



# The Pulse of Earthquake Engineering

News You Can Use — for members of the Earthquake Engineering Research Institute



January 15th, 2014

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## Message from the President

Welcome to *The Pulse of Earthquake Engineering*, the bi-weekly email newsletter of the Earthquake Engineering Research Institute.

— David A. Friedman, EERI President



## In Memoriam

### Remembering William A. Anderson (1937–2013)

It is with great sadness that we report the passing of EERI honorary member **William A. Anderson** (M. EERI, 2001). Trained as a Sociologist at the Ohio State University Disaster Research Center, Bill was a professor of Sociology at Arizona State University before going to the Engineering Directorate of the National Science Foundation in 1976, where he remained for the next 26 years. While on leave from NSF he took a position with the Disaster Management Facility at the World Bank, where he was one of the architects of the ProVention Consortium. In 2001 he moved to the National Academy of Sciences to direct the Disasters Roundtable and serve as associate executive director of the Division on Earth and Life Studies.

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Coming from a tradition of field research carried out in the immediate aftermath of disasters, Bill recognized the value of EERI's Learning from Earthquakes program, enabling multidisciplinary teams to collect perishable data after damaging earthquakes. NSF funding for the LFE program enabled EERI to disseminate field observations through written reconnaissance reports and live presentations throughout the country, and later via the World Wide Web.

Recognizing the need to develop ties to researchers in other earthquake-prone countries, Bill funded a series of international workshops that allowed researchers to exchange information about their work and to develop personal relationships. That tradition served EERI well after major earthquakes in many countries; it lived on after Bill left NSF, ensuring valuable post-earthquake research collaboration throughout the world.

**Bob Hanson** (M. EERI, 1968), former EERI President and honorary member, who worked with Bill at NSF recalls that "Bill was the ultimate professional, combining the expertise of his own field and a deep appreciation for and support of earthquake engineering professionals. When working with Bill you forgot that he was not trained as an engineer — he had the broad perspective of the needs of the earthquake risk reduction community. All of us, who had the privilege of working with him, will miss his grace in personal and professional interactions."

In Bill Anderson's *Oral History*, published by EERI in 2011, **Kathleen Tierney** (M. EERI, 1987), EERI Board Member and Director of the University of Colorado Natural Hazards Center noted that Bill was a "visionary and institution builder" at NSF and, subsequently, when he managed programs for the World Bank and the National Academies.

For decades, Bill advocated for multidisciplinary research and, through his persistence and coalition-building skills, played a pivotal role in its increasing importance. **Dennis Wenger**, who succeeded Bill's position as the Engineering Directorate at NSF, notes that, "Bill was instrumental in bridging the social and engineering sciences. He fought for us, worked diligently for us, and led us into an expansive, multidisciplinary existence."

Committed to NSF's goal to advance knowledge, Bill never lost sight of NSF's second goal, to fund research that contributed to the well-being of society. To do this, he understood the need to involve practitioners in research programs; there was no other



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## Calendar

1st International Conference on  
Infrastructure Resilience  
February 14-16, 2018  
[resilienceconference.ethz.ch](http://resilienceconference.ethz.ch)

10th Gulf Seismic Forum for  
Seismology and Earthquake  
Engineering Studies in the  
Arabian Plate Region  
March 19-22, 2018  
Muscat, Oman  
[conferences.squ.edu.om](http://conferences.squ.edu.om)

PEER - MTS Hybrid Simulation  
Workshop  
March 20-21, 2018  
PEER Richmond Field Station,  
Richmond, CA  
<http://www.mts.com/events/berkeley/>

Geotechnical Earthquake  
Engineering and Soil Dynamics  
Conference V  
June 10-15, 2018  
Austin, TX  
[www.geesd2018.org](http://www.geesd2018.org)

16th European Conference on

way to ensure that problems faced in practice were addressed by researchers, and that the results of laboratory testing and analytical research were available to those in practice. Bill funded organizations such as EERI, the Natural Hazards Center, and the Applied Technology Council to ensure this critical cross-fertilization. In 2007, **Bill Anderson** and **Chi Liu** were the first recipients of EERI's Special Recognition Award for their tireless work in support of the earthquake engineering profession.

**Polat Gülkan** (M. EERI, 1993), former *Earthquake Spectra* Editor and honorary member, remembers Bill as ". . . a small-framed man housing a big heart, endowed with noble manners and a matching erudite speech. The *Spectra* reviewer pool had very few experts with his broad vision for the needed interaction among the techno-scientific and socio-economic communities in ensuring seismic safety."

