

A National Center of Excellence in Advanced Technology Applications

Bulletin

Overview of MCEER's New Center Approach

A Message from the Director

Over the past year, MCEER has been active in refining its NSF-supported research and education activities, and expanding the strategic partners network. These activities have been influenced by many factors, including the attack on our nation last September 11, which has provided new opportunities to develop disaster resistant communities. In June, MCEER organized a plenary workshop (co-sponsored by the National Academy of Sciences and the Institute for Civil Infrastructure Systems) to bring together experts in blast engineering to meet with specialists in earthquake hazard mitigation and the emergency response community to determine areas of mutually beneficial and cooperative research. This is a new area of multidisciplinary cooperation, and MCEER looks forward to the research opportunities that may develop.

On another front, we have comprehensively examined and modified our research agenda, industry partnership program and research management structure. This has resulted in a revitalized Center-wide strategic five-year plan. The plan includes a refined mission statement: "to enhance the seismic resiliency of communities through improved engineering and management tools for critical infrastructure systems and emergency management functions by developing advanced knowledge and technologies through integrated team efforts."

Other highlights of this new approach include the creation of an Industry Advisory Board (IAB), comprised of architecture, engineering and manufacturing firms and government agencies, which will provide input to the MCEER Executive Committee in developing research tasks. The board is chaired by Gary Hart, Hart-Weidlinger Division of Weidlinger Associates, and the members are listed on [page 2](#).

This past March, MCEER hosted its annual meeting for researchers, students and industry participants. The meeting provided MCEER's management team with an opportunity to present the new Center approach. The meeting included an industry day segment that allowed IAB members to make presentations to all the attendees and a poster session for student researchers.

(continued on page 2)

Inside

Overview of New Center Approach	page 1
Report on Changureh, Iran Earthquake	page 2
Industry Advisory Board Members	page 2
New International Journal Published on Earthquake Engineering	page 3
ANCER Conference	page 3
Recent Events	page 4
Workshop Reviews	
Lessons from the WTC Attacks	page 4
3rd National Seismic Conference	page 5
ATC-17-2 Seminar	page 5
Third International Workshop on Transportation Facilities	page 6
MCEER Welcomes New Program Officer	page 6
SLC Activities	page 7
Plattsburgh, NY Earthquake	page 7
Field Mission to Taiwan	page 8
2002 REU Program	page 8
High School Student Internship Experience	page 9
Student Spotlight: Rory Connell	page 9
Kudos	page 10
Reviews from the UB-MCEER-EERI Seminar Series	
Mete A. Sozen	page 11
Emmanuel Velivasakis	page 12
Ronald T. Equchi	page 13
New MCEER Special Reports	
Draft LRFD Guidelines Available	page 13
Third National Seismic Conference Proceedings	page 14
New Report Series on World Trade Center Attack	page 14
New MCEER Technical Reports	page 15
Upcoming Events	page 16

New MCEER Approach

(continued from page 1)



■ Participants at MCEER's Annual Meeting pose for a group photo outside the University Inn and Conference Center in Buffalo.

The first joint meeting of the IAB/MCEER Executive Committees was held at the annual meeting in March. As a result of this meeting, specific research activities were identified as key to the



■ Members of the new Industry Advisory Board made presentations during the industry day segment. Shown above is Douglas Taylor, Taylor Devices.

achievement of MCEER's strategic plan, and corresponding task statements were requested from researchers who could contribute to the plan. In April, these statements were evaluated using a new prioritization matrix approach, and the result is the Year 6 research program. More details about the new five-year plan (for years 2002 – 2007) can be found on our website at <http://mceer.buffalo.edu/>. ❖

--George C. Lee, Director

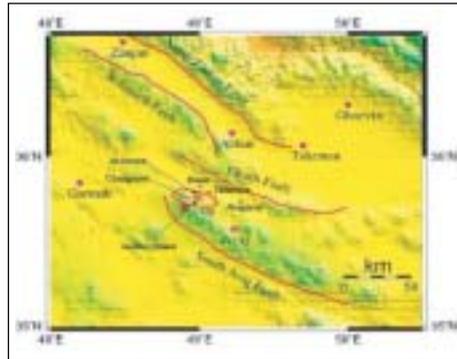
Preliminary Report on the Changureh, Iran Earthquake

On June 22, 2002 at 7:28 a.m. local time, a M_w 6.4 earthquake occurred in the northwestern region of Iran, causing significant damage and casualties to small mountainous towns and villages in the area. According to the International Institute of Earthquake Engineering and Seismology (IIEES), the Changureh (Avaj) earthquake was felt as far away as Tehran, approximately 180

miles east of the epicenter. The latest reports indicate that the death toll is 261, the number of injured exceeds 1,300 people, and over 25,000 people are homeless.



■ Devastation in Changureh, Iran.



(source: IIEES, 2002)

■ Fault Map of Northwestern Iran.

Dr. Babak Mansouri of ImageCat, Inc. prepared a preliminary report for MCEER. Dr. Mansouri was in Iran at the time of the earthquake and the full report is available from MCEER's website at http://mceer.buffalo.edu/publications/sp_pubs/Iran6-22-02/default.asp. ❖

Industry Advisory Board Members

John Abruzzo, The Thornton-Tomasetti Group

Jefferson W. Asher, KPFF Consulting Engineers, Inc.

Edward Bortugno, Governor's Office of Emergency Services

Paul Bryant, Mitigation Division, Federal Emergency Management Agency

Mohammed Ettouney, Weidlinger Associates, Inc.

John Gillengerten, State of California

Thomas H. Hale, State of California

Gary Hart, Hart-Weidlinger Division

Paul Hough, Armstrong World Industries, Inc.

Saif Hussain, SHA Coffman Engineers, Inc.

Roy A. Imbsen, Imbsen & Associates

Jeremy Isenberg, Weidlinger Associates, Inc.

Thomas Jung, Bureau of Architectural and Engineering Facility Planning

Mary Kerns, Enidine Inc.

Young-Suk Kim, Unison Industrial Co., Ltd.

D. Stanton Korista, Skidmore, Owings, & Merrill LLP

David Lee, East Bay Municipal Utility District

Peter Lee, Skidmore, Owings & Merrill LLP

R. Jay Love, Degenkolb Engineers

David K. MacLeod, Cannon Design

Jon Mochizuki, City of Los Angeles

Anoop Mokha, Earthquake Protection Systems, Inc.

Pat Moyer, Dynamic Isolation Systems, Inc.

Nobuo Murota, Bridgestone Corporation

Jean-Robert Pierre, Transenergie Hydro Quebec

Daniel Scorza, City of Los Angeles

Glenn Singley, City of Los Angeles

Ellis Stanley, City of Los Angeles

Douglas Taylor, Taylor Devices, Inc.

