Chairman Denham, Ranking Member Holmes Norton, and members of the Subcommittee, thank you for the opportunity to provide testimony on building codes and mitigation efforts to help minimize the costs associated with natural disasters.

The National Institute of Building Sciences (Institute) was established by Congress in 1974 upon recognition of a lack of an authoritative national source to make findings and to advise both the public and private sectors on the use of building sciences and technology to achieve recognized goals (12 USC 1701j-2).

To achieve its mission to support advances in building science and technology to improve the built environment, the Institute has established a diverse portfolio of councils and programs that engage building industry experts in examining and developing tools, technologies and practices to meet identified needs. This testimony reflects the diversity of hazards-related issues identified by many of our councils and projects such as the Multihazard Mitigation Council (MMC) and Building Seismic Safety Council (BSSC) to our ongoing work with the U.S. Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) and National Institute of Standards and Technology (NIST).

**Understanding Hazards and Mitigation**

Disasters come in many forms, from hurricanes and earthquakes to tornados and floods. Changing weather patterns are leading to increased incidents of droughts and strong storms. Just last week, the National Climatic Data Center reported that the nation is experiencing the largest drought since the
1950s. In June, about 55 percent of the country was in at least a moderate short-term drought—the highest level since December 1956—and at least 70 percent of the nation is in some state of drought. In 2011, hazards in the U.S. affected nearly 500,000 people, resulted in over 800 people killed and almost $60 billion in damages.\(^1\)

Understanding and addressing such potential disasters holistically provides the most economic and best performing buildings.

In the 106\(^{th}\) Congress, the Senate Appropriations Committee requested that FEMA fund a study to quantify the future savings from hazard mitigation activities. The Senate Report stated, “The Committee recognizes that investing in mitigation will yield reductions in future disaster losses and that mitigation should be strongly promoted. However, an analytical assessment is needed to support the degree to which mitigation activities will result in future ‘savings.’”\(^2\)

After an exhaustive effort engaging over 50 national experts, the MMC released the study findings in 2005.\(^3\) The study results include the oft-cited finding that one dollar spent on mitigation saves society an average of four dollars. Based on the findings, the MMC made the following recommendations:

- Mitigation is sufficiently cost-effective to warrant federal funding on an ongoing basis, both before disasters and during post-disaster recovery.
- Mitigation is most effective when it is carried out on a comprehensive, community-wide, long-term basis.
- Continuing analysis of the effectiveness of mitigation activities is essential for building resilient communities.

As defined by Congress in the Energy Independence and Security Act of 2007 (EISA), a high-performance building “integrates and optimizes on a life cycle basis all major high performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.” It is through this lens that we provide both the public and private sector with innovative solutions for the built environment.

Currently, no federal agency has the mandate or the ability to adequately consider all high-performance building attributes and support the numerous goals placed upon the building community. Considering just green building programs, the Government Accountability Office identified 94 initiatives housed in 11 agencies.\(^4\) Opportunities to increase collaboration across all building issues and within each individual issue area are necessary. A cross-agency working group on building-related issues that could develop holistic strategies for achieving national goals would be incredibly valuable.

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\(^1\) International Disaster Database, Centre for Research on the Epidemiology of Disasters, www.emdat.be.
\(^2\) U.S. Senate Report 106-161.
\(^3\) *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*, Multihazard Mitigation Council, National Institute of Building Sciences, 2005.
While buildings issues as a whole are not addressed comprehensively, the National Earthquake Hazard Reduction Program (NEHRP) provides an effective model for addressing the various agency responsibilities for earthquake risk reduction. Similar cooperative efforts should be examined for other hazards and other high-performance building attributes.

Under NEHRP, the Institute’s Building Seismic Safety Council works with leading experts to translate recent findings and research into improvements in building codes and standards.

The Role of Codes and Standards

When adopted by jurisdictions, codes and standards establish the community’s expectations for protecting the health, safety and welfare of its citizens. Such codes and standards are developed and then adopted through a series of actions that assure engagement from all relevant stakeholders. This engagement, along with effective adoption and enforcement, ensures the industry follows codes and standards, thus meeting the community’s expectations.

Codes and standards provide a common language and requirements for the design, construction and operations of buildings. This commonality provides many benefits for the public, the building industry and government. The public is assured that buildings provide a minimum level of protection from hazards, are accessible to users and maintain public health. Within the construction industry, manufacturers know they have the consistency in requirements necessary to invest in the production and development of products that meet these common needs; designers and contractors have consistent criteria to follow; and owners have buildings that possess a consistent baseline of attributes. Each industry segment can also develop the education and training activities it needs while being mindful of the overall codes and standards, and all industry members can work under these mutual requirements to achieve a common result. Governments can develop criteria with building expert input to assure technical feasibility and cost-effectiveness; access to an education and training infrastructure; and cost savings due to consistent methods for review and enforcement.

