

NSF Site Team Reviews MCEER Activities and Future Plans

On June 6-8, 2001, MCEER hosted its third annual site visit organized by the National Science Foundation's Division of Engineering Education and Centers. Dr. Joy Pauschke, NSF Program Officer, coordinated the site team to review MCEER's Year 4 activities and plans for Years 5-10. The written recommendations from this year's site visit team, including strengths, weaknesses, opportunities and threats (SWOT), will be reviewed by a Blue Ribbon Panel convened by NSF. The panel will also review the reports prepared by all three NSF Earthquake Engineering Research Centers in response to the issues and concerns raised by the site team in their SWOT analyses. Directors and other representatives of the three centers will brief the Blue Ribbon Panel in Washington, D.C. on July 26-27. The panel will then evaluate the centers and make their recommendations on program issues to NSF Program Officers. This will influence the direction of the three centers over the next several years.

Many people participated in this year's site visit, including MCEER staff, researchers, partners and students. The review began Wednesday morning, with introductions and an overview of MCEER's program by George Lee, Director, and Michel Bruneau, Deputy Director. This was followed by descriptions of each of MCEER's research programs. Presenters were:

Program 1: Seismic Evaluation and Retrofit of Lifeline Networks

- Masanobu Shinozuka, University of Southern California, electric power systems
- Stephanie Chang, University of Washington, earthquake loss estimation
- Thomas O'Rourke, Cornell University, water and gas systems

Program 2: Seismic Retrofit of Hospitals

- Michel Bruneau, MCEER and the University at Buffalo, seismic retrofit of hospitals
- Michael Constantinou, University at Buffalo, examples of projects and accomplishments made possible in the "Center" environment

Program 3: Earthquake Response and Recovery

- Kathleen Tierney, Disaster Research Center, University of Delaware

(continued on page 2)

Inside

NSF Site Team Visits MCEER	page 1
Workshop Explores Barriers to Implementing Earthquake Hazard Mitigation Measures	page 3
City of Buffalo Receives Project Impact Funding	page 4
MCEER Welcomes Six New Partners	page 4
Researchers Simulate Ground Motions from the 1906 San Francisco Earthquake	page 5
Recent Events	page 5
MCEER Organizes Third Na- tional Seismic Conference	page 6
Highway Project 094 Researchers Meet	page 6
Risk Assessment of Highway Systems Report Published	page 7
Program Manager Sought	page 7
SLC Activities	page 8
Student Spotlight: A. Natali Sigaher	page 9
US-PRC Exchange Program Seeks Participants	page 9
Seminar Series Review	page 10
2001 REU Students	page 10
Viewpoint Third World Conference on Structural Control	page 11
Kudos / Staff News	page 12
Research Progress and Accom- plishments: 2000-2001	page 13
Advanced Technologies for Loss Estimation CD-ROM	page 14
MCEER's Top Ten Reports	page 14
New MCEER Technical Reports	page 15
Upcoming Events	page 16

NSF Site Review

(Continued from page 1)

User Networks for Seismic Assessment and Retrofit of Critical Facilities

- Andrei Reinhorn, University at Buffalo

MCEER Industry/User Collaboration

- Donald Goralski, MCEER

Education and Educational Outreach

- Andrea Dargush, MCEER, education and educational outreach
- A. Natali Sigaher, University at Buffalo, MCEER Student Leadership Council activities

A highlight of this year's review was a student led demonstration of a research project currently being conducted at Cornell University. The initial full-scale testing series were of 12" diameter steel pipes and were conducted at Cornell. The second phase of testing included 30" and 36" diameter pipes and required equipment with capacities greater than that available at Cornell's structural testing laboratory. One of



- Site team members and other participants visited Taylor Devices, where a research team from Cornell University was conducting large full-scale tests on pipelines. James Mason (far right), a graduate assistant at Cornell, led the tour and described the research project.

MCEER's partners, Taylor Devices, Inc., volunteered the use of their facility for the large full-scale pipe testing and was the location for the demonstration. The research is investigating the feasibility of using fiber reinforced composite wraps to retrofit and reinforce welded slip joints on large diameter steel pipelines. Professor Thomas D. O'Rourke, with James A. Mason, a Ph.D. candidate at Cornell, and Ilker Tutuncu, who recently completed his Ph.D, is directing the project. Mason led the tour describing the test program and its outcome to date. Participating contractors (Master Builders, Inc, Fyfe Company, and R.J. Watson, Inc.) and one of the end users of the technology, the Los Angeles Department of Water and Power, were also there to answer questions for the NSF site team. The project provides an excellent example of how industrial partners and ultimate end users are participating in MCEER research projects. It also demonstrates how students play an integral part in the research process.

Partners intimately involved in Center research projects, including many from the users advisory groups for Programs 1, 2 and 3, attended the site review in support of the Center's research plan. The partners participated in a closed-door SWOT session with the site team and NSF officials. Later in the evening, several partners were recognized for their close cooperation and commitment to MCEER throughout the years.

The site team and NSF officials also met with University officials to discuss financial management procedures and other institutional policies.



- UB graduate student Dyah Kusumastuti explains her research to NSF Deputy Division Director Lynn Preston during the student poster session.

Using the Internet and videoconferencing facilities, virtual tours of the laboratories at University of Nevada-Reno, Rensselaer Polytechnic Institute, Cornell University and the University at Buffalo were coordinated by undergraduate student and former MCEER REU intern Jason Hanley, under the direction of Professor Andrei Reinhorn. Equipment at the host institutions was integrated with the capabilities at UB to provide the tours. Although the quality of the video transmissions varied, due to the shortcomings of current technology, the possibilities created by this capability are endless and will be explored for other uses in the coming year.

Many of MCEER's students attended the review and contributed posters for discussion and display. A formal poster session took place on Thursday, which gave the students an opportunity to discuss their research projects with the site team members. Other students presented posters remotely during the virtual lab tours. Later that day, the students participated in a closed-door SWOT session with the site team, and held a meeting of the Student Leadership Council (SLC) (see article on page 8). ❖

Student Poster Sessions

Jeffrey Berman, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Special Steel Shear Walls and Modular Infill Panels"

Quan Gan, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Vibration Control on Helicopter Blade – Aeronautical Application of MCEER Structural Control Technology"

Benedikt Halldorsson, Gang Dong and Apostolos Papageorgiou, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Seismic Hazard and Ground Motions"

WooYoung Jung, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Polymer Matrix Composite (PMC) Infill Walls for Seismic Retrofit"

Michael Kiley-Zufelt and Rory Connell, Disaster Research Center, University of Delaware
"Hospital Rehabilitation Impediments and Incentives"

Dyah Kusumastuti, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Development of Benchmark Model for Irregular Structures"

Diego Lopez Garcia, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"A Simple Method for the Design of Optimal Damper Configurations"

Wei Liu, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Performance-based Optimal Design of Building with Added Energy Dissipation Devices"

Babak Mansouri, Civil Engineering Department, University of Southern California
"Change/damage Detection in Seymen-Turkey Using ERS SAR Data"

