

MULTIPLE HAZARDS & EXTREME EVENTS

EARTHQUAKE RESEARCH PRODUCTS/CAPABILITIES PROVE ADAPTABLE TO OTHER HAZARDS/THREATS

REMOTE SENSING TECHNOLOGY USED IN HURRICANE'S AFTERMATH

Remote sensing technology deployed in South Florida to rapidly assess damage from Hurricane Charley, was originally developed to assess damage following earthquakes. The VIEWS (Visualizing Impacts of Earthquakes With Satellites) technology provided quick "before" and "after" high-resolution satellite images of devastation caused by the Category 4 hurricane.

It was deployed by researchers from MCEER – then the Multidisciplinary Center for Earthquake Engineering Research – who are developing its use for post-disaster response.

The system enabled researchers to collect valuable perishable data, which in the immediate aftermath of disaster, can hasten and improve urban damage assessment, emergency response, and regional recovery efforts.

This is the first time that such technology was used for severe hurricane damage detection. MCEER plans to continue its development and extend its application for multiple hazards and extreme events.

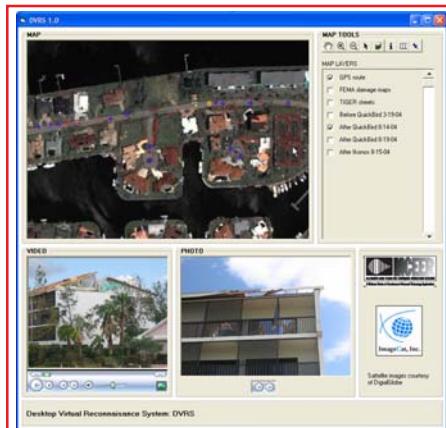
ANALYSES CITE DESIGN IN PREVENTING COLLAPSE NEAR WTC

In another case, MCEER researchers examining severely-damaged buildings near New York City's Ground Zero found that a redundancy in at least one building's design saved it from collapse following the September 11, 2001 attacks. The conclusion was reached after conducting a visual inspection and computerized linear and nonlinear analyses on the structure.

Findings show that rigid beam-to-column connections in the 39-story office building enabled gravity loads above a partially-collapsed segment, to be transferred to other supporting columns within the structure, thus saving it from collapse. Such computer analyses prove invaluable in the development of safer designs that better protect structures from a variety of forces, and provide a higher level of safety for building occupants and first responders.

Examples like these illustrate how MCEER products and capabilities developed to improve resilience against earthquakes also reduce vulnerability, minimize damage, and speed response and recovery from other hazards and threats. For this reason, the center emphasizes development of multi-use knowledge, tools and technologies within its current research portfolio.

This combined with the MCEER's team of expert researchers, partners and staff, and its state-of-the-art network of experimental and computational facilities, uniquely position the center to develop and deliver complete solutions to the challenging problems presented by a host of natural hazards and terrorist threats. MCEER has published five reports on its post-9/11 investigations. They are accessible online at mceer.buffalo.edu.



MCEER researchers deployed VIEWS technology to collect aerial damage data in South Florida following Hurricane Charley.

STRENGTHENING RESILIENCE

Reducing vulnerability, minimizing damage, and expediting recovery after disasters, aim to protect lives and quality of life. They are also factors that strengthen resilience against disasters.

MCEER's research program is predicated on strengthening resilience. Toward that end, its research, education and outreach programs deliver new knowledge, tools and technologies that strengthen resilience against disasters.

MCEER defines resilience as the ability of both physical and social systems to withstand & cope with disaster through situation assessment, rapid response, and effective recovery strategies.

Resilience is improved by reducing:

- Failures to infrastructure
- Consequences from failures (lives lost, damage, and adverse social and economic impacts)
- Time to recover – i.e., restoring the system to pre-disaster conditions

Factors such as robustness, redundancy, resourcefulness, and rapidity all play a role in enhancing resilience.

Research seeks to improve resilience on a variety of fronts: technical, organizational, social and economic.

MULTIPLE DISCIPLINES FOR MULTIPLE HAZARDS

Developing solutions for multiple hazards and extreme events requires collaboration and coordination of experts from multiple disciplines. It also requires a management system that keeps project participants working in tandem to deliver quality results on time and on budget.

MCEER has a track record for doing just that. The center enjoys a rich history of "engineering solutions" that improve resilience against earthquakes and other hazards.

Studies are problem-focused and market-driven, with an emphasis on developing real-world solutions for real-world applications.

