Editorial | *Should We Be Concerned About Resiliency?*

By Carrie Johnson, P.E., SECB

The concept of resiliency has been a topic of interest in a lot of emails I have received lately. There are two definitions on Dictionary.com for resilience (or resiliency).

1) The power or ability to return to the original form, position, etc., after being bent, compressed, or stretched; elasticity.
2) Ability to recover readily from illness, depression, adversity, or the like; buoyancy.

I find these definitions thought-provoking when considering what we need to do to make our communities resilient. Although the first definition applies more to structural principles and addresses some of the concepts we need to use to make our communities more resilient, it is really the second definition that rings true to me. I have been involved several times with assessing structures that were affected by natural disasters, and the ability to recover readily is key. The words illness and depression don't really apply, but the concept of dealing with adversity certainly does. It often involves very unfamiliar adverse conditions. It can be devastating to communities if there isn't the infrastructure and ability to quickly recover.

At the NCSEA Structural Engineering Summit, we had a very interesting panel discussion on current efforts to provide new ordinances to address resilience. The panelists were all from the Structural Engineers Association of California (SEAOC), and the ordinances they are working on focus on resilience for seismic events. The topics they discussed covered building rating systems, performance based design, and renewed efforts for retrofit ordinances. The discussion was lively. There has been a wave of discussions, innovations, and political involvement by California's structural engineering community. Efforts are underway to establish a rating system that can be used to describe the performance of buildings during earthquakes and other natural hazard events.

The concept of developing resilient communities to resist natural disasters certainly doesn't stop with seismic events. They can include both natural disasters like tornadoes, hurricanes, snowstorms and floods (both from Hurricanes and Tsunamis) and man-made disasters such as electrical outages, water contamination, wildfires, and explosions. Each of these types of disasters will require a new set of considerations. It also doesn't stop with buildings.

I remember the first time I fully realized how complex the issues involved with resiliency are. It was after an earthquake in South America. One of the engineers I met had visited the area in the aftermath and said that, while most of the buildings fared fairly well, the roads and bridges did not. Prior to this, my thoughts were focused mostly on buildings during disasters. People were sitting, waiting for food and supplies in buildings that were essentially intact. Without roads and bridges to bring in supplies, it took months and even years to get back to what would be considered normal.

The tsunami in the Indian Ocean in 2004 raised awareness about the need to address both warning systems for tsunamis and the unique recovery requirements. The damage recovery involved cleaning huge volumes of debris and dealing with contaminated water and soils, as well as extensive damage to the infrastructure. Another popular presentation at the Summit was a session by Gary Chock where he presented the new ASCE 7-16 *Tsunami Loads Design Standard*. The states of Alaska, Washington, Oregon, California, and Hawaii are most at risk for experiencing a tsunami event, and this standard will help address a need for missing information on what loads should be anticipated.

Hurricane Katrina uncovered issues with our aging infrastructure. Portions of the coast were designed for hurricane wind and wave forces, but proved to be inadequate. It also raised many questions about the ability to quickly get basic necessities such as electricity and water into damaged areas. Hurricane Sandy on the east coast in 2012 brought to light the weakness of our infrastructure in response to flooding in urban environments. Most of the current codes are really not applicable for urban conditions. Engineers from the Structural Engineers Association of New York (SEAoNY) have been involved with efforts to help cities and agencies develop criteria for what is appropriate. They are in the process of assessing how different types of construction responded and making recommendations for how to rebuild so the recovery happens more quickly.

There are tornados each year that should also be considered when designing for resilient communities. When wind forces in excess of 250 mph strike an area, there are multiple issues that have to be dealt with during recovery. Like tsunamis, the amount of debris can be overwhelming. Flooding is common and the need to restore electricity and clean water are issues that must be addressed. In Oklahoma, recent tornados have accentuated the need for quality special inspections. Buildings that were essential facilities, and should have been able to resist the winds better than surrounding structures, did not. Investigators found problems with the construction quality that should have been addressed with special inspections.

These are just a few examples of the long list of issues that need to be considered as we move forward with improving our communities to be more resilient. My resounding answer of "should we be concerned about resiliency?" is YES! We should be concerned and we should be willing to get involved. The concept of developing resilient communities will require structural engineers to team with other branches of engineering and community leaders to develop communities that are adaptable enough to respond quickly after a natural disaster. I think structural engineers are poised to lead the charge. We have been working with the concepts of designing structures to withstand disasters for years, and we should be ready and willing to take the lead as these efforts move forward.▪

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