science, Engineering, 1982

REGISTRATION

Civil Engineer in California
Professional Engineer in Illinois, Iowa, Kansas, Virginia
Structural Engineer in Illinois

PRACTICE AREAS

Collapse Investigation
Design Peer Review
Historic Preservation
Research and Testing
Seismic Evaluation
Structural Analysis / Computer Modeling
Structural Investigation

EXPERIENCE

Mr. Paulson joined WJE in 1982, and has conducted a wide variety of engineering projects. These projects include structural failure investigation; post-earthquake reconnaissance; seismic structural evaluation; investigation and repair of distressed structures; facade investigations; field load testing of structures; and structural laboratory testing. He is nationally recognized in the field of reinforcing steel and mechanical splicing of reinforcement.

Mr. Paulson is a Voting Member of American Concrete Institute Committee 318B, *Structural Concrete Building Code– Reinforcement and Development* and is a Voting Member of American Institute of Steel Construction TC7 *Evaluation and Repair*. He has published articles and given lectures in the areas of earthquake engineering, structural engineering for antiquated structural systems, testing, and use of mechanical reinforcing bar splices, and fatigue of reinforced concrete. He currently co-instructs "Seismic Design and Performance of Building Structures," a continuing education course offered by the American Society of Civil Engineers (ASCE).

REPRESENTATIVE PROJECTS

Collapse Investigation

- City of Chicago, Law Department: Fatal partial structural collapse of building under construction, Chicago, Illinois
- National Institute of Standards and Technology: Visual observations of the steel recovered from the World Trade Center disaster site, Gaithersburg, Maryland

Fire Damage Assessment

- Canadian Natural Resources, Ltd.: Structural inspection of CNRL Horizons fire-damaged delayed coker unit

Seismic Evaluation

- U.S. Department of State: Seismic strengthening design of porte cochere, Chancery Building, Manila, Philippines
- U.S. Department of State: Post-earthquake assessments, January 2001 earthquake, San Salvador, El Salvador
- U.S. Department of State: Seismic evaluation of housing, Bucharest, Romania

Structural Investigation

- Aloha Stadium: Seismic and wind structural safety review of existing stadium, Honolulu, Hawaii
- Cloud County Community College: Investigation and design of structural repairs, Concordia, Kansas
- The Marquette Building: Structural investigation and design for relocated elevator penthouse, Chicago, Illinois

Research and Testing

- On Behalf of ACI ITG-6: Mechanical properties of ASTM A1035 high strength steel bar reinforcement
- Various manufacturers: Acceptance testing of reinforcing bar mechanical splices according to various criteria

Historic Preservation

- Pilgrim Baptist Church: Post-fire facade retention system for masonry walls, Chicago, Illinois

PROFESSIONAL AFFILIATIONS

American Concrete Institute (ACI)
American Institute of Steel Construction (AISC)
American Society of Civil Engineers (ASCE)
Concrete Reinforcing Steel Institute (CRSI)
Earthquake Engineering Research Institute (EERI)
Structural Engineers Association of Illinois (SEAOI)

TECHNICAL COMMITTEES

ACI318-B - Structural Concrete Building Code: Subcommittee on Reinforcement and Development (Voting)
ACI 439 - Steel Reinforcement (Past Chairman)
AISC TC7 - Structural Steel Specifications Committee - Task Committee on Evaluation and Repair (Voting)
AISC TC9 - Structural Steel Specifications Committee - Task Committee on Seismic Design (Consulting)

WJE | ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

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Professional Committee Appointments

Voting Member, ACI Committee 318 Structural Concrete Building Code, Subcommittee B on Reinforcement and Development. *Committee 318 is charged with developing and maintaining the consensus standard "Building Code Requirements for Structural Concrete (ACI 318)." ACI 318 is the concrete construction code for the United States and is frequently adopted or adapted for use by other countries world-wide. Subcommittee B maintains those portions of the Code that relate to requirements for bond, development, detailing, and materials requirements for reinforcement. Subcommittee B also maintains the requirements for anchorage to concrete, including post-installed anchors.*

Consulting Member (former Chair, former Secretary, former Voting Member), ACI Committee 215 on Fatigue of Concrete

