ATC 117

Strategies to encourage state and local adoption of disaster-resistant codes and standards to improve resiliency

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Strategies to Encourage State and Local Adoption of Disaster-Resistant Codes and Standards to Improve Resiliency

Prepared by

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In Support of

THE BUILDING CODE ADOPTION AND ENFORCEMENT STRATEGY WORKGROUP OF THE MITIGATION FRAMEWORK LEADERSHIP GROUP (MitFLG)

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Notice

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Cover Photo: Crenshaw Elementary and Middle School building, located in the Crystal Beach area, Texas, and constructed in 2005 to serve as a hurricane shelter, which it did following 2008 Hurricane Ike (source: Laurie Johnson, October 2010)

Preface

In 2012 the Federal Emergency Management Agency (FEMA) awarded the Applied Technology Council (ATC) a 5-year task order contract to provide technical guidance and support to reduce the impacts of earthquakes and other hazards. Task order efforts carried out to date by ATC have focused on a broad range of activities, including support of the Federal Mitigation Framework Leadership Group (MitFLG) Building Code Adoption and Enforcement Strategy Workgroup in its identification and development of strategies to encourage adoption of building codes and standards to help improve resiliency nationwide (ATC-117 Project). The task order that authorized this effort required ATC to (1) conduct two workshops to obtain input on the best means to encourage State and local adoption of disaster-resistant building codes and standards, and (2) develop an internal FEMA report describing the findings of the workshops by the end of March 2015.

This document summarizes the technical efforts to date by the ATC Project Technical Committee, a small, diverse group of building code and hazard mitigation technical specialists engaged by ATC to carry out the developmental efforts. The main focus of the document is a list of recommendations emanating from the two project workshops and a series of webinars conducted by the MitFLG Workgroup prior to the workshops. Details about the workshops, input collected during the webinar series, and the evolution of the recommendations described in this report are provided in the companion ATC-117-1 Report, *Strategies to Encourage State and Local Adoption of Disaster-Resistant Codes and Standards to Improve Resiliency: Supporting Documentation.*

ATC gratefully acknowledges the numerous individuals who contributed to the development of this report, including those from various agencies and organizations who participated in the initial webinars and two workshops. Kevin Long of FEMA organized and led the webinars and organized the first workshop. The ATC Project Technical Committee (PTC), which consists of Christopher Jones (Chair and Project Technical Director), Robert Hanson; James Harris; Laurie Johnson (Lead Editor); Richard McCarthy; and Sara Yerkes, led the development of the draft recommendations, organized the second workshop, and developed this report. Scott Schiff served as Project Manager, Amber Houchen provided report production services, and

Bernadette Hadnagy coordinated logistics and invitations for the second workshop. The affiliations of these individuals are provided in the list of project participants.

ATC also gratefully acknowledges the efforts and support provided by Michael Mahoney (FEMA Task Order Contract Project Officer).

Christopher Rojahn
ATC Executive Director

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Chapter 1
Introduction

Recommendation 25 of the Hurricane Sandy Rebuilding Strategy calls upon the Federal Mitigation Framework Leadership Group (MitFLG) to coordinate Federal efforts to encourage States and localities to adopt and enforce the most current versions of the *International Building Code* (IBC) and the *International Residential Code* (IRC) (Hurricane Sandy Rebuilding Task Force 2013). The MitFLG has interpreted its charge to cover the current model building codes developed by the International Code Council (ICC)[1] and National Fire Protection Association (NFPA), as well as codes adopted by States or local jurisdictions based on the model building codes.

The Federal Emergency Management Agency (FEMA) has called upon the Applied Technology Council (ATC) to assist the MitFLG in developing a series of stakeholder-defined recommendations on the best means to encourage and/or aid State and local communities in the nationwide adoption of the most current disaster-resistant codes and standards.