James Mason, School of Civil and Environmental Engineering, Cornell University
"Fiber Reinforced Composites for Advanced Seismic Performance of Water Supplies"

Ehab M. Mostafa, School of Civil and Environmental Engineering, Cornell University
"Fragility Surfaces as a Measure of Seismic Performance"

M.V. Sivaselvan, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Seismic Progressive Collapse Analysis of Framed Structures"

Ran Tao, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Temporal Characteristics of Earthquake Ground Motion and Their Possible Implications on Structural Damage"

Ilker Tutuncu, School of Civil and Environmental Engineering, Cornell University
"Compressive Load and Buckling Response of Steel Pipelines During Earthquakes"

Eric Wolff, Department of Civil, Structural and Environmental Engineering, University at Buffalo
"Experimental and Analytical Study of Buildings Equipped with Seismic Isolation and Damping Systems with Emphasis on Primary and Secondary System Response Prediction"

Workshop Explores Barriers to Implementing Earthquake Hazard Mitigation Measures

MCEER researchers Bill Petak, University of Southern California, and Dan Alesch, University of Wisconsin at Green Bay, convened a workshop to solicit input from members of the practicing earthquake engineering community for a guideline document on overcoming barriers to implementing earthquake hazard mitigation measures. The workshop was held March 12, 2001 at Degenkolb Engineers in San Francisco, California. The guideline document is the product of a research task supported by MCEER.

Participants engaged in open discussion about the content and usefulness of the guidelines document, which identifies and categorizes barriers that occur throughout the implementation cycle. Overall, the group found the substance to be interesting and useful. A number of suggestions were made which would significantly improve the outcome of the research effort and make it more relevant to the practicing professional community. These suggestions are currently being addressed, and an MCEER technical report is being prepared.

A paper that summarizes this research effort is included in this year's **Research Progress and Accomplishments** volume, and can be viewed at <http://mceer.buffalo.edu/publications/resacom/0001/default.asp>. ♦

City of Buffalo Receives Project Impact Funding



Over the past two years, MCEER has been an active participant in establishing a FEMA-supported Project Impact Community in Buffalo, New York. Recently, the efforts of the Buffalo Project Impact Steering Committee were instrumental in securing the grant, under the leadership of Deputy Commission John Sniderhan of the City of Buffalo Emergency Operations Center. Andrea Dargush has served as MCEER's representative to the committee.

FEMA's Project Impact initiative provides seed money to U.S. communities to carry out disaster mitigation activities with the help of public-private sector partnerships. The program's objectives include improving the disaster resiliency of the community and reducing vulnerability and dependence on federal disaster relief assistance.



■ Buffalo, New York was officially designated as a Project Impact community this past May. John Sniderhan addressed representatives of numerous partnering organizations (above); George Lee signed the Memorandum of Agreement on behalf of the University at Buffalo (right).



A signing ceremony was held on May 4, 2001 to officially designate Buffalo as a recipient of FEMA Project Impact funds. As one of several representatives of the University at Buffalo involved in the Project Impact effort, MCEER Director George C. Lee signed a Memorandum of Agreement on behalf of the University at the ceremony. The Memorandum of Agreement signifies the willingness of the University to work together with the City to advance its Project Impact goals.

Project funding in Buffalo will be dedicated to a range of mitigation projects, including improved snow removal programs, severe weather communications enhancements, seismic network installation and upgrading of the city's emergency operations center.

A new Buffalo Project Impact website (<http://www.projectimpact.ci.buffalo.ny.us>) was developed with the assistance of MCEER webmaster Michael Kukla. Additional kickoff activities are scheduled to take place over the next several months. ❖

MCEER Strategic Partnerships Network Welcomes Six New Partners



MCEER welcomes six new members to its Strategic Partnerships Network. They are Arup, Degenkolb Engineers, and KPFF Consulting Engineers, who have subscribed to membership as Premier Partners, and Bridgestone Corporation, SHA Coffman Engineers, and Skidmore Owings & Merrill, who join at the Partner level.

Arup, Degenkolb, KPFF, and SHA Coffman are engineering firms. Skidmore Owings & Merrill is an architectural engineering firm. Bridgestone is a manufacturer of seismic isolation bearings.

They join existing members Enidine, Inc. and Taylor Devices, Inc. (Flagship Partners); Dynamic Isolation Systems, Inc. and Weidlinger Associates, Inc. (Premier Partners); and Cannon Design, Earthquake Protection Systems, Inc., Imbsen & Associates, Inc., and Thornton-Tomasetti Group (Partners) as members. Additional information on MCEER's Strategic Partnerships Network, and links to all member web sites can be found at <http://mceer.buffalo.edulpartnerships>.

The Strategic Partnerships Network features three levels of membership: Flagship Partner, Premier Partner, and Partner, each with its own array of Network benefits. Annual membership fees are: \$10,000 for Flagship Partners; \$3,500 for Premier Partners; and \$1,000 for Partners.

The Network encourages interaction between industry colleagues and MCEER researchers. It offers preferred enrollment in MCEER continuing education courses, provides access to top students throughout MCEER's nationwide consortium of institutions, and provides opportunities for collaborative studies with center researchers, fellow members, and government agencies.

For more information on the MCEER Strategic Partnerships Network, contact Donald J. Goralski at MCEER, email: goralski@acsu.buffalo.edu, or visit the "Partnerships" section of our web site at <http://mceer.buffalo.edulpartnerships>. ❖

Researchers Develop Simulations of Ground Motions from the 1906 San Francisco Earthquake

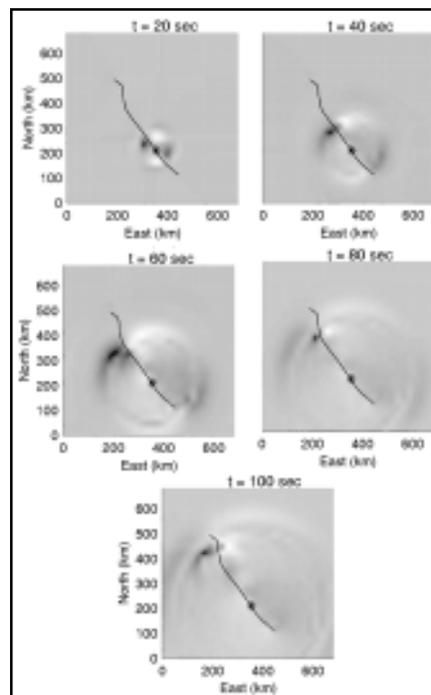
This year, San Francisco observed the 95th anniversary of its devastating 1906 earthquake. On April 18, during the annual meeting of the Seismological Society of America, Professor Apostolos Papageorgiou and doctoral candidate George P. Mavroeidis, engineering seismologists from the Department of Civil, Structural and Environmental Engineering, University at Buffalo, presented their research to quantitatively simulate the low-frequency, near-field ground motions produced by this historic event.

