On January 21, 2010, MCEER Director Andre Filiatrault led a team of 10 French-speaking engineers to Port-au-Prince, Haiti. Their mission was to assess the safety of buildings – principally hospitals, schools and food storage facilities that remained standing following the January 12, 7.0M earthquake.

The Emergency Engineering Support effort was initiated by the Appropriate Infrastructure Development Group (AIDG) on behalf of the United Nations. MCEER quickly joined this effort and played a pivotal role in the recruitment, selection and deployment of the initial structural engineering team. The seven-day mission was critical to easing the delivery of medical services, food and water to the Haitian people. Perhaps more importantly, it laid a foundation for a more sustainable UN effort to continue the evaluation of an estimated 100,000 damaged structures still standing in Port-au-Prince.

The team was stationed at the United Nations Stabilization Mission in Haiti (MINUSTAH), adjacent to the Port-au-Prince airport. Members included Andre Filiatrault (MCEER, University at Buffalo), team leader; Jean-Philippe Simon, Reginald DesRoches, Dan Gregory, Scott DeHollander, Gabrielle Rigaud, Vladimir Charles, Eddy Germain, Caroline Zennie; (front) Wassim Ghannoum.
Haiti Relief Mission

Continued from page 1

Postearthquake Safety Evaluation of Buildings) rapid building assessment procedures. ATC donated 15 field manuals and condensed instruction materials to the effort.

Upon arriving at the UN compound, the team met with relief officials to recommend and establish a protocol to field and fulfill inspection requests. They created a special email address (EES-Haiti@hotmail.com) and a database to log requests and monitor the inspection process to completion. Included for each facility are its GPS coordinates, assigned ATC-20-1 placards, and hyperlinks to corresponding ATC-20-1 evaluation reports and building photos, among other relevant information. These procedures have been adopted by the United Nations Office for Project Services (UNOPS), which continues to direct emergency engineering support going forward.

One troubling aspect to the team was the realization that many hospitals and other critical facilities that remained undamaged following the earthquake were going unused as Haitians feared they would collapse from aftershocks. Consequently, medical procedures were being conducted outdoors, and a significant amount of food and water was going undistributed.

In addition to hospitals and food storage facilities, team members also assessed stability of other infrastructure including government buildings, UN buildings, embassies, and NGO headquarters. In all, they inspected 115 buildings.

Their volunteer efforts took place under the guidance of representatives from the United Nations Development Programme, Food for Health International, and other AIDG humanitarian partner organizations, that escorted them through the various inspection sites in Haiti. At times they traveled under the protection of UN military escort.

UNOPS is continuing these Emergency Engineering Support activities, which will take several months to complete.

Virtual Disaster Viewer Used to Disseminate Images and Topographical Data from Haiti Earthquake

On January 20, 2010, a World Bank-ImageCat-RIT airborne remote sensing data collection, disseminated by MCEER, began over the earthquake stricken regions of Haiti.

The reconnaissance involved daily flights over a seven day period to collect remote sensing imagery in the visible and infrared, as well as light detection and ranging (LiDAR) topography in the area around Port-au-Prince, Haiti. The data was processed quickly and made available for viewing through the Virtual Disaster Viewer (VDV), located on the MCEER website at http://vdv.mceer.buffalo.edu.

Up-to-date damage information including collapsed buildings, bridges and other barriers, as well as environmental changes...
Damage Assessment Activities Following Haiti Quake

MCEER and the LESAM (Landscape-based Environmental System Analysis & Modeling) Laboratory, two centers located at the University at Buffalo, are part of a worldwide group of experts (GEO-CAN, which stands for Global Earth Observation-Catastrophe Assessment Network) who are working to develop accurate damage assessments of the earthquake-stricken areas of Haiti. Led by Chris Renschler, Associate Professor of Geography, the MCEER/LESAM group is using fifteen centimeter Google aerial imagery to estimate and classify building damage based in the Western portion of Port-au-Prince to distinguish collapsed buildings from those left intact, and then identify the degree of damage to individual buildings. These levels are based on the European Macroseismic Scale 1998 (http://geology.about.com/library/bl/blems.htm).

Results are available through the Virtual Disaster Viewer (VDV), developed by ImageCat, Inc., and hosted at http://vdv.mceer.buffalo.edu.

MCEER Joins EERI Team to Investigate Damage to Nonstructural Components Following the 8.8M Chile Earthquake

MCEER investigator Gilberto Mosqueda, Assistant Professor in the Department of Civil, Structural and Environmental Engineering, University at Buffalo, is part of the EERI Reconnaissance team investigating the aftermath of the 8.8-magnitude Chile earthquake that struck the South American nation on February 27, 2010.

Dr. Mosqueda led the nonstructural components part of the reconnaissance team, and was joined by two former University at Buffalo graduates: Gokhan Pekcan, Assistant Professor at the University of Nevada, Reno, and Rodrigo Retamales, a professional engineer in Chile. They were in Chile March 6-14, 2010, to assess nonstructural damage sustained by hospitals and other engineered buildings. Eduardo Miranda, Associate Professor at Stanford University, joined the team later in the week.

The team’s preliminary findings are available on MCEER’s website at http://mceer.buffalo.edu/research/Reconnaissance/Chile2-27-10/damage-reports.asp. Their reports focus on damage to equipment, ceiling tiles, piping systems, and other building systems, particularly in hospitals. Prepared at the time of the field investigations, they contain preliminary summaries of damage, initial observations and many photographs. These reports are also part of the EERI Chile Earthquake Clearinghouse (http://www.eqclearinghouse.org/20100227-chile/).