**Mary Comerio** (M. EERI, 1988), EERI President-Elect, laments that, "Bill Anderson's passing leaves a sad and empty space in the earthquake engineering community. He was a quiet force — someone who made social science research an integral part of the larger technical research program. We all owe him a debt of gratitude for his leadership and his guidance during his many years at NSF. Equally important, we will all remember him for his kindness, good humor, and grace. Bill was a true gentleman. Bill was a family man. We all knew what his wife, Norma, and daughter, Candice, were doing, and he never failed to ask after our spouses, partners, and children. He knew them all and kept track of their progress. The loss of such a person reminds us all to think more and care more about the work and the lives of everyone in our community."



Actively involved with EERI to the end, Bill rotated off the EERI Board of Directors in 2012 and chaired the 2013 Nominating Committee. This past fall, the EERI Board of Directors, on the recommendation of the Honors Committee, voted to make Bill an Honorary Member of EERI at the 2014 Annual Meeting. Upon learning of this honor, Bill, in his always gracious and giving manner, expressed his gratitude to the members of EERI he had the privilege of working alongside for so many years.

Throughout his career, Bill was a determined advocate for greater involvement of women and other under-represented populations. In his address to the EERI community at the 50th Annual Meeting in 1998, he noted a "shocking lack of participation by persons from minority groups in the profession." While considerably more women are now involved in disaster research and engineering, there has been little increase in the very few African and Hispanic Americans in earthquake engineering and related disciplines. After a very full and productive career, this remained Bill's greatest disappointment. We can pay tribute to Bill by building on the foundation he laid that

Earthquake Engineering  
June 18–21, 2018  
Thessaloniki, Greece  
[www.16ecee.org](http://www.16ecee.org)

## **11th U.S. National Conference on Earthquake Engineering**

June 25–29, 2018

Los Angeles, CA

[www.11ncee.org](http://www.11ncee.org)

Deep Foundations Institute  
(DFI) 43rd Annual Conference  
October 24–27, 2018  
Anaheim, California  
[www.dfi.org](http://www.dfi.org)

Sixth International Symposium  
on Life-Cycle Civil Engineering  
(IALCCE2018)  
October 28–31, 2018  
Ghent, Belgium  
[www.sarcos.eng.cam.ac.uk](http://www.sarcos.eng.cam.ac.uk)

GeoMEast 2018 International  
November 24–28, 2018  
Cairo, Egypt  
[www.GeoMEast2018.org](http://www.GeoMEast2018.org)

16th Symposium on Earthquake  
Engineering (16SEE)  
December 20–22, 2018  
Roorkee, India  
[16SEE-2018](http://16SEE-2018)

### **EERI 71st Annual Meeting**

March 5–8, 2019

Vancouver, B.C., Canada

[2019am.eeri-events.org](http://2019am.eeri-events.org)

broadened our community, both in the research we undertake and those we work alongside. EERI is looking at ways to honor Bill and to recognize the contributions of this very special colleague.

### **Celebration of Life Service**

The Anderson family is planning a Celebration of Life Service for Bill to be held on March 22, 2014. By the end of January, details for the celebration of his life, as well as an on-line Memorial Guest Book, where those who knew him can post remembrances, will be announced. We will also share the family's wishes regarding how to honor Bill in lieu of flowers.

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## News of the Institute

### **EERI Election Results: 2014 President-Elect and Directors**

EERI would like to announce the election results for President-Elect and Directors.

**Mary Comerio** (M. EERI, 1988) received the endorsement of voters to be EERI's President-Elect. Comerio is Professor in the Graduate School at UC Berkeley and a faculty member in Architecture since 1978, serving as Chair from 2006 to 2009.



Mary Comerio



James Malley



David Wald

The new EERI Directors are **Jim Malley** (M. EERI, 1990) and **David Wald** (M. EERI, 1988). Malley is a Senior Principal with Degenkolb Engineers of San Francisco, California. Wald is a seismologist with the U.S. Geological Survey (USGS) in Golden, Colorado, and is on the Geophysics Faculty at the Colorado School of Mines. Malley and Wald will assume their new posts at the first Board of Directors meeting in 2014.