The simulations provide the first quantitative approach to estimating the ground motions from this earthquake, which ruptured over 300 km of the San Andreas fault. The researchers produced ground motion "snapshots" of low-frequency displacements and velocities for an extended area covering central and northern California and for 15 selected locations in the vicinity of the earthquake, including downtown San Francisco, Oakland, the Golden Gate Bridge, Fort Bragg and San Jose. These "snapshots" give an idea of the intensity of ground motion that was experienced during the earthquake.

The simulations were based on accurate slip models recently developed by USGS researchers. The slip models, which describe how much one side of the fault slipped in relation to the other, provided the necessary input to reproduce the ground motion generated by the 1906 earthquake and to quantitatively reconstruct the long-period displacement and velocity field experienced by central and northern California.

The research focused on long-period motions, which are ground motions that

are slower and consist of seismic waves in which there are fewer oscillations per minute. Large earthquakes release a lot of energy in the long-period range, so this range is important. At the same time, certain structures, such as high-rise buildings and suspension bridges, are considered long-period structures that are expected to suffer or to be more severely tested during large events. The researchers plan to expand the models



■ Snapshots taken at equal time intervals indicating the evolution of the vertical ground displacement with respect to time for central and northern California obtained using the slip model proposed by Thatcher et al. (1997). The black solid line indicates the San Andreas fault trace, while the star indicates the epicenter of the 1906 earthquake. The maximum synthetic vertical displacement is approximately 0.2 m.

(Continued on page 13)

Recent Events...

March 1, 2001 – July 31, 2001

March 12, 2001

Workshop on Overcoming Barriers to Implementing Earthquake Hazard Mitigation Measures
San Francisco, California

March 26, 2001

MCEER Executive Committee Meeting
Video Conference

March 26-31, 2001

Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics
San Diego, California
(Co-sponsors: MCEER and others)

March 29, 2001

Post-earthquake Structural Evaluation Short Course
Buffalo, New York

April 6, 2001

Seminar by Dominic Kelly, Simpson, Gumpertz & Heger Inc.
Design Philosophy in Regions of Low-to-Moderate Seismicity
Buffalo, New York

April 18, 2001

Joint Meeting of the Scientific and Implementation Advisory Committees
Chicago, Illinois

May 4, 2001

Project Impact Signing Ceremony
Buffalo, New York

May 10-11, 2001

Second ATC-35 National Earthquake Ground Motion Mapping Workshop
San Francisco, California

May 12, 2001

Highway Project Research Coordination Meeting: Seismic Risk Assessment and Loss Estimation
San Francisco, California

June 6-8, 2001

NSF Site Visit
Buffalo, New York

June 14-15, 2001

Highway Project Research Coordination Meeting: Special Bridges, Earthquake Protective Systems and Foundations and Geotechnical Studies
Sacramento, California

July 26-27, 2001

NSF Blue Ribbon Panel
Washington, D.C.

July 30, 2001

MCEER Research Experiences for Undergraduates (REU) Workshop
Video Conference

MCEER Organizes Third National Seismic Conference and Workshop on Bridges and Highways

Deadline for Abstracts Extended to August 31



The deadline for submission of abstracts for the *Third National Seismic Conference and Workshop on Bridges and Highways* has been extended to August 31, 2001. Organizers will accept 50 to 60 papers for formal presentations. Another 25 papers will be selected for poster sessions.

The conference theme is "Advances in Engineering and Technology for the Seis-

mic Safety of Bridges in the New Millennium." Presentations will focus on the latest advancements in earthquake design and retrofit, and on new and innovative technologies — including the latest research and developments in earthquake engineering for bridges, highway systems, and components. The program is scheduled for April 28 through May 1, 2002, in Portland, Oregon.

One-page typewritten abstracts should be submitted by August 31, 2001 to: *Third National Seismic Conference and*

Workshop on Bridges and Highways, c/o MCEER, University at Buffalo, Red Jacket Quadrangle, Buffalo, NY 14261-0052; phone: (716) 645-3391; fax: (716) 645-3399; email: mceer@acsu.buffalo.edu; or via the web site (see address below).

Authors should clearly indicate the topic under which their abstract is submitted (see the web site for a complete listing). They will be notified of acceptance in September 2001. For more information, visit the conference web site at <http://mceer.buffalo.edu/meetings/3nsc/default.asp>. ❖

Researchers Meet to Coordinate Efforts on Highway Project 094

During the months of May and June 2001, two coordination meetings were held among researchers working on the MCEER Highway Project. MCEER Project 094 researchers working in the areas of seismic risk assessment and loss estimation met in San Francisco on May 12, and researchers working in the areas of special bridges, earthquake protective systems, and foundations and geotechnical studies met in Sacramento, California on June 14 and 15. The objectives for both meetings were threefold:

- Review work conducted and results obtained during Research Year 1;
- Facilitate the coordination of work being conducted during Research Year 2;
- Initiate planning for Research Years 3 and 4.

Many of the tasks being conducted under MCEER Project 094 require close cooperation and integration among these researchers, as the final products

resulting from the project are expected to comprise several design and retrofit manuals and procedures for special bridges (e.g., medium and long-span truss structures, arches, and suspension and cable-stayed bridges) that address a range of technical issues including ground motion and seismic hazard representation and input, foundation and substructure design and performance, and superstructure performance and retrofitting.

During both meetings, Dr. Ian Buckle, technical coordinator of Project 094 and professor of civil engineering at the University of Nevada, Reno, set the stage by providing an overview of the focus and intent of the project, and his vision as to how each of the major task areas will eventually feed into the primary project deliverables. This was followed by presentations from each researcher, who discussed work completed in Research Year 1 and described preliminary recommendations/results. Each re-

searcher then presented work proposed for Research Year 2, and subsequent discussions were held among the group to refine approaches and proposed products.

Due to a long delay between the time that Research Year 1 ended and Year 2 started, it was proposed that a multi-year research plan and budget be prepared. Researchers therefore discussed project needs and proposed tasks for Years 3 and 4, and were charged with developing preliminary task statements and budgets by the end of July 2001. The preliminary research tasks and budgets will be reviewed by the project Research Committee in late August, and a final Year 3 (and possibly Year 4) research plan will be prepared and submitted to the Federal Highway Administration in October 2001. It is anticipated that Research Year 3 will start on January 1, 2002, and each subsequent Research Year will be based on the calendar year. ❖

Risk Assessment of Highway Systems Report Published

MCEER recently published **A Risk-Based Methodology for Assessing the Seismic Performance of Highway Systems**, by S.D. Werner, C.E. Taylor, J.E. Moore III, J.S. Walton and S. Cho, as part of its regular series of technical reports (MCEER-00-0014). This report was developed under MCEER's Highway Project, which is sponsored primarily by the Federal Highway Administration.