MCEER’s Information Service has compiled a wealth of resources on the earthquake, which are available from http://mceer.buffalo.edu/infoservice/disasters/Chile-Earthquake-2010.asp.
Report on the West Sumatra Earthquake of September 30, 2009

A government office building in Padang suffered damage due to soft story collapse mechanism.

A team of engineers from the Institute of Technology, Bandung, Indonesia, investigated the devastating effects of the West Sumatra earthquake of September 30, 2009, with support from MCEER. The team, comprised of Dyah Kusumastuti, Made Suarjana, I. Wayan Sengara and Rildova, visited the impacted area about a month after the earthquake. Dr. Kusumastuti received her Ph.D. from the University at Buffalo and Dr. Rildova received his Ph.D. from Virginia Polytechnic Institute and State University. Both participated in MCEER research while completing their degrees.

The West Sumatra earthquake occurred at 17:16:09 local time (10:16:09 GMT) on September 30, 2009 with a moment magnitude of \( M_w \) 7.6, epicenter of 0.789°S, 99.961°E, and depth of 80 km (USGS and BMKG - Indonesian Meteorology, Climatology, and Geophysical Agency). The earthquake was located in the subduction zone of the Indo-Australian and Eurasia plate. The reported peak ground acceleration (PGA) at the Andalas University, Padang, was approximately 0.3g.

The earthquake caused more than 1,100 fatalities and 3,000 injuries, damaging more than 100,000 structures, with losses estimated at IDR 21.6 trillion (USD 2.3 billion), as quoted from an official report by the Indonesian National Disaster Management Agency. Most of the losses were caused by damage to infrastructure, especially housing. The team focused their efforts on the city of Padang, with a particular interest in school buildings and public facilities.

A brief summary of the reconnaissance mission is available from the MCEER website at: http://mceer.buffalo.edu/research/Reconnaissance/default.asp. A full length MCEER technical report is in preparation.

~Submitted by Dyah Kusumastuti, Institute of Technology, Bandung, Indonesia

Virtual Disaster Viewer

Continued from page 2

such as heat sources, pollution and vegetation changes, could be determined with the data collected. The images can be used to better coordinate emergency response and relief activities in the short term, provide baseline data for recovery of the community in the long term, and aid research efforts to improve future response to similar disasters.

The reconnaissance was arranged by the NSF-sponsored Information Products Laboratory for Emergency Response (IPLER) project, co-led by the Rochester Institute of Technology (RIT) and the University at Buffalo (UB) and one of its industry partners (ImageCat, Inc.). The collaborative effort is led by Ronald Eguchi (ImageCat, Inc.), Don Mckeown and Jan van Aardt, (RIT’s Center for Imaging Science) and Chris Renschler (MCEER and the National Center for Geographic Information and Analysis located at UB).

The rapid response project was funded by the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) through a contract with ImageCat, Inc. The data collection is coordinated with the U.S. Geological Survey and NOAA, who have also requested additional imagery and specific LiDAR collection for a more accurate mapping of the fault line that caused the earthquake as well as the post-event tremors.

For more information on IPLER, an NSF-sponsored partnership between the Rochester Institute of Technology and the University at Buffalo dedicated to innovation in disaster management, visit http://ipler.cis.rit.edu.
MCEER Joins in National Guard Earthquake Response Exercise

Six-day training event in Buffalo/Niagara Falls, NY draws participation of 2,000-plus military and civilian emergency responders from Northeast US, Canada and abroad

MCEER joined with members of the National Guard, and officials from Western New York, New York State and other state, regional and federal agencies in “Vigilant Guard New York,” a six-day training exercise simulating response to a magnitude 5.9 earthquake hitting the Buffalo/Niagara Falls region.

The event, which took place November 1-6, 2009, is one of four national-level disaster response exercises conducted annually by the National Guard Bureau and the United States Northern Command in conjunction with civilian first responders and local governments around the United States. It drew participation of more than 1,300 National Guard Soldiers and Airmen from across New York, Pennsylvania, Massachusetts, Vermont, Connecticut, and the U.S. Virgin Islands, as well as hundreds of first responders from New York, surrounding states and Canada.

During the exercise, teams from the National Guard, U.S. Army Corps of Engineers and other specialized units, conducted hazardous materials detection drills and simulated search and rescue operations at rubble piles, specially assembled to replicate a collapsed hospital and multi-level parking garage.

The rubble piles also served as a backdrop to a media conference during which Andre Filiatrault, MCEER Director and University at Buffalo Professor of Structural Engineering, joined National Guard, state and local leaders to open the exercise.

Dr. Filiatrault provided guidance to New York State Emergency Management officials in the development of a HAZUS scenario for the event. He drew upon his knowledge of Canada’s 1988 Saguenay, Quebec earthquake – the largest to occur in eastern North America in more than 50 years – in helping GIS planners refine their model for the postulated Buffalo earthquake.

Dr. Filiatrault and Donald Goralski, MCEER Chief of Staff, also participated in two table-top planning exercises to aid planners in their development of the exercise. Other MCEER investigators from the University at Buffalo – George Lee, Adel Sadek, and Andrew Whittaker – and UB Geology Professor Robert D. Jacobi also made themselves available for media interviews.

