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# STOP BLAMING DISASTERS ON FORCES BEYOND OUR CONTROL

As we enter the new millennium, let us recognize that the losses resulting from natural or malevolent events that cause major property damage, severe injuries, and unnecessary death are not always due to forces beyond our control. We can prevent these losses by changing the way we think and act about design and construction projects. New tools, technologies, and techniques can improve structural safety, security, and reliability and protect owners, occupants, and users against loss and casualties.

Hurricane Mitch, the African embassy bombings, the ice storms in Canada and the northeastern US last winter, the Oklahoma City bombing, flooding and earthquakes in California, tornadoes and flooding in Florida, and wildfires in the Southwest are threats to the safety and security of the public and the reliability of our constructed environment. Today's engineering design community must recognize these threats and address them in our standards, building codes, and designs. We know that disasters will continue to strike and we must reduce their impact on the public. We must demand and create innovative solutions that assure a higher level of structural performance when disasters strike.

Our building codes and standards today do not adequately assure public life-safety and property performance against disasters. When Hurricane Andrew pounded South Florida on August 24, 1992, 85,000 dwelling units were destroyed, leaving hundreds of thousands of people homeless. Because the wind speed of Hurricane Andrew was within the design criteria of the stringent South Florida Building Code, such massive building damage was unanticipated. Many buildings that were expected to withstand hurricanes did not survive Hurricane Andrew. While hurricane prediction is still an inexact science, the risks from hurricane forces, like those from fire and earthquake, are quantifiable and controllable. Appropriate decisions with regard to siting, design, quality control during construction, and improving infrastructure facilities can provide good protection from such losses and reduce economic impact. Federal Emergency Management Agency (FEMA) costs alone for Hurricane Andrew totaled $1.655 billion. Six hurricane seasons later, building codes have not been changed and upgraded to mitigate such losses to the best of the author's knowledge.

The Oklahoma City Federal Building bombing on April 19, 1995, horrified America. Such large malevolent threats entered the public awareness in the form of domestic terrorism when about 4800 pounds of explosive material concealed in a rented truck exploded 15 feet from a non-redundant structural member of the Alfred P. Murrah Federal Building in downtown Oklahoma City. The explosion and progressive collapse of the 9-story building killed 168 people, injured hundreds more, resulted in millions of dollars in losses, and profoundly changed America's awareness of terrorism. The American Society of Civil Engineers (ASCE) and FEMA have offered a report with specific recommendations for new structures and facilities based on the lessons learned

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from this bombing. The cost for incorporating these recommendations into the design and construction of new buildings has been estimated to increase total costs by only 1 to 2 percent, which need not be an obstacle to the voluntary incorporation of these recommendations in new construction in the future.

Hurricane Mitch devastated Central American and Mexico and threatened the U.S. The U.S. embassy bombings in Africa killed 224 people. Before it is again too late, let us begin in earnest to upgrade, improve, and strengthen our building codes and standards to help mitigate against the effects of natural hazards and terrorism. The human and property costs of ignoring our emerging responsibilities are too high. We must develop and apply comprehensive standards that protect against seismic effects, severe wind conditions, blast effects, floods, wildfires, ice storms, and the other risk environments of our complex and interconnected infrastructure.

There are questions we can ask ourselves as we seek to meet the new responsibilities of our profession.

- Why do we evacuate buildings during natural disasters or acts of violence? Buildings should be designed as a refuge to protect lives and property investments.