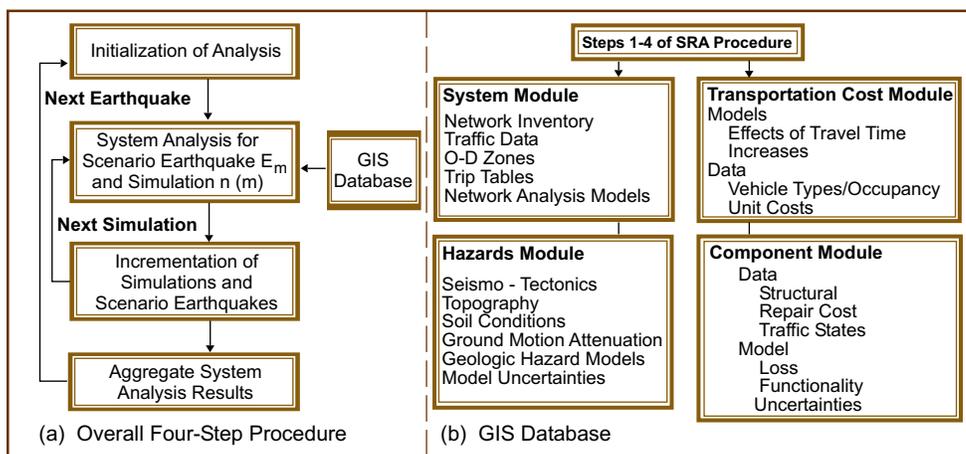
The report resulted from research which first investigated and demonstrated how a network-based seismic risk assessment methodology could be developed and applied to a regional highway system. Based on this, the research then developed a formal set of methodologies and procedures for conducting a seismic risk assessment of highway networks and systems, and applied this to a case study example. The formal methodologies and case study example, which is based on probabilistic scenario New Madrid Seismic Zone earthquakes in the region near Memphis, Tennessee, are fully described and documented in the report.

At the time the research was initiated in 1993, there was skepticism as to whether the state of technology in systems-based

risk assessment methodologies could support advances applicable to highway systems. As this report well documents, significant progress has been made in the field and the methodologies proposed can be readily applied by transportation agencies. Although additional work will be required to refine these methodologies and to develop integrated software packages that can be easily used by transportation agencies, several such agencies have already expressed interest and may be conducting their own assessments of the approaches provided in the report. Work is also continuing on this through MCEER's current Highway Project 094 research program.

A paper summarizing much of this research effort was included in this year's **Research Progress and Accomplishments** report, and can be downloaded from <http://mceer.buffalo.edu/publications/resaccom/0001/default.asp>.

Report MCEER-00-0014 is available for \$35.00 through MCEER Publications, phone: (716) 645-3391; fax: (716) 645-3399, email: mceer@acsu.buffalo.edu; or via the publications section of the web site at <http://mceer.buffalo.edu/publications/default.asp>. ❖



■ Risk-based methodology for assessing seismic performance of highway systems.

MCEER Seeks Bridge Engineering Research Program Manager

MCEER is seeking a bridge engineering research program manager to provide day-to-day administrative and technical management of the MCEER Highway Project. This full-time non-academic position is located in the main office of MCEER, which is headquartered at the University at Buffalo.

Minimum qualifications required for the position include the following: research program/project management experience, with an emphasis on bridge engineering; excellent demonstrated verbal and written communication skills; BS in Civil Engineering or Structural Engineering; and knowledge of the operations of AASHTO and its committees, State Departments of Transportation and the Federal Highway Administration. Additional qualifications strongly preferred include: experience in or knowledge of earthquake engineering; MS, ME, or Ph.D degree in Structural Engineering; Professional Engineering registration.

Please submit a letter of interest and resume or curriculum vitae to Connie Beroza, MCEER, University at Buffalo, Red Jacket Quadrangle, Buffalo, NY 14261-0025; e-mail: apply@mceermail.buffalo.edu. ❖

Student Leadership Council Activities

The MCEER Student Leadership Council (SLC) has been very busy in the past few months. Recently, the SLC members participated in the annual NSF Site Review in Buffalo, on June 6-8. SLC students played a key role in demonstrating MCEER's achievements and progress in the three major program areas funded by NSF. The SLC activities in the previous year as well as plans for the current year were summarized by chairperson Ani Natali Sigaher.

As was mentioned in the last SLC column, the council put together its own research accomplishments volume for the first time, which was debuted at the NSF site visit. Entitled **Student Research Accomplishments: 2000-2001**, the volume contains 20 articles – 9 long papers and 11 abstracts – submitted by students about their research projects. This volume turned out to be a great success and received very positive feedback. Hence, the SLC and MCEER are planning to repeat this volume in years to come. Gauri-Shankar Guha of Pennsylvania State University edited the volume and should be congratulated on an excellent job. On a side note, Gauri has accepted a faculty position at Arkansas State, where he will be starting in August 2001.

During the site visit, the SLC members also presented posters on their research projects and answered questions for the site review panel. This was an excellent opportunity for the students to face a review panel and also to receive valuable feedback about their work. Following the poster session, the SLC members had a chance to interact with the NSF review panel during the Strengths, Weaknesses, Opportunities and Threats of MCEER (SWOT) analysis, led by Ani Natali Sigaher. The



■ *Members of the SLC attended and participated in the recent NSF visit.*

SWOT session provided the students with the opportunity to voice their opinions on how MCEER is doing in its mission to develop earthquake resilient communities. It is the authors' opinion that the SWOT went very well and that the SLC was most helpful in telling how well MCEER was doing in achieving its mission.

The SLC also took the student gathering at the NSF visit as an opportunity to have a productive meeting regarding its future plans.

In the meantime, three SLC students, Diego Lopez-Garcia, Michael Kiley-Zufelt, and Gauri-Shankar Guha, have finalized plans for the SLC retreat – thanks to much hard work. The retreat will be held August 10 - 12 at Penn State University in State College, Pennsylvania. All submittal dates will be passed by the time of this publication. SLC students will give brief presentations about their work followed by valuable peer review. They will also attend a guest lecture by MCEER researcher Dr. Adam Z. Rose, Penn State, and will have plenty of time for socializing with each other.

Following the retreat, the SLC will meet in late October during the annual Principal Investigators' Meeting to discuss the council's future activities. ❖

— Submitted by Jeffrey W. Berman,
University at Buffalo

SLC Debuts First Issue of Student Research Accomplishments

MCEER's Student Leadership Council (SLC) published its own version of the "Research Progress and Accomplishments" report as a way to



showcase the research work of its members. This first issue was coordinated and edited by Gauri Guha, a Ph.D. candidate in the department of energy, environmental and mineral economics at the Pennsylvania State University. The topics range from traditional civil and lifeline engineering to applications of advanced technologies to social impacts and economic modeling. Papers are presented in two formats: full length, which provides details on the background/motivation for the research, a brief view of prominent work in the area of research, proposed technique/methodology employed, current status of work, how it advanced the state of the art, results from experiments/simulations and how it will be expanded in the future. The shorter format papers are abstracts that either summarize the research, or expand on one of the points listed above.

The report is available from the publications section of our web site in PDF format at <http://mceer.buffalo.edu/publications/studentResearchAccom/0001/default.asp>. A limited number of copies are available by contacting MCEER publications. ❖

Ani Natali Sigaher is a Ph.D. student and graduate research assistant in the Department of Civil, Structural and Environmental Engineering at the University at Buffalo. Her advisor is MCEER researcher Dr. Michael C.

