

A Vision for a High-Performance Future

How many of you keep bucket lists—things you want to do while you still can? Over the holidays, I had the good fortune to cross an item off of mine. I went to the South Island of New Zealand. It's definitely worth the 30 hours of travel—each way! We stayed in Christchurch for several nights. As you will recall, two earthquakes hit the city, one in September 2010 and another, which is believed to have been an aftershock, in February 2011. The first earthquake didn't cause any fatalities. The second, however, killed 185 people. It occurred at lunch time and some of the buildings that had survived the first quake simply collapsed. Christchurch has suffered at least 13,000 aftershocks.

Prior to September 2010, Christchurch was not considered a high-risk seismic area and had a policy that triggered retrofits only during major alterations. The February quake devastated the city's central district. About 80% of the buildings in the city center were red-tagged and face demolition. Chain link fences with "Do Not Enter" signs still surround buildings in the city's core. As of April 2013, the estimated cost of recovery was \$40 billion. This is for a city with fewer than 400,000 residents. Fortunately, New Zealand enjoys one of the highest insurance rates. About 90% of Christchurch residents were covered. Christchurch had building codes similar to ours and more insurance coverage than we do. Yet, despite that, full recovery has remained elusive. Walking around Christchurch was a constant reminder about the catastrophic losses to buildings and the economy, as well as the accompanying devastating changes in people's lives, caused by natural hazards.

Observing firsthand the challenges that Christchurch continues to face, we need to ask, "How can we build better so that fewer people die or are injured, and so that buildings and infrastructure, the necessary underpinnings of our economy, are resilient?" The subject of this

conference is achieving a resilient future. When we talk about our future, we can't just focus on new buildings. As we saw in Christchurch, we must also focus on what is already built. When we talk about performance, we need to focus on existing buildings and existing supporting infrastructure in addition to what we build new. It is all part of an interconnected system. The performance of what we have now is critically important for communities, for military readiness, and for our economy.

As you also know, a lot of our infrastructure is old—in some cases really old. Consider Washington DC, for example. The DC Water sewer system pipes date back to the Civil War. The construction materials include everything from brick to vitrified clay to cast iron to concrete. In the United States, we replace our infrastructure at a rate of 1 to 2 percent a year. At that replacement rate, aging infrastructure will continue to challenge us, probably for many years to come. So when we do replace or retrofit our existing buildings and infrastructure, we need to make sure that we get it right--that we build resiliently.

At a minimum, when we invest in replacement or retrofit, those structures should withstand the hazards we believe they will face over their projected life span. Tackling these issues takes, time, money, and thoughtful planning, and it takes leadership and foresight to anticipate future needs now, to build for a more resilient tomorrow. When we have an opportunity to renovate, retrofit, or modify an existing building, regardless of the source of the funds, design professionals need to work with the owner to try to build in as much resiliency as possible as part of the project. Indeed, broadly speaking, we know that the return on this incremental investment for resilience pays off over the life of the building - much of our knowledge of this comes from a previous NIBS study. As our work in this area grows, it is clear that we need more precise economic studies and decision-support tools to help justify the costs for resilient investments.

So what does a vision for a high-performance future mean for new buildings? We need to design new buildings for the performance that we expect and require, and we need to build them to withstand the hazards that we can reasonably expect over the life of the building. That means that we must take into account the already occurring and projected impacts of climate change over the design life of the building. Climate change is happening now and the rate of change is accelerating. If we continue to build our buildings solely based on what we have experienced in the past, we run the risk that our investment is wiped out with the next big event.

How many of you are familiar with the Third National Climate Assessment? I highly recommend that you familiarize yourself with it. It's an authoritative document produced over four years by more than 300 top climate scientists and experts overseen by a national advisory committee consisting of 60 members. It makes clear that, "Climate change, once considered an issue for a distant future, has moved firmly into the present." That document describes, on a regional basis, the impacts from climate change that we are already experiencing and that we are predicted to experience. For example in this region, the Assessment tells us that we need to plan for sea-level rise, increased storm surge, more really hot days, and higher temperatures overall. We will also see increases in extreme precipitation, where extraordinary amounts of rainfall in a short period of time--what I have heard emergency managers call "rain bombs."

It seems that the news these days is full of record breaking weather events. 2015 was the hottest year on record globally and the second warmest year on record in the United States—2012 was the first. And indeed, last summer, news reports from New Delhi and Pakistan, told us just how devastating the impacts of extreme heat can be on human health. Are our buildings designed to accommodate extreme heat; can

our HVAC systems perform adequately; what happens when there are “brown outs” or loss of electricity altogether?

Last year was also the third wettest year in the last 121 years since records have been kept. In the Carolinas and Texas, we saw record setting rains and flooding, causing loss of life and destruction of property. There was enough rain in 5 days in the Carolinas to just about solve the multi-year drought in the West. Can our drainage systems, buildings, and streets withstand “rain bombs”—the types of extreme precipitation events we are seeing ever more routinely? In 2015, for the first time in U.S. history, wildfires charred more than 10 million acres across the nation. That’s approximately the size of Massachusetts and Connecticut combined.

