



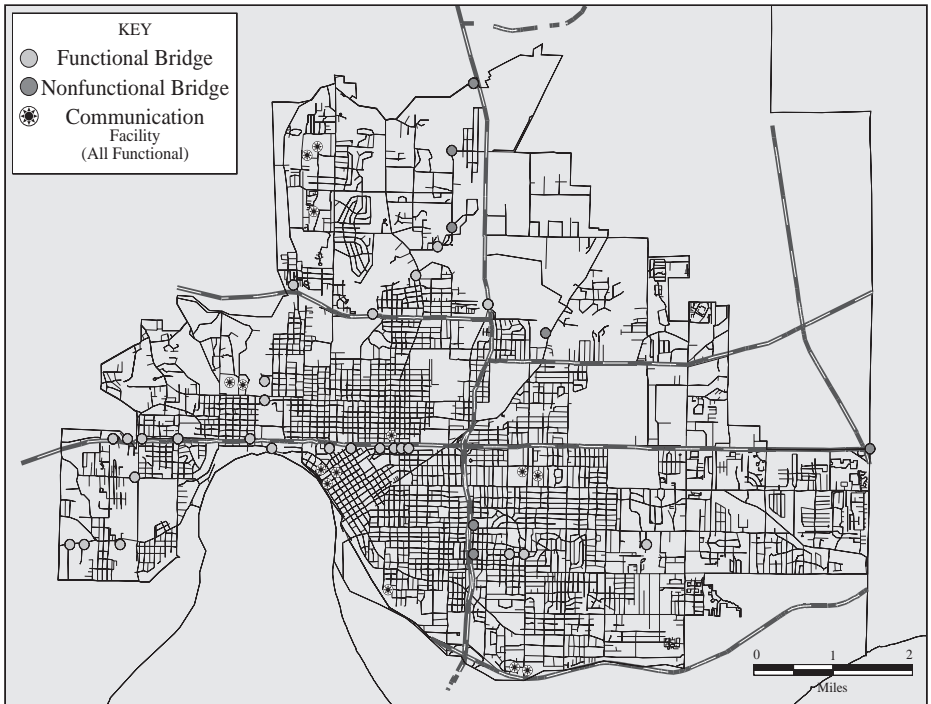
## DISASTER RESISTANT COMMUNITIES: A Community-Based Approach to Hazard Mitigation

**O**ne of the inescapable facts of life is that virtually no community is immune from natural hazards - whether it be flooding, severe weather, tornadoes, winter storms, and even earthquakes. The March, 1997 floods in Kentucky, Indiana, and several other Midwest states drew the nation's attention once again to the destructive power of these hazards. The bottom line, disaster related losses continue to escalate. From 1992 to 1997, disasters have cost the federal government alone nearly \$14 billion in aid to individuals and local governments, four times the amount from the previous four years. This figure does not include insurance losses, and business losses.

Aside from dollar losses, disasters exact a heavy toll on the victims. Within seconds or minutes, homes and businesses can be disrupted or severely damaged by floods, earthquakes, severe weather and other natural disasters. Community recovery can take years.

### The Good News

These hazards are not unavoidable calamities. *The good news is that the escalating losses from disasters can be stemmed.* Communities can take action to reduce future losses. Building codes can be adopted and *enforced*. Design and construction techniques can be adopted that will strengthen and reduce damages from disasters. Schools, hospitals, day care centers, and other "critical facilities" can be targeted for mitigation programs to improve the safety of these facilities from flooding, earthquakes and high winds. Losses from flooding can be significantly reduced through community participation in the National Flood Insurance Program.



The FEMA HAZUS loss estimation methodology can be an integral feature of a Disaster Resistant Community program. Source: Risk Management Solutions, Inc.

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### ***A New Approach to Dealing with Natural Hazards***

In essence, we have the knowledge and tools to reduce the vulnerability of our communities to natural hazards. What is needed is a fundamental shift in public perceptions of natural hazards. Hazard reduction policies and practices need to be integrated into the mainstream of community and business activities throughout the central United States and the nation. Furthermore, these mitigation policies and programs should be compatible with community goals, as reflected in local comprehensive plans.

Against this backdrop, the Federal Emergency Management Agency has made the creation of disaster resistant communities in high risk areas a priority. To accomplish this goal, FEMA will focus on three major areas of activity: 1) Establishing a Pre-Disaster Mitigation Fund program, which will provide financial incentives for communities to use in reducing the vulnerability of buildings and infrastructure; 2) Implementing a Public - Private Partnership to promote a closer working relationship with the business community in carrying out mitigation programs; and 3) Overhauling FEMA's public assistance programs to streamline procedures and reduce the recovery time.

### ***What is a Disaster Resistant Community?***

Disaster "resistance" is an objective. Achieving "disaster resistance" will be a long-term proposition. Expressed in terms of performance standards, a community may be considered disaster "resistant" when - after a major, damaging earthquake, hurricane, flood or other disaster - the following conditions are present:

- Instead of heavy casualties, there is a *minimal loss of life and limited interruption of public services* - including emergency medical and health services, electric and water utilities, transportation and communications.
- The private sector is able to *resume business operations* in a timely manner, thus contributing to the

recovery of the community (e.g., becoming part of the solution, rather than a big part of the problem).

- The community is able to *manage the response operations*, supplemented by pre-planned resources from neighboring communities and State government resources.
- The community is able to *recover* to at least pre-disaster conditions in an accelerated, ordered, pre-planned manner.

A "disaster resistant community" - a term first introduced by Don Geiss, of the International City and County Management Association - is a comprehensive, community-based, incentive-driven approach to hazard mitigation that emphasizes *pre-disaster* mitigation actions, and the involvement of the *business community* in a public - private partnership with local government.

Disaster resistance does not mean that there will be no damage, casualties and economic losses in large natural disasters. A major earthquake, for example, will cause substantial damages. A 500-year flood or a major tornado in an urban area will also cause substantial damages.

The overall objective of a Disaster Resistant Community program is to *reduce* the vulnerability of a community - including business and industry - to natural hazards, so that when a major flood, earthquake, tornado, or other natural hazard event *does occur* - injuries, deaths, property damage, economic losses and human suffering are *minimized*, and community recovery can be *accelerated*.

### ***Disaster Resistant Community Versus Showcase Community***

The Institute for Business and Home Safety (IBHS), a non-profit educational organization dedicated to "reducing injuries, property damage, economic losses and human suffering caused by natural disasters" has launched a national initiative to nominate and support the development of "Showcase Communities." These are communities that demonstrate - through adoption of a resolution - a public commitment to

developing and implementing a community hazard mitigation strategy. IBHS has further identified a number of

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**“Disaster ‘resistance’ is an objective...and a longterm proposition.”**

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requirements to be a Showcase Community (e.g., a community must adopt the latest model building code without modifications). Central to the Showcase Community initiative is the emphasis on a Partnership approach (IBHS has signed MOU's with several national organizations), and the use of incentives to promote mitigation. After an applicant community has adopted a resolution and becomes a Showcase Community, IBHS and its Partners will provide direct support to enable the community to implement the provisions of the mitigation strategy (example: one requirement is for the community to conduct a non-structural retrofit of all non-profit child care centers. The community conducts the assessment of the child care centers; the Partnership carries out the retrofit).

Finally, participation in the Showcase Community program enables the community to take advantage of a range of incentives and cost savings (e.g., possible insurance premium reductions for specified mitigation actions; low interest loans for retrofitting, and others). The fundamental premise is that if mitigation is to take place in this country on a meaningful scale, it must involve business and homeowners, and it must involve incentives.

In essence, the Showcase Community program can be viewed as an important *first step* towards "disaster resistance." It offers a structured program, with specific criteria and requirements that must be met by a prospective "showcase" community. Disaster "resistance", on the other hand, is a long-term proposition that will take decades to achieve, and involve a shift in community perceptions about natural hazards, and the need to assume personal and civic responsibility for the protection of our families, businesses, and communities from the effects of disasters.

### Why is it Important for a Community to Pursue “Disaster Resistance”?

While a community may never become truly “resistant” to disasters, there is clear evidence that local commitment to mitigation will, over time, significantly reduce community and business vulnerability to natural hazards. A local mitigation strategy will, when implemented:

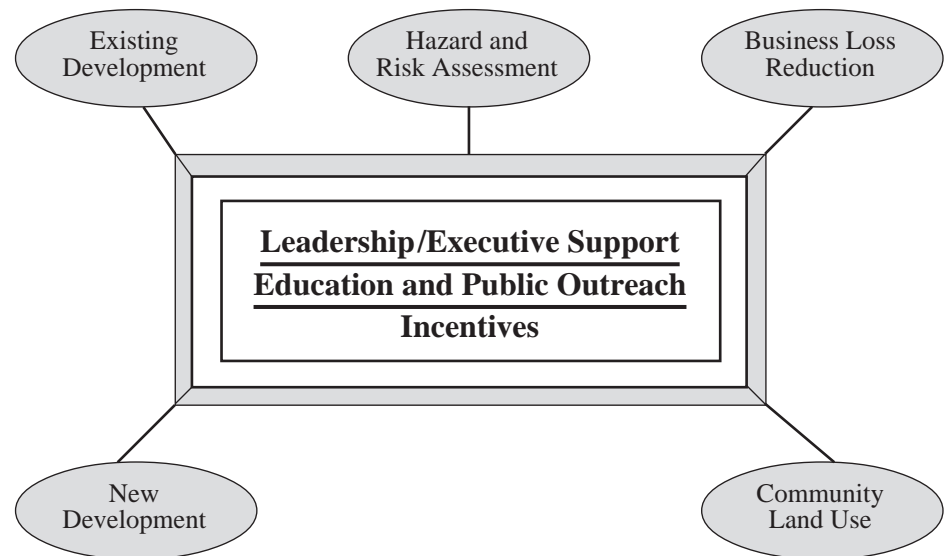
- Save lives, and generally make communities safer from disasters.
- Reduce property damages and economic losses from disasters.
- Minimize social disruption.
- Enable local governments to provide essential services - health, public safety, welfare - following a disaster.
- Improve the chances that business will survive, and be able to resume operations in an expedited manner.
- Shorten the recovery period - for business, and the community at large.
- Enhance the “marketability” of the community by demonstrating public and private commitment to building a community infrastructure that will survive major disasters.