The Institute extends appreciation to **Tom Tobin** (M. EERI, 1986), Past-President, **David Friedman** (M. EERI, 1988), Vice President, and **Ivan Wong** (M. EERI, 1997), Director, for their years of outstanding service and dedication to EERI. Also, thanks to all the EERI members who took the time to consider all the exceptional candidates and cast their votes.



Tom Tobin



David Friedman



Ivan Wong

It is not too early to start thinking about next year's election. The Nominating Committee

## Social Links



## Tell Us Your Thoughts

Submit your questions regarding *The Pulse of Earthquake Engineering* at [pulse@eeri.org](mailto:pulse@eeri.org). You may also submit your content for consideration at [pulse@eeri.org](mailto:pulse@eeri.org).

*The Pulse* is sent on the first and fifteenth day of each month (or the first business day after). Please contact us if you don't receive these issues.

welcomes suggestions from the membership, including self-nominations. Nominees for director must have been active (or honorary) members of EERI for at least five years, and must not have been nominated to the Board in the last two years. To submit a name for consideration, send a brief note giving the name and qualifications of the potential candidate to the Nominating Committee in care of the EERI office. All submissions are confidential.

Members of the Nominating Committee included: chair and honorary member **Bill Anderson** (M. EERI, 2001), **Ross Boulanger** (M. EERI, 1992), **Joe Maffei** (M. EERI, 1989), honorary member **Susan Tubbesing** (M. EERI, 1988), and executive director **Jay Berger** (M. EERI, 2005).

### **EERI Endowment Donors**

EERI would like to thank the donors to the Endowment Fund and acknowledge their recent contributions. EERI's Endowment supports innovative projects that assure the Institute's continuing leadership in the earthquake engineering profession.

*The list below reflects donations that the Institute received during the month of December 2013.*

**\$5,000**

Blume Foundation

**\$3,000**

Faultline Foundation

**\$1,000**

Clarence R. Allen

Thomas D. O'Rourke

**\$500**

Robert E. Bachman

James O. Jirsa

Laurence Kornfield

James K. Mitchell

Douglas J. Nyman

G. Rodolfo Saragoni

L. Thomas Tobin

**\$200-\$350**

William A. Anderson

Jay Berger

Ian G. Buckle

Arrietta Chakos

Ted M. Christensen

C. Terry Dooley

A.J. Eggenberger

Joe Hollstein

I.M. Idriss

Klaus H. Jacob

Paul C. Jennings

James M. Kelly

George C. Lee

Stephen L. Perlof

Cynthia L. Perry

Susan K. Tubbesing

Loring A. Wyllie Jr.

T. Leslie Youd

Howard L. Zee

**\$100-\$200**

Donald G. Anderson

Scott Ashford

Ali Bakhshi

Nesrin Basoz

Jonathan D. Bray

Ricardo Dobry

Sigmund A. Freeman

John R. Hayes Jr.

William T. Holmes

George F. Horowitz

Ronaldo Luna

Andrew T. Merovich

Judith Mitrani-Reiser

Vilas Mujumdar

Maurice S. Power

Richard C. Quittmeyer

Jim Swaisgood

Fred M. Turner

Donald L. Wells

Sharon L. Wood

Stan Zagajeski

**Other Amounts**

Claudio Chesi

John A. Egan

Michael E. Kreger

JoAnn B. Matamoros

Neven Matasovic

Irving J. Oppenheim

Michael J. O'Rourke

Bozidar Stojadinovic

Kenneth C. Topping

Robert A. Williams

## Employment Opportunity at EERI

EERI is seeking a creative, experienced, technology-aware, and dynamic **Program Manager**. This person will be a key staff member with internal and external leadership responsibilities. The Program Manager will have responsibility for multiple externally and internally funded projects and programs, creating and leading professional development programs, and supporting the Institute's committees and chapters.

The Program Manager must be self-motivated, flexible, an excellent communicator, and an outstanding team player. An interest in and knowledge of earthquake engineering and global risk reduction is highly desirable. The Program Manager reports to the Executive Director and should be adept and comfortable working in a collaborative environment within a flat organizational structure. Some travel is required. The starting salary is competitive and is based on qualifications and experience. EERI provides a comprehensive employee benefits package, paid vacation, holidays, sick days, and a casual professional working environment in City Center Oakland on the BART line.

The deadline to apply is **February 5**. For more information on responsibilities and desired qualifications, please visit <https://www.eeri.org/wp-content/uploads/Program-Manager.pdf>.