These record setting events carry an urgent message, namely, that when it comes to climate change impacts, we can’t just continue to use historical data, coupled with safety factors, as a reasonable prediction of what will happen in the future. Mark Bove, a meteorologist at Munich Reinsurance America was recently quoted as saying that, as these hazards increase, we don’t seem to be taking notice. In his words, "We tend not to build buildings to withstand the storms that we already see, let alone how they might change in the future."

According to the Congressional Budget Office, in 2014, the Federal government spent \$96 billion on infrastructure, with 43 percent of that on new construction. How are we, the Federal government, ensuring we are incorporating resiliency in our infrastructure spending? How well is the private sector incorporating resiliency? The American Society of Civil Engineers recently issued a report entitled, “Adapting Infrastructure and Civil Engineering Practice to a Changing Climate.” That report recommends that engineers “develop a new paradigm for engineering practice in a world in which climate is changing, but cannot be projected with a high degree of certainty.”

This need for a new paradigm is urgent. The President has repeatedly stressed the importance of hazard mitigation. In the words of President Obama, “Climate change, and especially rising seas, is a threat to our homeland security, our economic infrastructure, the safety and health of the American people.” President Obama’s administration has already taken proactive steps to address climate change. The President established his climate action plan in June 2013. That plan has three pillars, cut emissions, prepare the U.S. for the impacts of climate change, and lead internationally on both cutting emissions and preparing for the impacts.

During the recovery from Superstorm Sandy, we invested billions to help communities rebuild and we committed to “build back better” -- to rebuild infrastructure to a higher standard. We want to build it right the first time, not have to pay to rebuild it twice. Almost exactly a year ago, the President Signed an Executive Order establishing a Federal Flood Risk Management Standard. The Standard and Executive Order ensure that agencies expand management for federally-funded projects from the current base flood level (100-year) to a higher vertical elevation and corresponding horizontal floodplain. Agencies were given the option of utilizing one of three approaches:

1. Utilizing best-available, actionable data and methods that integrate current and future changes in flooding based on science –this is our version of performance-based design for climate change,
2. Two or three feet of elevation, depending on the criticality of the building, above the 100-year, or 1%-annual-chance, flood elevation, or

500-year, or 0.2%-annual-chance, flood elevation. The Standard does not prohibit building in a floodplain. The Standard, however, does require that Federally-funded projects be resilient – whether through

elevating or other flood proofing through design and construction methods.

To encourage resilient construction, the Federal government also launched HUD's National Disaster Resilience Competition. That competition made \$1 billion available to communities that have been struck by natural disasters in recent years. We've recently designated Resilience AmeriCorps cities across the United States. Creation of the Resilience AmeriCorps responds to a recommendation made by the President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience to enhance commitments to building resilience in vulnerable communities disproportionately affected by the impacts of climate change.

On a more tactical level, we have worked to prepare the nation for the potential impacts from El Nino. This El Nino is predicted to be one of the strongest on record. It has already produced significant global impacts. El Niño is expected to affect temperature and precipitation patterns across the United States during the upcoming months. In the international realm, the President signed an Executive Order requiring all international investments to be screened for climate resilience. So when we invest in a road, or a malaria project, we will make sure that our taxpayer dollars are more likely to last for the life of the project.

Despite these efforts, we still face enormous challenges in design techniques to achieve a high-performance future. How do we make sure that we continue to learn from the past, as we are doing with the Christchurch earthquakes, as well as incorporate considerations of accelerating impacts of climate change to ensure that our infrastructure lasts as long as it is intended to?

Each of you can make a difference, a critical difference. The choices you make today-- the advice and guidance you give to your clients,

customers, and colleagues, the planning you do now--it can all contribute to a safer and more resilient future if it incorporates considerations of climate change and resiliency. We know we need better models and in some instances, data. You can help us understand what information you need to build resiliently. We also very much need your innovative solutions. How do we handle the risk of liquefaction in an earthquake like we saw in Christchurch; how do we make sure that our structures survive a wildfire; how do we ensure continuity of operations when our infrastructure floods?

You have the power to change the course of our history. What has guided design choices in the past--the 100 year flood, the 500 year flood, the maximum temperature tolerance--those guide posts can no longer safely guide us. You can help by accelerating the update and creation of new codes and standards that embrace resiliency. Those codes and standards can significantly influence the design of buildings to ensure incorporation of resilience considerations, including resilience to climate impacts. You can help raise awareness with industry and other partners, including state and local governments, about the need to embrace resiliency and climate change adaptation. In short, you can help make sure that we are resilient to the impacts of climate change and other hazards--that lives are saved, that our economy remains vital, and that communities are protected.

I want to thank you for your important work. As I share these thoughts with you, it occurs to me that no good deed goes unpunished. Unfortunately, we need even more help from you. As President Obama has stated, when it comes to climate change, there is such a thing as being too late. Thank you.