Consulting Member, ACI Committee 408 on Bond and Development

Consulting Member, ACI Committee 355 on Anchorage to Concrete

Voting Member (former Chair, former Secretary), ACI Committee 439 on Reinforcing Steel

Voting Member, ACI ITG-6, Innovative Task Group on Design using High Strength Reinforcement. *This Task Group developed a guidelines report for design of structural concrete reinforced with high strength steel bars having specified yield strength of 100 ksi (690 MPa). Report was completed in 2010 and task group now discharged.*

Former Chair, ACI Subcommittee 439B on Mechanical Splicing of Reinforcing Steel (subcommittee now transferred to ACI Committee 408)

Voting Member, Task Committee TC-7 on Evaluation and Repair of the AISC Specifications Committee. *The Specifications Committee maintains the consensus standard "Specification for Structural Steel Buildings (AISC 360)" and "Seismic Provisions for Structural Steel Buildings (AISC 341)." These are the structural steel building design specifications used within the United States. Task Committee TC-7 is charged with developing and maintaining the provisions with the "Specification" that relate to existing buildings.*

Consulting Member, Task Committee TC-9 on Seismic Design of the AISC Specifications Committee. *Consulting member to an ad-hoc subcommittee within TC-9 for study of compactness requirements for seismic concentric brace members in compression.*

Chair, CRSI Research and Development Committee.

Member, CRSI Bar Producers/ Materials Properties Committee

Consulting Member, CRSI Reinforcement Anchorages and Splices Committee

Former Chair, Task Group on Chapter 16 Structural Design Provisions, of the Working Group D of the City of Chicago Code Initiative

General Professional Memberships

American Society of Civil Engineers (ASCE)
American Concrete Institute (ACI)
Concrete Reinforcing Steel Institute (CRSI)
Structural Engineers Association of Illinois (SEAOI)
American Institute of Steel Construction (AISC)
Earthquake Engineering Research Institute (EERI)

Honors and Other Appointments

Fellow of the American Concrete Institute: elected October 2004; inducted April 2005.

"Award of Merit," Structural Engineers Association of Illinois, "Marquette Building Cornice Replication," June 2005.

National Science Foundation (NSF), appointed as review panel member for the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) program, empanelled as follows: NEES Research, June 28 and 29, 2004; NEES Research, May 17-18, 2005; NEES Research, May 23-24, 2005; NEES Research, June 14-15, 2005; NEES Grand Challenge, June 6, 2006; NEES Grand Challenge, May 23-24, 2007; May 21-22, 2008; May 11-12, 2009; NEES Operations, September 8-10, 2010; and NEES Operations, August 2-3, 2012 (future appointment). *These review panels are typically composed of structural engineering consultants, academics, and other professionals with recognized expertise in the area of seismic engineering. The NEESR panels advise the U.S. NSF regarding disposition for funding (highly recommended; recommended; not recommended) of seismic engineering research proposal applications submitted for NEESR funding. Grand Challenge panels review proposals with anticipated funding of US$4,000,000 over a three-year life. The NEES Operations panels advise the NSF as to whether the contract entity that operates the Network for Earthquake Engineering Simulation is operating the Network in a satisfactory manner.*

"The Marquette Building - 140 South Dearborn Street - Exterior Restoration and Cornice Reconstruction," Preservation Excellence Award, Commission on Chicago Landmarks of the City of Chicago, 2006.

Board of Directors, Structural Engineers Foundation of Illinois, Chicago, Illinois, term from 2006 to 2008.

University of Texas at Austin, Civil, Architectural, and Environmental Engineering Department: External Advisory Committee. Appointed to three-year term from 2007 to 2009.

Project Review Panel for ATC-98 (Task Order 25), "Use of High-Strength Flexural Reinforcement in Reinforced Concrete Seismic Design." Appointed 2011; ongoing through 2013. *The primary objective of the Task 25 project is to study and make recommendations concerning the utilization of high-strength steel reinforcing bars in concrete structures subjected to earthquake ground motion.*

Publications

Paulson, Conrad, Jr., Karl H. Frank and John H. Breen, "A Fatigue Study of Prestressing Strand," *Research Report 300-1*, 108 pages. Austin, Texas: Center for Transportation Research, Bureau of Engineering Research, The University of Texas at Austin, April, 1983.