1.1 Hurricane Sandy Rebuilding Strategy, Recommendation 25

Following the devastation wreaked by Hurricane Sandy across much of the northeastern United States in late October 2012, President Obama issued an Executive Order forming the Hurricane Sandy Rebuilding Task Force[2] to "identify and work to remove obstacles to resilient rebuilding in a manner that addresses existing and future risks and vulnerabilities and promotes the long-term sustainability of communities and ecosystems" (White House, 2012). The *Hurricane Sandy Rebuilding Strategy*, released in August 2013, includes a summary of Task Force activities, and a long-term rebuilding plan that includes input from key governmental stakeholders. The *Strategy* is informed by an assessment of current and future risks; specifies outcomes,

[1] The ICC is an association whose mission includes developing consensus model codes and standards. Its approximately 50,000 members include Federal, State and local code enforcement and fire officials, architects, engineers, and other construction professionals and manufacturers.

[2] The Hurricane Sandy Rebuilding Task Force is composed of representatives of all partner Federal agencies, with an advisory group of elected State, local, and tribal officials from the most affected areas.

goals and actions as well as any proposed legislative, regulatory, or other actions; and provides a plan for monitoring progress (White House, 2012).

Recommendation 25 of the Hurricane Sandy Rebuilding Strategy asserts that using "disaster-resistant building codes is the most effective method to ensure new and rebuilt structures are designed and constructed to a more resilient standard" (Hurricane Sandy Rebuilding Task Force, 2013, 82). It calls upon the MitFLG to serve as the Federal interagency coordinating body to promote both State and local adoption and enforcement of the most current versions of the model codes published on a three-year cycle by the ICC. The 2015 versions of the IBC and IRC[3] are now available from the ICC.

1.2 MitFLG Building Code Adoption and Enforcement Strategy Workgroup

Per the recommendation of the Task Force, the Federal Mitigation Framework Leadership Group (MitFLG)[4] agreed to serve as the lead interagency coordinating body for Recommendation 25. To do so, the MitFLG established a Building Code Adoption and Enforcement Strategy Workgroup composed of subject matter experts from interested departments and agencies[5]. The Building Code Workgroup's (BCWG) charge is to "develop a comprehensive approach and standard mechanisms for all Federal agencies with authorities and responsibilities related to building code compliance and enforcement to encourage and/or aid State and local communities in the nationwide adoption of the most recent IBC, IRC, and other codes that will increase resilience" (Hurricane Sandy Rebuilding Task

[3] The IBC and IRC are comprehensive codes used for most construction in the United States. The IRC is a stand-alone code for one-and two-family dwellings and townhouses.

[4] The Mitigation Framework Leadership Group draft charter (MitFLG, 2013) indicates that the primary federal agencies in the group shall consist of (but not be limited to) the following agencies: Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Environmental Protection Agency, General Services Administration, Department of Health and Human Services, Department of Homeland Security, Department of Housing and Urban Development, Department of the Interior, Department of Justice, Small Business Administration, and Department of Transportation.

[5] Workgroup member agencies are the Department of Homeland Security (DHS) National Protection and Programs Directorate (NPPD) Office of Infrastructure Protection, U.S. Fire Administration (USFA), FEMA Federal Insurance and Mitigation Administration (FIMA), the National Institute of Standards and Technology (NIST), National Oceanic and Atmospheric Administration (NOAA), Department of Housing and Urban Development (HUD), General Services Administration (GSA), White House Council on Environmental Quality (CEQ), Department of Treasury Federal Insurance Office (FIO), and State and local members.

Force, 2014, 60). The BCWG has interpreted this charge as covering the current model building codes developed by the ICC and NFPA, as well as the jurisdiction codes adopted at the State or local jurisdiction level based on the model building codes.

The BCWG is developing a recommended Strategy for building code adoption and/or enforcement, as it relates to building codes and other codes that will increase community resilience for all natural hazards. A series of stakeholder groups have been established to provide input into the strategy development process. The BCWG plans to submit its final version to the MitFLG before June 30, 2015, aiming for concurrence on the Strategy at the July 2015 MitFLG quarterly meeting.

1.3 Report Organization

This report consists of several chapters. Project-related activities to date are described in Chapter 2. Chapter 3 provides the final set of 15 recommendations pertaining to strategies and approaches that the Federal government and other stakeholders may take to encourage and/or aid States and local communities in the adoption of the most current building codes. Chapter 4 identifies the top priority recommendations for the Federal government to implement and also the *most important* and other *important* recommendations to be undertaken by non-Federal stakeholders and which may or may not involve Federal agencies.