Ronald Tognazzini, City of Los Angeles

Christos Tokas, State of California

Thomas Whitlow, Memphis Light, Gas and Water

Michael Willford, ARUP

New Journal Published to Enhance Exchange of Earthquake Hazard Mitigation Research Between China and International Community

Earthquake Engineering and Engineering Vibration (EEEV) is a new journal published by the Institute of Engineering Mechanics (IEM), China



Seismological Bureau, in cooperation with MCEER. The main objective is to promote scientific exchange between Chinese and international scientists and engineers to improve the theory and practice of earthquake hazards mitigation, preparedness, and recovery. MCEER's role emphasizes introducing Chinese researchers to the systems-integrated, multidisciplinary research being carried out through the Center.

The *Journal of Earthquake Engineering and Engineering Vibration* is the first English-language journal to be published in China and will be issued by IEM twice per year. It will include approximately 20 papers in each issue, with a balanced number from Chinese and international authors. Both original and invited papers

addressing state-of-the-art knowledge and practice in earthquake engineering will be included. The journal is peer reviewed, and has an international editorial board (for a list of members, see the [journal's website](#)).

The following is a list of some subject areas describing the scope of the journal:

- Evaluations of damage to structures and engineering systems resulting from recent earthquakes.
- New observations of strong motion characteristics and data processing techniques.
- Seismic risk and hazard analysis of civil infrastructure systems.
- Site effects on structures and geotechnical earthquake engineering.
- Seismic behavior and design criteria for buildings and lifeline systems.
- Advances in structural dynamics relevant to earthquake engineering.

- Theory and practice of health monitoring for structures under extremely loading.
- Seismic retrofit strategies for existing infrastructure systems.
- Structural response modification using emerging control technologies and high performance materials
- Engineering structural vibration under wind, wave and other dynamic loadings

Papers are currently being solicited for future issues. Submission instructions can be found on MCEER's web site at <http://mceer.buffalo.edu>, or by contacting one of the managing editors: Xiong Jianguo, Professor, IEM, CSB, 9 Xuefu Road, Harbin 150080, China, email: xiongjg@iem.net.cn; or Jane Stoyale, Publications Manager, MCEER, University at Buffalo, Red Jacket Quad, Buffalo, NY 14261 USA; email: jestoyale@mceermail.buffalo.edu. ❖

ANCER Conference on Advances in Earthquake Engineering Research

The Asian-Pacific Network of Centers for Earthquake Engineering Research (ANCER) has scheduled its first major meeting, *International Conference on Advances and New Challenges in Earthquake Engineering Research*, August 15-20, 2002. This conference is dedicated to the late Professor Liu Huixian, and will consist of two consecutive meetings in Harbin and Hong Kong, China.

The Harbin component of the conference, hosted by the Institute of Engineering Mechanics, China Seismological Bureau (IEM, CSB), scheduled for August 15-17, 2002, will focus on new

challenges and innovative solutions in earthquake engineering.

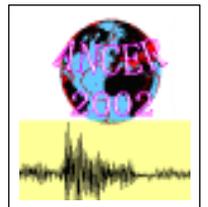
The Hong Kong conference component, hosted by the Hong Kong Polytechnic University (HK Poly U), scheduled for August 19-20, 2002, will emphasize problems that concern areas of moderate seismicity and intelligent infrastructure engineering. Research in the development and application of advanced technologies will be the common underpinning of both meetings.

For more information, visit the conference web site at <http://mceer.buffalo.edu/>

[outreach/intActivity/ANCER/conference-new.htm](#).

For the Harbin conference, contact: Dr. Hou Xingmin, phone: 86-451-665-2663; fax: 86-451-666-4755; e-mail: ieec2002-iem@iem.net.cn.

For the Hong Kong conference, contact: Professor Y.L. Xu, e-mail: cerylxu@polyu.edu.hk; fax: 852-2334-6389; or Dr. Eddie S.S. Lam, e-mail: ceeddiel@polyu.edu.hk; Fax: 852-2334-6389. ❖



Lessons from the World Trade Center Terrorist Attack: Management of Complex Civil Emergencies and Terrorism-Resistant Civil Engineering Design

MCEER, in collaboration with the National Research Council (NRC) and the Institute for Civil Infrastructure Systems (ICIS) organized a workshop, *Lessons from the World Trade Center Terrorist Attack: Management of Complex Civil Emergencies and Terrorism-Resistant Civil Engineering Design*, held June 24-25, 2002



■ Richard Little and Michel Bruneau summarized some of the key outcomes at the conclusion of the workshop.

in New York City. The objective was to review whether knowledge developed during the past to enhance seismic resilience could be used to help achieve terrorism-resistant communities, and at the same time, investigate whether lessons learned from blast-resistant engineering could be used to enhance earthquake engineering practice.

Over 100 experts from a wide variety of backgrounds joined together to address social and engineering issues in an integrated, multidisciplinary format. Sessions alternated between management of complex civil emergencies and engineering issues to achieve terrorism-resistant civil engineering design.

Proceedings are currently being assembled, and will contain introductory material prepared by the Steering Committee, short biographic material from all



■ Workshop participants exchange perspectives between sessions.

the presenters, one-page abstracts for each of the presentations, recommendations for future research, and a CD containing all of the PowerPoint presentations made at the workshop. The proceedings will be available from MCEER in early September. ❖

Recent Events...

February 25-26, 2002

New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) Meeting
Columbia University, New York City, New York

March 6, 2002

Seminar by Ronald T. Eguchi
Using Synthetic Aperture Radar and Other Remote Sensing Technologies to Detect Earthquake Damage in the 1999 Marmara, Turkey, Earthquake
Buffalo, New York
Webcast address:
<http://civil.eng.buffalo.edu/webcast>

March 7-9, 2002

MCEER Annual Meeting
MCEER Executive Committee and Industry Advisory Board Meeting
Student Leadership Council Meeting
Buffalo, New York

March 15, 2002

Seminar by Emmanuel Velivasakis
World Trade Center Disaster
Buffalo, New York
Webcast address:
<http://civil.eng.buffalo.edu/webcast>

April 5, 2002

Seminar by Mete A. Sozen
A Way of Thinking
Buffalo, New York

April 11, 2002

New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) Meeting
New York City, New York

April 15, 2002

MCEER Executive Committee Meeting

April 28 – May 2, 2002

Third National Seismic Conference and Workshop on Bridges and Highways
Portland, Oregon

May 30-31, 2002

ATC-17-2 Seminar on Response Modification Technologies for Performance-Based Seismic Design
Los Angeles, California

June 19-21, 2002

US-PRC Protocol Meeting
Las Vegas, Nevada

June 24-25, 2002

Lessons from the World Trade Center Terrorist Attack: Management of Complex Civil Emergencies and Terrorism-Resistant Civil Engineering Design
New York City, New York

July 21-25, 2002

7th U.S. National Conference on Earthquake Engineering
Boston, Massachusetts

July 30-August 1, 2002

KEERC/MCEER Joint Seminar
Buffalo, New York

National Bridge Conference Attracts over 350 Professionals

The *Third National Seismic Conference & Workshop on Bridges & Highways* attracted more than 350 bridge and highway engineers, design consultants, and federal, state and local transportation owners from throughout the U.S. and abroad. With more than 40 technical presentations, 21 poster presentations, and 24 exhibitors, the conference served as a forum on the latest practices and technological advancements in seismic design and retrofit for bridges and highways in all seismic zones.