### Elements of a Disaster Resistant Community: CUSEC’s Model

The Central U.S. Earthquake Consortium has developed a DRC model that is designed to bring together key community officials - public, private, nonprofit, professional, and others - to develop a local mitigation strategy that is organized around at least six program or goal areas, as reflected in Figure 1.

**Hazard and Risk Assessment** - The starting point for a community-based mitigation program and strategy is a comprehensive assessment of the vulnerability of the community to earthquakes, floods, tornadoes, severe weather, and other natural hazards.

## DISASTER RESISTANT COMMUNITY



**FIG.1** CUSEC’s DRC Model is designed to bring community officials together to develop a mitigation strategy that is organized around at least six goal areas.

**Goal:** Each *Disaster Resistant Community* should have a comprehensive, updated (preferably GIS based) Hazard and Risk Assessment that will provide a baseline of information on community and business vulnerability, and can be used by leaders to set reasonable performance objectives and priorities for mitigation, response and recovery from natural hazards. The HAZUS earthquake loss estimation methodology - which will be expanded to include flood and wind hazards - should be an integral feature of a Disaster Resistant Community.

**Education and Public Outreach** - The key to reducing loss of life, personal injuries, and damage from natural disasters is widespread public awareness and education on the nature of the hazards, and steps that can be taken before, during, and after an event. Education and Public Outreach is the foundation of a DRC program; without an informed and knowledgeable public, progress towards “disaster resistance” will be limited.

**Goal:** Each *Disaster Resistant Community* should have a program and strategy in place to raise the public awareness of natural hazards, and measures that can be

taken to improve disaster preparedness and promote mitigation. Community leaders, both in government and the private sector, should be able to understand the political, economic, and social benefits of investing in mitigation.

**Community Land Use** - Planners and other local officials have access to maps and studies that identify the spatial boundaries of hazards, including floodplains, areas of potential liquefaction (ground failure). This information allows local officials to develop and implement “avoidance strategies” to limit development in hazard prone areas of our communities. These strategies should be incorporated into a community’s comprehensive plan, and used to guide decisions on future land use. Finally, the post-disaster recovery phase offers numerous opportunities to achieve mitigation through changes in community land use planning and implementation.

**Goal:** Each *Disaster Resistant Community* should have an officially adopted land use plan that identifies hazard-prone areas, and policies and procedures to limit development in these areas.

<b>Loss Estimation Outputs (Level 2)</b>	
<p><b>Maps of seismic hazards</b></p> <ul style="list-style-type: none"> <li>• Contour maps of intensities of ground shaking</li> <li>• Contour map of permanent ground displacement</li> <li>• Liquefaction probability</li> <li>• Landslide probability</li> </ul> <p><b>Characterization of damage to general building stock</b></p> <ul style="list-style-type: none"> <li>• Structural and nonstructural damage probabilities by census tract building type and occupancy class</li> </ul> <p><b>Transportation and utility lifelines</b></p> <ul style="list-style-type: none"> <li>• For all components of all lifelines: damage state probabilities, cost of repair or replacement and expected functionality for various times following earthquake</li> <li>• For potable water system: percent service reduction to serviced areas</li> <li>• For electric power systems: probabilistic estimate of service outages</li> </ul> <p><b>Essential facilities</b></p> <ul style="list-style-type: none"> <li>• Cost of repair or replacement</li> <li>• Loss of beds in hospitals and medical facilities</li> </ul> <p><b>High potential loss facilities</b></p> <ul style="list-style-type: none"> <li>• Location of dams</li> <li>• Location of nuclear plants</li> </ul>	<ul style="list-style-type: none"> <li>• Location of military installations</li> <li>• Others</li> </ul> <p><b>Fire following earthquake</b></p> <ul style="list-style-type: none"> <li>• Number of ignitions by census tract</li> <li>• Percentage of burned area by census tract</li> </ul> <p><b>Inundated areas</b></p> <ul style="list-style-type: none"> <li>• Exposed population and exposed dollar value of facilities</li> </ul> <p><b>Hazardous material sites</b></p> <ul style="list-style-type: none"> <li>• Location of facilities with hazardous materials</li> </ul> <p><b>Debris</b></p> <ul style="list-style-type: none"> <li>• By weight and type of material</li> </ul> <p><b>Social losses</b></p> <ul style="list-style-type: none"> <li>• Displaced households</li> <li>• Number of people requiring temporary shelter</li> <li>• Casualties in four categories of severity</li> </ul> <p><b>Dollar losses associated with general building stock</b></p> <ul style="list-style-type: none"> <li>• Cost of repair or replacement</li> <li>• Loss of contents</li> <li>• Business inventory damage or loss</li> <li>• Relocation costs</li> <li>• Business income loss</li> <li>• Loss of rental income</li> </ul>

FIG. 2 The HAZUS program will generate loss estimate outputs in either a map or tabular format.

**Existing Development** - Communities in the Central U.S. have high concentrations of unreinforced masonry buildings (URMs) and other *hazardous* structures that pose a risk to our citizens - at home and in the workplace - in the event of an earthquake. Other existing structures are located in areas that are chronically subject to flooding. Thus, a major challenge for local officials is “how to address the vulnerability of existing hazardous buildings and utilities” in a manner that is sensitive to the political, social, and economic realities.

**Goal:** Each *Disaster Resistant Community* should have an officially adopted strategy for reducing the vulnerability of existing development. The strategy should include performance objectives for different categories of development, including:

1) Public facilities (e.g., government buildings) and electric utilities. For example, community leaders may decide that these facilities and systems should be able to be repaired and occupied or used shortly after a disaster.

2) Facilities essential to emergency response (police, fire, emergency operations centers, emergency

communications). For example, community leaders may decide that these facilities should be designed and built to function immediately after the “maximum credible event”.

3) High occupancy buildings.

**“Recent disasters have shown that a key to recovery is the ability of businesses to resume operations.”**

**New Development** - While much of our building stock is vulnerable to disasters, it is important that we do not *add to the problem of exposure to hazards*. This can be accomplished by siting, designing, and constructing new buildings and lifelines (public works and utility system) in a manner that minimizes their vulnerability to natural disasters.

**Goal:** Each *Disaster Resistant Community* should have an officially adopted policy and implementation strategy to minimize the vulnerability of new construction to natural disasters. This strategy should include performance objectives for different

categories of structures (e.g., new commercial, residential and industrial structures should be constructed in a manner that in the maximum credible event, there will be no loss of life and occupants will be able to safely leave the building).

**Business Vulnerability Reduction** - Recent disasters have shown that a key to recovery is the ability of businesses - large and small - to resume operations following the disaster. Because of this, an increasing number of communities are examining the feasibility of forming “business preparedness councils” that bring together the leadership and expertise of businesses, emergency preparedness, the engineering and scientific community, and others to develop a partnership approach to reducing the vulnerability of businesses to all hazards.

**Goal:** Each *Disaster Resistant Community* should have a business preparedness and recovery strategy that is the product of collaboration between the business community and local government. This strategy should have clearly defined objectives; have executive support from business and government; and identify and prioritize measures that can be implemented to increase disaster preparedness of business, improve coordination with the public sector, and reduce long-term business vulnerability to natural disasters.





# EVANSVILLE, IN - HENDERSON, KY PILOT PROJECT

In order to test the CUSEC Disaster Resistant Community model and further refine the program, two pilot communities were selected by the CUSEC Board of Directors: Evansville, Indiana (population 180,000) and Henderson, Kentucky (population 25,000). These communities were selected on the basis of their moderate/high risk (earthquakes and flooding), demonstrated local leadership, and perceived support for mitigation (in both public and private sectors). A workshop was held on April 15-16 to launch the pilot project.

## Workshop Goal

The workshop goal was to “develop a model Disaster Resistant Community Program” in Evansville and Henderson that will, when implemented, significantly reduce the vulnerability of these communities to future natural disasters. The DRC “model” could then be adapted to other high risk communities in the Central U.S.

## Workshop Objectives

1. To demonstrate how *HAZUS* - a “loss estimation methodology” and software program - can be used to assess community risk to earthquakes, and eventually floods and hurricanes.
2. To demonstrate the benefits of mitigation - actions taken prior to a disaster to reduce risk.
3. To develop a community-based mitigation strategy and implementation plan that reduces the vulnerability of Evansville and Henderson to natural disasters.
4. To develop a model Disaster Resistant Community Program that can be adapted to other states and regions.

## Developing a Local Mitigation Strategy: Pre-Workshop Activities

The local Mitigation Strategy that will serve as the centerpiece of a Disaster Resistant Community Program will

incorporate six key elements: Hazard and Risk Assessment, Education and Public Outreach, Existing Development, New Development, Community Land Use, and Business Vulnerability Reduction.

At the outset, emphasis was given to establishing “working groups” in each of the six areas, comprised of local leaders - public and private - and specialists from a variety of disciplines, with expertise in earthquake and flood hazard mitigation, public education, emergency management, and risk assessment.

Each working group was given four hours to develop a strategy and implementation plan for their specific “mitigation area.” To guide the discussion and ensure a degree of consistency among groups, a four step process was adopted. Each group, under the direction of the facilitator, was asked to: 1) Validate the goal statement and clarify definitions; 2) Identify and discuss current efforts in Evansville and Henderson that addressed the “mitigation area” (e.g., existing programs that educate the public on hazards); 3) Identify and prioritize programs and initiatives that—when implemented—will advance the stated goal (e.g., ensure that new development is located, designed, and constructed in a manner that will minimize damages from natural hazards); and 4) Develop an implementation strategy that addresses the “who, what and how” of implementing the priority programs that were identified by the group.

## Steering Committee Conclusions and Recommendations

An Interim Report was prepared, which outlined twenty-six recommendations - grouped under six key areas: Hazard and Risk Assessment, Education and Public Outreach, Existing Development, New Development, Community Land Use, and Business Vulnerability Reduction.

A Steering Committee was formed, and a meeting was held in Evansville on May 21 that brought together key State and local officials, and representatives of

“Partner organizations” that will have a significant role in the implementation of a model Disaster Resistant Community Program for Evansville, and Henderson.