- Why do we often wait for the next disaster to test the effectiveness of a building retrofit or enhancement that resulted from studying the previous disaster? There are now ways to evaluate an upgrade for its effectiveness before being incorporated into buildings. New performance evaluation methods for architect/engineers (A/Es) to use include:

  - Improved scale-modeling and simulation techniques
  - Massively parallel computers to evaluate full structural models
  - Component material performance predictions
  - Non-destructive health monitoring systems throughout the life of a building
  - Instrumentation installed during construction for life-cycle monitoring

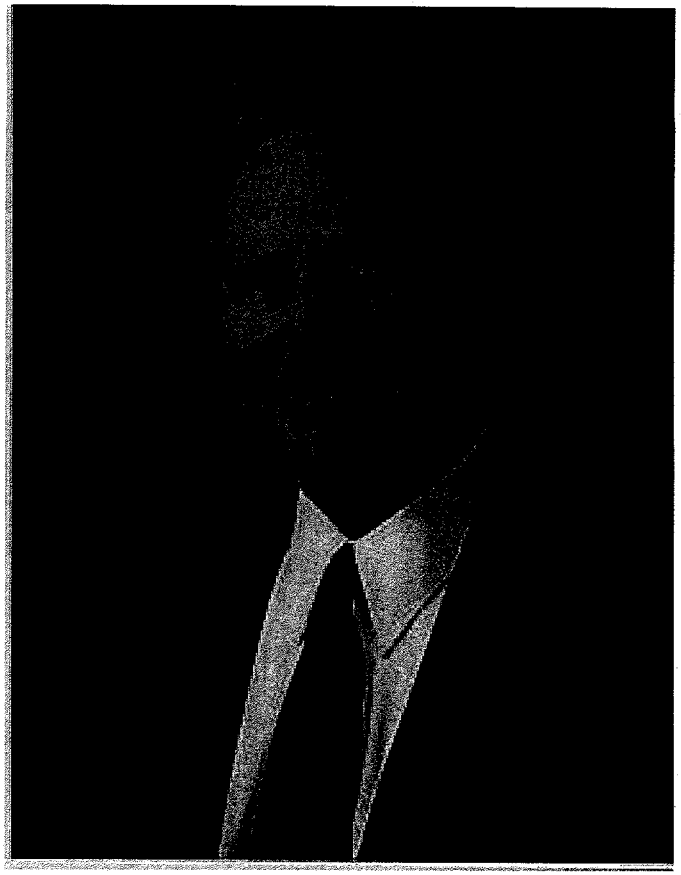
- Are A/Es taking a lead role in improving the life-safety features of buildings and physical infrastructure by staying abreast of new methods to improve the performance of our structures against natural and malevolent disasters? Indeed, if increased emphasis on knowledge of life-safety measures became a professional requirement, with liability implications, our customers could then be convinced to accept the costs of enhancing building performance. Two methods come to mind to achieve such an increased emphasis on life-safety methods:

  - Professional licenses could define and clarify performance responsibilities and liabilities for improved life-safety emphasis.
  - Professional societies could endorse increases in standards of education and performance in life-safety for architects and engineers.

These suggestions for reducing the unacceptably high costs of the losses that we currently incur in the as-built environment are not necessarily the only suggestions, but we, the A/E community, cannot afford to do nothing. A partnership of industry, academia, government and the A/E profession is a way to clarify the problem and select appropriate solutions. Within the government, our science and engineering laboratories are a repository of technologies, tools, and techniques developed to serve national high-consequence defense missions. A program developed at one of the national laboratories is intended to bring these rigorous scientific and engineering efforts to bear upon improving the response of engineered structures to natural disasters and other threats. Risk management approaches, advanced modeling and simulation capabilities, nondestructive evaluation techniques, and structural health monitoring capabilities are a few of the tools available at the national laboratory to improve structural performance in such hazardous environments as windstorms, explosions, floods, or earthquakes.

There is so much more that A/Es can be doing to protect against loss from disasters. Building owners, users, and occupants are coming to expect such protection. In turn, the changing expectations will necessarily change the way we protect against the effects of disasters. We need to recognize the changing expectations for disaster protection and upgrade our professional standards, building codes, and toolkits to address the challenges of disasters and stop blaming forces beyond our control.

Hurricane Fran, 1996 (FEMA photo)
http://www.fema.gov/phlib/3460.jpg



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