■ Many organizations displayed their products and services at the conference. Shown above are Greg Lawson and Amarnath Kasalanati, DIS, Inc.

Sponsored by the Federal Highway Administration (FHWA), Oregon DOT and Washington State DOT, and organized by MCEER, the conference was held April 28-May 1, 2002 in Portland, Oregon. This is the third conference in the series and follows successful conferences



■ Pictured at the conference are (from left): Tom Lulay, Oregon DOT; James Roberts, Imbsen & Associates/Caltrans; Roland Nimis, FHWA; and Gary Hamby, FHWA.

held in San Diego, California in 1995 and in Sacramento, California in 1997. The theme of this year's event was "Advances in Engineering and Technology for the Seismic Safety of Bridges in the New Millennium."

Roland Nimis, Western infrastructure chief for FHWA, served as the host of the workshop. He welcomed the participants and introduced the opening keynote speakers. The first speaker, Gary Hamby, Western regional director of the FHWA, told the audience that the highway administration is working with the Office of Homeland Security and the

American Association of State Highway and Transportation Officials (AASHTO) to assess the vulnerability of bridges and overpasses during the next three to six months. Hamby said that the national highway system must be able to adapt not only to natural disasters such as earthquakes, but also to acts of terrorism that could disrupt transportation and seriously damage the economy. Another keynote speaker, James Roberts, who has spent 50 years with the California Transportation Department, gave an overview of new technology and designs being used to minimize earthquake damage.

Other sessions featured topics including lessons learned from recent earthquakes (since 1998), seismic design practices and specifications, design of major bridges in high and moderate seismic areas, effects of near field earthquakes on bridges, an international forum on advanced earthquake design and mitigation technologies and approaches that have been implemented in other parts of the world, seismic practices for transportation structures and systems, displacement based design, emerging seismic design and retrofit technologies, and development and testing of the new LRFD seismic design specifications for highway bridges.

Order information for the Proceedings, available from MCEER, is provided on [page 14](#). ❖

150 Gather for ATC-17-2 Seminar

MCEER and the Applied Technology Council (ATC) jointly sponsored the *ATC-17-2 Seminar on Response Modification Technologies for Performance-Based Seismic Design* on May 30-31, 2002 in Los Angeles. It was the third in a series of seminars first held in San Francisco in 1986. The seminar focused on seismic isolation, energy dissipation, active and semi-active con-

trol systems, and the use of new materials in structural response modification.

A highlight of the seminar was a field trip to several local facilities that incorporate seismic isolation. Participants visited the Conexant Facility, a microchip wafer fabrication plant that was seismically retrofitted with a rubber base isolation system while the plant remained in operation; St. John's Health

Center, which is a base isolated structure currently under construction; the University of Southern California Hospital, a base isolated hospital subjected to strong ground shaking during the 1994 Northridge earthquake; and Los Angeles City Hall, which began a retrofit program in 1999 that includes installation of about 450 rubber isolation bearings, 70 sliding isolation bearings, and 70 fluid viscous dampers. ❖

Third International Workshop on Performance Based Seismic Design and Retrofit of Transportation Facilities

The *Third International Workshop on Performance Based Seismic Design and Retrofit of Transportation Facilities* was held in Tokyo, Japan on July 9-11, 2002, at the Tokyo Institute of Technology. The meeting was followed by a one-day study tour in the Tokyo area. The Federal Highway Administration sponsored the U.S. delegation. The first two workshops in the series were organized by the National Center for Research in Earthquake Engineering (NCREE), Taipei, Taiwan, and held in July 1999 and September 2000, in Taipei.



■ Participants visited several bridges under construction by the Japan Highway Public Corp as part of the study tour.

The workshop allowed participants to review the state of performance-based design of bridges in the U.S., Japan and Taiwan, and discuss some of the key issues that must be addressed to ensure effective implementation of this design concept. About 50 people participated in



■ The study tour participants rode the Maglev train, which can reach speeds of up to 450 km/hr.

the workshop, with 10 from the U.S., 10 from Taiwan, and the rest from Japan.

As part of the study tour, the participants visited the Maglev (magnetic levitation) train testing track facility, where participants rode the train at speeds up to 450 km/hr. The group then visited several bridges under construction by the Japan Highway Public Corporation between Tokyo and Kyoto.

Proceedings of the workshop, including technical papers, resolutions and research recommendations, were published by the Tokyo Institute of Technology. A limited number of copies will be available through MCEER Publications.

Photos are courtesy of the Kawashima Research Group. To view additional photographs from the workshop and study tour, go to <http://seismic.cv.titech.ac.jp>. ❖

MCEER Welcomes New Program Officer

MCEER is pleased to welcome Jerome S. O'Connor, P.E., F-ASCE, as Senior Project Manager for Transportation Research. He will assume responsibility for coordination of the Center's Highway Project, sponsored primarily by the Federal Highway Administration (FHWA).



Jerry joins us with a wealth of knowledge and practical experience in bridge engineering, having been an employee of the New York State Department of Transportation (NYSDOT) for 20 years. Most recently, he served as Bridge Management Engineer in Region 6 (Southwestern New York) and became known for his advocacy of advanced technologies.

During his tenure at NYSDOT, Jerry served on several research oversight panels and worked jointly with the Federal Highway Administration on a number of projects and workshops. He initiated one of the first projects awarded by FHWA under its Innovative Bridge Research and Construction Program and led two projects that received national recognition. The first project involved replacing a deteriorated bridge with an innovative composite bridge that offered more weight capacity and allowed for quick and economical installation. In the second project, a bridge scheduled for replacement was instead rehabilitated by removing much of its dead load. This extended the service life of the bridge, and the project received the 2000 Charles Pankow Award for Innovation from the Civil Engineering Research Foundation (CERF).