Chapter 2
Project Activities

The overall goal of the MitFLG Building Code Adoption and Enforcement Strategy Workgroup (BCWG) is to increase the nation's resilience against natural disasters, including, hurricanes, floods, wind storms, earthquakes and tsunamis, by identifying strategies and approaches to encourage State and local adoption of current disaster-resistant building codes and standards, including related actions that could be undertaken by Federal agencies. The specific project-related activities of the Applied Technology Council (ATC) have been to: (1) document input in a series of FEMA-organized webinars to solicit input from various stakeholder groups on the means to encourage and facilitate the adoption and enforcement of building codes and standards nationwide; (2) organize and lead a meeting of the MitFLG Building Code Workgroup and the ATC project team (first workshop) to augment and further develop the ideas obtained during the six FEMA-organized webinars; (3) prepare a draft report recommending the means to encourage and facilitate the adoption and enforcement of building codes nationwide; (4) plan and conduct a second workshop to obtain input on the draft recommendations from a larger group of stakeholders; and (5) revise and finalize a report for internal FEMA use based on input from the second workshop. The approach to each of these activities and key outcomes to date are summarized in the following sections.

2.1 MitFLG Building Code Adoption and Enforcement Strategy Workgroup Webinars

In January 2015, FEMA organized a series of webinars on behalf of the MitFLG Building Code Workgroup (BCWG) to solicit input from various stakeholder groups on the means to encourage and facilitate the adoption of building codes and standards nationwide. Invitees to these webinars came from MitFLG's major stakeholder groups. Figure 1 shows the composition of agencies and stakeholder interests represented in those groups.

To provide greater flexibility to the invitees, six webinars were held between January 9th and 20th. Altogether, there were approximately 70 participants—50 of which attended at least one of the seminars. Participants came from six Federal agencies