Constantinou, Professor and Chair of the department. Her research concentrates on the development, testing and modeling of innovative energy dissipation configurations, such as the recently developed "toggle-brace" and "scissor-jack" systems. These systems extend the applicability of damping devices to stiff systems and to systems under wind excitation. Conventional damper configurations in such systems are ineffective due to the small drift that they undergo.

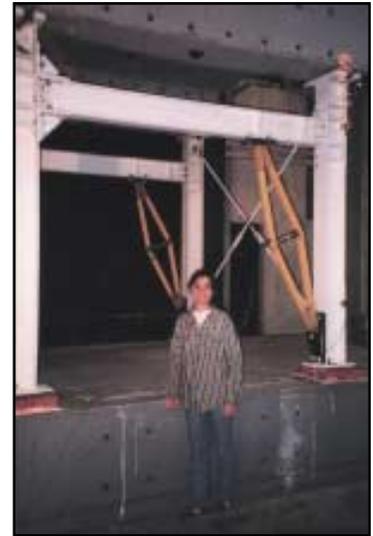
In addition to her research work, Natali has served as president of the EERI Student Chapter at UB (UB-EERI) in 1998-1999 and 1999-2000 academic years, as well as president of MCEER's Student Leadership Council since its inception last year.

Natali was born and raised in Istanbul, Turkey, which is located in a region that is known to be seismically active and has suffered a number of devastating earthquakes. According to Natali, when she was studying civil engineering at Bogazici University, she took a few courses on earthquake engineering and "met professors who were involved in projects which attracted my interest. I realized that although earthquakes have always been a threat to Turkey, there was still a lot to be done. By the time I was preparing for graduate school, I had decided to concentrate on earthquake engineering."

Natali has been part of several reconnaissance efforts investigating earthquakes in Turkey. Following the 1995 Dinar earthquake, she was part of a team comprised of researchers from three major universities of Turkey. She observed, "It was long after the earthquake but the pain and suffering the people went through was still there. This helped me to see how immense the responsibility of a civil engineer is when designing a building; the slightest mistake was paid by innocent people. Following the site visit, I took part in the retrofit of the slight to medium damaged reinforced concrete and masonry buildings - a project assigned to the universities by the Turkish government." Several years later, in 1999, Natali was in Istanbul when the deadly Izmit earthquake struck a major part of Marmara Region on August 17th. She visited several of the severely damaged areas, just days after the earthquake, as part of the U.S. reconnaissance team.

Natali expects to graduate in May 2002. Since her earliest years in graduate school, she has been heavily involved in research on earthquake engineering. She has taught classes at the university and tutored privately. As a result, teaching and research have been her major academic interests. She plans to look for a faculty position where she can be involved both in teaching and research. She is also interested in working as a practicing engineer, in a company where she could have the opportunity to use her knowledge on earthquake engineering and contribute to advances in this field.

In her spare time, Natali enjoys going to the movies, traveling (especially to Turkey to see her family), biking and swimming in the summers and playing the piano. ❖



■ *A. Natali Sigaher stands in front of the scissor-jack damper system she is testing on the shake table at the University at Buffalo.*

US – PRC Exchange Program Seeks Participants

On behalf of the National Science Foundation, MCEER coordinates a researcher exchange program between the U.S. and the Peoples' Republic of China. Funding still remains to support short-term travel to China to carry out

collaborative earthquake research in areas of mutual interest to both countries. Additional information and applications are on the MCEER website at <http://mceer.buffalo.edu>. Applications must be submitted by September 15, 2001 and

travel must be completed by January 31, 2002. Inquiries may be directed to Andrea Dargush at (716) 645-3391 ext. 106, or via email: dargush@acsu.buffalo.edu. ❖



Design Philosophy in Regions of Low-to-Moderate Seismicity

Dominic Kelly, Simpson Gumpertz & Heger Inc.

Mr. Dominic Kelly, Simpson Gumpertz & Heger Inc., gave a seminar entitled *Design Philosophy in Regions of Low-to-Moderate Seismicity*, at the University at Buffalo on Friday, April 6, 2001. This was the fourth seminar in a series sponsored by the MCEER Student Leadership Council, the University at Buffalo's EERI student chapter (UB-EERI), the Networking Program of MCEER and the Department of Civil, Structural and Environmental Engineering. Nearly 50 people attended and enjoyed the presentation and discussions.

After an introduction by Dr. Andrew S. Whittaker of UB, Mr. Kelly presented differences in intensity of ground shaking, in the amount of drift that buildings undergo, and in the inherent lateral strength of the gravity systems in regions with different levels of seismicity. Because of these differences, the design philosophy in regions of low-to-moderate seismicity should be different from those in regions of high seismicity. However, the current design philosophy in regions of low-to-moderate seismicity is not as well developed as it is in regions of high seismicity. He then discussed why and how current design and construction practices would likely lead to greater inconsistencies in the level of life-safety and property damage protection that various building types provide in low-to-moderate regions.

Finally, he presented how the design philosophy in regions of low-to-moderate seismicity should differ from that of regions in high seismicity. According to Mr. Kelly, differences should be considered in intensity of ground shaking for earthquakes of varying return periods, in the amount of building drift expected, and in the structural configurations and details.

A brief discussion session followed, initiated by questions from various faculty members and students in attendance.

As with the previous three seminars, this one was broadcast successfully over the Internet and is accessible at <http://civil.eng.buffalo.edu/webcast/>. Professor Andrei Reinhorn and undergraduate student Jason Hanley, from Computer Science and Engineering, were responsible for the system implementation. ❖

—Submitted by Yasuo Kitane, University at Buffalo



■ Dominic Kelly addressed development of a design philosophy in regions of low-to-moderate seismicity.

Seven Students Participate in 2001 REU Program



MCEER has selected seven students to participate in the Research Experiences for Undergraduates (REU) Program this summer. The students, their home university, summer host institution, advisor(s), and research topic are listed in the table below.

Student	University	Summer Host Institution	Advisor(s)	Topic
Malita Anders	Univ. of Central Florida	University at Buffalo	Profs. A. Reinhorn and A. Whittaker	Seismic design and testing
Laura Barton	Rensselaer Polytechnic Institute	Cornell University	Prof. Thomas O'Rourke	Performance of soils under earthquake-induced deformation
Michael Mio	Univ. of California - Santa Barbara	UCLA/Imagecat	Bijan Houshmand and Ronald T. Eguchi	Application of remote sensing technologies for earthquake recovery
Gary Nottis	Bucknell University	Lamont Doherty Earth Observatory of Columbia University	Dr. Klaus Jacob	Seismic hazard characterization of greater New York City area
Michal Orlikowski	Princeton University	University of Southern California	Prof. M. Shinozuka	Risk and reliability in seismic design
Pamela Romano	Catholic University	University at Buffalo	Profs. A. Reinhorn and A. Whittaker	Seismic design and testing
John Sanders	Univ. of Illinois - Urbana-Champaign	University of Delaware	Prof. Kathleen Tierney	Public sector approaches to mitigation

Students will meet to discuss their experiences and present findings at a symposium in Salt Lake City, Utah on August 10-12, 2001. ❖



The Pernicious Effect of Using Statistics for Long Return Period Events

by Michel Bruneau, MCEER Deputy Director

The statistical probability of an earthquake occurring in a given place or time is often used to make critical decisions in hazard mitigation. This anecdote is presented so readers can consider the potential impact of relying solely on statistics to implement policy.