Jerry can be reached at MCEER, phone (716) 645-3391 ext. 107; e-mail js07@mceermail.buffalo.edu.

Highway Project 106 Research Summary

From time to time, research summaries from current or recently completed projects will be posted on our web site. The first article, "Stability of Elastomeric Isolators: Critical Load Tests and Computations," by Satish Nagarajaiah and Ian G. Buckle, is available for download from http://mceer.buffalo.edu/research/HighwayPrj/112_106/default.asp. The article describes research to validate a new theoretical model developed to numerically study the buckling of elastomeric bearings at high shear strains. ❖

Student Leadership Council Activities

The MCEER Student Leadership Council (SLC) was very active during the *MCEER Annual Meeting*, held in Buffalo, New York from March 6-9, 2002. The meeting provided an important opportunity for students to discuss future plans for the SLC. In addition, students presented their research at the poster session or during a student presentation plenary session at the meeting.

The first day of the *Annual Meeting* was devoted entirely to SLC activities. Following opening remarks from SLC president Ani Natali Sigaher, students practiced their presentations to receive comments and criticism from their peers. The majority of the day was devoted to discussing several issues, including the upcoming *Student Research Accomplishments* publication, the SLC website, and this summer's retreat for MCEER students. The students also discussed developing a promotional brochure for the SLC to recruit new student researchers for MCEER projects. In addition, the SLC discussed its presence at future national meetings such as those hosted by the Earthquake Engineering Research Institute (EERI) and the 7th National Conference on Earthquake Engineering (7NCEE).

The meeting served as a brainstorming session for a collaborative future SLC



■ *Gordon Warn (Above) and Diego Lopez Garcia (Right) discuss their research with researchers, students and industry partners at the poster session portion of MCEER's Annual Meeting*



project that will incorporate the various disciplines in the MCEER research community. The forthcoming Tri-Center field mission trip to Taiwan was also discussed during the meeting (see review on page 8).

Elections were held for leadership positions in the council for the upcoming year. The results were: Jeff Berman, University at Buffalo, president; Rory Connell, University of Delaware, vice president; and Benedikt Halldorsson, University at Buffalo, activities coordinator. Following the SLC meeting, the students attended a webcast seminar lecture that was given by Ronald Eguchi,

ImageCat, Inc. (see seminar review on page 13).

Fifteen students presented posters at the *MCEER Annual Meeting*. The posters updated fellow MCEER researchers and industry partners on student research projects. In addition to the posters, four student presentations were given during the *Annual Meeting*: "Preparing for Y2K and JCAHO: Incentives for Hospital Rehabilitation" by Rory Connell, University of Delaware; "Development of Engineered Cementitious Composite Materials for Seismic Strengthening and Retrofit" by Keith Kesner, Cornell University; "A Simulation for Exploring the Dynamics of Recovery" by Scott Miles, University of Washington; and "Quantification of Cross-Effect in a Linear MDOF Structure" by Tony Yang, University at Buffalo.

The SLC would like to thank Ani Natali Sigaher for her two years of service as president. Natali has played a pivotal role in the development of the SLC, and the MCEER students would like to thank her for her hard work.

The next student meeting will be held during the forthcoming SLC annual retreat in August. ❖

--Submitted by Rory Connell, Disaster Research Center, University at Delaware

Moderate Earthquake Strikes Near Plattsburgh, New York

On April 20, 2002, an earthquake struck near Plattsburgh, New York that was felt throughout New York State and New England, and in areas of Ohio, Maryland, and Quebec, Canada. The USGS reported a preliminary magnitude of 5.1. Minor damage occurred in the epicentral area, including bridge damage in Jay, New York, and road damage in Keesville, New York. A bridge in

Lake Placid, New York, and a window and foundation in Au Sable Forks, New York were also damaged. Plattsburgh is located in the Adirondack Mountain region, an area of relatively frequent seismic activity. An earthquake similar in size occurred approximately 80 miles to the southwest in October 1983.

Jeffrey Berman, a member of MCEER's Student Leadership Council, followed

up with officials in Plattsburgh and New York State regarding the effects of the earthquake. This information is available at http://mceer.buffalo.edu/outreach/pr/NY_eq_plattsburgh.asp. Additional information about the earthquake is available at <http://earthquake.usgs.gov> and <http://neic.usgs.gov/neis/bulletin>. ❖

MCEER Student Participates in Tri-Center Field Mission to Taiwan

Diego Lopez Garcia, Ph.D. candidate in the Department of Civil, Structural and Environmental Engineering at the University at Buffalo, was among eight students and one faculty member who traveled to Taipei, Taiwan, for a week of study at the National Center for Research on Earthquake Engineering (NCREE). The students were sponsored by the three U.S. earthquake centers, MCEER, PEER and MAE. The mission was organized by MAE and coordinated by Professor Paul Roschke from Texas A&M University (MAE).

The group convened at NCREE for two days of presentations by experts from



■ *Diego Lopez Garcia (right) and Dr. Juin-Fu Chai (NCREE Field Mission Coordinator) at NCREE's Structural Laboratory in Taipei.*

NCREE. The next two days consisted of a field trip to the Chi-Chi earthquake region. Sites visited included Feng-Yuan, Chung-Cheng Park (fault precipice), Pei-Feng bridge, Shi-Kang dam, Shi-Wei bridge, Tong-Feng bridge, Wu-Feng, Kuan-Fu Elementary School (geological damage), Tsau-Tun, Shu-Kung Junior High School (reconstructed school), Tsau-Tun, Ninety-Nine Peaks (landslide), Yen-Feng bridge, Chi-Lu cable stayed bridge and Chi-Chi town (epicenter). Several local people invited the group into their homes or businesses and showed examples of non-engineered repair and retrofit. The last full day included presentations by NCREE members, one by PEER student Charles Chadwell, University of California, Berkeley and a presentation by all of the MAE/MCEER/PEER students.

After their return to the U.S., the students have been asked to make at least two presentations during the fall 2002 semester based on information they learned during the trip. One presentation is to be given to groups of students or adults in the U.S. that do not have an academic



■ *The Field Mission Team pose in front of the Chi-Lu Bridge, which was under construction at the time of the 1999 Chi-Chi earthquake. The bridge suffered some damaged and is not yet open to traffic.*

background in engineering or earthquakes, such as for middle or upper level high school students or lower-division undergraduate students. The second presentation is intended to be a technical seminar for graduate students and interested professors at the earthquake centers.