Vigilant Guard is a national exercise program that provides coordinated training among National Guard forces and local, state, regional and federal partners against a variety of different homeland security threats, including natural disasters and terrorist attack.

For more information on partnering opportunities with MCEER, contact Don Goralski at (716) 645-5151 or goralski@buffalo.edu
Bridge Engineering Speaker Series Offers Unique Learning Opportunity

Some of the nation’s leading experts in the field of bridge engineering are participating in a new Bridge Engineering Distinguished Speaker Series at the University at Buffalo. Held on Monday evenings at 5:00 p.m. EDT, the presentations cover a wide variety of topics in bridge engineering, including project development, public policy and learning from bridge failures.

Speakers for the 2009-2010 academic year include practitioners, State Department of Transportation officials and other government officials.

Biographies, abstracts and presentation materials for all the speakers are available at http://mceer.buffalo.edu/education/Bridge_Speaker_Series/default.asp.

The Distinguished Speaker Series is part of a graduate-level class offered through the Department of Civil, Structural and Environmental Engineering at the University at Buffalo. The presentations are webcast live each week and are free, but pre-registration is required (visit the link above to register).

Professional development credit is also available for individual presentations. The fee is $50 per professional development hour (PDH). To register for PDH credit, contact Michele Sacco at msacco@buffalo.edu or call (716) 645-3307.

The Bridge Engineering Distinguished Speaker Series was established in collaboration with AASHTO’s Subcommittee on Bridges & Structures, and with the support of the Federal Highway Administration through MCEER. For more information, please contact Jerry O’Connor at 716-645-5155 or via email at jso7@buffalo.edu.

Researchers from UB and UNAM Explore Areas of Collaboration

On August 27-28, 2009, a delegation from the Instituto de Ingenieria at the Universidad Nacional Autonoma de Mexico (II-UNAM) visited MCEER, University at Buffalo, to explore areas of potential collaboration on research topics in earthquake engineering. Discussions focused on three major themes:

- Interchange of experiences and experimental training
- Hybrid simulation of large-scale structural models to trace generation of damage to collapse
- Seismic behavior and design of bridges including protective systems and health monitoring

The event was organized by Gilberto Mosqueda, University at Buffalo. Other participants were Andre Filiatrault, George Lee and Mark Pitman, University at Buffalo; and David Muria Vila, J. Alberto Escobar, Roberto Gomez Martinez, Juan Jose Perez Gavilan, and Roberto Sanchez Ramirez, II-UNAM.

MCEER headquarters is now located in Ketter Hall, on the University at Buffalo’s North Campus. Center Management, Industry Partnerships, Publications and Information Technology have relocated to the new offices. Highway Project and Special Projects staff remain at the Center’s Red Jacket location. Our new mailing address is:

MCEER
University at Buffalo, State University of New York
133A Ketter Hall
Buffalo, New York 14260

Refer to MCEER’s website for a complete listing of staff contact information.
The 7th International Workshop on Remote Sensing and Disaster Response was one of the most diverse workshops to date in this series. Over 30 participants from eight countries delivered 24 presentations on a broad set of topics dealing with rapid response; disaster preparedness and integration with modeling; hurricanes, windstorms, and tsunamis; earthquake effects; advances in analytical techniques, and disaster recovery.

MCEER investigator Chris Renuschler discussed his involvement with the Information Products Laboratory for Emergency Response (IPLER), which was recently formed to address technological challenges in linking remote sensing, GIS and environmental models for decision support in managing disasters (see story on IPLER’s involvement following the Haiti earthquake on page 2).

In addition, two panel sessions were organized: (1) Data Issues: Rapid Access to Remote Sensing Datasets; and (2) Perspectives of End Users: Emergency Managers and Decision Makers.

A special banquet dinner talk by Albert Lin, California Institute for Telecommunications and Information Technology, University of California, San Diego Division, introduced a National Geographic Society study to “Search for the Tomb of Genghis Kahn: Using Modern Tools to Hunt for an Ancient Past.”

The workshop, held at the University of Texas at Austin on October 22-23, 2009, was organized by Ellen Rathje, Department of Civil, Architectural & Environmental Engineering, UT at Austin. Additional support was provided by Arleen Hill, Department of Earth Sciences, University at Memphis, and ImageCat, Inc.

The Eighth International Workshop on Remote Sensing will be held at the Tokyo Institute of Technology in Tokyo, Japan September 30-October 1, 2010. For more details, contact Ron Eguchi at rte@imagecatinc.com or Beverley Adams at bja@imagecatinc.com.

Proceedings are available at http://mceer.buffalo.edu/research/Remote_Sensing/Workshop_Series/default.asp.
New Edition of *Peace of Mind in Earthquake Country*

*Peace of Mind in Earthquake Country*, by Peter I. Yanev and Andrew C.T. Thompson, has been completely updated and greatly expanded. Originally published over 30 years ago, the third edition reflects the latest advances in earthquake science, engineering, and financial management techniques for homeowners, home buyers, and businesses in earthquake country.

In this comprehensive resource, the authors demystify the technical aspects of earthquakes and present a do-it-yourself approach to home and business preparedness.

To order the book, visit: [http://www.theearthquakebook.com](http://www.theearthquakebook.com).

Ultimate Scientists Club Visits MCEER

MCEER hosted a homeschool science group from the Rochester, NY area on October 25, 2009 for a combined lecture and demonstration on the core geophysical elements of earthquakes, the dangers from seismic disasters and the merits of earthquake engineering. The middle school students and their parents are participants in the Ultimate Scientists Club, mentored by Jeff Nidetz. The visit was suggested by a student who had read about the UB-NEES Equipment site in an issue of *Popular Science*.