Counting brothers, sisters, children, parents, grandparents, uncles, aunts and cousins, there are 50 members in my family. Tallying old and young, their average age is also 50. Interestingly, it just so happens that over the past 50 years, only one aunt was ever involved in a car accident. It was a terrible head-on collision, and she acknowledges that, without a doubt, the safety belt she wore on that day saved her life. Her doctor agrees, as does most of my family, although honestly, for reasons unknown to me, a few among them still refuse to this day to buckle-up when they drive.

Statistically speaking, it remains that in my immediate region (i.e., my family), a head-on collision is a rather low-probability event. In any given year, there is a one in 2,500 chance that one of us will be involved in such a car crash. Simply, for 50 members in my family having only one accident in 50 years, this equals 1 woman/man-year with an accident out of 2,500 woman/man-years. In other words, a 3% probability of this happening to me in 75 years. No wonder I have never witnessed a car crash.

My uncle is a mechanical engineer who works for one of the big auto manufac-

turers. Typically, he designs and tests seat belt systems. I brought my mathematical assessment that car crashes are rare events to his attention. I went as far as to suggest that, given that I would live at best 100 years, it might be wise and more economical to design belts to resist smaller loads. Statistically speaking, over 100 years, the accident in which I am more likely to be involved will probably be a minor fender bender. In that perspective, it might be sufficient for my purposes to use a belt designed to resist only 1/3 of the design loads that would otherwise be considered based on a 2,500 year return period.

Without blinking, he replied: "Hey, it's only your life! But if you are going to carry other passengers, they may not be aware that riding in your car carries a higher risk of death. Should they die in your car during a crash, you can bet lawyers will find guys like me to testify that it is possible to design a seat belt to resist the 2,500 return-period car crash, and that seat-belts ought to be designed that way."

Damn lawyers! Ah, forget them. I still thought it was unreasonable to expect me to spend money on a seat belt when I could use that money for other purposes. Particularly since my car has infinite needs for repairs and maintenance (getting new tires is currently on the list as an example of some badly deferred maintenance). Why should I not be allowed to drive half a car if half a

car is all I can afford? What's a 0.0004 chance that I'll be involved in a car crash this year? Insignificant! Hence, thanks to statistics, it was possible to make the problem nearly disappear in my mind.

Until last week, when a drunk driver rammed me head-on. Although I had buckled-up, more by habit than by intent, my wife did not. Statistics will not bring her back, and that, my friend, is the pernicious effect of statistics. ❖

—Editor's Note: The analogy to a car accident is a fictional account included only to illustrate the author's point of view.

Third World Conference on Structural Control Seeks Abstracts

Organizers are now planning the *Third World Conference on Structural Control (3WCSC)*, to be held July 7-12, 2002 in Como, Italy. Abstracts are currently being solicited, and are due by September 15, 2001. A brochure describing this event in more detail is included inside this issue of the **Bulletin**.

For further information about the conference, contact the 3WCSC Organizing Committee, c/o Mrs. Nadia Tansini, A. Volta Cultural Center, Villa Olmo, Via Cantoni 1, 22100 Como, Italy, Fax: +3-903-157-3395, e-mail: congress@icil64.cilea.it. ❖



Kudos

★ Four students from the Department of Civil, Structural and Environmental Engineering, University at Buffalo, received awards this past May during the department's commencement reception. **Oscar Ramirez, Eric Wolff** and **Diego Lopez Garcia** received the first "Dr. Sophokles E. Logiadis Prize" for graduate students in structural engineering. The award is given to deserving students who demonstrate high scholastic ability and make a substantial contribution to the advancement of the technologies of seismic isolation and seismic energy dissipation. Eric and Diego are currently MCEER students, while Dr. Ramirez is now Director of the Center for Experimental Engineering at the Technical University of Panama. **Jeffrey Berman** received the I.H. Shames Outstanding Teaching Assistant Award for demonstrating dedication to the department and exemplary performance as a teaching assistant. For more information, see <http://www.civil.buffalo.edu/Graduate/awards.html>.

★ **Gauri-Shankar Guha**, Ph.D. candidate in the department of energy, environmental & mineral economics, Pennsylvania State University, received the Norman & Ardeth Frisbey International Student Award in April. This award honors and recognizes



■ Three UB graduate students received the Dr. Sophokles E. Logiadis Prize. Shown from left are Oscar Ramirez, Eric Wolff, Professor Michael Constantinou, and Diego Lopez Garcia

outstanding contributions to international understanding by a graduate international student at Penn State.

★ **Ali Rejaie**, Ph.D. candidate in the department of civil engineering and International Institute of Innovative Risk Reduction Research on Civil Infrastructure Systems at the University of Southern California received an award in recognition of excellence in scholarship, leadership and service to the life of the USC from Michael J. Jackson, Vice President for Student Affairs. The award is presented to three international graduate students at USC each year. He also received the "Outstanding Achievements in Civil Engineering Education" award from the Association of Professors and Scholars of Iranian Heritage. Both awards were presented in April.

MCEER Staff News

★ MCEER's computer specialist **Barbara McManus** received the Zonta District 4 2001 Zontian Daisy Award for her leadership, initiative, and team contributions to the local Zonta chapter. The Zontian Daisy award is presented to a deserving volunteer whose outstanding achievements have contributed to enhancing the mission of Zonta International. For more information, see

the Zonta Club web site at <http://zontadistrict4.bfn.org>.

★ After two and a half years as Information Specialist at MCEER, **Laura Taddeo** has accepted a position at UB's Science and Engineering Library. Laura will be greatly missed by both customers and staff. We wish her well in her new position.



■ Barbara McManus, MCEER's computer specialist, received the 2001 Zontian Daisy Award.

News From the Information Service

EQNET Gains Visibility; Offers Job Listings for Non-profits

Visits to the EQNET site have increased dramatically since the beginning of this year. From November 1999, when the counter was first installed, to January 2001, there were 25,437 visitors to the site, which amounted to an average of 2,130 visits per month. On July 2, 2001, the total was 46,415, an increase of 17,471 visitors, or over 4,100 visits per month, a notable increase in traffic.

EQNET is now offering a listing of job opportunities in not-for-profit earthquake engineering and hazard mitigation organizations. Job listings can easily be submitted on the EQNET site at <http://www.eqnet.org>. In addition, a new comment/evaluation form has been added. For questions or comments about these new features, contact Yi Chen Wang, EQNET webmaster, via e-mail at ycwang@acsu.buffalo.edu. ❖

Research Progress and Accomplishments: 2000-2001

The third annual **Research Progress and Accomplishments** report highlights MCEER's achievements in research and education during the past year. The papers in this volume highlight efforts in intelligent response and recovery, hospitals, water and gas pipelines, electric power networks, and bridges and highways.