MCEER is grateful to NCREE for its significant contribution to the success of the Field Mission. MCEER extends its appreciation to all NCREE members who contributed their time and expertise to make this opportunity a great educational experience. ♦

--Submitted by Diego Lopez Garcia, University at Buffalo

Three Students Participate in 2002 REU Program



MCEER has selected three students to participate in the Research Experiences for Undergraduates (REU) program this summer. This year's students are:

- **Daniel Fenz**, University at Buffalo, who is working on a project entitled "Frictional Behavior of Nonmetallic Materials for Use in Sliding Bearings." His advisor is Michael Constantinou.
- **Nishadi Karunarathne**, Catholic University of America, Washington, D.C., is working at the University at Buf-

falo under the direction of Andrei Reinhorn. The project title is "Damping of Frame Structures: An Educational Shake Table Test."

- **Robert Payne**, Cornell University, is working with faculty advisor Thomas D. O'Rourke on a project entitled "Critical Lifeline Response to Granular Failure Triggered by Earthquakes."

The students will present the results of their activities at the *REU 2002 Symposium* in Keystone, Colorado, August 8-11, 2002. ♦

MCEER's Student Leadership Council (SLC) has launched a new web page. The site includes information about the Council's organization, members, activities, the REU program, reviews from recent meetings, as well as news items and announcements about upcoming events. The site can be reached by visiting MCEER's home page at <http://mceer.buffalo.edu> and selecting Education.

High School Student Describes Internship Experience at MCEER

The internship is part of an ongoing Amherst Senior High School program which matches students with researchers in the western New York area. Under the supervision and advisement of Andrea Dargush, Jake is the second student which MCEER has mentored in the program.

My four month internship at MCEER gave me the opportunity to study, first hand, what takes place in a new and relevant scientific research center.

At MCEER, I was involved in a project that was to monitor crustal displacement by using the Global Positioning System (GPS). Using the Internet, I was able to search for relevant data. I also started another project that will attempt to in-

corporate topographic, soil composition, and chemical and biological threats in urban areas.

I worked in an engineering lab at Ketter Hall at the University at Buffalo. I helped graduate student Tony Yang in his project that studies the cross-planar vibrations in a simple structure. Theoretically, when a building is vibrated due to an earthquake, it is only supposed to vibrate in that direction. However, due to structural and material defects, the building vibrates in both an X and Y direction. Accelerometers placed at various points on a model measure different acceleration.

My experience at MCEER has shown me how to quickly filter the Internet for rel-

evant information needed in a professional environment. I am very grateful for the opportunity to spend time in an engineering lab.❖

--Submitted by Jake Davis, Amherst Senior High School, Amherst, New York

Editor's Note: In his laboratory activities, Jake was mentored by Tony Yang, a former MCEER REU intern, who is now completing his Master's degree at the University at Buffalo and starting a Ph.D. program at the University of California, Berkeley. Jake, who at the same time interned at Roswell Park Cancer Institute in Buffalo, New York, graduated with the class of 2002 and plans to major in physics as an undergraduate student.

Student Spotlight

Rory Connell is pursuing a Master's Degree in Sociology from the Disaster Research Center, University of Delaware. He became interested in earthquake hazard mitigation primarily through working at the Disaster Research Center, supervised by Dr. Kathleen

Tierney. He has also worked extensively on the Center's hospital mitigation study as well as an assessment of Project Impact, the Federal Emergency Management-sponsored community mitigation program.

Rory's research project identifies the impediments that health care facility operators and owners must overcome before undertaking the rehabilitation of existing structures and systems, as well as the incentives that might make these actions possible. Entitled "Hospital Rehabilitation: Impediments and Incentives" the study, which includes thirteen focus groups from hospitals in New York, California and Tennessee, also identifies the criticality of different hospital systems and functions immediately following a disaster event. Rory is currently analyzing the qualitative data from this study, which contains both quantitative and qualitative data, for his master's thesis.

When asked about his future plans, Rory said, "I plan to complete my degree at the end of Summer, 2002. Then, I will look for work in government or organizational emergency management."

Rory currently serves as the Student Leadership Council (SLC) vice-president, and was responsible for contributing the column on the activities of the SLC in this issue of the *Bulletin* (see article on page 7).

In his free time, Rory plays guitar in a Philadelphia-based music group. His other interests include songwriting and home recording, movies, writing short stories, reading, going to baseball games and painting.❖



■ *Rory Connell poses with his dog, Addie.*



Kudos

★ MCEER Investigator **Mircea D. Grigoriu** has been awarded *the 2002 Alfred M. Freudenthal Medal* of the American Society of Civil Engineers (ASCE). Professor Grigoriu was cited "for his original theoretical developments and applications of probabilistic methods to civil engineering." The *Freudenthal Medal* is presented in recognition of distinguished achievement in safety and reliability studies applicable to civil engineering. A faculty member at Cornell University, School of Civil and Environmental Engineering, since 1980, Professor Grigoriu's research interests are in structural dynamics, random vibration, stochastic mechanics, fracture mechanics, and applied probability. He received the award at the *15th Engineering Mechanics Division Conference*, June 2-5, 2002 in New York City.



★ **T. T. Soong**, Samuel P. Capen Professor of Engineering Science, University at Buffalo, and co-principal investigator of the NSF Center Grants which established NCEER in 1986 and MCEER in 1997, has been awarded the 2002 Nathan M. Newmark Medal by the American Society of Civil Engineers (ASCE). The award was presented at the *15th Engineering Mechanics Division Conference*, June 2-5, 2002, in New York City. The Newmark Medal is given to an ASCE member whose outstanding contributions in structural mechanics have substantially strengthened the scientific base of structural engineering. Dr. Soong was cited "for his pioneering work, innovations and leadership in the theory and applications of structural control systems in civil infrastructure facilities."



★ **Stephanie E. Chang**, research assistant professor at the University of Washington and long-time MCEER researcher, received the 2001 Shah Innovation prize "for her innovative contributions to earthquake loss estimation and lifeline seismic risk analysis, and her success in the unique and difficult role of bridging the engineering and social science research and practicing communities." According to the 2001 selection committee, Stephanie's career "reflects the innovation, creativity and entrepreneurial spirit honored by the prize. Not only does she work in both the academic and professional worlds, and the U.S. and international contexts, but she also spans the engineering and social science communities."



Endowed by a generous gift from the Haresh Shah family, the \$10,000 Shah Family Innovation Prize is awarded annually to younger professionals and academics for creativity, innovation and entrepreneurial spirit in the field of earthquake risk mitigation and management. Stephanie received the prize at *EERI's Annual Meeting* in Long Beach, California, held on February 6-9, 2002.