The visit, hosted by Andrew McNeil of MCEER’s Information Service, included a presentation incorporating numerous photos detailing structural damage from past earthquakes and the archived test videos from the NEESWood Benchmark Shake Table Testing of a Full-Scale Two-Story Townhouse Woodframe Building performed at the University at Buffalo in November 2006. The students and their parent teachers had previously studied the basics of seismology and arrived with a host of questions concerning the work performed by MCEER.
Following the 7.0M earthquake in Haiti on January 12, 2010, University at Buffalo doctoral candidate Pierre Fouché was greatly affected—not just as a multi-hazard engineering student, but as a native of the country.

“After this catastrophic event, the questions and uncertainties have increased,” says Pierre, who was interviewed by several media outlets in the weeks after the earthquake to talk about reconstruction of his country and the considerations in building a stronger Haiti that can better withstand future natural disasters. CNN recognized Pierre’s contributions by naming him one of CNN’s intriguing people for the week of January 21, 2010.

Growing up in a country known to be vulnerable to natural disasters was largely what motivated Pierre to pursue a degree in engineering. After graduation, Pierre plans to go into practice and acquire hands-on experience that he can integrate into a career in academia and research. He would like to bring his knowledge back to Haiti to help change the way that engineering and design are carried out there.

“Coming here to study I knew that I had a responsibility in getting my countrymen to think about the bigger picture as related to the vulnerability and exposure of the country to multiple hazards,” Pierre says. “While already, in itself, this was no small task, this responsibility has grown after this quake. Besides the reconstruction process, a more comprehensive path has to be taken to get us out of the hole we are in back home.”

In his research project, “Multi-hazard Engineering and Design of Bridge Structures,” Pierre is developing an integrated and cost-effective bridge system that aims to offer a single optimized solution to the constraints of multiple hazards. Pierre was encouraged to explore multi-hazard engineering by his advisor, Michel Bruneau, professor of Civil, Structural and Environmental Engineering, University at Buffalo, and previous director of MCEER.

Pierre was named a Fulbright Scholar in 2006. He also received the School of Engineering Dean’s Fellowship in 2007, the Presidential Fellowship in 2008 and the Chair’s Graduate Recognition Award in 2010, all from UB. He earned his undergraduate engineering degree from Université Quisqueya in Port-au-Prince, Haiti. He expects to graduate in December of this year.

NCEER/MCEER Founder Honored at Retirement Dinner

Dr. Tsu T. “Larry” Soong, SUNY Distinguished Professor and Samuel P. Capen Professor of Engineering Science, Department of Civil, Structural and Environmental Engineering, University at Buffalo, and one of the founders of MCEER (originally the National Center for Earthquake Engineering Research - NCEER), was honored for over 40 years of academic service to the University at Buffalo on November 14, 2009. Held at the Ramada Hotel in Amherst, NY, over 50 of Dr. Soong’s colleagues, family members and friends gathered together to celebrate his long and fruitful career.

The festivities began when two fellow faculty members, George Lee and Andrei Reinhorn, made presentations on the life and times of Larry Soong. Dr. Lee’s talk focused on the many coincidences between his life and Dr. Soong’s, beginning in their native homeland of China, continuing through their years in Taiwan, and their eventual meeting as colleagues at the University at Buffalo. Andrei Reinhorn discussed Dr. Soong’s many academic achievements, in particular his development and implementation of structural control systems in China, Japan and the U.S.

Over his long and productive career, Dr. Soong has mentored over 45 Ph.D. and M.S. students, published 10 books, 134 journal publications, and 138 conference papers, and been the recipient of many prestigious awards, most notably the ASCE Norman Medal (1999) and the ASCE Nathan Newmark Medal (2002). He also led the field implementation of passive energy dissipation technology in a U.S. Naval supply facility in San Diego, California. The retrofit, completed in 1996, was the first seismic upgrade of a reinforced concrete structure using viscoelastic damper technology.

While retired, he is still actively involved in research and mentoring. He will be spending about four months this year and the next at the Hong Kong Polytechnic University as Chair Professor of Engineering Science, primarily working with students on research projects related to the implementation of structural control devices and health monitoring of bridges and towers in Hong Kong and China.
The UB-NEES Site hosted the Research Experiences for Undergraduates Program (REU) Young Researcher Symposium at the University at Buffalo, August 20-22, 2009. Thirty-four REU students from across the continental United States, Hawaii and Puerto Rico participated in this three-day event, which was also attended by several NEES-site REU coordinators.

Following a welcome by A. Scott Weber, Chair of UB's Department of Civil, Structural and Environmental Engineering, the group toured the UB-NEES Structural Engineering and Earthquake Simulation Laboratory (SEESL) and watched a test demonstration on one of the two shake tables.

The tour and test demonstration were followed by four UB faculty and graduate student presentations on NEES research projects and related topics, including:

- Professor S. Thevanayagam, “Geotechnical Earthquake Engineering”
- M.S. candidate Jessica Fuchs, “Seismic Performance of Nonstructural Systems”
- M.S. candidate Daniel Gavahi, “Performance Based Design of Reinforced Concrete Walls”
- Professor Gilberto Mosqueda, “Hybrid Simulation of Structures to Collapse”

The heart of the Symposium commenced on Saturday morning at UB’s Center for Tomorrow. Here, the REU students presented posters based on their respective 10-week summer research experiences and answered questions from fellow REUs and NEES-site coordinators.