Paulson, Conrad, Jr., "Real-Time Data Acquisition in Structural Testing," *Computing in Civil Engineering*, W. Tracey Lenocker, editor, pages 368-378. Proceedings of the Fourth Conference on Computing in Civil Engineering, Boston, Massachusetts, October 27-31, 1986. New York: American Society of Civil Engineers, 1986.

Paulson, Conrad, Jr. and Karl H. Frank, "A Fatigue Study of Prestressing Strand," *Materials and Member Behavior*, Duane S. Ellifritt, editor, pages 319-331. Proceedings of the sessions at Structures Congress '87 related to materials and member behavior, Orlando, Florida, August 17-20, 1987. New York: American Society of Civil Engineers, 1987.

Paulson, Conrad, Jr. and John M. Hanson, "A Summary and Review of Fatigue Data for Mechanical and Welded Splices in Reinforcing Bars," *Structural Materials*, James F. Orofino, editor, pages 382-391. Proceedings of the sessions related to structural materials at Structures Congress '89, San Francisco, California, May 1-5, 1989. New York: American Society of Civil Engineers, 1989.

Kelley, Steven J., Deborah Slaton and Conrad Paulson, "Assessment Techniques Utilized with Historic American High Rises", *Structural Repair and Maintenance of Historical Buildings*, C.A. Brebbia, editor, pages 61-70. Ashurst, Southampton, U.K.: Computational Mechanics Institute, 1989.

Paulson, Conrad, co-author, Deborah Slaton, editor, *Wild Onions: A Brief Guide to Landmarks and Lesser-Known Structures in Chicago's Loop*. Chicago: Association for Preservation Technology International, 1989.

Paulson, Conrad, and John M. Hanson, Final Report on NCHRP Project 10-35, "Fatigue Behavior of Welded and Mechanical Splices in Reinforcing Steel", December, 1991. Published in abbreviated form as "Fatigue Behavior of Welded and Mechanical Splices in Reinforcing Steel," *Research Results Digest, Number 197*, National Cooperative Highway Research Program, Washington, D.C., June 1994, 9 pp.

Hunderman, Harry J., Conrad Paulson, Deborah Slaton, and John P. Stecich. "Investigation of the Facade of the San Jacinto Monument, Houston, Texas, USA," *Structural Repair and Maintenance of Historical Buildings*, C.A. Brebbia, editor. Southampton and Boston: Computational Mechanics Publications, scheduled for publication, 1994.

Paulson, Conrad. "Structural Clay Tile," a chapter in *Twentieth Century Building Materials: History and Conservation*, Thomas C. Jester, ed., McGraw-Hill, 1995.

Paulson, Conrad, Raymond H.R. Tide, and Donald F. Meinheit, "Modern Techniques for Determining the Capacity of Cast Iron Columns", *Standards for Preservation and Rehabilitation*, ASTM STP 1258, S.J. Kelley, ed., American Society for Testing and Materials, Philadelphia, PA, 1996, pp. 186-200.

Paulson, Conrad, Raymond H.R. Tide, and Donald F. Meinheit. Discussion of "Cast-Iron-Column Strength in Renovation Design," by D. Friedman. Discussion appears in *Journal of Performance of Constructed Facilities*, ASCE, v. 10, no. 4, November 1996. p. 184.

Paulson, Conrad, "Review of Seismic Performance Criteria for Reinforcing Bar Mechanical Connections," *Proceedings of the Sixth U.S. National Conference on Earthquake Engineering*, Earthquake Engineering Research Institute, 1998.

Paulson, Conrad, "Code and Testing Requirements for Seismic-Class Reinforcing Bar Mechanical Splices," *Proceedings: Fifth Conference on Tall Buildings in Seismic Regions*, Los Angeles Tall Buildings Structural Design Council, 2000.

Paulson, Conrad, contributor, annotated photos, "Preliminary Reports and Annotated Images from the El Salvador Earthquakes of January 13th and February 13th, 2001," CD-ROM published by Earthquake Engineering Research Institute, September, 2001.