★ **Donald J. Goralski**, MCEER's Senior Program Officer for Industry/User Partnerships, received the Marilyn G.S. Watt Alumni Award from the Communication Studies faculty of Canisius College. The award recognizes alumni of the department who have distinguished themselves in their careers. He received the award during the department's annual spring honors and awards event, which was held on April 22 at Canisius College.

★ **Thomas D. O'Rourke**, Thomas R. Briggs Professor of Engineering in the School of Civil and Environmental Engineering at Cornell University, and long-time member of MCEER's Executive Committee, received the endorsement of the voters as President-Elect of the Earthquake Engineering Research Institute (EERI).



He will serve one year as President-Elect, followed by two years as President and one year as Past President. Tom was formally welcomed to his new post at the *EERI Annual Meeting*, held February 6-9, 2002 in Long Beach, California.

★ MCEER Director **George C. Lee** was honored for his 40 years of service to the School of Engineering and Applied Sciences, University at Buffalo. He was honored at a dinner hosted by UB President William Greiner, and by a reception held at the School of Engineering, hosted by current Dean Mark Karwan. Dean Karwan noted that George is the first faculty member in the School of Engineering to reach the 40-year mark. When asked about his achievements, George attributed his success to his commitment to the collective achievement of the faculty members of the institution and its goals.



Prior to serving in his current roles as MCEER Director, Samuel P. Capen Professor of Engineering, and Senior University Advisor for Technology, George was Chair, Department of Civil Engineering (1974-1977), and Dean, School of Engineering and Applied Sciences (1977-1995), Associate Director, Calspan-UB Research Center (1984-1989) and Acting Director, National Center for Earthquake Engineering Research (1989-1991).

UB-MCEER-EERI Seminar Series at the University at Buffalo

The EERI student chapter of the University at Buffalo (UB-EERI), the MCEER Student Leadership Council, the Networking and Education Programs of MCEER, and the University at Buffalo's Department of Civil, Structural and Environmental Engineering jointly sponsor a series of seminars on a variety of topics related to earthquake hazard mitigation. The purpose of the seminar series is to widen accessibility to timely, technical presentations by students, researchers, visitors and affiliates of MCEER. The seminars are broadcast over the Internet in real-time, and can be viewed anytime at <http://civil.eng.buffalo.edu/webcast>. UB's Professor Andrei Reinhorn and undergraduate student Jason Hanley, from Computer Science and Engineering, arrange the webcasts.

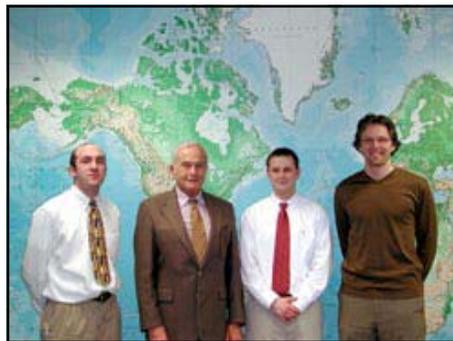
A Way of Thinking

Dr. Mete A. Sozen, Purdue University

On April 5, 2002, Dr. Mete A. Sozen of Purdue University gave the 2002 EERI Distinguished Lecture entitled "A Way of Thinking," which was included as the ninth in the ongoing seminar series on earthquake engineering topics. However, at the request of Dr. Sozen, the seminar was not webcast.

Mr. Darren Vian, Ph.D. candidate in the Department of Civil, Structural and Environmental Engineering (CSEE), president of the UB-EERI Student Chapter, and member of the MCEER Student Leadership Council (SLC), opened the seminar by welcoming the standing-room-only audience of approximately sixty people, and introducing the speaker.

Prof. Sozen began his presentation by explaining how it would differ from most technical presentation on engineering topics. In his abstract for the presentation, he wrote: "Structural engineering is a profession. A profession is characterized by the need to exercise judgment within a domain defined by a set of canons. The structural engineering canons have developed sometimes as a result of and sometimes despite the interaction between science and experience. That structures were built successfully without science and, worse yet, even with the wrong science for hundreds of years and that science has, so far, been insufficient to guarantee predictability, emphasize the challenge in



■ Dr. Mete A. Sozen is shown with UB-EERI-SLC students (from left) Darren Vian, Prof. Sozen, Gordon Warn, and Benedikt Halldorsson following his seminar.

discriminating between the poles: "Science is all!" and "Experience is all!" The territory in between is vast and slippery. It is difficult to navigate a true course without giving in to the lure of one pole or the other. Today, ready access to versatile and powerful software enables the engineer to do more and think less. It is not often questioned whether the exact analysis of the approximate model qualifies as an approximate analysis of the structure itself. To contemplate once again the role of analysis in design is not a waste of time.

A way of thinking about structural design was developed in a series of iterations in the mid 20th century by three engineers. Their goals were not global. The whole was made up of specific solutions for specific problems. But when their contributions are viewed together, a complete way of thinking about

structural design becomes discernible. The goal of this talk is to encourage engineers to review the works of Harald M. Westergaard, Hardy Cross, and Nathan M. Newmark as a whole not for the specific processes but for the general principles of their art of thinking about structural design.

Of the three, Harald M. Westergaard was the immaculate and painstaking scholar with a penchant for simple and direct expression. His vision of the relationship between theory and design is captured by his statement "... a simple device can yield perhaps 80 percent of the truth whereas the next 10 percent would be difficult to obtain and the last 10 percent impossible...."

Hardy Cross was the creative genius more interested in the engineering artifact than its analysis. Though intensely interested and eminently successful in the development of analytical methods for structures, he kept his students' eyes on the prize by repeating that a building is to build and not to analyze. Perhaps he said it all about the role of analysis in design when he wrote "All analyses are based on some assumptions which are not quite in accordance with the facts. From this, however, it does not follow that the conclusions of the analysis are not very close to the facts."

As a graduate student in 1930's at Urbana, Illinois, Nathan M. Newmark

(continued on page 12)

World Trade Center Disaster

Emmanuel Velivasakis, LZA Technology, A Division of The Thornton-Tomasetti Group

On Friday, March 15, 2002, Emmanuel Velivasakis of LZA Technology gave a presentation entitled "World Trade Center Disaster." It was the eighth presentation in the ongoing seminar series on earthquake engineering topics held at the University at Buffalo.

Mr. Darren Vian, Ph.D. candidate at the Department of Civil, Structural and Environmental Engineering (CSEE), president of the UB-EERI Student Chapter, and member of the MCEER Student Leadership Council (SLC), opened the seminar by welcoming the audience and introducing the speaker.