Sixteen papers are included, with contributions from over 75 researchers, practitioners and students. Illustrating MCEER's multidisciplinary approach, these studies involve researchers from many different disciplines, working towards the creation of more earthquake resilient urban infrastructures systems. Papers in this year's volume are:

- **Earthquake Motion Input and Its Dissemination Via the Internet** by *Apostolos S. Papageorgiou (Principal Author), Benedikt Halldorsson and Gang Dong*
- **Overcoming Obstacles to Implementation: Addressing Political, Institutional and Behavioral Problems in Earthquake Hazard Mitigation Policies** by *Daniel J. Alesch and William J. Petak* (see article on page 3)
- **Large Scale Experiments of Permanent Ground Deformation Effects on Steel Pipelines** by *Koji Yoshizaki, Thomas D. O'Rourke, Timothy Bond, James Mason and Masanori Hamada*
- **Experimental and Analytical Study of Base-Isolation for Electric Power Equipments** by *M. Ala Saadeghvaziri and Maria Q. Feng*
- **Recommended Changes to the AASHTO Specifications for the Seismic Design of Highway Bridges (NCHRP Project 12-49)** by *Ian M. Friedland, Ronald L. Mayes and Michel Bruneau*
- **Literature Review of the Observed Performance of Seismically Isolated Bridges** by *George C. Lee, Yasuo Kitane and Ian G. Buckle*
- **A Risk-Based Methodology for Assessing the Seismic Performance of Highway Systems** by *Stuart D. Werner* (see article on page 7)
- **Analysis, Testing and Initial Recommendations on Collapse Limit States of Frames** by *Darren Vian, Mettupalayam Sivaselvan, Michel Bruneau and Andrei M. Reinhorn*
- **Centrifuge-Based Evaluation of Pile Foundation Response to Lateral Spreading and Mitigation Strategies** by *Ricardo Dobry, Tarek H. Abdoun and Thomas D. O'Rourke*
- **Analysis and Design of Buildings with Added Energy Dissipation Systems** by *Michael C. Constantinou, Gary F. Dargush, George C. Lee (Coordinating Author), Andrei M. Reinhorn and Andrew S. Whittaker*
- **Using Cost-Benefit Analysis to Evaluate Mitigation for Lifeline Systems** by *Howard Kunreuther (Coordinating Author), Chris Cyr, Patricia Grossi and Wendy Tao*
- **Retrofit Strategies For Hospitals in the Eastern United States** by *George C. Lee, Mai Tong and Yasuhide Okuyama*
- **Passive Site Remediation for Mitigation of Liquefaction Risk** by *Patricia M. Gallagher and James K. Mitchell*
- **Advanced GIS for Loss Estimation and Rapid Post-Earthquake Assessment of Building Damage** by *Thomas D. O'Rourke, Sang-Soo Jeon, Ronald T. Eguchi and Charles K. Huyck*
- **Seismic Evaluation and Retrofit of the Ataturk International Airport Terminal Building** by *Michael C. Constantinou, Andrew S. Whittaker and Emmanuel Velivasakis*

- **Estimating Earthquake Losses for the Greater New York City Area** by *Andrea S. Dargush* (Coordinating Author), *Michael Augustyniak, George Deodatis, Klaus H. Jacob, George Mylonakis, Laura McGinty, Guy J.P. Nordenson, Daniel O'Brien, Scott Stanford, Bruce Swiren, Michael W. Tantala and Sam Wear*



The full color report is available from the publications section of our web site in PDF format at <http://mceer.buffalo.edu/publications/resaccom/0001/default.asp>. A limited number of black and white copies are available by contacting MCEER publications. ❖

Researchers Develop Simulations of Ground Motions from the 1906 San Francisco Earthquake
(Continued from page 5)

Researchers Develop Simulations of Ground Motions from the 1906 San Francisco Earthquake

(Continued from page 5)

to simulate ground motions over the entire frequency range and produce input motions and spectra appropriate for engineering design and applications.

More information about this research is available from the MCEER Users Network, at http://civil.eng.buffalo.edu/users_ntwk/index.htm and/or <http://civil.eng.buffalo.edu/engseislabl>.

Reference

Thatcher W., Marshall G., and Lisowski M., 1997, "Resolution of fault slip along the 470-km-long rupture of the great 1906 San Francisco earthquake and its implications," *Journal of Geophysical Research*, 102:5353-5367. ❖

MCEER Publishes CD-ROM on Using Advanced Technologies for Loss Estimation



Assessment of **A**dvanced Technologies for Loss Estimation, by David Tralli (MCEER-00-SP02), describes the current state of

advanced airborne and space borne remote sensing and ground-based technologies applicable to earthquake hazard mitigation. The report reviews three advanced technologies in detail: seismological systems, the Global Positioning System (GPS) and remote sensing.

The emergence of airborne and space borne remote sensing systems, from optical to microwave spectral bands, has created arguably the most significant opportunity for improving loss estimation methodologies. When fully operational for natural hazards risk management applications sometime in the next decade, these systems and attendant data visualization technologies will provide enhanced measurement accuracy, near-real-time capability, greater geographic coverage and hold the promise of reduced operational cost.

This 80-plus page report, produced on CD-ROM, contains many links to Internet sites, numerous references to additional resources on the topic, two examples of the resolution provided by LiDAR (fly-through files of a 1-m digital elevation model (DEM) collected over Baltimore, Maryland, using the Optech ALTM airborne laser terrain mapping system flown by Airborne-1 Corp), as well as recommendations for future research. The report is in PDF format, and requires Adobe® Acrobat®™ Reader 4.05 to view. It is available from MCEER Publications for \$25.00. ❖

MCEER's Top Ten List - Best Selling MCEER Reports in Calendar Year 2000

The count is in! The ten best selling MCEER reports for the year 2000 are as follows, with the reconnaissance reports from the Marmara, Turkey and Chi-Chi, Taiwan earthquakes topping the list. The following list is in order of sales, beginning with the most popular report. They are:

- **The Marmara, Turkey Earthquake of August 17, 1999: Reconnaissance Report**, edited by C. Scawthorn; with major contributions by M. Bruneau, R. Eguchi, T. Holzer, G. Johnson, J. Mander, J. Mitchell, W. Mitchell, A. Papageorgiou, C. Scawthorn, and G. Webb, 3/23/00, MCEER-00-0001
- **The Chi-Chi, Taiwan Earthquake of September 21, 1999: Reconnaissance Report**, edited by G.C. Lee and C.H. Loh, with major contributions by G.C. Lee, M. Bruneau, I.G. Buckle, S.E. Chang, P.J. Flores, T.D. O'Rourke, M. Shinozuka, T.T. Soong, C-H. Loh, K-C. Chang, Z-J. Chen, J-S. Hwang, M-L. Lin, G-Y. Liu, K-C. Tsai, G.C. Yao and C-L. Yen, 4/30/00, MCEER-00-0003
- **Response of Buried Pipelines Subject to Earthquake Effects**, by M.J. O'Rourke and X. Liu, MCEER-99-MN03
- **Proceedings of the 7th U.S.- Japan Workshop on Earthquake Resistant Design of Lifeline Facilities and Countermeasures Against Soil Liquefaction**, edited by T.D. O'Rourke, J.P. Bardet and M. Hamada, 11/19/99, MCEER-99-0019