For decades, the United States has led the development and implementation of compliance verification with construction-based standards and codes (e.g. building construction regulations). In the past, strong consensus-based standards development programs have encouraged growth in the industrial segments by ensuring that American businesses understand the health, safety and performance-based requirements for their products, systems and services. This created a level playing field where manufacturers could successfully compete. Compliance with building construction regulations through activities such as traditional code enforcement, which references thousands of consensus-based standards, has provided for an increasingly safe and efficient built environment for homes, commercial buildings and places of assembly. However, the current economic downturn is creating new and significant challenges for the code enforcement community.

Municipalities are delaying the adoption of updated model codes due to the perception that updated codes increase construction costs while providing an uncertain return on investment. Countering this perception requires the development of more widely accepted metrics to demonstrate payback periods for energy- and water-efficiency provisions, as well as better methods to present how code
updates are based on the latest knowledge and experience to protect public safety. Faced with the prospect of enforcing more codes of increasing complexity with fewer people, many municipalities resort to concentrating on enforcing only the basic life safety requirements of the construction codes. With these constraints, building officials are less likely to enforce energy and water efficiency provisions, which in turn means the energy and water efficiency gains expected from updated codes are not being fully realized.

To improve the built environment while dealing with ongoing economic stresses associated with compliance verification, new compliance paths must be identified that then can open opportunities for codes and standards developers to explore new formats, criteria, adoption mechanisms and/or timelines for compliance verification, resulting in increased compliance rates and/or reduced costs associated with compliance verification. Meeting this challenge is important to public and private-sector agencies or entities that want to increase levels of compliance with current and future codes and standards. The information is even more important to those who purchase or lease buildings and pay expenses to operate them, but cannot ensure compliance with codes or standards due to a lack of training or resources. New approaches in code criteria, format and adoption, and new methods to assess compliance will need to be considered to ensure effective implementation and conformance with the code requirements—particularly as codes and standards require higher levels of building performance. Such codes will require different formats to present the criteria, increased scope, or extension beyond issuance of the initial certificate of occupancy.

New technological advancements, such as building information modeling (BIM), can play a role in relieving these constraints. They can help by improving the quality of code compliance verification. They also can improve the municipality’s ability to cope with the burden of enforcing more complex energy and water efficiency-related provisions because jurisdictions can evaluate the data contained within the model codes and other requirements electronically. However, work still remains before BIM accomplishes the levels of interoperability needed to be deployed as a code-checking tool. Further, jurisdictions also need the training and tools to utilize BIM. Work to incorporate compliance checks with BIM is progressing and BIM may ultimately be an excellent tool for improved levels of code compliance, eventually streamlining code approvals by allowing plans and submittals to be code checked automatically and with fewer errors. Significant triple bottom line savings for building owners and developers are foreseen. Specifically in the hazard response arena, the widespread use of BIM can provide first responders digital access to building layouts and other important information.

A strong codes and standards development community supports a strong and robust economy. Government at all levels must work together with standards and codes developers to address the challenges of better articulating the benefits of participation in their various development processes. They need to encourage more widespread verification of compliance with construction codes and support the development of BIM and other technology-based initiatives that help streamline approvals and improve the quality and consistency of enforcement.

Within the recently enacted transportation bill (Moving Ahead for Progress in the 21st Century Act or MAP-21), several important provisions focused on building codes and how their effective adoption and enforcement can serve as mitigation strategies. Section 100235 calls on FEMA to examine the potential
role of building codes in floodplain management and section 100243 allows communities to apply Community Development Block Grants to supplement state or local funding for the administration and enforcement of building codes. I strongly urge this Subcommittee to support these and similar requirements and ensure their funding.

While the adoption and enforcement of codes and standards is typically left to state and local authorities, there are opportunities for the federal government to support their adoption and limit the potential exposure of taxpayer funds for recovery and rebuilding efforts. The bipartisan Safe Building Code Incentive Act of 2011 (H.R. 2069) is one such example of an opportunity to reward proactive jurisdictions for implementing proven mitigation strategies. The legislation is supported by numerous private sector organizations representing insurance, design and construction, local governments and public safety interests.

The National Infrastructure Advisory Council has recognized the role of design and construction in promoting resilience stating, “Government should endeavor to better understand the role of design and construction in infrastructure resilience. Application of this understanding will help to shape policy, R & D Funding, and incentives that can spur technological innovation as well as the robust design and construction of critical infrastructures needed for resilience.”

A 2010 summit on designing for resilience sponsored by DHS looked specifically at codes and standards and identified the importance of including resilient design concepts in a performance-based approach, as well as continuity of operations. An integrated suite of standards, codes and guidelines that support resiliency for buildings and infrastructure should be developed with the participation of relevant codes and standards organizations. Incentives and education of regulators and their constituents will be essential to ensuring uniform adoption of resiliency objectives.

As the entity charged by Congress to provide an authoritative source for findings and advice to the public and private sector on the use of building science and technology to achieve national goals, the Institute is pleased to offer its expertise to the Subcommittee, Congress at-large and federal agencies.

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