Mr. Velivasakis described how in New York City, emergency response teams, including hundreds of police officers and firefighters, were immediately dispatched to the World Trade Center site by the Mayor's Office of Emergency Management. Simultaneously, the New York City Department of Design and Construction retained four major construction management firms to assist in the search and rescue operation, as well as LZA Technology, which was charged with responsibility for all structural engineering operations at the site.

He discussed and showed numerous examples of how the structural engineer played a crucial role in enabling the intense search and rescue effort to proceed without hindrance on a 24-hour basis, while maintaining safety in an environment fraught with the risk and danger posed by partially collapsed and severely damaged structures.

With many photographs to illustrate the situation facing the engineers, Mr. Velivasakis expanded on the services provided by LZA Technology at and around ground zero. These services included immediate damage assessment of



■ *Emmanuel Velivasakis described the role of structural engineers at ground zero in the aftermath of the World Trade Center attack.*

buildings in the collapse area, assistance with demolition and temporary stabilization procedures, design of grillages and analysis of existing structures to support construction equipment, coordination of the survey monitoring of existing damaged structures, and inspection of hundreds of buildings in the area surrounding the collapse site.

Mr. Velivasakis' presentation was received by generous applause, after which Mr. Vian moderated the discussions. After Mr. Velivasakis answered numerous questions from the audience, the seminar was closed. ❖

--Submitted by Benedikt Halldorsson,
UB-EERI secretary

Sozen Seminar Review

(continued from page 11)

worked with Professors Cross, the artist, and Westergaard, the analyst. In retrospect, he appears to have excelled them both in scholarship and creativity. It is difficult to capture Newmark's state of mind with a single quote. Things came easily to him and, in general, he did not take the time to write to be understood. But his flashes of genius in applied mechanics demonstrate his

thinking was a perfect fusion of his gifted teachers. His quick grasp of the important and his ability to cut through seemingly complex problems using sophomore-level mechanics is at once astounding and delightful. He was a master of the synecdoche. A dam would be modeled as a rigid object with a single degree of freedom. A multidimensional ground motion became a pulse. His understated apology after having represented one component of an entire ground motion by one half of a square wave, "It would be possible to consider a sinusoidal pulse but this complicates the expressions unnecessarily," is enough to make one stop in one's tracks. Because of the pinnacles of his achievements in simplifying geotechnical and structural design, it is easy to miss that his strongest contribution was to expand and deepen the way of thinking set into motion by Cross and Westergaard.

The thinking of Cross, Westergaard and Newmark did not always intersect completely. But when it came to the relationship of structural mechanics to design (all three had design experience and remained active and interested in structural design throughout their careers), they were completely together. To them, structural mechanics was perfect as long as it was not applied. When it was applied, it had to be applied with judicious care to maximize return in relation to investment. As long as one was going to be wrong anyway, one might as well be wrong the easy way.

After Dr. Sozen's interesting and personal presentation, Mr. Vian moderated the discussions and finally, after thanking our guest with a generous applause, the seminar was closed. ❖

--Submitted by Benedikt Halldorsson,
UB-EERI secretary

Using Synthetic Aperture Radar and Other Remote Sensing Technologies to Detect Earthquake Damage in the 1999 Marmara, Turkey Earthquake

Ronald T. Eguchi, ImageCat, Inc.

Ronald T. Eguchi of ImageCat, Inc. gave a seminar entitled "Using Synthetic Aperture Radar and Other Remote Sensing Technologies to Detect Earthquake Damage in the 1999 Marmara, Turkey Earthquake" at the University at Buffalo on March 6, 2002. Mr. Eguchi's presentation was the seventh in the ongoing seminar series.

As with the other seminars held this semester, Darren Vian opened the event by welcoming the audience and introducing the speaker.

Mr. Eguchi described the activities of an MCEER research team, who for the past several years have been investigating the use of remote sensing technologies in post-earthquake damage detection. This research has focused on various aspects of damage detection including: 1) detection of damage or no damage, 2) quantification of various damage states, on a regional basis, and 3) quantification of damage to specific buildings. The research team has found that currently available remote sensing data (namely, SPOT, Landsat, and certain radar data, such as ERS) can indeed detect major changes to cities caused by extensive damage from an earthquake. In certain situations, remotely sensed data can also verify particular damage states (such as collapsed buildings).

To test and validate the methodology, the research team applied specially developed change detection algorithms to two areas of Turkey. Both areas, Golcuk and Adapazari, were devastated in the 1999 Marmara, Turkey earthquake. In Golcuk, severe damage was observed to multi-story residential structures, in addition to some ground subsidence



■ Ronald T. Eguchi discussed the application of remote sensing technologies to post-earthquake damage detection.

problems. To estimate change, a broad set of change detection algorithms was applied to the analysis. For the two areas above, Landsat and ERS data were used to assess major structural changes caused by the earthquake. These data were provided by the European Space Agency. For the Golcuk area, they also obtained SPOT data from researchers in Turkey who are also investigating the use of remotely sensed for damage detection.

The significance of these findings is far-reaching. As demonstrated in many prior disasters, delayed or impeded response can lead to further damage (as in the case of unchecked fires) and prolonged recovery. Ultimately, these impacts burden the local and regional infrastructures with higher recovery costs and additional social burdens. They concluded that by developing and implementing technologies that allow for more rapid evaluation of regional damage, a community's level of resilience can be increased. This research is sponsored by MCEER and by the National Science Foundation through a special grant on the Marmara, Turkey earthquake.

(continued on page 14)

Draft LRFD Guidelines for Seismic Design of Bridges Now Available

A preliminary version of the new *Recommended LRFD Guidelines for the Seismic Design of Highway Bridges* (including Part I: Specifications, Part II: Commentary and Appendices, USGS CD-ROM entitled "Seismic Hazard Curves and Uniform Hazard Response Spectra for the United States," and instructions for using the CD-ROM with the Guidelines) are available for a limited time through MCEER. A final, published version of these documents, along with several detailed design examples demonstrating their application and use, are planned for publication in 2003.

The guidelines contain recommended specifications for the seismic design of highway bridges. They were developed on the basis of work conducted by a joint venture between MCEER and the Applied Technology Council (ATC), sponsored by the National Cooperative Highway Research Program (NCHRP) of the Transportation Research Board, under NCHRP Project 12-49, "Comprehensive Specifications for the Seismic Design of Bridges." The provisions are currently under review for possible adoption as an AASHTO Guide Specification. They are performance-based, and address state-of-the-art aspects of highway bridge seismic design, including the latest approaches for representation of seismic hazard, design and performance criteria, improved analysis methods, steel and concrete superstructure and substructure design and detailing, and foundation design.