The Steering Committee meeting was guided by three objectives: 1) To identify priority programs and initiatives for Evansville and Henderson, using the matrix of programs outlined in the Interim Report as a guide; 2) To determine whether Evansville or Henderson wished to apply for participation in the Showcase Community Program; and 3) To establish a Steering Committee that can coordinate program development and implementation. The Steering Committee made the following recommendations:

### 1. Utilize a Phased Approach to Developing and Implementing a DRC Program.

The group acknowledged that a Disaster Resistant Community Program for Evansville-Vanderburgh County will be a long term effort. Achieving “disaster resistance” will be accomplished through a phased approach. The first priority is to get organized, draft a policy statement, and develop a program plan. This initial phase is referred to as *Stage 1: Partnership Agreement*. It is a critical phase. This is when the partnership is conceived, agreements are worked out, and objectives and priorities are agreed upon. Figure 3 - which was developed with input from Tom Tobin (workshop speaker) - outlines the objectives and sample activities in a long-term, phased approach to achieving disaster resistance.

### 2. Apply for the Community Showcase Program

There was broad agreement among the Steering Committee members that the Showcase Community Program, administered by the Institute for Business and Home Safety (IBHS) in partnership with several national and regional organizations, is an excellent opportunity to “pull together” the Evansville leadership in a structured program, with clear objectives, that offers incentives and

resources (certainly technical) to “jump start” a local Disaster Resistant Community Program.

Jim Russell, Vice-President, IBHS, provided an overview of the range of incentives (e.g., reduced insurance premiums for mitigation actions) and partnership technical and material assistance that would be provided (e.g., IBHS and its Partnership would carry out retrofit of all non-profit child care centers in Evansville).

A *draft* list of criteria for Showcase Communities was presented. To become a Showcase Community, Evansville agreed to meet the following criteria:

1. To adopt the latest model building code without modifications.
2. To receive the Building Code Effectiveness Grading Schedule grade and develop an improvement strategy.
3. To participate in the National Flood Insurance Program, and receive a Community Rating Service grade and develop an improvement strategy.
4. To have a minimum of 8 on the fire suppression rating system.
5. To undergo a community risk assessment conducted by IBHS and the Partnership.
6. To develop and offer mitigation training to professionals (e.g., engineers, architects, building officials, contractors).
7. To conduct non-structural retrofit assessment of all non-profit child care centers so that the Partnership can retrofit them.
8. To provide public education of natural hazards and mitigation techniques to certify homeowners to qualify them for incentives.
9. To develop K-12 school curriculum teaching about natural hazard risks and mitigation.
10. To ensure that the community has a land use plan, a planner, and makes zoning decisions in compliance with their land use plan.
11. To develop an emergency recovery plan and post-disaster recovery plan.
12. To develop a Disaster Recovery Business Alliance to formulate and implement a business mitigation strategy.
13. To develop public/private sector incentives.
14. To participate in the Partnership Seal of Approval inspection and certification.

Roger Lehman (Building Commissioner), pointed out to the Steering Committee that Evansville-Vanderburgh County has been actively involved in promoting mitigation during the past ten years, through training programs and demonstration projects, and thus has met several of the IBHS criteria. A missing component in the local program, however, is a Business - Government alliance that can direct and coordinate a local business preparedness and mitigation strategy.

### **3. Form an Evansville-Vanderburgh County Disaster Recovery Business Alliance**

At the April 15-16 workshop, the Business Vulnerability Reduction work group recommended that Evansville pursue the formation of a “Disaster Recovery Business Alliance” that will bring together business and government leaders in a partnership program to reduce the vulnerability of local business to natural disasters, and significantly improve their ability to recover. Mary Carrido (Disaster Recovery Business Alliance/workshop facilitator) provided the Steering Group with an overview of DRBA, and its role as a catalyst in forming and supporting local business alliances in high risk communities across the nation.

The Steering Committee endorsed the proposal to form a Disaster Recovery Business Alliance for Evansville, as an integral feature of a long-term effort to reduce business and community vulnerability to natural hazards. The group further agreed on the following:

1) the Metropolitan Evansville Chamber of Commerce will serve in a supporting role in developing a “unified” local business - government alliance; and 2) the short-term priority is to identify and form a “secretariat” to undertake the following: organize and conduct meetings, take and distribute minutes, recruit members, develop a brochure and other outreach materials, and serve as the focal point for local fundraising and coordination with external organizations (e.g., CUSEC, Indiana State Emergency Management Agency, the Disaster Recovery Business Alliance/ Irvine, CA, and local business alliances around the nation).

The secretariat function is critical. It is the “glue” that holds the alliance together in the initial, formative stages of alliance development. In the Memphis alliance (the “Business Emergency Preparedness Council”), this function is performed by a senior member of a local insurance company, with support from an active core membership of 12-15 companies, CUSEC and local government. To date, approximately \$40,000 has been raised from local business to support the Memphis alliance (part of which will be matched by the Electric Power Research Institute, through the national DRBA). The goal for the Memphis Business Emergency Preparedness Council is to raise \$100,000 in 1997, and hire a part time director to manage the alliance, and coordinate the implementation of projects and activities.

As the Evansville business alliance builds support and attracts members during the organizational phase, attention will also be focused on identifying potential projects and activities that can be carried out - under the auspices of the Evansville business alliance - that highlight the advantages and benefits of business participation in this partnership effort. As was pointed out, while many businesses have *internal* plans and procedures for responding to and coping with disasters, few businesses have developed *external* plans that take into consideration the disruption of electric power and water, lack of access to and from their facilities,

loss of workforce for extended periods of time, and other factors that have direct and immediate implications for business resumption and recovery. In this context, there was discussion among Steering Committee members on the value of FEMA's Earthquake Loss Estimation Program (HAZUS), as a tool that can be used to support a Disaster Resistant Community Program, and the business alliance.

#### 4. Use the FEMA Earthquake Loss Estimation Program - or "HAZUS" - to Support Business and Community Risk Assessment

An accurate hazard and risk assessment is the starting point for a Disaster Resistant Community Program, including the proposed Evansville Business alliance. The HAZUS Loss Estimation Methodology, which will be available from FEMA through the National Institute for Building Science (NIBS), can become an important risk assessment tool for the Evansville program. As demonstrated at the April 15-16 workshop, HAZUS can be used to describe: 1) *quantitative estimates of losses* from earthquakes, including direct costs for repair and replacement of damaged buildings and lifelines, and direct costs associated with loss of function (e.g., loss of business revenue); 2) *functionality losses*, including loss-of-function and restoration times for buildings, critical facilities and transportation systems; and 3) *extent of induced hazards*, including fire, flood, and hazardous materials releases. In essence, HAZUS can be used to determine the nature and extent of the earthquake risk in Evansville (flooding and wind will be added later), which is critical to establish community mitigation priorities, including business.

Evansville officials - with support from the Indiana State Emergency Management Agency - propose to purchase and install the HAZUS software program; to identify a technical working group to coordinate the data input and receive HAZUS

training; and to fully integrate the risk assessment to support programs and decision-making in the Building Department, Area Planning, Emergency Management, and the Evansville Disaster Recovery Business Alliance.

#### 5. Implement Short-Term/Momentum Building Initiatives

The Steering Committee discussed the importance of maintaining the momentum from the workshop. Towards this end, the Education and Public Outreach committee, formed after the workshop, identified a series of projects that will promote earthquake risk reduction, and directly involve the business community.

In addition, the local Fox affiliate - WTVW - produced a four part series that aired on May 5-8, and addressed the vulnerability of Evansville to earthquakes and other hazards, with emphasis on school safety and the role of HAZUS as a risk assessment tool that can be incorporated into the Evansville program.

#### Henderson - Henderson County

A Steering Committee will be formed for Henderson, to examine the opportunities and determine the program priorities for that community. In the meantime, Henderson officials - led by Mark McCarty - will closely monitor the Evansville "Stage 1 activities," and participate in Steering Group meetings.

### Phased Approach to Disaster Resistant Communities

DRC Stage	Objective	Sample Activities
Stage 1: Partnership Agreement (initial 2 months)	To reach agreement on objectives and expectations	<ul style="list-style-type: none"> <li>• Policy statement drafted</li> <li>• Program plan developed</li> <li>• Resource committed</li> <li>• Process identified to measure progress</li> <li>• Organizations formed</li> <li>• External accountability determined (e.g., reports to elected bodies)</li> </ul>
Stage 2: Start-Up (approx 2 years)	To establish public and private sector capability needed to carry out risk reduction projects and activities	<ul style="list-style-type: none"> <li>• Partnership activities commence</li> <li>• Partner training conducted</li> <li>• Hazard baseline established</li> <li>• Partner expectations refined</li> <li>• Business councils are formed and operating</li> </ul>
Stage 3: Operational (approx 3-10 years)	To carry out risk reduction policies and practices; integrate mitigation into public and private sectors	<ul style="list-style-type: none"> <li>• Knowledgeable constituency created</li> <li>• Partners trained</li> <li>• Mitigation practices and programs carried out in public and private sectors</li> <li>• Tangible evidence of reduced risk</li> <li>• Progress measured annually and external reports made</li> </ul>
Stage 4: Institutionalization (10 years plus)	To fully integrate mitigation into normal routines of government agencies, utilities and businesses	<ul style="list-style-type: none"> <li>• External partners will have fulfilled their responsibilities</li> <li>• Attitudes, policies, practices, and relationships formed during earlier stages are well established; a solid foundation is in place</li> <li>• Progress is easily measured</li> </ul>

FIG. 3 Phased Approach to Disaster Resistant Communities. Source: Tom Tobin: Tobin & Associates, Mill Valley, CA



Furthermore, as training programs are identified and held in Evansville, Henderson representatives will be encouraged to participate with their Evansville counterparts. In this way, both communities can take advantage of “economies of expertise/effort” in this “sister-city” approach to establishing disaster resistant communities. Finally, the March 1997 floods in Kentucky, which impacted 94 counties, drastically curtailed the participation from the Kentucky Disaster and Emergency Services in the April 15-16 workshop. As the flood recovery efforts in Kentucky begin to be scaled back in terms of State personnel requirements, it is anticipated that additional resources (notably from the Kentucky DES), will be available to support the Henderson program.