The Symposium culminated with an evening dinner featuring MCEER partner and guest speaker, Doug Taylor, CEO of Taylor Devices, Inc. Mr. Taylor spoke on “Research and Development Engineering - An Industry Perspective,” and shared many stories and experiences as an engineer and inventor.

While in Buffalo, the group had an opportunity to visit Niagara Falls, where in addition to seeing the mighty Niagara River, they also rode the whirlpool jet boat. The fast-paced boat ride takes participants on an exciting journey into the Niagara Gorge, the famous whirlpool and through Devil’s Hole Rapids.

The event was planned and coordinated by UB-NEES Site Operations Manager, Tom Albrechcinski, with assistance from Sofia Tangalos, of MCEER’s Information Service.

IDARC Computer Program Updated to Version 7.0

IDARC, a computer program for nonlinear structural analysis that allows many aspects of concrete behavior to be explicitly modeled, has recently been updated, and a new technical report and users manual is available (see report review on page 14). The IDARC program was developed by MCEER investigator Andrei Reinhorn, University at Buffalo, and was first introduced in 1987.

Version 7.0 includes the following features and additions:
- Addition of new rocking column element
- New nonlinear-elastic-cyclic model with either negative or positive stiffness
- Added story velocity output
- Added white-noise ground motion analysis for horizontal and vertical shaking
- Expanded limits of numbers of elements and input wave data
- Added special spring hysteretic model for wire base isolation element
- New “case studies” for examples and program validation
- Expanded Users Group and internet site support

Details of the program’s new features and enhancements, references to the analytical basis for them, and program availability information can be found on the IDARC web site at http://civil.eng.buffalo.edu/idarc2d50.
Five Volume Series on Remote Sensing For Resilient Multi-Hazard Disaster Response Now Available

A new series of reports on “Remote Sensing for Resilient Multi-Hazard Disaster Response” document seven years of scientific research conducted by MCEER researchers at ImageCat Inc., in conjunction with international multi-hazard researchers. The series provides a collective account of remote sensing and GIS-based damage assessment methodologies and applications. The reports focus on specific damage detection techniques recently developed and implemented in the aftermath of several disasters, such as the Bam earthquake, Hurricane Charley and Hurricane Katrina.

**Volume I: Introduction to Damage Assessment Methodologies**, by Beverley Adams and Ronald Eguchi, sets the groundwork for the report series by introducing the use of remote sensing and advanced technologies for resilient multi-hazard disaster response. The report does this by analyzing the roles of “Technology Push” and “User Pull” in the increased use of remote sensing, presenting a conceptual model for organizing post-disaster deployments, and reviewing literature of prior research activities using advanced technologies including remote sensing. The three case studies used for research in the subsequent reports are also described.

**Volume II: Counting the Number of Collapsed Buildings Using an Object-Oriented Analysis: Case Study of the 2003 Bam Earthquake**, by Luca Gusella, Charles Huyck and Beverley Adams, documents exploratory research in the use of a new image processing technique. The technique is based on ‘object-oriented’ analysis to count the number of buildings that collapsed during the 2003 Bam, Iran earthquake.

**Volume III: Multi-Sensor Image Fusion Techniques for Robust Neighborhood-Scale Urban Damage Assessment**, by Beverley Adams and Anneley McMillan, investigates multi-sensor pixel-based image fusion methodologies, combining ‘before’ and ‘after’ images from two different high-resolution optical satellites in order to assess neighborhood damage extent and severity. The 2003 Bam earthquake was used as this case study as well.

**Volume IV: A Study of Multi-Temporal and Multi-Resolution SAR Imagery for Post-Katrina Flood Monitoring in New Orleans**, by Anneley McMillan, Jeremy Morley, Beverley Adams and Simon Chesworth, is an investigation of the performance of multi-resolution SAR data for detecting urban flood using fine-beam and standard-beam Redarsat-1 scenes. Flooding due to Hurricane Katrina was used as the case study.

**Volume V: Integration of Remote Sensing Imagery and VIEWS Field Data for Post-Hurricane Charley Building Damage Assessment**, by J. Arn Womble, Kishor Mehta and Beverley Adams, investigates the use of remote sensing and advanced field data collection technologies for improving response to extreme windstorm events. Perishable field data and supporting satellite imagery collected in the aftermath of Hurricanes Charley and Ivan were used as case studies.

The reports are available from the MCEER website at [http://mceer.buffalo.edu/publications/catalog](http://mceer.buffalo.edu/publications/catalog).
Whittaker Named Director of SEESL

Professor Andrew Whittaker was named Director of the Structural Engineering and Earthquake Simulation Laboratory (SEESL) in the Department of Civil, Structural and Environmental Engineering, University at Buffalo, as of October 1, 2009. Whittaker has been a member of the UB faculty since late 2000, is a licensed Civil and Structural Engineer in the State of California, and has research interests that include earthquake and blast engineering. MCEER Director Andre Filiatrault, past Director of SEESL, will continue to serve on the SEESL Executive Committee.