Paulson, Conrad, editor, "Preliminary Observations on the El Salvador Earthquakes of January 13 and February 13, 2001", EERI Special Earthquake Report, *EERI Newsletter*, Earthquake Engineering Research Institute, July 2001.

Paulson, Conrad, contributing author, "Buildings" section in "Preliminary Observations on the El Salvador Earthquakes of January 13 and February 13, 2001", EERI Special Earthquake Report, *EERI Newsletter*, Earthquake Engineering Research Institute, July 2001.

J. Koerber, H. Hunderman, and C. Paulson, "Restoration of the San Jacinto Monument, USA", *Structural Engineering International*, Volume 11, No. 4, November 2001.
Paulson, Conrad, "Seismic Versus Wind Design Base Shear Forces In Eastern and Midwestern United States," Paper No. 1590, *Proceedings, 13th World Conference on Earthquake Engineering*, Canadian Association for Earthquake Engineering, Vancouver, B.C., 2004.

C. M. Moe [Freisinger], C. Paulson, G. R. Searer, A. A. Erickson, and B. Wonneberger, "Structural Strengthening of Aloha Stadium," Proceedings of the 2011 Structures Congress, April 14–16, 2011, Las Vegas, NV.

Paulson, Conrad, "Modern Strength Assessment of Antiquated Structural Metals," *APT Bulletin*, accepted for anticipated publication in 2012.

Continuing Education and Other Instruction Given

"Structural Systems" in the session on Architectural and Structural Systems, and "Rookery Building: The Structural Investigation" in the session on Case Studies and Repairs; lectures presented at "High Rise Buildings: Investigation and Analysis," APT Training Course in conjunction with the APT 89 Chicago Conference: "Make No Little Plans," Chicago, Illinois, September 3-9, 1989. Sponsored by the Association for Preservation Technology International.

"Fatigue of Structural Concrete Members," lecture presented during session on "Bridge Fatigue and Research," as part of "Bridges 1991 – Ninth Biennial Lecture Series," Chicago, Illinois, March 27, 1991. Presented on behalf of John M. Hanson, President, Wiss, Janney, Elstner Associates, Inc. Co-sponsored by the Structural Division, Illinois Section, American Society of Civil Engineers, and the Department of Civil Engineering, Illinois Institute of Technology.

"Seismic Issues." Invited speaker, Architectural Preservation course, School of the Art Institute, Chicago, Illinois. May 6, 1997; December 8, 1997; December 14, 1998.

"Metals in Historic Buildings: Investigation and Rehabilitation." APT 1997: "Less is More Conference," Chicago, September 28-30, 1997. Sponsored by the Association for Preservation Technology International.

"Old Materials and Modern Structural Design Codes," United States Department of State, OBO Civil and Structural Division, May 13, 2009, Arlington, Virginia. Sponsored by OBO, U.S. Department of State.

"Structural Arch Floor Systems," United States Department of State, OBO Civil and Structural Division, January 14, 2010, Arlington, Virginia. Sponsored by OBO, U.S. Department of State.

"Seismic Design and Performance of Building Structures," co-instructor of two-day long continuing education course, providing instruction on contemporary seismic design according to philosophy of U.S. seismic design practice. Various locations nationwide: Boston (May 2000), New Jersey (April 2001), Las Vegas (May 2001), Atlanta (February 2002), Chicago (March 2002), Miami (January 2003), Philadelphia (March 2003), City Building Department, Phoenix (August 2003), Denver (January 2004), Boston (March 2004), Sacramento (January 2005), Nashville (March 2005), Washington (March 2006), Orlando (January 2007), Secaucus, New Jersey (March 2007), Consolidated Edison, New York City (March 2007), New Orleans (January 2008), Chicago (March 2008), Atlanta (January 2009), Chicago (March 2010), Boston (March 2011), Chicago (March 2012), Portland, Maine (anticipated March 2013). Sponsored by the American Society of Civil Engineers Continuing Education Department.

"Assessment, Repair, and Strengthening of Structural Cast and Wrought Iron," Symposium on the Restoration of Cast and Wrought Iron, Wood Auditorium, Avery Hall, Columbia University New York, New York, March 19 and 20, 2011. Sponsored by the Association for Preservation Technology International.

