

Editorial | Responding to Forces of Nature

By Carrie Johnson, P.E., SECB, Secretary, NCSEA



Earthquakes, tornados, heavy snowstorms and other forces of nature have been in the news a lot this year, and in parts of the country we haven't normally expected them. We even had a 5.6 magnitude earthquake in Oklahoma. It was surreal, feeling the earthquake and then turning on the news to find that we were under a tornado watch on the same night. While I've kidded with fellow engineers from Texas about not being in an earthquake-prone region like Oklahoma, I still had to stop and think about the code requirements. The natural tendency after any major event is a call to strengthen the codes; but what we really need to do is look at this thoughtfully and carefully, and take each type of event and the corresponding probability into account.

As structural engineers, we should be helping the public find a balance between continually updating codes and enforcing the ones we have. On the one hand, we will lose the public's trust if we do not make updates based on what we have learned from past events. On the other hand, we are doing ourselves a disservice if we allow design requirements to be revised to the extent that they limit the individual engineer's ability to design efficiently, or they increase the overall cost of construction to the extent that structures aren't built.

We need to study in-depth the buildings that sustain damage under any given event, asking the following series of questions: Was the event in excess of the current code? Did the original drawings meet the code in effect at the time it was constructed? Was the structure constructed in conformance with those drawings? Were the failures due to the need for stronger codes or from lack of enforcement of the existing codes?

Although I may not have expected an earthquake in Oklahoma, the code does require engineers in Oklahoma and throughout the country to design for earthquakes. Historically, I think some of these requirements have been ignored. After each significant earthquake event, we need to look at the structures that did sustain damage and analyze whether or not that damage is in excess of what should have been expected. If so, the codes do need to change; but if not, we should work more on enforcement of existing requirements.

Over the last twenty years, there are areas of the country where the loads have been increased to account for snowfalls in excess of the code; but not all buildings have been brought up to the new standard. The practice of analyzing the code snow loads for adequacy needs to occur on a continual basis; but we also need to look deeper than the ground snow load when we are analyzing the situation. When a problem occurs, knowing whether or not the structure in question was

designed for the current code, with the current drifting requirements, could make a significant impact on answering questions about the need for further code changes.

This year, there are certainly parts of the country where structures sustained major tornado damage, but the probability that any individual building will be subjected to a tornado is actually very small, on the order of 1/100,000. This means that, even in the most tornado prone region of the country, a building would be expected to experience tornado effects only one time every one hundred thousand years. As a result, the building codes do not currently require design of buildings for tornado resistance. The design wind speeds experienced in the Joplin, Missouri, tornado this year were in excess of 250 mph, which corresponds to a wind pressure nearly eight times the current design requirements. In this case, it may not be practical to require designing the entire building for the worst case. Other solutions, such as safe rooms, should be considered as options.

If enforcement of the current code design and construction requirements would have eliminated the damage, should we be working on code changes or code enforcement? If upgrading existing buildings to the current requirements would have eliminated the damage, should we be working more actively to help communities understand why upgrades are a good idea? The *International Existing Building Code* has requirements for remodeled structures. Those for additional parking, additional restrooms, etc., are enforced to a much greater degree than the structural requirements. Perhaps we would also have a greater effect on public safety if we spent more time lobbying jurisdictions to enforce the special requirements already present in the current codes. In parts of the country, these requirements are either ignored or largely misunderstood by local jurisdictions. In other cases, they are only enforced on buildings over a certain size or complexity.

We also do ourselves a disservice if we add requirements in the code that are overly difficult or impractical to calculate. You just have to look at the trial design problem results to see that we may already be at that point. At last year's NCSEA Annual Conference in Oklahoma City, Ron Hamburger gave a very interesting presentation on the code update process. During the presentation, he took time to ask the audience to vote on several ideas for future codes. One that I believed was very thought provoking was an idea that perhaps the main code should cover 90% of the buildings and the remaining 10% would require specialty codes. An idea like this may allow us to simplify design concepts where we can and still ensure that the designs for complex buildings or complex areas aren't left out.

There are a lot of things we can do to have a positive effect; and they all require time and effort. We need to get involved, at the local, state, and national levels, with all jurisdictions that control how structures are designed and built. The main idea here is to get involved. It requires time, effort, and thoughtful work. The more people who decide to get involved, the more we can do! ■