## EVANSVILLE BECOMES NATION'S FIRST SHOWCASE COMMUNITY

In a signing ceremony on July 8 - attended by Federal, State, community and business leaders - Evansville-Vanderburgh County officially became the nation's first "Showcase Community."

Harvey Ryland, President and CEO of the Institute for Business and Home Safety (IBHS), and Wilson Cooney, President of USAA and Chairman of IBHS, formally designated Evansville as a Showcase Community. Mayor Franklin McDonald accepted on behalf of the City of Evansville, and its citizens.

The ceremony took place at the Enterprise Zone Day Care Center, which has been selected by the community as the first day care in Evansville to undergo a non-structural retrofit to increase the safety of the children in the event of an earthquake or other major disaster.

Evansville's participation in the Showcase Community Program is significant for several reasons. First, community leaders have demonstrated a public commitment to hazard vulnerability reduction. The City and County Council adopted a resolution pledging support for the Showcase Community Program, and specifically their intent to implement the major provisions of the program.

In addition, the Evansville Disaster Recovery Business Alliance has been formed. Dale Olson, President and CEO of Citizens Insurance of Evansville, has been appointed Chairman. Mary Carrido, Disaster Recovery Business Alliance, announced that \$50,000 in matching

funds has been raised to support the Evansville DRBA (see *Business Alliances: Their Role in a DRC Program*). The Alliance will play a pivotal role in the Showcase Community Program, bringing together the leadership of the business community to develop a long-term program to reduce the vulnerability of business and industry to natural and technological hazards.

One of the priorities of the Showcase Community Program will be to carry out non-structural mitigation measures (e.g., securing computers, bookshelves, cabinets, ceiling fixtures, water heaters, etc.) at all nonprofit day care centers in Evansville-Vanderburgh County.

Other initiatives include: 1) Enrollment in the Community Rating System program by September, 1997, which will reduce insurance rates of homeowners based on the community's agreement to adopt certain floodplain management practices; 2) Participation in the "Seal of Approval" program, administered by IBHS, which will include the construction of a model home that includes "disaster resistant" features; 3) A Business Executive Roundtable to be held on August 27-28 - organized by the Disaster Recovery Business Alliance in coordination with the Evansville DRBA - to "examine business vulnerability and resumption principles and practices, and to develop a local business strategy;" and 4) Revision of the Evansville/Vanderburgh County Comprehensive Plan to incorporate the most recent data and maps on the earthquake and flood hazard risk.

The ceremony concluded with statements of support for the Evansville-Vanderburgh County program from several officials, including: Michelle Burkett, Regional Director, Region V, Federal Emergency Management Agency, Patrick Ralston, Director, Indiana State Emergency Management Agency, Kathy Shoettlin, Director of Public Relations, American Red Cross, and Tom Durham, Executive Director, Central U.S. Earthquake Consortium.



# ROLE OF BUSINESS ALLIANCES IN A COMMUNITY-BASED MITIGATION PROGRAM

**R**ecent disasters have shown that a key to recovery is the ability of businesses - large and small - to resume operations in a timely manner. Because of this, an increasing number of communities are examining the feasibility of establishing “business preparedness councils” that bring together the leadership and expertise of business, emergency preparedness, the engineering and scientific community, and others to develop a partnership approach to reducing the vulnerability of businesses to flooding, tornadoes and severe weather, earthquakes, and other hazards.

Businesses play a key role in a Disaster Resistant Community program and approach to vulnerability and risk reduction. The reason is straightforward. If businesses do not survive a disaster, people are out of work, a community’s revenue stream is severely disrupted, and a ripple effect begins to occur that prolongs the recovery phase.

While many businesses have *internal* plans and procedures for responding to and coping with disasters, fewer businesses have developed *external* plans that take into consideration the disruption of electric power and water, lack of access to and from their facilities, loss of workforce for extended periods of time, and other factors that have direct and immediate implications for business resumption and recovery.

Against this backdrop, the Disaster Recovery Business Alliance (DRBA) was established to build partnerships between business and government that will lead to significant improvements in the ability of business to recover from natural disasters (see article). With assistance from DRBA, CUSEC and others, at least three communities in the Central U.S. have developed “disaster recovery business alliances” to promote business vulnerability reduction.

## *Memphis Business Emergency Preparedness Council (BEPC)*

The Business Emergency Preparedness Council, which was initially formed in 1991 but “revitalized” in 1996, is a coalition of business and government in the Memphis region dedicated to promoting business vulnerability reduction, recovery, and preparedness.

Under the leadership of Don Batchelor, a local insurance executive and current Chair, BEPC has launched a re-invigorated campaign to build membership, raise funds and establish clear direction and priorities for the organization (which has an active membership of about twenty businesses).

An important milestone was the decision of the BEPC membership to become affiliated with the Disaster Recovery Business Alliance (DRBA). With a matching grant of \$50,000 from the Tennessee Valley Authority - through DRBA - the BEPC has been busy raising funds locally to build a solid operating base from which to carry out its programs and initiatives. The efforts literally paid dividends. On June 24, the BEPC sponsored a reception, held in conjunction with the *Titantic Exhibit* in downtown Memphis, which brought together city leaders in the business and government sectors to announce that the target of \$100,000 had been reached. With start-up funds in hand, BEPC transitioned into the next phase with the hiring of an executive director, Jeff Crenshaw.

On June 25, an all day strategic planning session was held, attended by representatives from DRBA, CUSEC, local government, and business. At this session, the following priorities were agreed upon:

1) To build a broad-based membership that includes representatives from the manufacturing sector, insurance, banking, transportation, trade (wholesale and retail), utilities, construction and other sectors that have a role and vested interest in business vulnerability reduction.

2) To develop a county-wide vulnerability analysis that addresses not only the *physical* damages that could occur from earthquakes, floods and other natural



disasters, but also the *economic* vulnerability, expressed in terms of direct economic losses (e.g., damages to buildings and contents) and indirect economic losses (e.g., interruptions in critical supplies).

3) To develop a post-disaster plan and strategy for communication and coordination between government and the business community in the aftermath of a major disaster.

The Memphis Business Emergency Preparedness Council has made significant strides in the past six months. With an executive director and start-up funding in place, this coalition of business and government is well positioned to begin the implementation phase of priority projects and initiatives.

### ***Evansville Disaster Recovery Business Alliance***

Evansville presents a second public-private partnership model. One of Evansville's priorities as a Showcase Community is to form a Disaster Recovery Business Alliance that can provide a forum for decisionmaking as relates to charting a course for business vulnerability reduction in Evansville-Vanderburgh County.

The impetus for the Evansville DRBA was the April 15-16 Disaster Resistant Community workshop in Evansville. The breakout group on Business Vulnerability Reduction was charged with "developing a strategy and implementation plan to reduce the vulnerability of businesses in Evansville to natural hazards.

Seven projects were identified and prioritized. The group recommended the formation of a business alliance to coordinate the implementation of these projects.

A Steering Committee was formed. The Chief Executive Officer of the Metropolitan Evansville Chamber of Commerce took a lead role, together with the Evansville Building Commissioner. On July 8, it was announced that Dale Olson, CEO of Citizens Insurance would be the Chair of the Evansville DRBA. Furthermore, it was announced that approximately \$50,000 had been raised - to be matched locally - to support the "embryonic" DRBA.

The next step was to convene an Executive Roundtable on August 27 to gain support of key business executives, and to devote a day (August 28) to prioritizing programs and developing an implementation strategy.

### ***New Hanover County/Wilmington (NC) Disaster Recovery Business Alliance***

North Carolina is the sight of a third "Disaster Recovery Business Alliance" model. This article was prepared by **Will Brothers**, of the North Carolina Division of Emergency Management.

The North Carolina Division of Emergency Management is leading an effort to develop an alliance of business and industry, government agencies, and community volunteer organizations to address the vulnerability of Wilmington area businesses - and the community at large - to natural disasters.

The purpose of this alliance is to create a partnership that will encourage business and industry to work in concert with government agencies, research and academia and others to develop pre-disaster plans and strategies to reduce community vulnerability to hurricanes, earthquakes, floods and other natural disasters, and in the process to expedite private sector recovery after a disaster. This broad-based initiative will also focus on mitigation and prevention planning as key elements in the recovery process.

This pilot effort - known as the New Hanover County/Wilmington Disaster Recovery Business Alliance - is taking place in a region of North Carolina that has experienced recent disasters. This area was victimized by both Hurricane Bertha in July 1996, and Hurricane Fran in September 1996. Against this backdrop, a series of introductory meetings were held in May 1997 to discuss the nature of this initiative, who needs to be involved, and how the community - and businesses - will benefit from participation in the alliance.

The response by the private and public sector has been very positive, with total support from business, industry and government. A Steering Committee meeting will held in September 1997. Eric Tolbert, State Emergency Director for North Carolina is directing this new initiative.

Partners within the Division include the Carolina Power and Light Company, the Electric Power Research Institute, and the Disaster Recovery Business Alliance.

## **FORMING A DISASTER RECOVERY BUSINESS ALLIANCE: SOME CONSIDERATIONS IN GETTING STARTED**

Is your community considering the formation of a Disaster Recovery Business Alliance? If so, there are a number of steps that you can take to get started, as outlined below.

*Step 1: Determine the need for, and feasibility of, establishing a DRBA.*

In the "organizational/start-up" phase, an important first step is to articulate to the leadership of the business community the benefits of establishing a Business Alliance, its role in reducing business vulnerability, and how a "public-private partnership" can be used to establish and sustain a DRBA.

Example: The Evansville Chamber of Commerce co-sponsored, with CUSEC, a Business Executive luncheon to discuss the vulnerability of Evansville to natural hazards, the need for government-business coordination, and the role of an Evansville Business Alliance.

*Step 2: Form an "Executive Committee" and elect a chairman to lead the "organizational/start-up phase."*

Every successful Disaster Recovery Business Alliance has a "sparkplug" who takes the lead in organizing the Alliance, coordinating with "external" organizations (e.g., State emergency management agency, Disaster Recovery Business Alliance, CUSEC, FEMA, etc.) who can provide assistance, and otherwise assume

a leadership role in “getting the Business Alliance started.”