- **Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils**, edited by T.L. Youd and I.M. Idriss, 12/31/97, MCEER-97-0022
- **Guide to Remedial Measures for Liquefaction Mitigation at Existing Highway Bridge Sites**, by H.G. Cooke and J. K. Mitchell, 7/26/99, MCEER-99-0015
- **Passive Energy Dissipation Systems for Structural Design and Retrofit**, by M.C. Constantinou, T.T. Soong, and G.F. Dargush, MCEER-98-MN01
- **Screening Guide for Rapid Assessment of Liquefaction Hazard at Highway Bridge Sites**, by T. L. Youd, 6/16/98, MCEER-98-0005
- **Site Factors and Site Categories in Seismic Codes**, by R. Dobry, R. Ramos and M.S. Power, 7/19/99, MCEER-99-0010
- **Seismic Reliability Assessment of Critical Facilities: A Handbook, Supporting Documentation, and Model Code Provisions**, by G.S. Johnson, R.E. Sheppard, M.D. Quilici, S.J. Eder and C.R. Scawthorn, 4/12/99, MCEER-99-0008

Our web site offers a complete list of technical reports and their abstracts. 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>. ❖



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. To request a complete list of titles and prices, contact MCEER publications.

MCEER's web site offers a complete list of technical reports and their abstracts. The publications section 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>.

Experimental Investigation of P-Delta Effects to Collapse During Earthquakes

D. Vian and M. Bruneau, 6/25/01, MCEER-01-0001, 360 pages, \$35.00

This report addresses structural safety and the risk of damage, by determining the collapse performance limit in engineering terms. It documents an experimental study of the P-delta effect on a Single Degree of Freedom (SDOF) test structure subjected to earthquake ground motion. Fifteen four-column frame specimens were subjected to progressive unidirectional ground shaking and structural response was measured up to collapse. An example of how to use the experimental data for analytical model verification is provided. A full series of tests

with a single specimen were analyzed using a simple SDOF dynamic analysis program. The example illustrated the shortcomings/inaccuracies of a particular simplified model of structural damping. Test structure performance was compared with proposed limits for minimizing P-delta effects in highway bridge piers. The stability factor was found to have a strong relationship to the relative structural performance in this regard. Performance was also compared with currently used strength and stability limits for axial-moment interaction. Specimens generally reached accelerations and maximum base shear (as a fraction of the system's weight) in excess of the maximum spectral accelerations calculated considering second order effects, but less than that considering only member strength.

Proceedings of the Second MCEER Workshop on Mitigation of Earthquake Disaster by Advanced Technologies (MEDAT-2)

Edited by Michel Bruneau and Daniel J. Inman, 7/23/01, MCEER-01-0002, 314 pages, \$35.00

About 35 practitioners and researchers from earthquake engineering and other fields of advanced technology participated in the second *Mitigation of Earthquake Disaster by Advanced Technologies (MEDAT-2)* workshop. The workshop, held in Las Vegas, Nevada on November 30 – December 1, 2000, focused on the application of advanced technologies (nondestructive inspection, health monitoring advanced materials, innovative devices, etc.) for the seismic evaluation and retrofit of health care facilities. Discussion sessions centered on mitigation techniques for soil liquefaction, structural damage and nonstructural damage. The proceedings contain 30 papers and minutes from the discussion sessions. Extensive materials from this workshop, including presentation materials, are posted on our web site at http://mceer.buffalo.edu/publications/sp_pubs/medat2/default.asp. ❖

Publications Order Form			
Name _____	Publication #	Authors	Price
Address _____			

City/State/Zip _____			
Country _____			
Telephone _____ Fax _____	Make checks payable to the "Research Foundation of SUNY"		Shipping Total
Shipping Options <input type="checkbox"/> Media Mail (Book rate) - U.S. (no additional charge) <input type="checkbox"/> Priority – U.S. (add \$3 per title) <input type="checkbox"/> Global Economy (surface, international, add \$5 per title) <input type="checkbox"/> Global Priority to Canada or Mexico (add \$6 per title) <input type="checkbox"/> Global Priority – All Other International (add \$9 per title)		For Credit Card Orders: Name on credit card _____ Card number _____ Expiration date _____ Card type (circle one) VISA Mastercard American Express Signature _____	
<i>Use this form to order technical reports, monographs and other publications from MCEER.</i>			

Published by

Multidisciplinary Center for Earthquake
Engineering Research
University at Buffalo
State University of New York
Red Jacket Quadrangle
Buffalo, NY 14261
Phone: (716) 645-3391
Fax: (716) 645-3399
E-mail: mceer@acsu.buffalo.edu
World Wide Web Site: [http://
mceer.buffalo.edu](http://mceer.buffalo.edu)
ISSN 1520-2933

Staff

Editor: Jane Stoyale
Illustration/Photography: Hector Velasco
Layout/Composition: Michelle Zuppa

Some of the material reported herein is based upon work supported in whole or in part by the Earthquake Engineering Research Centers Program of the National Science Foundation, the State of New York, the Federal Highway Administration of the U.S. Department of Transportation, the Federal Emergency Management Agency and other sponsors. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of MCEER or its sponsors.



University at Buffalo *The State University of New York*

Upcoming Events

April 28 – May 1, 2002

Third National Seismic Conference and Workshop on Bridges and Highways: *Advances in Engineering Technology for the Seismic Safety of Bridges in the New Millennium* ■ Portland, Oregon

Sponsored by:

Federal Highway Administration ■ Oregon Department of Transportation
■ Washington State Department of Transportation

Organized by:

MCEER

Contact:

Michael S. Higgins, P.E., Pure Technologies U.S. Inc., 10015 Old Columbia Road, Suite B-215, Columbia, MD 21046 ■ Phone: (800) 537-2806
■ Fax: (410) 309-7051 ■ E-mail: mike.higgins@soundprint.com

Web Site:

<http://mceer.buffalo.edu/meetings/3nsc/default.asp>

July 21 – 25, 2002

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

Sponsor:

Earthquake Engineering Research Institute

Organizing Committee:

MCEER

Contact:

Andrea Dargush, MCEER ■ Phone: (716) 645-3391 ext. 106 ■ Fax: (716) 645-3399
■ E-mail: dargush@acsu.buffalo.edu

Web Sites:

<http://mceer.buffalo.edu/meetings/default.asp> and <http://www.eeri.org>



A National Center of Excellence in Advanced Technology Applications

University at Buffalo, State University of New York
Red Jacket Quadrangle
Buffalo, NY 14261

NON-PROFIT
U.S. POSTAGE
PAID
Buffalo, N.Y.
Permit No. 311

Change Service Requested

Please check the appropriate box below, correct the label, and return to MCEER.

Add name to list Correct address Take name off list