Kulicki Named Recipient of the 2009 Richard S. Fountain Award

John Kulicki, Chairman and CEO of Modjeski & Masters, was awarded the 2009 Richard S. Fountain Award by the American Iron and Steel Institute's Steel Bridge Task Force and the AASHTO technical committee for structural steel design. The award is presented annually to recognize leadership in steel bridge research and outstanding efforts to advance AASHTO specifications. Kulicki was a participant in the 2009-2010 Bridge Engineering Distinguished Speaker Series and is an active participant in MCEER's highway research program.

Sadek leads UB 2020 Extreme Events Strategic Strength

Adel Sadek, Associate Professor in the Department of Civil, Structural and Environmental Engineering, University at Buffalo, was named Acting Chair of UB 2020’s Extreme Events: Mitigation and Response strategic strength. As Chair, Sadek will oversee university-wide activities focused on the development of innovative and integrated solutions to limit the impact of extreme hazards. This effort includes the collaborative involvement of experts with a wide range of knowledge from a variety of disciplines throughout the university. For more information on UB 2020’s initiative, visit http://www.buffalo.edu/ub2020/overview.

Staff News

Sarah Haner joined MCEER in August 2009 as a Media Production Specialist and Webmaster. Prior to joining MCEER, Sarah held positions as a Writer/Editor and Communications Specialist for Penn State University’s Energy Institute and as a Producer/Writer for Seven Three Media, LLC. Sarah received her B.A. in journalism from Penn State University in 2004.

Jane Stoyle Welch, MCEER’s Publication Manager, was married to Michael Welch on September 26, 2009. Jane has managed MCEER’s publications group since 1987.

Save the Date!

MCEER’s Annual Meeting will be held September 16-17, 2010 in Buffalo, NY. Related activities include the commissioning and first test of the MCEER-Calspan Full-Scale Bridge Test Program in nearby Ashford, NY, and an International Geological Hazards Workshop, planned for September 16-20.

For more information, contact Don Goralski at (716) 645-5151 or goralski@buffalo.edu.

Shaken Allegiances: A New Novel by Michel Bruneau

Michel Bruneau, Professor, Department of Civil, Structural and Environmental Engineering, University at Buffalo and former MCEER Director, recently published his second work of fiction, a novel titled *Shaken Allegiances*. The book offers an original and entertaining view of the first 48 hours following a devastating earthquake on Montreal Island, on the eve of a referendum on Quebec’s independence and in the dead of winter. Told from the various viewpoints of politicians, emergency responders, members of the media, structural engineers, medical students and others who are often relied upon for leadership following a major disaster, the book uncovers the dark side of human nature, revealing a metaphorical disaster created by self-serving egos.

New Technical Reports

Development of a Steel Plate Shear Wall Bridge Pier System Conceived from a Multi-Hazard Perspective
By David Keller and Michel Bruneau, MCEER-08-0030, 12/19/08, 244 pages, $35.00

This report introduces an innovative and integrative concept of a bridge box pier system that incorporates Steel Plate Shear Walls (SPSW) to resist multiple hazards including earthquakes, vehicle collisions, tsunamis and indirectly storm surges, and blasts. The proposed bridge pier concept simultaneously considers the constraints and demands for each hazard of interest. Simplified approaches for multi-hazard analyses and design are presented. Additionally, nonlinear finite element analyses are performed to better understand the system’s behavior. It is found that the system has adequate ductility, redundancy and strength to resist each of the hazards.

Modal Analysis of Arbitrarily Damped Three-Dimensional Linear Structures Subjected to Seismic Excitations
By Yi-Lun Chu, Jianwei Song and George C. Lee, MCEER-09-0001, 1/31/09, 228 pages, $35.00

This report presents a theoretical framework for the seismic analysis of arbitrarily damped three dimensional linear structures. A complex 3-D modal analysis-based approach is developed to estimate the seismic responses to multi-directional excitations, accounting for effects of out-of-plane coupled motions and over-damped vibration modes. The procedures are suitable for the seismic analysis of structures with complex geometric shapes enhanced with damping devices introducing non-classical damping. A new modal combination rule, based on the theory of stationary random vibration and the existence of principal axes of ground motions, is developed to calculate the peak responses of structures subjected to seismic inputs given in terms of response spectra. The proposed modal combination considers correlations among perpendicular excitation components and between vibration modes. Finally, an over-damped mode response spectrum that accounts for the peak modal response resulting from the over-damped modes is proposed.

Air-Blast Effects on Structural Shapes
By G. Ballantyne, A.S. Whittaker, A.J. Aref and G.F. Dargush, MCEER-09-0002, 2/2/09, 120 pages, $25.00

This report investigates the effect of short-duration blast loadings on structural shapes of finite width. A series of numerical analyses on W-shapes are performed using a computational fluid dynamics code. Results such as peak reflected overpressure and reflected impulse are compared to values computed using empirical data reported in the literature for reflecting surfaces of infinite width. Significant reductions in loading are observed. The finiteness of the width dimension allows a low pressure wave to propagate inwards on the front surface of the section, lowering the pressure more quickly.

MCEER • UB-EERI • MCEER SLC • UB-CSEE

Seminar Series

The EERI student chapter of the University at Buffalo (UB-EERI), MCEER, the Department of Civil, Structural and Environmental Engineering (CSEE) and the CSEE Graduate Student Association jointly sponsor a seminar series on a variety of topics related to earthquake and extreme events hazard mitigation. The purpose of the seminar series is to widen accessibility to timely, technical presentations by students, researchers, visitors and affiliates of MCEER. All seminars are held at the University at Buffalo, and most are broadcast over the Internet in real-time. They can be viewed at http://mceer.buffalo.edu/education/webcast/default.asp.