Conference Session Moderator

"Advances in Fatigue of Concrete," co-moderator, ACI Spring Convention, Seattle, Washington, April 6, 1997.

Mechanical Splices in Seismic and Blast Applications, substitute co-moderator, ACI Spring 2001 Convention, Philadelphia, PA., 27 March 2001.

Presentations

"Real-Time Data Acquisition in Structural Testing," presented at Session CP37, "Computerized Structural Design and Analysis," Fourth Conference on Computing in Civil Engineering, Boston, Massachusetts, October 27-31, 1986. Sponsored by the Technical Council on Computer Practices of the American Society of Civil Engineers, the ICES Users Group, and the Society for Computer Applications in Engineering, Planning and Architecture.

"A Fatigue Study of Prestressing Strand," presented at Session 61, "Fatigue and Fracture of Reinforcing Steel," Structures Congress '87, Orlando, Florida, August 17-20, 1987. Sponsored by the Structural Division of the American Society of Civil Engineers.

"Fatigue Testing of Welded and Mechanical Splices in Reinforcing Steel," presented at Technical Session, "New Developments on Fatigue of Concrete Structures," ACI Fall Convention, Seattle, Washington, November 8-13, 1987. Sponsored by the American Concrete Institute.

"A Summary and Review of Fatigue Data for Mechanical and Welded Splices in Reinforcing Bars," presented at Session 57, "Fatigue and Fracture of Cables and Reinforcing Steel," Structures Congress '89, San Francisco, California, May 1-5, 1989. Sponsored by the American Society of Civil Engineers.

"Assessment Techniques Utilized with Historic American High Rises," session on Investigation and Diagnostics, part of conference track on Stabilization and Repair, the APT 89 Chicago Conference: "Make No Little Plans," Chicago, Illinois, September 3-9, 1989. Sponsored by the Association for Preservation Technology International.

"Fatigue Behavior of Mechanical and Welded Splices in Reinforcing Bars", session on "Safety and Effectiveness of Steel Reinforcement and Mechanical Connections", ACI Fall Convention, Philadelphia, Pennsylvania, November 12, 1990. Sponsored by the American Concrete Institute.

"NCHRP Project 10-35 — Fatigue of Mechanical and Welded Splices in Reinforcing Bars", presented to the CRSI Reinforcing Anchorages and Splices Committee, Chicago, Illinois, November 6, 1991. Sponsored by the Concrete Reinforcing Steel Institute.

"NCHRP Project 10-35 — Fatigue of Mechanical and Welded Splices in Reinforcing Bars", presented as part of the Structural Engineering Seminar Series, Purdue University, West Lafayette, Indiana, April 24, 1992. Sponsored by the Civil Engineering Department of Purdue University.

"Modern Techniques for Determining the Capacity of Cast Iron Columns", presented at the International Symposium on Standards for Preservation and Rehabilitation, Monday, October 11, 1993. Sponsored by ASTM Committee E-6 on Performance of Buildings and its Subcommittee E06.24 on Building Preservation and Rehabilitation Technology.

"Modern Techniques for Determining the Capacity of Cast Iron Columns", presented as part of the Structural Engineering Seminar Series, Purdue University, West Lafayette, Indiana, February 8, 1994. Sponsored by the Civil Engineering Department of Purdue University.

"Modern Techniques for Determining the Capacity of Cast Iron Columns", presented at Graduate Students' Structural Engineering Seminar at the Phil M. Ferguson Structural Engineering Laboratory, University of Texas at Austin, Austin, Texas, April 7, 1994.

"Rapid Seismic Evaluation of Essential Facilities in the City and County of Yuma, Arizona", presented to the Yuma County Board of Supervisors, Yuma, Arizona, August 16, 1994.

"Seismic Evaluation of the Montana National Guard Headquarters Building", Department of Disaster and Emergency Services, State of Montana, Helena, Montana, September 4, 1995.

"Fatigue of Mechanical and Welded Splices in Reinforcing Bars", presented at the Western Bridge Engineers' Seminar, Sacramento, California, October 4, 1995.

Yield-Reversal Testing of Mechanical Connections in Reinforcing Bars, presented to ACI Committee 439, ACI (American Concrete Institute) Fall Convention, Montreal, Quebec, November, 1995.