The first twelve months or so will be devoted to building the organization, recruiting members, raising funds, and identifying programs and initiatives that will reduce the vulnerability of the community and businesses to natural hazards and other potential risks.

With the assistance of an Executive Committee and Alliance members, the Chairman’s responsibilities will fall into at least three areas:

#### *Organizational*

Establish charter and identify Alliance goals, priorities, and resource needs.

#### *Administrative*

Serve as the principal point of contact with external organizations in the organizational phase.

Organize and conduct meetings of the Alliance. Ensure that minutes of the meetings are recorded and distributed.

Develop a constituency building and outreach strategy to “grow” the Alliance (e.g., develop a brochure, establish a link on a local web page, etc.).

Recruit members - business and government - who will take an active role in Alliance activities.

#### *Financial*

Recruit a Treasurer. Establish an Alliance dues structure.

Organize and conduct a fund-raising campaign to meet financial needs.



*Step 3: Identify and prioritize programs and initiatives that will galvanize support for the Alliance and at the same time reduce the vulnerability of businesses to natural hazards and other potential risks.*

This step is important, and will help to define the Alliance. Both Evansville and Memphis have used roundtable discussions and one-day workshops to “establish their identities,” identify their priorities, assess strengths and weaknesses, identify gaps in expertise, and lay the groundwork for a strategic plan.

This is also when the “external” organizations - FEMA, State Emergency Management Agency, American Red Cross, CUSEC, Disaster Recovery Business Alliance, Association of Contingency Planners, and others - can play an important role in providing technical and financial assistance.

In the final analysis, the success of an Alliance comes down to local leadership, and commitment to make the Alliance work. There is no shortage of technical expertise and “implementable” programs; what is needed is vision, and follow-through on creative ideas.

## **DISASTER RECOVERY BUSINESS ALLIANCE<sup>SM</sup>**

The Disaster Recovery Business Alliance (DRBA) is an innovative, proactive, and collaborative approach to minimizing the social and economic losses which result from regional disasters. The DRBA is supported by the Electric Power Research Institute, U.S. Department of Energy, and Southern California organizations which have supported the two year old program, the Orange County Disaster Recovery Alliance.

The Charter of the Disaster Recovery Business Alliance has five elements:

- To provide ongoing research and development into the role of the private sector in mitigating losses from a wide range of natural and man-caused disasters;
- In the above capacity, to provide liaison at national and international levels with public agencies, researchers, and trade associations to advance shared goals of hazard mitigation on behalf of communities and essential commercial services;
- To provide launch support, programs, leadership development, continuity and corporate structure to a network of regional alliances and their local members;
- To create a planning and needs-assessment environment which will facilitate the cohesive deployment of relevant mitigation and recovery technologies;
- To provide a central point of administration, financial management, and financial development for the regional alliances and associated technology user groups.

The Disaster Recovery Business Alliance approach to disaster mitigation is complementary to other organizations and their missions in six ways:

- A focus on strengthening *critical inter-corporate dependencies*, rather than on corporate planning;
- Emphasis on *lifelines and key economic players* serving a metropolitan area, not all businesses at once;
- *Corporate membership*, represented by teams of enterprise-wide expertise, rather than individual professional memberships;
- *Systematic recovery planning process* with progressive deliverables, resulting in permanent and ongoing legacy to the participants and the community;
- Focus on *recovery and reconstruction*, rather than emergency response;
- Restoration and optimization of *normal commercial channels*, not disaster relief.



# MISSOURI SEISMIC SAFETY COMMISSION OFFERS RECOMMENDATIONS TO GOVERNOR, LEGISLATURE

**T**he Missouri Seismic Safety Commission (MSSC) formally presented their state mandated report on Missouri's earthquake threat and preparedness to Missouri Governor Mel Carnahan on May 7, 1997. The Commission was created by legislative Statute in 1993 to guide the State's earthquake risk reduction efforts. Missouri is at risk from moderate to large damaging earthquakes occurring on the New Madrid, the Wabash, the Nemaha, and other regional fault systems.

The Commission is comprised of 15 individuals with expertise in areas that are important to earthquake risk reduction: public utilities, soils engineering, architecture, local government, electric engineering, insurance, American Red Cross, planning, business, fire protection, geology, emergency management and structural engineering. Two State elected officials are also Commission members.

The report offers 38 recommendations to the Governor and Legislature. However, the Commission prioritized the top eight recommendations to the Governor.

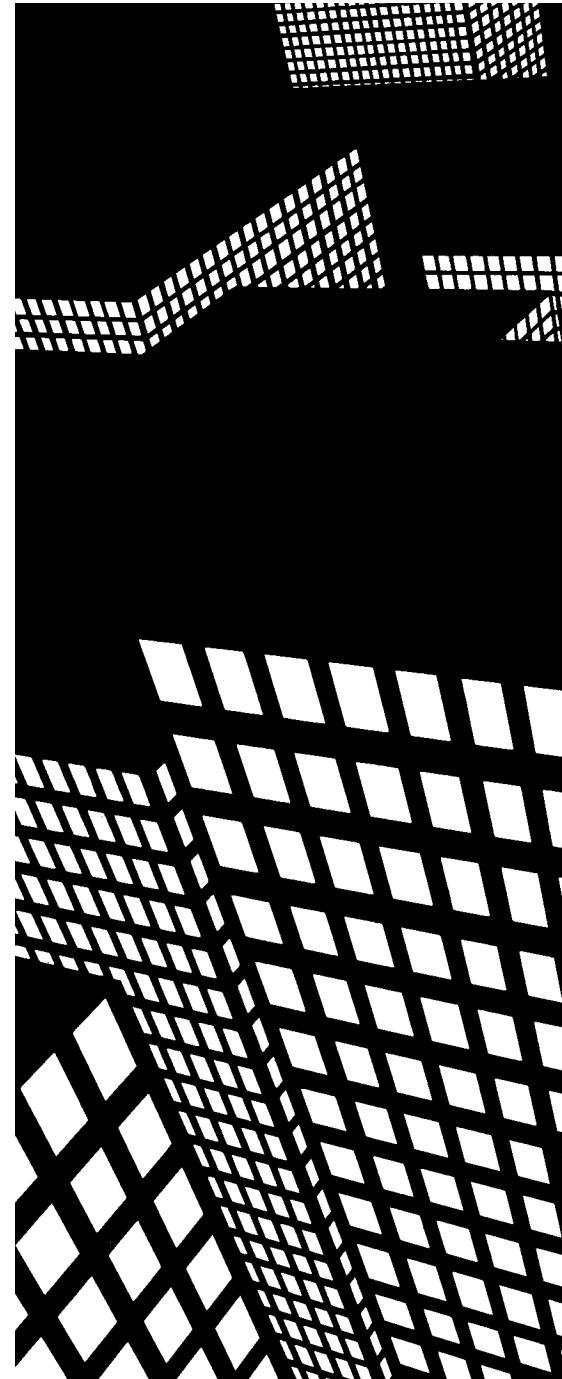
The top priority for the *Awareness and Education Committee* is to continue and increase earthquake awareness activities to Missouri citizens. This past year, the Commission sponsored an Earthquake Awareness Week (February 2-8) and distributed public awareness materials to 47 counties most at risk from an earthquake.

The *Response and Recovery Committee's* top priorities are to encourage continued response training for local emergency management officials, first responders and to increase offerings of the Community Emergency Response Training (CERT) to Missouri's citizens. A second recommendation is to continue to train volunteer engineers, architects, and building inspectors to rapidly inspect damaged buildings through the Structural Assessment Visual Evaluation (SAVE) training.

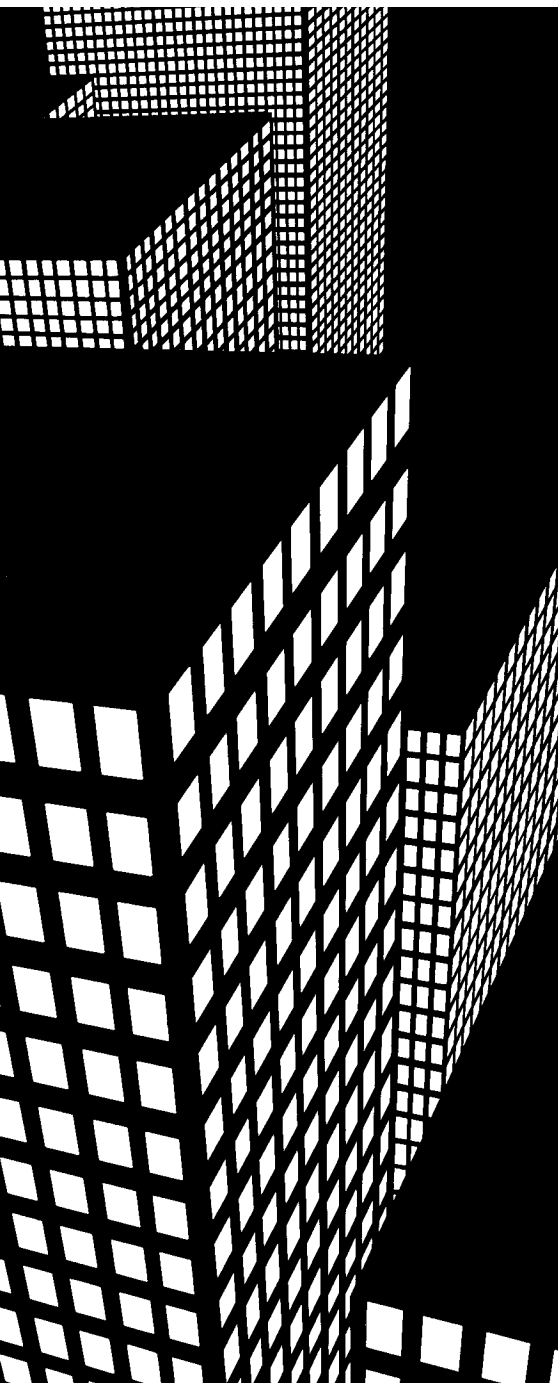
The *Geoscience Committee's* two top recommendations are to establish a Geoscience Response Team to conduct and study post earthquake damage in Missouri. They also recommend the current Earthquake Mapping Project sponsored by the State Emergency Management Agency continue.