The Transition from University to Professional Practice
Graeme Ballantyne, P.E., LEED AP, Senior Engineer at Thornton-Tomasetti, Inc. San Francisco, CA, October 2, 2009

The transition from university to professional practice can be formidable. New people, new expectations and new environments further complicate the transition. One learns that professional practice is more than calculations on engineering paper. Graeme Ballantyne, a recent University at Buffalo graduate, discussed his transition into professional practice, from Philadelphia and later to San Francisco, both with Thornton-Tomasetti.

Post-Strengthening of Masonry Structures with Fiber Reinforced Polymers
Werner Seim, Professor, University of Kassel, Germany, September 4, 2009

Dr. Werner Seim’s seminar focused on how fiber reinforced polymers (FRP) can be effectively used in the post-strengthening of masonry structures. Dr. Seim talked about manufacturing the FRP material by wet-layup directly on the surface of the masonry structure, and discussed possible applications of this method. He presented results of experimental research carried out at the University of Kassel.
than if the section had infinite width. As the blast wave engulfs the section over its width and depth, there is a component of positive pressure on the rear face of the section that opposes the positive pressure on the front surface, which can substantially reduce the net pressure loading below that computed using empirical data. The percentage reduction varies as a function of the size of charge and standoff distance, with the largest reductions observed for small charges and large standoff distances.

Water Supply Performance During Earthquakes and Extreme Events

By Amanda L. Bonneau and Thomas D. O’Rourke, MCEER-09-0003, 216/09, 252 pages, $35.00

This report presents the development of a functional Decision Support System for the seismic and multi-hazard performance of water supplies. An improved hydraulic network model of the full 2007 Los Angeles Department of Water and Power (LADWP) water distribution system is presented. The improved model includes an enhanced simulation of the time-dependent response, all sources of earthquake damage, and fragility curves to probabilistically characterize the seismic damage to facilities such as tanks, reservoirs, regulation stations and pumps. The network model is validated through comparison of model results for the effects of the 1994 Northridge earthquake with actual areas of lost water service as well as pre- and post-earthquake flow measurements documented by LADWP. An actual decision support problem faced by LADWP system management is used to demonstrate the application of the proposed methodology. The LADWP is modeled with and without several key reservoirs, which have been removed from service to meet water quality standards, to assess their influence on supplying water after an earthquake. It is demonstrated that opening the disconnected reservoirs immediately after a severe earthquake improves serviceability, with the most substantial impact in areas with the highest population densities.

Generalized Linear (Mixed) Models of Post-Earthquake Ignitions

By R.A. Davidson, MCEER-09-0004, 7/20/09, 124 pages, $25.00

This report presents a comprehensive approach to statistical modeling of post-earthquake ignitions and to data compilation for such modeling, and applies it to present day California. Specifically, regression models are developed that can be used to estimate the number of ignitions per census tract as a function of tract characteristics and the ground shaking experienced in a specified earthquake. The new approach recognizes the discrete nature of ignition counts by using generalized linear and generalized linear mixed models for the first time in this type of application. It includes careful model selection and goodness-of-fit analyses, examines multiple covariates to estimate ignitions, and uses a census tract as a unit of study to enable better estimates at a finer geographic resolution.

IDARC2D Version 7.0: A Program for the Inelastic Damage Analysis of Structures


This report summarizes the enhanced modeling and analysis capabilities of the IDARC program series for analysis, design and support of experimental studies. The analytical models described include frame structures with rigid or semi-rigid connections made of beams, columns, shear walls, connecting beams, edge elements, infill masonry panels, inelastic discrete springs (connectors), and damping braces (viscoelastic, viscous, friction and hysteretic). Hysteretic models with improved degradation parameters can trace sections to complete collapse. The nonlinear characteristics of the analytical models are based on a flexibility formulation and an improved distributed plasticity with yield penetration model. Properties of members are calculated by fiber models or by formulations based on mechanics. The analysis techniques include improved nonlinear static analysis (with monotonic and cyclic loadings), nonlinear dynamic analysis with multi-component ground motions and gravity loads, and quasi-static analysis of the type required by laboratory experiments. The analyses include enhanced evaluation of inelastic response through damage analysis of members and the global structure, using methods based on energy, stiffness and ductility including monitored damage progression. Finally, new case studies are included as examples of use of inelastic analyses.

Enhancements to Hospital Resiliency: Improving Emergency Planning for and Response to Hurricanes

By Daniel B. Hess and Lucy A. Arendt, MCEER-09-0007, 7/20/09, 78 pages, $25.00

This report extends research previously conducted by the authors about the maintenance of critical lifelines (water, power, hospitals) and critical infrastructure following extreme events. The authors examined hospital decision making in the immediate aftermath of Hurricane Katrina in 2005 and Hurricane Gustav in 2008. During on-site interviews in New Orleans shortly after Hurricane Katrina, hospital administrators were quick to identify changes they intended to make to emergency procedures, most driven by the severely negative outcomes of Hurricane Katrina. The current research, which reports on hospital experiences during Hurricane Gustav three years after Hurricane Katrina, represents the “post” phase of a naturally occurring “pre-post” experiment by documenting the changes to emergency planning—precipitated by hospitals’ experiences during Hurricane Katrina—and subsequently operationalized during Hurricane Gustav.
Assessment of Base-Isolated Nuclear Structures for Design and Beyond-Design Basis Earthquake Shaking
By Y.N. Huang, A.S. Whittaker, R.P. Kennedy and R.L. Mayes, MCEER-09-0008, 8/20/09, 152 pages, $30.00