## 10NCEE Updates: Registration and Papers

Registration for the Tenth U.S. National Conference on Earthquake Engineering (10NCEE) will open in late January. Visit the **10NCEE website** for the latest updates and news at [www.10ncee.org](http://www.10ncee.org).

### Papers

The 10NCEE program committee received nearly 800 papers from potential authors and presenters. Authors will receive review comments and confirmation of acceptance of their papers by February 1, 2014. Final revised papers will be due by March 15, 2014. Final submission of the paper must be accompanied by payment of the full conference registration fee for the presenting author.



## Renew Your EERI Membership for 2014

On December 30, 2013, EERI members (except student and honorary members) were sent via email the fourth membership renewal notice for 2014. The personalized email message provided a link to their personal renewal page showing contact information

with options for selecting chapter membership and making a voluntary contribution to the EERI Endowment Fund.

If you did not receive this message, please e-mail Membership Coordinator Juliane Lane at [juliane@eeri.org](mailto:juliane@eeri.org), and she will re-send the message with your personal link.



### Drawing Winner

In early December, the Institute announced a drawing for a free 10NCEE conference registration to all EERI members who renewed by December 31, 2013. We are happy to announce EERI member **Bora Gencturk** (M. EERI, 2008) has won the drawing. Gencturk is Assistant Professor of Civil Engineering at the University of Houston. Congratulations!

**We hope you will continue to support EERI and renew your membership for 2014.**  
*Together, we can reduce earthquake risk for our communities.*

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## Publications

### Earthquake Spectra: November Issue

The November 2013 issue of *Earthquake Spectra* (volume 29, number 4) is available in print and online at <http://earthquakespectra.org/toc/eqsa/29/4>, where you may browse the table of contents online for your favorite topics. This *Spectra* issue was mailed last week, and EERI members should receive it shortly if they haven't already.

This *Spectra* issue is the second one led by Editor **Jonathan P. Stewart** (M. EERI, 1994) and Associate Editor **Yousef Bozorgnia** (M. EERI, 1986). Stewart is professor and chair of the Department of Civil and Environmental Engineering at the University of California, Los Angeles. Bozorgnia is executive director of the Pacific Earthquake Engineering Research (PEER) Center at the University of California, Berkeley, and adjunct professor of the Structural Engineering, Mechanics, and Materials (SEMM) program.



### Earthquake Spectra: Preprint Manuscripts



In late December and early January, ten preprint manuscripts were posted on the [Earthquake Spectra](#) website prior to their formal publication. The list of new preprint manuscripts, including authors, follows:



- "Practical Implementation of generalized force vectors for the multi-mode pushover analysis of building structures" by **F. Soner Alici** and **Halûk Sucuoğlu** (M. EERI, 1996)
- "Local strengthening of RC structures as a strategy for seismic risk mitigation at regional scale" by **R. Frascadore, M. Di Ludovico, A. Prota, G.M. Verderame, G. Manfredi, M. Dolce,** and **E. Cosenza**
- "Development of Earthquake Energy Demand Spectra" by **Ahmet Anil Dindar** (M. EERI, 2010), **Cem Yalçın, Ercan Yüksel, Hasan Özkaynak,** and **Oral Büyüköztürk**
- "Incorporation of Velocity Pulses in Design Ground Motions for Response History Analysis Using a Probabilistic Framework" by **Ibrahim Almufti** (M.EERI, 2011), **Ramin Motamed** (M. EERI, 2010), **Damian N. Grant** (M. EERI, 2008), and **Michael Willford** (M. EERI, 2009)
- "Systematic ground motion observations in the Canterbury earthquakes and region-specific non-ergodic empirical ground motion modeling" by **Brendon A. Bradley** (M. EERI, 2012)
- "A SSHAC Level 3 Probabilistic Seismic Hazard Analysis for a New-Build Nuclear Site in South Africa" by **Julian J. Bommer** (M. EERI, 1992), **Kevin J. Coppersmith** (M. EERI, 1985), **Ryan T. Coppersmith, Kathryn L. Hanson** (M. EERI, 2001), **Azangi Mangongolo, Johann Neveling, Ellen M. Rathje** (M. EERI, 1996), **Adrian Rodriguez-Marek** (M. EERI, 1999), **Frank Scherbaum, Refilwe Shelembe, Peter J. Stafford** (M. EERI, 2008), and **Fleur O. Strasser**
- "Significance of Rotating Ground Motions on Behavior of Symmetric- and Asymmetric-plan Structures: Part 1. Single-story Structures" by **Juan C. Reyes** and **Erol Kalkan** (M. EERI, 2002)
- "Displacement-based Seismic Design for Reinforced Masonry Shear-wall Structures, Part 1: Background and Trial Application" by **Farhad Ahmadi** (M. EERI, 2012), **Marios Mavros, Richard E. Klingner, Benson Shing** (M. EERI, 1985) and **David McLean**