The *Mitigation Committee's* priority recommendations to the Governor and Legislature include: 1) legislation to incorporate seismic safety into all buildings; 2) a continuation of the program - administered by the Missouri Department of Transportation - to continue to upgrade and retrofit all Missouri bridges; and 3) a request that the Legislature appropriate General Revenue funds to support the bridge retrofitting program.

In the next two years, the Missouri Seismic Safety Commission plans to continue to implement the 38 recommendations in their report and to begin working with private industry to implement seismic safety in the workplace.



# MEMPHIS LIGHT, GAS, AND WATER CARRIES OUT SEISMIC RETROFITTING TO PROTECT LIFELINES

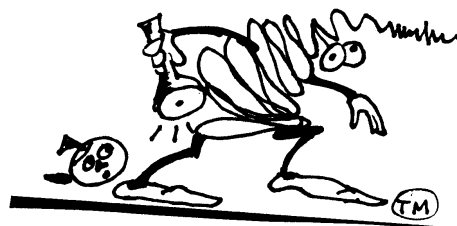


Since the 1989 Loma Prieta earthquake, Memphis Light, Gas and Water (MLGW) has pursued an aggressive plan to upgrade the utility's electrical distribution system to reduce the vulnerability of this critical lifeline following a damaging earthquake. Studies carried out by Allen and Hoshall (Memphis), the University of Memphis, and the National Center for Earthquake Engineering Research (NCEER) have focused on the vulnerability of the electrical system to groundshaking, and potential liquefaction. These studies have also noted the interdependency of lifelines; that is, in the case of Memphis, water supply and distribution is dependent on the availability of electric power (which power water pumping stations).

A new initiative, undertaken with funding provided by FEMA, is focusing on water distribution. The MLGW has carried out a seismic retrofit project to protect its Davis Water Pumping Station (located in Southeast Memphis), and to enhance the survivability of the connections between the water distribution lines in one third of the city's production wells. The total cost of the retrofit of the Davis Water Pumping Station project is \$448,000; the estimated cost of replacing the pumping station in the event of a large earthquake is \$17 million. The cost increases to \$112 million when lost revenue from lack of water service is factored in.

The second phase of the project will involve the replacement of 55 of the city's 170 rigid production well connectors with flexible connectors which better withstand the ground motions and displacement often caused by seismic activity. The project involves installing a flexible connection between the rigid well pipe and the collecting main. The result, according to MLGW engineers, is that the connectors will increase the well's capacity to withstand a 6.5 to 7.5 earthquake in the New Madrid seismic zone. The cost of retrofitting each well is approximately \$9,200; this investment will help MLGW avoid estimated losses of \$188,000 per day for each well connector damaged in a future event.

This project will provide a number of benefits to not only MLGW, but the community at large. Recent earthquakes continue to demonstrate how critical water supply is to business resumption and the pace of community recovery efforts. Furthermore, it is clear that a lack of water is going to serve as a major impediment to firefighting efforts, and other critical functions associated with emergency response and immediate recovery efforts.



# CUSEC STATE GEOLOGICAL SURVEYS PRODUCE SOIL AMPLIFICATION MAP FOR EARTHQUAKE LOSS ESTIMATION

The New Madrid region is the most seismically active area east of the Rocky Mountains. Since its inception, CUSEC has recognized the importance of basing its policies and programs on scientifically sound information of the seismic hazard. Against this backdrop, the CUSEC State Geologists were organized, with funding from USGS, to assist the member states in identifying, gathering, analyzing, and interpreting seismic hazard information. The following article was written by **Robert Bauer**, Illinois State Geological Survey, and the CUSEC State Geologists Project Coordinator.

The first electronic map showing the classification for soil amplification from earthquake activity was turned over to the Federal Emergency Management Agency (FEMA) for inclusion in their national computer program for Earthquake Loss Estimation. The map, 108 miles east-west and 70 miles north-south, covers the southern 1/3 of Illinois

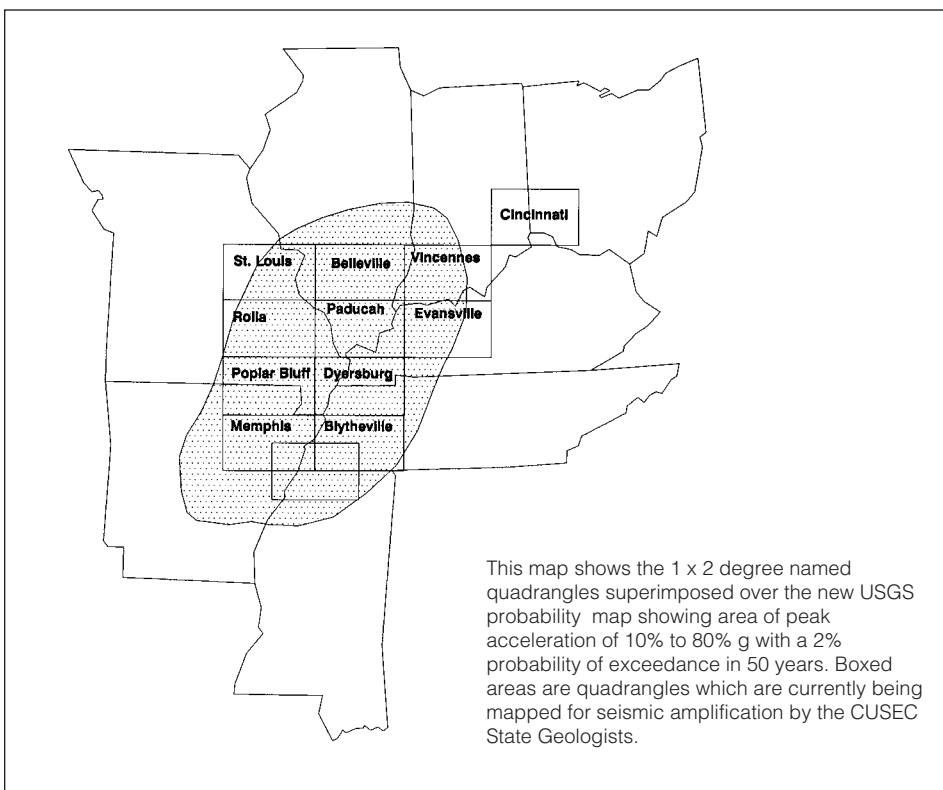
and parts of Missouri, Kentucky and Indiana and was produced by the State Geological Surveys in coordination with the Central U.S. Earthquake Consortium (CUSEC). This is the first of 12 maps of a scale of about one inch equals four miles, that will cover most of the high earthquake risk areas surrounding the New Madrid Fault Zone .

These maps are specifically designed to be used in FEMA's computerized program that will be made available nationally to state and local governments in 1997. The maps, when used in conjunction with placement of an earthquake of any magnitude, will show how much the soils will amplify the earthquake ground motions. The Loss Estimation methodology will then estimate the amount of damage to buildings and infrastructure, and casualties. This will be a valuable tool for mitigation work, preparing earthquake response plans and producing realistic earthquake scenarios for exercises for emergency managers to

use. This work has been supported by the U.S. Geological Survey's National Earthquake Hazards Reduction Program along with matching funds from the individual State Geological Surveys.

Earthquake ground motion amplification or amplification capability maps are based on the understanding of the earth's upper 100 feet of geologic materials - 3-dimensional maps. It has been found that variations in soil properties and their thickness produce different amounts of amplification of earthquake ground motion. Other researchers have previously produced a correlation between measured amplifications, observed earthquake intensities (shaking), shear-wave velocities characteristic of the soils, and physical properties of geologic materials as mapped in the upper 100 feet of sediment. With these correlations, a classification criteria of Soil Profile Types was established. Amplification of earthquake ground motions by soils is primarily dependent on their shear-wave velocity characteristics. The CUSEC State Geologists collected available shear-wave velocity measurements of soils in the Midwest and compared them to the near surface soil profiles. It was found that the soil types of the Midwest and their shear-wave velocities correlated with the previously defined classification which was based on work in the Western U.S. Therefore, amplification maps in the Midwest can be produced with a 3-dimensional understanding of the near surface materials and assigning general shear-wave velocity values as defined in the classification and making some of our own shear-wave velocity measurements for unique stacks of materials in the Midwest.

The role and potential contributions of the CUSEC State Geologists in the development of HAZUS and other key programs will be among the subjects of a joint meeting between the State Geologists and Earthquake Program Managers on September 10, in Memphis.





# SEISMIC SAFETY OF EXISTING BUILDINGS: AN UPDATE

One of the greatest challenges for policy makers and practitioners in the earthquake risk reduction field is *how to effectively address the complex issues associated with reducing the vulnerability of existing hazardous buildings (e.g., unreinforced masonry structures) that comprise a significant portion of the building stock in the downtown areas of communities in the Central U.S. - large and small.* The following article provides an overview and update of an important FEMA led initiative on Seismic Safety of Existing Buildings. It was written by **Ugo Morelli**, Policy Manager at FEMA, who has taken a leadership role in the development of the national program to promote seismic safety of existing buildings.

## Introduction

Since 1984, the Federal Emergency Management Agency (FEMA) has had underway a comprehensive, closely coordinated program to develop a body of building practices that would increase the ability of existing buildings to withstand the forces of earthquakes. Societal implications and issues related to the use of these improved practices have also been examined. At a cost of about \$25 million, two dozen publications, software programs, and audio-visual training materials have already been produced and distributed. The intended audiences includes design professionals, buildings regulatory personnel, local and State planning and development personnel, high-level managers, master builders, educators, researchers, and the general public. The program has proceeded along separate, but parallel approaches in dealing with private-sector and with Federal buildings.