Projects involve coordination of decentralized multidisciplinary teams and problem-focused studies that yield new knowledge, tools and technologies to help protect and improve critical infrastructure, response and recovery in times of disaster.

Today, MCEER coordinates teams involving more than 38 researchers at 19 institutions in 10 states.

ADDITIONAL PROJECTS OFFER MULTI-USE PROMISE

While focused specifically on producing solutions that strengthen our nation's resilience against earthquakes, other current MCEER studies also seek expanded, multi-hazard/multi-use applications. These include development and examination of:

- Loss-Estimation Methodologies that will:
 - help better model regional economic losses due to disasters
 - improve understanding of direct economic losses, social impacts and community resilience when utility lifelines are damaged
- Decision Support Tools to:
 - help organizational decision-makers of healthcare and utility services assess the cost of potential losses and disaster mitigation measures in the context of organizational needs
 - enhance urban disaster recovery through greater understanding of linkages between households, businesses and service providers
- Analytical Methodologies for improved restoration of utility services (electrical power and water) following disasters
- Structural Analyses of Multi-Story Buildings to improve understanding of progressive collapse and save lives of occupants and first responders
- Structural control technologies to reduce damaging vibrations to structures and their contents
- Remote sensing technologies to enhance damage assessment, emergency response and post-disaster recovery

MCEER EXPERTISE, CAPABILITIES AND PARTNERSHIPS LAY FOUNDATION FOR EXPANDED STUDIES ON MULTIPLE HAZARDS AND EXTREME EVENTS

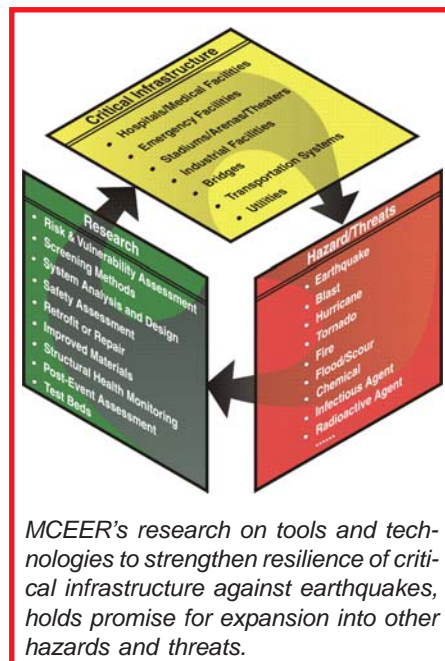
Efforts to enhance resilience of infrastructure and communities against extreme events (natural disasters, technological disasters, and acts of terrorism) have risen dramatically in recent years.

To our advantage, many known similarities exist between the preparedness, response, and recovery needs from one hazard to the next.

In these cases, resilience tools and technologies developed by MCEER, to address earthquake hazards for critical infrastructure and emergency response and recovery, hold promise for expansion and improving resilience measures for other hazards and extreme events.

MCEER's multidisciplinary expertise, unique capabilities and facilities, and its successful history of collaboration with business, industry and government partners across the United States, provide a foundation on which to address the research needs for a broad range of hazards and threats.

This, in concert with the center's proven track record of successfully managing large-scale, multi-million dollar, problem-focused research, education and outreach projects, position it well to embrace these new challenges.



PUBLIC & PRIVATE PARTNERSHIPS

Application of research products requires that they be user-friendly, economically-feasible, and socially- and politically-acceptable. To ensure these qualities in research outcomes, MCEER actively engages participation of business, industry and government partners at all levels.

These stakeholders play a critical role in helping to define needs that shape MCEER research. They provide insight and capabilities that add quality and value to the final product – and, they play a vital role in ushering application of new protective measures into the marketplace.

OUTREACH AND EDUCATION

It's been said that "Knowledge is power." At MCEER, the belief is that applied knowledge is truly powerful. Consequently, the center's work doesn't stop at the end of the research pipeline.

MCEER publications, partnerships, information services and continuing education comprise an array of strategic outreach services that help push research products into application. Publications and information services help raise awareness and understanding of new knowledge, tools and technologies to reduce vulnerability to hazards and threats. Partnerships and continuing education initiatives enable practitioners to advance their knowledge of state-of-the-art discoveries and best practices, via face-to-face interaction with MCEER's expert researchers.

ENGINEERING SOLUTIONS

Since 1986, MCEER has been a leader in developing large-scale multi-million dollar research, education and outreach projects that yield valuable products and services – and deliver practical knowledge and technology solutions for the design and retrofit of structures and critical infrastructure, including improvement of emergency response and recovery.



Headquartered at the University at Buffalo