- “Displacement-based Seismic Design for Reinforced Masonry Shear-wall Structures, Part 2: Validation with Shake-table Tests” by **Farhad Ahmadi** (M. EERI, 2012), **Marios Mavros**, **Richard E. Klingner**, **Benson Shing** (M. EERI, 1985) and **David McLean**
- “Loss Estimation of Tall Buildings Designed for the PEER Tall Building Initiative Project” by **Nilesh Shome** (M. EERI, 2000), **Nirmal Jayaram**, **Helmut Krawinkler**, and **Mohsen Rahnema** (M. EERI, 1998)
- “Lessons from the Behavior of a Monitored Eleven-story Building during the 2011 Tohoku Earthquake for Robustness against Design Uncertainties” by **Zhe Qu** (M. EERI, 2009), **Hiroyasu Sakata**, **Saburoh Midorikawa** (M. EERI, 1999) and **Akira Wada** (M. EERI, 1994)
- “Analytical Seismic Fragility Analyses of Fire Sprinkler Piping Systems with Threaded Joints” by **Siavash Soroushian** (M. EERI, 2011), **Arash E. Zaghi**, **Manos Maragakis** (M. EERI, 1984), **Alicia Echevarria**, **Yuan Tian** (M. EERI, 2012) and **Andre Filiatrault** (M. EERI, 1986)

To read preprint manuscripts or browse the complete list of preprint manuscripts, visit the *Earthquake Spectra* website at <http://earthquakespectra.org/toc/eqsa/0/0>.

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## Program Updates

### Apply Now for EERI Housner Fellows Leadership Program

EERI is now accepting applications for the second class of its innovative leadership program, the **Housner Fellows** Program. This program has the strategic objective “to recognize and equip promising and motivated young to mid-career professionals with the confidence, skills and sense of responsibility needed to become lifelong leaders and advocates of earthquake risk reduction.”

The comprehensive program includes: a one-week hands-on leadership institute, two years of professional mentoring, participation in the EERI Annual Meeting and possible participation in a policy or reconnaissance-related activity. For this class, the leadership institute and EERI annual meeting will be back-to-back in July in Alaska. Two highlights of this engaging program are the group and individual projects, both targeted at real issues in seismic safety. Funding is being provided by a gift from **Professor George Housner**, one of EERI's founding members, and support from the **Federal Emergency Management Agency** (FEMA) and the **Global Facility for Disaster Reduction and**

## Recovery (GFDRR) of the World Bank.

Three Fellows in the next class will be GFDRR-Housner Fellows, specifically from priority GFDRR countries (see <https://www.gfdrr.org/node/156> for list). There is no set age range for the program—if you consider yourself a young to mid-career professional, this may be the program for you.

Each class will have 5 to 8 members. More information and application requirements are available at <http://www.eeri.org/projects/housner-fellows-program>.

Applications are due by **March 1, 2014**. Selected Fellows will be announced by April 15, 2014.

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## Announcements

### NEES/EERI Research-to-Practice Webinar: Seismic Stability of Levees Resting Atop Peat Soil

*Date:* Wednesday, February 5, 2014

*Time:* 11:30 am – 1:00 pm Pacific Time (U.S. and Canada)


*Presenters:* **Scott J. Brandenburg** (M. EERI, 2001), UCLA; **Jonathan P. Stewart** (M. EERI, 1994), UCLA; **Curt Schmutte**, Schmutte Consulting; **Anne Lemnitzer** (M. EERI, 2006), University of California, Irvine

Understanding the level of seismic risk facing the Sacramento-San Joaquin Delta is of national concern given that the country's two largest water diversion systems are located in the southern portion of the estuary. Recent studies of seismic risk in the Delta indicate that a moderate earthquake in the region could cause multiple simultaneous levee breaches that would flood Delta "islands" and draw in saline water from the west, thereby halting delivery. These studies focused primarily on the seismic response of liquefiable sands and silts within and beneath the Delta levees, which is widely acknowledged by experts as being a significant problem. However, most Delta levees are founded on peat soil, often in combination with sandy soils, and much less is currently understood about the seismic deformation potential of peat.