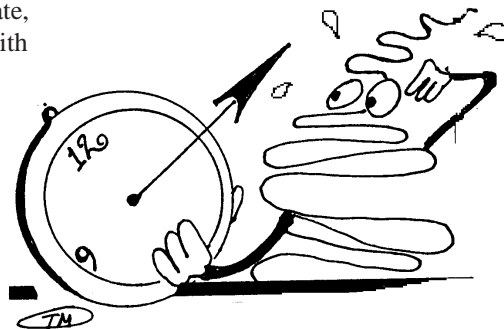
## Private Sector Buildings

Already available to private-sector practitioners and other interested parties is a "technical platform" of consensus criteria on how to deal with some of the major engineering aspects of seismic rehabilitation of buildings. This technical material is contained in a trilogy, with supporting documentation, completed in 1992: 1) a method for rapid identification of buildings that might be hazardous in case of an earthquake that can be conducted without gaining access to the buildings themselves; 2) a methodology for a more detailed evaluation of a building that identifies structural flaws that have caused collapse in past earthquakes and might do so again in future earthquakes, now undergoing upgrading and expansion; and 3) a compendium of the most commonly used techniques of seismic rehabilitation.

In addition to these engineering topics, the program has also been concerned with societal implications of seismic rehabilitation. Two editions of a study of seismic rehabilitation costs have been prepared. Benefit/cost models and associated software for application to both private-sector buildings and Federal buildings have also been developed. For the use of decisionmakers, major socio-economic issues that are likely to arise in a locality that undertakes seismic rehabilitation of its building stock have been identified, together with ways to array them, and methods to analyze them. Potential incentives have also been identified.

The culmination activity in this field will be the completion in September 1997 of *The NEHRP Guidelines for Seismic Rehabilitation of Buildings and Commentary*, FEMA 273 and 274, a comprehensive set of nationally applicable and consensus-backed technical criteria intended to ensure that buildings will better withstand earthquakes. This is a multi-year, multi-million dollar effort that represents a first of its kind in the United States and will fill a significant gap in the segment of the National Earthquake Hazards Reduction Program dealing with the seismic safety of existing buildings. These publications will allow practitioners to choose design approaches consistent with different levels of seismic safety as required by geographic location (seismicity), performance objective, type of building, occupancy, or other relevant considerations. Included will be new analytical techniques and acceptance criteria for all building materials and building types that will yield reliable estimates of the seismic performance of rehabilitated buildings.

The two documents are being given consensus review by representatives of a broad spectrum of users, including the construction industry, building regulatory organizations, building owners and occupants groups, academic and research institutions, financial establishments, local, State and Federal levels of government, and the general public. They have passed the first ballot and are now being balloted again to resolve issues raised in the first ballot. This process is intended to ensure their national applicability and encourage their widespread acceptance and use by practitioners. It is expected that, with time, the *Guidelines* and *Commentary* will be adapted and adopted by model building code organizations and standards-setting groups, and thus will diffuse widely into the building design and practices of the United States.



Significant corollary products of this activity are expected. Principal among them will be *Example Applications of the NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, FEMA 276, an engineering applications handbook with refined costs data; a somewhat similar handbook, *Planning for Seismic Rehabilitation: Societal Issues*, intended for the use of decisionmakers at the local government level, building owners, and similar audiences; a plan for a structured transfer of the technology embodied in the *Guidelines* using advanced dissemination media; an identification of means to ensure the continuing currency and adequacy of the *Guidelines*; and an identification of the most urgent research and development needs.

### Federal Buildings

In compliance with a Congressional mandate contained in P.L. 101-614, a set of technical criteria with commentary was developed by the Interagency Committee on Seismic Safety in Construction (ICSSC), with management and funding by FEMA. The criteria provide Federal agencies with minimum life-safety standards for both the seismic evaluation and the seismic rehabilitation of buildings in agency inventories. To promulgate the standards, an Executive Order was also prepared.

The order (No. 12941) was signed by the President on December 1, 1994. In addition to promulgation of the standards, it initiates a modest program of seismic rehabilitation in Executive Branch owned and leased buildings by requiring that the new standards be applied in five specified conditions, or "triggers". One such condition, and probably the most significant of the five, is a normal upgrading or renovation of a Federally owned or leased building costing more than 50 percent of the replacement value of that building. The Order also requires Federal Agencies to inventory their owned and leased building stock and develop data on the cost of seismically rehabilitating it by

December 1998. These data will be the basis for the preparation by FEMA of a comprehensive long-term program to ensure the seismic safety of all owned and leased Federal buildings that is due to the Congress by December 1, 2000. Guidance to the Agencies as to how to proceed in the preparation of the required materials was completed and issued by the ICSSC by December 1, 1995, as mandated by the Order. Agencies are progressing toward implementing the guidance as quickly as resources can be mustered. A summary of the progress so far achieved was made available to the President and the Congress in March 1997 in the first mandated biennial report on this subject.

## STATUS REPORT ON OTHER SEISMIC SAFETY INITIATIVES

In addition to the **NEHRP Guidelines for the Seismic Rehabilitation of Buildings** and related **Commentary** (FEMA 273 and FEMA 274, respectively), which are the "cornerstone" projects of a national effort to improve seismic safety of existing buildings, there are other important, related initiatives in this ongoing effort.

**The Updating of FEMA 178, NEHRP Manual for the Seismic Evaluation of Existing Buildings**, aims at expanding and updating the existing document, which has become a *de facto* standard in this country and a *de jure* standard in Canada (with some modifications). The new version will cover higher-than-life-safety levels (consistent with the *Guidelines*), incorporate lessons learned from

earthquakes that have occurred in this decade, and reformat the contents into an American Society of Civil Engineers (ASCE) pre-standard.

**The Plan 2005 Project** is designed to provide FEMA with another "roadmap" for improving the seismic safety of existing buildings, similar to an effort in 1985. The Earthquake Engineering Research Institute (EERI) is the contractor; an issues workshop was held on August 12-13 to launch this important initiative. The project is scheduled for completion in March, 1998.

**The Case Studies Project** is intended to provide defensible evidence that the **Guidelines for the Seismic Rehabilitation of Buildings** yields rationale designs, is easy to use in the "real world", is not too expensive to apply, is not more stringent than new-building provisions, and in the process, addresses "predictable" questions and issues that are likely to arise among design professionals. A planned mix of 50 buildings will be analyzed during the course of this project, which is scheduled for completion in the spring of 1999.



# PLANNING FOR SEISMIC REHABILITATION: SOCIETAL ISSUES

While considerable progress has been made in recent years in the technical and engineering aspects of “seismic rehabilitation” of existing buildings, emphasis more recently is being placed on “societal” issues. In essence, what are the socio-economic issues that need to be addressed to effectively promote the adoption of seismic rehabilitation of existing buildings? This is a key component of the Seismic Rehabilitation of Existing Buildings initiative, as reflected in the following article, prepared by **James R. Smith**, Executive Director, Building Seismic Safety Council.

Those involved in the complex process of preparing the NEHRP Guidelines for the Seismic Rehabilitation of Buildings (FEMA 273) and its Commentary (FEMA 274) recognized from the outset the importance of helping users deal with the social, economic, and public policy complexities of rehabilitation. They noted that seismic rehabilitation decision-makers quite likely are not technically oriented but will have to say “yea” or “nay” on incorporating information into local practices, be they business or regulatory. The Societal Issues volume (FEMA 275) has been prepared by Dr. Robert Olson, Robert Olson Associates, Inc., as part of the Guidelines effort to: (1) acquaint potential users of the Guidelines with typical problems not related to design and construction processes that might arise when planning or engaging in seismic rehabilitation projects and programs; and (2) to alert readers to the difficulties inherent in implementing seismic rehabilitation recommendations.

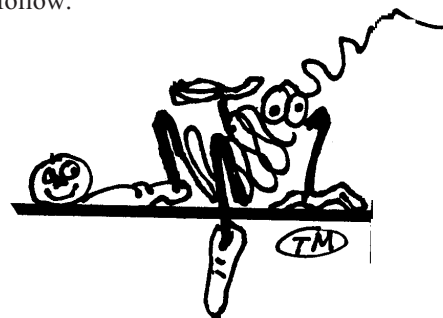
The goals of seismic rehabilitation are important. They include, above all, protecting life and property in future earthquakes as well as protecting investments, lengthening a building’s usable life, reducing demands on post-earthquake search and rescue efforts, protecting historic structures, shortening business interruption time, maintaining inventories and customers, and reducing the possibility of having to relocate. Other goals include limiting the need for post-earthquake emergency shelter and temporary housing, minimizing the release of hazardous substances, conserving natural resources, avoiding the costly processes of settling insurance claims and applying for post-disaster aid, protecting savings and contingency funds, reducing the amount of debris to be disposed, and greatly facilitating an earthquake stricken community’s return to normal patterns of activity.

The *Societal Issues* volume is structured to emphasize two basic user-oriented concepts.

- The first is a four-step iterative process designed to outline a set of decision points so the user can determine the need for and scope of seismic rehabilitation efforts.
- The second offers a simple “Escalation Ladder” to help users understand the degree of conflict inherent in and the implications of choosing what, if any, seismic rehabilitation strategies to follow.

The publication also examines the spectrum of socioeconomic issues or problems that could face those involved in seismic rehabilitation efforts; each issue is discussed in terms of the nature of the problem, typical issues, and some example solutions. The spectrum includes issues related to historic properties, the distribution of economic impacts, occupant dislocation, business interruption, effects on housing stock, rehabilitation triggers, financing rehabilitation, legal problems, and the selection of buildings or properties for rehabilitation.

Inasmuch as the majority of users of the *Guidelines* and this publication are most likely to be design professionals, local building and planning officials and private owners, three illustrative “application scenarios” are presented. Each scenario presents a situation (for a private company facilities manager, a local government city manager and building official, and a consulting engineer) and a list of considerations that would commonly have to be addressed. This publication also provides an extensive reference section to help the reader locate additional applicable materials.





# SEISMIC SAFETY OF EXISTING BUILDINGS:

## Reducing Earthquake Hazards in the Central U.S.

This booklet, written by Robert B. Olshansky, University of Illinois at Urbana-Champaign, is the latest in the popular series, *Reducing Earthquake Hazards in the Central U.S.* Other booklets cover: Seismic Building Codes, Critical Facilities, State Seismic Safety Advisory Committees, Historic Resources, Seismic Hazards Mapping, Nonstructural Hazards, and Education of Architects and Engineers.

One of the greatest challenges facing State and local planners, hazards managers, policy makers and others who have a role in promoting seismic safety is, “how to reduce the vulnerability of existing hazardous buildings.” More specifically, in a region of the nation where the earthquake risk can be characterized as “low probability - high consequence,” what steps can be taken - over a period of several years - to gradually reduce the vulnerability of these structures?