The set costs \$60.00 and can be ordered by contacting [MCEER Publications](mailto:mceer@mceermail.buffalo.edu), phone: (716) 645-3391, ext. 105; fax: (716) 645-3399; e-mail: mceer@mceermail.buffalo.edu. ♦

Proceedings Available from Third National Seismic Conference

The *Proceedings of the Third National Seismic Conference and Workshop on Bridges and Highways* focus on the latest advancements in earthquake design and retrofit for bridges, highway systems and components. The conference is the third in a series, following events held in Sacramento in 1997 and San Diego in 1995. This third proceedings volume focuses on seismic events, lessons learned and design code developments that have taken place since 1997 (see review on page 5).



The 600-plus page proceedings contain 44 full-length papers and 17 poster session papers on the following topics:

- Lessons learned from recent earthquakes (since 1998)
- Seismic design practices/specifications
- Design of major bridges in high and moderate seismicity areas
- Effects of near field earthquakes on bridges
- International forum on advanced earthquake design and mitigation technologies and approaches
- Seismic practices for transportation structures and systems
- Displacement based design
- Emerging seismic design and retrofit technologies
- Development and testing of the new LRFD seismic design of highway bridges.

The proceedings are \$40.00 and can be ordered by contacting **MCEER Publications**, phone: (716) 645-3391, ext. 105; fax: (716) 645-3399; e-mail: mceer@mceermail.buffalo.edu.

MCEER Publishes Special Report Series on The World Trade Center Attack

MCEER has issued a report series titled *Engineering and Organizational Issues Related to The World Trade Center Terrorist Attack*. The series is based on the premise that the World Trade Center attack could be seen as a “proxy” for what a major earthquake might do in a complex, densely populated, modern urban environment. Like an earthquake, the terrorist attack occurred with virtually no warning. As would be expected in an earthquake, fires broke out and multiple structural collapses occurred. As has been observed in major urban earthquakes and in other disasters (e.g., Hurricane Andrew), structures that performed critical emergency functions were destroyed, heavily damaged, or evacuated for life-safety reasons.

Additionally, because the majority of the damage occurred to relatively new and well-engineered structures and because the emergency response system in New York City was considered well prepared for all types of emergencies (particularly terrorist attacks), the attack and its aftermath provide a useful laboratory for exploring a variety of engineering and emergency management issues.

With funding from the National Science Foundation (NSF), MCEER initiated a research project to collect perishable data in the aftermath of the WTC attack for later study to gain a better understanding of how resilience is achieved in physical, engineered systems, and in organizational systems. *Engineering and*

Eguchi Seminar Review

(continued from page 13)

Mr. Eguchi’s presentation was received by generous applause, after which Mr. Vian moderated the discussions. A num-

Organizational Issues Related to The World Trade Center Terrorist Attack presents these findings. Each report in the series focuses on a narrow aspect of the disaster as studied by MCEER researchers. These reports, as listed below, are available in PDF format or as hard copies that can be ordered from the MCEER web site at <http://mceer.buffalo.edu>:



- **Overview of Damage to Buildings near Ground Zero**, by Michel Bruneau, Andrew Whittaker and Andrei Reinhorn, MCEER-02-SP02
- **Reconnaissance and Preliminary Assessment of a Damaged Building Near Ground Zero**, by Jeffrey Berman, Gordon Warn, Andrew Whittaker and Michel Bruneau, MCEER-02-SP03
- **Emergency Response in the Wake of World Trade Center Attacks: The Remote Sensing Perspective**, by ImageCat, Inc., Charles K. Huyck and Beverley J. Adams, MCEER-02-SP05.

Each report is \$25.00. To order reports, contact MCEER Publications, phone: (716) 645-3391, ext. 105; fax: (716) 645-3399; e-mail: mceer@mceermail.buffalo.edu.

ber of interesting questions were posed from the active audience, and after the discussions, the seminar was closed.❖

—Submitted by Benedikt Halldorsson,
UB-EERI secretary

New MCEER Technical Reports

MCEER technical reports are published to communicate specific research data and project results. Reports are written by MCEER-funded researchers, and provide information on a variety of fields of interest in earthquake engineering. The proceedings from conferences and workshops sponsored by MCEER are also published in this series.

MCEER's web site offers a complete list of technical reports, abstracts, and prices. The publications catalog allows users to search the report list by subject, title and author, and to place orders for these reports. Visit the site at <http://mceer.buffalo.edu/publications/default.asp>.

Assessment of Performance of Bolu Viaduct in the 1999 Duzce Earthquake in Turkey

By P.C. Roussis, M.C. Constantinou, M. Erdik, E. Durukal and M. Dicleli, 5/8/02, MCEER-02-0001, 140 pages, \$25.00

This report describes the impact of the destructive 1999 Duzce (Turkey) earthquake on the Bolu Viaduct, a 2.3-km long seismically isolated structure which was essentially complete when the

earthquake occurred. The viaduct suffered a complete failure of its seismic isolation system and narrowly avoided total collapse due to excessive differential ground, substructure, and superstructure movement. The report presents an evaluation of the design of the seismic isolation system of this structure and an assessment of its performance in the Duzce earthquake. The evaluation of design and assessment of performance are important in developing experience in the design of seismically isolated structures and in validating analysis and design specifications.

Seismic Behavior of Rail Counterweight Systems of Elevators in Buildings

by Mahendra Pal Singh, Rildova and Luis E. Suarez, 5/27/02, MCEER-02-0002, 216 pages, \$35.00

The study described in this report focused on the seismic performance of elevator systems. The report begins with an overview of elevator systems used in buildings, including various components of the system and their functions. From the standpoint of seismic performance, the rail-counterweights are the most vulnerable components of the system. Current code procedures used for the

design of the rail and guidance system are provided, as is a survey of available literature on the seismic response and performance evaluation of elevator systems. The authors develop simple linear and more realistic nonlinear models to evaluate the seismic performance of the rail-counterweight system. The linear model provides a convenient tool for a preliminary study of the system to provide valuable insight into the dynamic behavior; it can also be conveniently used to examine protective options to improve seismic performance of the system. The nonlinear model, on the other hand, is necessary to study the performance of the system under more realistic seismic conditions. A comprehensive parametric study is conducted to evaluate the effect of various parameters on the seismic response of the system.

The analytical models and approach described in the report will aid in seismic evaluation of hospitals equipped with elevators for vertical transportation. This study will also help the designers and manufacturers of the elevator systems understand why elevators behave as they do in earthquakes and will help them to evaluate the modification and design changes that may be necessary to improve their seismic performance.

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July 21 - 25, 2002

**7th U.S. National Conference on Earthquake Engineering:
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■ **Park Plaza Hotel** ■ **Boston, Massachusetts**

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