This report presents the technical basis for proposed changes to the 2010 edition of ASCE Standard 4, Seismic Analysis of Safety-related Nuclear Structures. Three performance statements to achieve the objectives of ASCE 43-05, Seismic Design Criteria for Structures, Systems and Components in Nuclear Facilities, are assessed: (1) individual isolators shall suffer no damage for design level earthquake shaking, (2) the probability of the isolated nuclear structure impacting surrounding structure (moat) for 100% (150%) design level earthquake shaking is 1% (10%) or less, and (3) individual isolators sustain gravity and earthquake-induced axial loads at 90th percentile lateral displacements consistent with 150% design level earthquake shaking. Nonlinear response-history analysis is performed in support of items (2) and (3), accounting for the variability in both earthquake ground motions and seismic isolator properties. Eleven sets of ground motions are recommended for response-history analysis of base isolated nuclear structures.

Quantification of Disaster Resilience of Health Care Facilities
By G.P. Cimellaro, C. Fumo, A.M. Reinhorn and M. Bruneau, MCEER-09-0009, 9/14/09, 212 pages, $35.00

This report presents concepts of disaster resilience of constructed infrastructure and proposes a methodology for its quantitative evaluation. A unified terminology framework is proposed and implemented for resilience evaluation of health care facilities subjected to earthquakes. The framework is formulated and exemplified for an existing medical facility and a hospital network. In addition, an organizational model describing the functionality of the emergency service of a hospital is developed and implemented. A hybrid simulation and analytical metamodel is developed to estimate, in real time, the hospital functional capacity and its dynamic response, accounting for the influence of structural and nonstructural physical damage on the hospital organization. Finally, a hospital network is modeled to study the effects on disaster resilience of collaborative operations of health care facilities. The proposed resilience framework captures the effects of disasters, and the effects of preparedness and restoration, and therefore, constitutes a valuable tool for decision makers, designers and engineering practitioners.

Performance-Based Assessment and Design of Squat Reinforced Concrete Shear Walls
By C.K. Gulec and A.S. Whittaker, MCEER-09-0010, 9/15/09, 326 pages, $35.00

This report investigates the failure mechanisms of shear-critical squat reinforced concrete walls, commonly used in many commercial buildings and safety-related nuclear structures. A database with experimental data obtained from 434 tests is assembled to improve the current state of knowledge on squat wall response. The adequacy of the peak shear strength predictive equations in current design provisions is evaluated, and improved empirical equations are developed. Squat walls are modeled using finite elements to predict their monotonic and cyclic responses. Modeling decisions that are critical to predict the wall responses are explored and recommendations for finite element modeling are made. Macro-level hysteretic models are prepared for a small number of squat walls for which digital load-displacement data are available. The calibrated Ibarra-Krawinkler pinching model is used to properly capture the strength, stiffness degradation and pinching effects in the walls response. Information in the database is used to identify damage states and to develop fragility functions for buildings and safety-related nuclear structures incorporating squat reinforced concrete walls.

---

**Publications Order Form**

<table>
<thead>
<tr>
<th>Name</th>
<th>Publication #</th>
<th>Authors</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

City/State/Zip

Country

Telephone: Fax

Make checks payable to the "UB Foundation" Shipping Total

Shipping Options

☐ Media Mail (Book rate) • U.S. (no additional charge)
☐ Priority – U.S. (add $4.95 per title)
☐ Global Priority to Canada or Mexico (add $11.45 per title)
☐ Global Priority – All Other International (add $13.45 per title)

For Credit Card Orders:

Name on credit card

Card number

Expiration date

Signature

Use this form to order publications from MCEER or visit the Publications Catalog at http://mceer.buffalo.edu/publications/catalog.html.
Third International Earthquake Symposium
March 5-6, 2010 | Dhaka, Bangladesh
This conference aims to bring together professionals from different regions to present and discuss topics related to earthquake engineering, seismology and earthquake disaster management. The goals are to promote preparedness against earthquakes, mitigation of earthquake risk, and the exchange of information and ideas in earthquake engineering. MCEER Director Andre Filiatrault is on the conference advisory committee. For more information, contact Raquib Ahsan at iesb3dhaka@gmail.com.

Ninth U.S. National and Tenth Canadian Conference on Earthquake Engineering: Reaching Beyond Borders
July 25-29, 2010 | Toronto, Canada
This conference will provide an opportunity for researchers and practitioners to share the latest knowledge and techniques for understanding and mitigating the effects of earthquakes. It is the first time that a conference of this scale is jointly organized by EERI and the Canadian Association for Earthquake Engineering, MCEER Director Andre Filiatrault is the conference co-chair, and Donald Goralski and Gilberto Mosqueda are part of the organizing committee. More information is available at: http://www.2010eqconf.org.

MCEER Annual Meeting
September 16-17, 2010 | Buffalo, New York
MCEER's Annual Meeting will be held September 16-17, 2010 in Buffalo, NY. Related activities include the commissioning and first test of the MCEER-Calspan Full-Scale Bridge Test Program in nearby Ashford, NY, and an International Geological Hazards Workshop, planned for September 16-20.
Details of the meeting are being planned as of press time, and will be made available on our website. For more information, contact Donald Goralski at (716) 645-5151 or goralski@buffalo.edu.