This booklet outlines a step by step process for communities to follow in developing a strategy for seismic “rehabilitation” (repairing or strengthening of an existing building to improve its seismic safety). Seismic rehabilitation not only will save lives and minimize injuries from future earthquakes, but also protect property, maintain continuity of business operations, and preserve affordable housing and historic buildings.

In laying out the step-by-step process, reference is made to key studies and publications - notably the FEMA Earthquake Hazards Reduction Series (“yellow books”) - that provide more detailed information on each of the recommended actions contained in *Seismic Safety of Existing Buildings*.

The first step is to identify structures in your community that may be vulnerable to earthquakes. Fortunately, the federal government, through the Applied Technology Council (ATC), has developed a systematic method for visually evaluating buildings for seismic safety. The “ATC-21” procedure is also outlined in a 1995 CUSEC publication, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Guide for Communities in the Central United States*.

With an inventory in hand, Olshansky lays out the following steps: 1) *Determine hazardous building priorities in your community*, giving consideration to hazardous structural types (e.g., unreinforced masonry, steel or concrete frame, etc.), occupancy and use (e.g., buildings that hold large numbers of people, and critical occupancy buildings such as schools and hospitals), historic buildings, and public buildings; 2) *Consider what seismic rehabilitation is going to cost*, including direct costs (actual rehabilitation) and indirect costs (e.g., costs to community, owner, tenant, etc.); and 3) *Choose an appropriate seismic rehabilitation plan for stabilizing existing buildings*. A range of options are offered, from voluntary programs, which are the easiest to implement (but not always the most effective), to mandatory programs, which may be the most effective, but also are the most expensive and controversial means of achieving seismic rehabilitation.

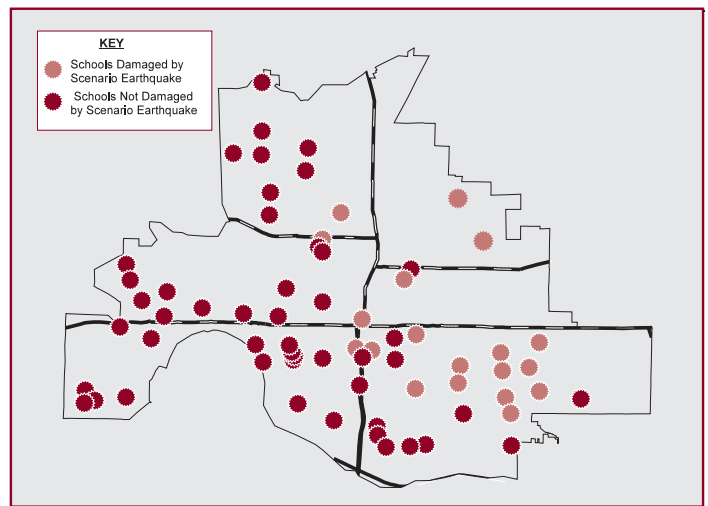


FIG 4. HAZUS can be used to support an inventory of hazardous structures in your community. Source: Risk Management Solutions, Inc.

The final section examines the critical issue of “how to pay for seismic rehabilitation.” Private sector and community incentives are examined, as well as the role of State and federal governments in providing financial and technical assistance to communities and homeowners to promote seismic rehabilitation of existing buildings.

The value of this booklet is that it provides a simplified, easy to follow process for communities and individuals who are interested in rehabilitating their hazardous buildings. As mentioned in the previous articles, there is a tremendous amount of technical information and research on the subject of seismic rehabilitation. It is easy to become overwhelmed with data and studies. *Seismic Safety of Existing Buildings* is not intended to provide practitioners with a great deal of technical data, but rather builds a “framework and methodology for approaching seismic rehabilitation of existing buildings.” With the aid of several case studies from around the country, this publication is very readable, and useful.

## USEFUL PUBLICATIONS

### **The Northridge Earthquake: Land Use Planning for Hazard Mitigation.**

Steven French, Arthur Nelson, S. Muthukumar, and Maureen M. Holland. 1996, 160 pp. Prepaid (\$10.00) copies available from the City Planning Program, College of Architecture, Georgia Institute of Technology, Atlanta, GA 30332-0155.

The Northridge earthquake (1994) provided an opportunity to examine the effectiveness of land use planning for seismic safety, which has been mandated in California for the past twenty years. Among the findings, the study determined that: 1) the hazard delineation and public awareness components were effective; 2) less damage occurred in areas that were previously identified as likely to experience liquefaction; and 3) planning had a modest overall impact on reducing earthquake damage. This study provides land use planners and other practitioners in the Central U.S. with insight into role - and limitations - of land use planning as a tool for mitigating losses from future earthquakes.

**Economic Consequences of Earthquakes: Preparing for the Unexpected.** Edited by Barclay Jones. Report: NCEER SP-0001; ISBN 0-9656682-0-7). Copies (\$40) are available from NCEER Publications, Red Jacket Quadrangle, State University of New York at Buffalo, Buffalo, NY 14261.

This special report examines the ramifications of large-scale earthquakes in the U.S. and preparedness options to minimize losses. Fifteen commissioned papers are contained in the report, prepared by experts in the fields of seismology, engineering, sociology, business and insurance. This publication is useful to business, financial and government policymakers - and others who are interested in the earthquake risk

in the U.S., and the potential implications for economic recovery. Among the topics addressed: characteristics of earthquakes in the Eastern and Central U.S., the impact of earthquakes on businesses and the economy, and recommendations for future action.

### **Existing School Buildings: Incremental Seismic Retrofit Opportunities.**

Edited by Len Benning. 1995, 60 pp. Limited copies available from the Federal Emergency Management Agency, 500 C Street, SW. Washington, DC 20472.

One of the most significant challenges for local officials who are concerned with earthquake risk reduction and public safety is "what to do with existing hazardous school buildings (e.g., unreinforced masonry)?" This intent of this document is to provide technical guidance to school district facility managers for linking specific incremental seismic retrofit opportunities to specific maintenance and capital improvements projects. The premise is - the best opportunity for implementing any structural or non-structural mitigation technique is in conjunction with a maintenance or capital improvement project. With that in mind, the project team developed a matrix of retrofit measures that could be undertaken by school facility managers in concert with general school maintenance or improvement projects. In the process, this document provides a useful framework with which to develop a strategy for reducing the vulnerability of individual schools.

**Engineering and Socioeconomic Analysis of a New Madrid Earthquake: Impacts of Electricity Lifeline Disruptions in Memphis, Tennessee.** Edited by Masanobu Shinozuke, Adam Rose and Ronald Eguchi. National Center for Earthquake

Engineering Research (NCEER). Limited copies available from NCEER Publications, Red Jacket Quadrangle, State University of New York at Buffalo, Buffalo, NY 14261.

Electricity is one of several utilities termed "lifelines" because of their crucial role in maintaining social and economic systems and because of their network characteristics, which make them especially vulnerable to disruption from natural disasters. This monograph, produced by an interdisciplinary team for NCEER, presents an integrated study of the implications of an electricity lifeline disruption caused by a major earthquake in the New Madrid Earthquake Zone. Chapters address the results of a survey on business vulnerability in Memphis, estimates of economic impacts, and estimates of regional impacts. Among the findings of the study: while Memphis businesses are highly vulnerable to loss of electric power, this concern and general awareness of the problem is not - generally speaking - being translated into widespread adoption of preparedness and mitigation measures. The authors suggest that a new strategy is needed, one that incorporates incentives.



The CUSEC Board and staff bid a fond farewell to Joe Dillard, board member from Arkansas, and wish him all the best in his new pursuits. Gov. Huckabee announced that Bud Harper, county executive from Sebastian County, will become the new director in Arkansas. CUSEC also welcomes Patrick Ralston, State Director, Indiana State Emergency Management Agency. Pat was formerly the director, Indiana Department of Natural Resources. Mike Lynch, former Program Manager, Kentucky has become the State Hazard Mitigation Officer for Kentucky, and his position has been taken by Gelonda Casey, who comes to the KYDES from the Kentucky Workforce Development Cabinet where she assisted in the coordination of a federally funded training and education program, the Job Training Partnership Act (JTPA).

### Addressing the Earthquake Risk in the Central U.S.: A Forum for Insurance and Earthquake Hazards Professionals

December 3, 1997 at the Peabody Hotel, Memphis

This one day forum will focus on the nature, scope and characteristics of the earthquake risk in the Central United States, with emphasis on the implications for the insurance industry. Sessions will cover: *Seismic Risk in the Central U.S.*; *Availability of Data and Maps on the Earthquake Risk*; *Insuring the Earthquake Risk in the Central U.S.: Meeting the Challenge*; *Implementing Mitigation Measures: Role of the Insurance Industry*; *Establishing a "Working Partnership" with Insurance Industry*. For more information on this forum, please contact CUSEC.

The **Central United States Earthquake Consortium** is a not-for-profit corporation established as a partnership with the Federal government and the seven member states: Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee; and ten associate member states: Alabama, Georgia, Iowa, Louisiana, South Carolina, North Carolina, Ohio, Oklahoma, Nebraska and Virginia. The Federal Emergency Management Agency provides the basic funding for the organization.

CUSEC's purpose is to help reduce deaths, injuries, damage to property and economic losses resulting from earthquakes occurring in the central United States. Basic program goals include: improving public awareness and education, mitigating the effects of earthquakes, coordinating multi-state planning for preparedness, response and recovery; and encouraging research in all aspects of earthquake hazard reduction. CUSEC supports the International Decade for Natural Disaster Reduction.

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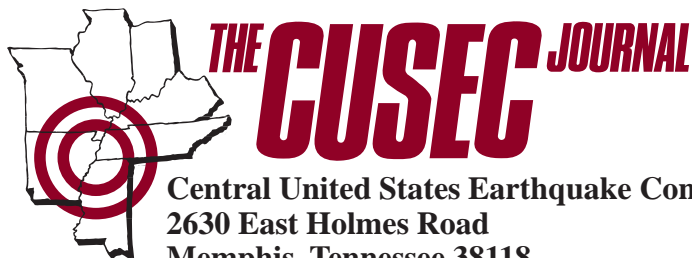
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