"A 'Time History' of Earthquakes and Seismic Codes," presented at poster session during '96 EERI (Earthquake Engineering Research Institute) Annual Meeting, Los Angeles, California, February 8, 1996.

"The New AASHTO Provisions for Fatigue Design of Mechanical and Welded Splices," ACI 1997 Spring Convention, Seattle, Washington, April 6, 1997.

"Review of Seismic Performance Criteria for Reinforcing Bar Mechanical Connections," *Sixth U.S. National Conference on Earthquake Engineering*, sponsored by Earthquake Engineering Research Institute, Seattle, Washington, June 3, 1998.

"Code and Testing Requirements for Seismic-Class Reinforcing Bar Mechanical Splices," Fifth Conference on Tall Buildings in Seismic Regions, sponsored by Los Angeles Tall Buildings Structural Design Council, Los Angeles, California, May 5, 2000.

"El Salvador Earthquake," Earthquake Engineering Research Institute, 2001 Annual Business Meeting, Monterrey, CA, February 10, 2001.

"Relationship Between Strength and Ductility for Mechanical Splices," Mechanical Splices in Seismic and Blast Applications, ACI Spring 2001 Convention, Philadelphia, PA., 27 March 2001.

"Seismic Versus Wind Design Base Shear Forces In Eastern and Midwestern United States," Session MTC 8 "Design Criteria and Methods - Building Codes", 13th World Conference on Earthquake Engineering, sponsored by the Canadian Association for Earthquake Engineering, Vancouver, B.C., August 5, 2004.

"The Seismic Design Provisions of the ASCE 7 Standard" to the Vancouver Structural Engineering Group Society (VSEGS), 17 November 2005, Vancouver, British Columbia.

"The Emergence of Seismic Structural Engineering Following The Great San Francisco Earthquake of 1906", 8th U.S. National Conference on Earthquake Engineering, April 17-21, 2006.

"Application of Modern Structural Building Codes to Archaic Materials" at the 2006 Codes Conference, Association for Preservation Technology, Chicago, Illinois, April 6, 2006.

"Pilgrim Baptist Church - Progress Towards Rebuilding", October 20, 2007, to the Rebuilding PBC Stakeholder's Group, Chicago, Illinois.

"Pilgrim Baptist Church - Progress Towards Rebuilding", Sept 28, 2007 to the Chicago Architecture Foundation, Chicago, Illinois.
"The House I was Afraid Of…" and two other case studies, to the Graduate Student's Structural Engineering Seminar Series at the University of Texas at Austin, Oct 24, 2007, Austin, Texas.

"Aloha Stadium - An Engineering History," Engineers and Architects of Hawaii, Feb 1, 2008, Honolulu, Hawaii.

"Application of Contemporary Structural Building Codes to Antiquated Materials", ASCE Structural Engineering Institute 2008 Congress, April 26, 2008, Vancouver, British Columbia.

"Structural Certification: Aloha Stadium Case Study," Structural Engineers Association of Hawaii, August 16, 2008, Maui, Hawaii.

"Actual Tensile Properties of Steel Reinforcing Bars", CRSI Material Properties Committee, March 4, 2009, Tempe, Arizona.

"Application of Contemporary Structural Building Codes to Antiquated Materials", Engineers and Architects of Hawaii, August 14, 2009, Honolulu, Hawaii.

"Old Materials and Modern Structural Design Codes," Structural Section of ASCE Wash DC, January 13, 2010, Washington, DC.

"Investigative (or "Forensic") Engineering and Architecture with Historic Buildings", Docents of the Chicago Architectural Foundation, Chicago, Illinois, March 1, 2010.

Invited Lecture: "Forgotten but not Gone: Antiquated Structural Metals," Symposium Honoring Karl H. Frank, University of Texas at Austin, March 4, 2010.

Invited Lecture: "Reinforcing Bars: Substituting Grades and Types," General Session, CRSI Spring Technical Meeting, Tempe, Arizona, March 11, 2010.

"Forgotten but not Gone: Antiquated Structural Metals," to the American Institute of Steel Construction (AISC) in-house engineering staff, Chicago, Illinois, April 20, 2010.