This NEES/EERI research-to-practice webinar will present findings from a recently completed NEES field test of a model levee resting atop peaty organic soil, and an ongoing NEES centrifuge study of nonliquefiable and liquefiable levee fills resting atop peat. The field tests were performed during the summer of 2011 and 2012, and the

project was completed in March 2013. The first of two centrifuge tests was performed in November 2013, and the second will be performed in a few months.

For the complete webinar description and registration information, visit the NEES website at <http://nees.org/events/details/255> .

### **The U.S. Resiliency Council (USRC): Founding Membership Opportunity**

The **U.S. Resiliency Council®** (USRC), a new organization that will implement a building rating system for the earthquake performance of buildings, was formed as a 501(c)3 nonprofit organization. Its objective is to facilitate the use of technical standards and systems such as those developed by SEAONC and ARUP as a basis for owners, lenders, communities, and other stakeholders to evaluate and communicate building resilience objectively and consistently. A long term goal of the USRC will be to consider a broad range of perils beyond earthquakes (e.g., hurricane, flood, blast).

The USRC will award Earthquake Resilience Ratings, much like the US Green Building Council® issues LEED® ratings. The USRC will establish an accreditation program for professional engineers who wish to employ the rating system. The USRC will also include peer review and validation of ratings. These features of the USRC rating process are a direct response to stakeholders' perceived need to ensure integrity of the system.




A key principle of the USRC is that it will not develop technical standards for assessing risk. Rather, the USRC's board and technical advisory committees will identify existing or developing technical standards (e.g., SEAONC and ARUP systems) that can be used to generate a rating.

At this time, the USRC is looking for firms and individuals to become Founding Members of the organization. Founding members will demonstrate industry leadership to create widespread interest in greater earthquake resilience. In addition, founding members will help establish initial priorities and long-term strategy of the USRC, including specific benefits of membership. If you have such an interest please contact EERI Member **Ron Mayes** ([rlmayes@sqh.com](mailto:rlmayes@sqh.com); 415-343-3031) for further details.

### **"Considering the Quake: Seismic Design on the Edge" Exhibit**

**Considering the Quake: Seismic Design on the Edge** explores the elegant, and oftentimes, elusive intersection between the aesthetics of architectural form and the technicality of structural design, through the lens of earthquake engineering. Curated by **Professor Ghyslaine McClure**, P.Eng, and founded/curated by **Dr. Effie Bouras**, of the

McGill University Department of Civil Engineering and Applied Mechanics, this exhibit emerged from their research on the resiliency of emergency shelters and civil protection buildings, such as schools and hospitals, in earthquake zones throughout the world.

Venue: [American Institute of Architects, Center for Architecture](#) , New York City  
Opening: February 13 – May 26, 2014

## CON SIDER ING THE QUAKE

Envisioned as a "science center" for design, the exhibition, which is tailored not only for the architecture and engineering communities, but an invested public as well, will feature full-sized seismic technology utilized in buildings, architectural and structural models, seismic testing videos, including clips from Tomas Koolhaas' new documentary titled REM, and a 500N shake table from North American Wave Spectrum Science and Trade Inc.

International in scope, projects include: the Office for Metropolitan Architecture's (OMA) groundbreaking Taipei Performing Arts Center, CCTV and Shenzhen Stock Exchange; a house rebuilt on the site of a catastrophic earthquake, by Chilean architects Pezo von Ellrichshausen; The Regional Emergency Management Center in Italy; Daniel Libeskind's Contemporary Jewish Museum in San Francisco with OLMM Consulting Engineers; Singapore/Tokyo based, Studio SKLIM's, Earthquake resistant Hansha Reflection house, work by California-based Tipping Mar Engineers and **Degenkolb Engineering**; Star Seismic, an innovative seismic technology, firm based in Utah that has pioneered the engineering and design of buckling restrained braces (BRBs). Other original projects are also featured.

*Exhibition Installation by SOFTlab in consultation with **ARUP***

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### Earthquake Engineering Research Institute

499 14th Street, Suite 220, Oakland, CA 94612-1934 USA

phone: 510-451-0905 | fax: 510-451-5411 | email: [eeri@eeri.org](mailto:eeri@eeri.org) | website: [www.eeri.org](http://www.eeri.org)

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