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Structural Engineers Respond to Disasters and Advance the Practice

Structural engineers provide vital and valuable services to ensure safe and secure places for everyone to live, work, and play. Structural engineers leverage years of scientific data and learning to design structures for the conditions they're likely to experience during their lifetime. We consider the geographic location, soil conditions, and surrounding environment to determine appropriate design forces that reflect natural hazards relevant to the given community, from seasonal snowfall, rain, and floods to hurricanes, tornadoes, and earthquakes. Building codes establish minimum design requirements to provide basic safety against these hazards but do not, and cannot, necessarily prevent damage from occurring. Structural engineers have unique expertise about the expected performance of the structures in our communities relative to different types of hazards and are well-equipped to use that expertise to aide in disaster response and recovery. In addition to the immediate and short-term efforts, structural engineers also engage in longer-term efforts to learn from each event in order to advance the science and practice of structural engineering and modify building codes when warranted. Some of the ways that structural engineers are involved include:

Structural Engineers as 2nd Responders

The International Code Council and the National Council of Structural Engineers Associations (NCSEA) have joined forces to create the Disaster Response Alliance (DRA) to help communities recover as quickly as possible after a major disaster. The DRA maintains a single, national database of skilled volunteers ready to assist with response and recovery activities. These activities include post-disaster safety assessments (both Rapid and Detailed), other building damage assessments, and additional code-related functions in the aftermath of a disaster. The goal of assessing structures shortly after an event is to allow people to re-occupy buildings when it is safe to do so and begin the recovery process. The DRA's national database of volunteers is available to local and state jurisdictions as well as federal government agencies for pre- and post-disaster assistance.

Read more:

- Making a Difference when Disaster Strikes (https://www.structuremag.org/?p=12763)
- Nepal Earthquake Building Safety Assessment (http://www.ncsea.com/downloads/files//Publications/StructuralConnection/Board%20Thoughts/Nepal%20Earthquake%20article%206.2015.pdf)

Listen:

- First and Second Responding Structural Engineers: What You Need to Know (https://engineeringmanagementinstitute.org/tsec-89-first-second-responding-structural-engineers-you-need-know/)

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Knowledge Sharing

Professional Organizations, such as NCSEA and its Member Organizations (state-level Structural Engineers Associations), are vital to facilitate knowledge sharing between structural engineers. As a profession, we constantly work to improve our collaboration so that lessons learned can be implemented throughout the industry, resulting in improved building codes, increased safety, and enhanced resilience for our shared communities. Post-disaster 2nd responders and other reconnaissance teams provide valuable data to inform these efforts.

Read More:

- When a Natural Disaster Hits, Structural Engineers Learn From the Destruction (https://www.smithsonianmag.com/innovation/when-a-natural-disaster-hits-structural-engineers-learn-from-destruction-180978690/)
- Tsunami Design in ASCE 7-16: An Overview of the New Provisions (http://www.ncsea.com/calendar/2016/10/6/20161006_thomastsunamiasce716/)
- The Most Common Errors in Seismic Design & How to Avoid Them (https://www.structuremag.org/?p=8972)
- FAQs – Structural Engineering for Hurricanes and Structural Engineering for Tornados (http://www.ncsea.com/resources/engineers/)

Advocacy

A significant way structural engineers can ensure positive changes are implemented is through focused advocacy efforts. Volunteer committees of practicing structural engineers spend thousands of hours each year reviewing the latest research and practical observations in order to advocate changes to standard practice and governing codes. Advocacy includes promoting effective standards, codes, and ordinances that remain focused on building safety and also advance concepts in support of community resilience. It also includes being a resource to community leaders and officials as they pursue informed guidelines and ordinances to benefit their constituencies. A few examples might include:

- Structural engineers in Northern California helping the City of San Francisco develop a Building Occupancy Resumption program to assist building owners to complete safety assessments as soon as possible following an earthquake event.
- Structural Engineers in Southern California working with local officials to create a variety of Seismic Retrofit Ordinances through the “Safer Cities” program.
- Structural Engineers were part of a multi-stakeholder task force to develop guidelines for milestone inspections following the tragic condominium collapse in Surfside, FL

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Enhanced Performance through Intentional Design

Building Codes only provide limits on the minimum design values for natural hazards, based on accepted risk tolerance models. Owners and property managers are encouraged to consult structural engineers to understand how expected building performance relates to these minimum default risks. Structural engineers can help owners understand if the performance expectation meets their needs, the potential benefits of enhanced design criteria above and beyond the code minimums, and the additional long-term benefits to be gained through short-term investments. Understanding the code-based minimum expected performance and the unique performance needs for a specific project allows structural engineers to intentionally design to meet the desired performance expectations for the specific project.

Read more:

- Communicating with Owners and Managers of New Buildings on Earthquake Risk (https://mitigation.eeri.org/files/fema389.pdf)
- Earthquake-Resistant Design Concepts (https://www.fema.gov/sites/default/files/documents/fema_p-749-earthquake-resistant-design-concepts_112022.pdf)
- Building the Performance you Need (https://www.fema.gov/sites/default/files/documents/fema_p-58-7_building_the_performance_you_need.pdf)
- Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time (https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1254.pdf)
- Performance-Based Wind Design (https://www.structuremag.org/?p=16030)