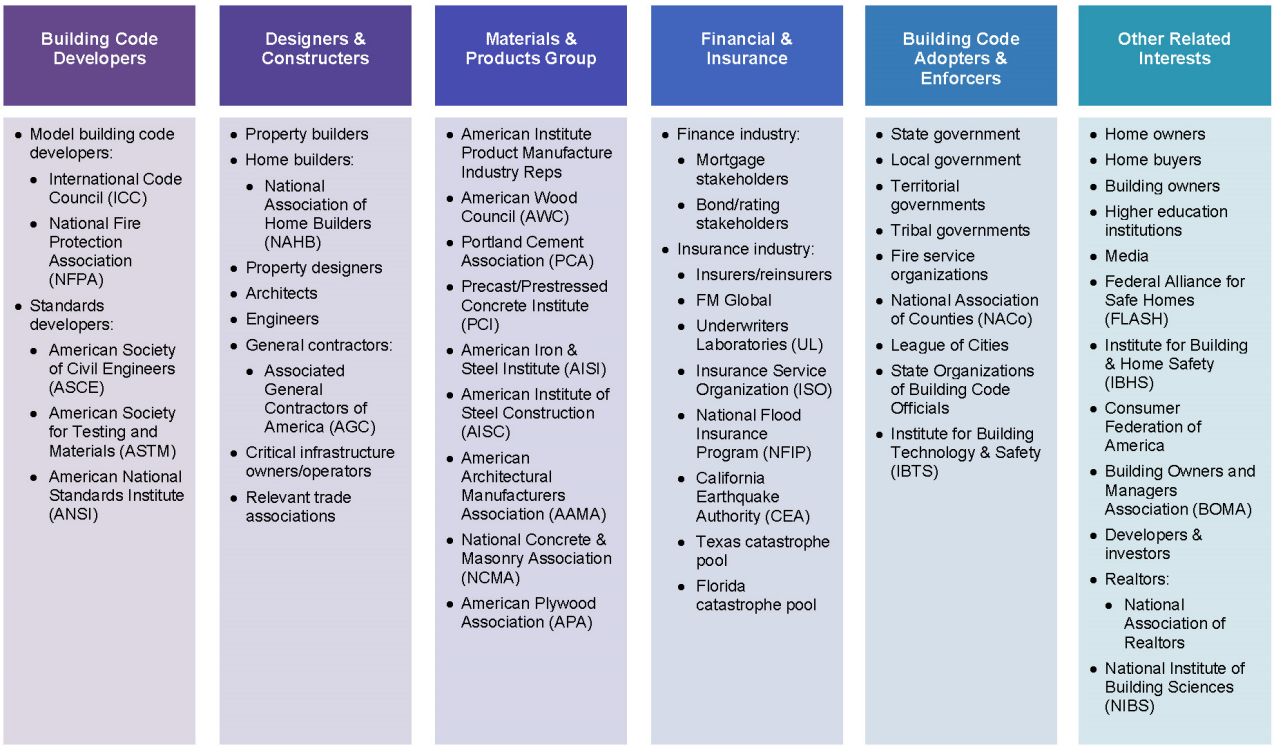

Figure 2-1 MitFLG building code workgroup stakeholder groups.

(FEMA, GSA, HUD, NIST, NOAA, and USFA), over 20 industry and consulting organizations, and three State and regional agencies.

In each of the webinars, stakeholders were given the opportunity to discuss five specific questions and one open-ended question. They were also invited to provide written responses to each of the six questions during the webinar (or revisit in a subsequent webinar) prior to the closing date of the webinars. The six questions presented to the stakeholders were:

1. Under what circumstances have you seen federal action (e.g., proposition, advocacy, research, etc.) lead to code enhancement?
2. What examples can you provide where you have seen an opportunity for a Federal agency able to offer additional support (e.g., research incentives) to you and for all?
3. What barriers (e.g., access to research) have you encountered as a result of a Federal action?
4. What does the best Federal coordination with you look like?
5. When have you seen communication/messaging from the Federal government or from others work well? And what made the communicator/messenger best positioned to deliver the message?
6. Do you have any other input you would like to provide?

Altogether, the webinars gathered a diverse collection of experiences and beliefs as to how to improve adoption and enforcement of up-to-date, effective building codes.

Following the last webinar, ATC prepared a summary of the stakeholder input for consideration in the first workshop of the MitFLG BCWG and the ATC project team in February 2015.

2.2 First Project Workshop

The first workshop for this project was held at the National Building Museum in Washington D.C. on February 3, 2015. It was a joint meeting of the MitFLG BCWG and the ATC project team with 20 participants from these two groups. Its purpose was two-fold: first, to augment, evaluate and further develop the comments and ideas offered during the six FEMA-organized webinars; and, second, to discuss the planning and conduct of a second workshop to obtain input on a draft set of recommendations from a larger group of stakeholders.

Discussion at the February 3rd workshop centered on the same six questions presented to stakeholders during the January webinar series. Workshop participants reviewed the input gathered from the webinar series, suggested additions or changes, and offered new recommendations and topic areas for consideration. One key action item resulting from the workshop involved undertaking development of some case studies of State and local code adoption both pre- and post-disaster to be presented at the second workshop and included in the ATC-117-1 supporting documentation report.

Also, on the day prior to the first workshop, the Project Technical Committee met at the ATC Office in Arlington, Virginia. Discussion mainly focused on reviewing the results of the webinar series, preparations for the first workshop, and suggestions for the organization and contents of the project report.

2.3 Draft Recommendations

Drawing upon all the data collected by the MitFLG Building Code Workgroup, the webinar series and the first project workshop, a set of 32 draft recommendations were developed by the Project Technical Director with initial input and review by the ATC project team. The draft recommendations were included in the preliminary project report prepared and distributed to all the participants at the second workshop. They were organized into the following four topical areas:

- Building Code Education, Training and Outreach

- Technical and Economic Studies by (or Sponsored by) Federal Agencies
- Building Code Development
- Agency Leadership, Cooperation and Coordination.

2.4 Second Project Workshop

The second workshop was held on March 12, 2015 in Arlington, Virginia. The 49 participants included members of the MitFLG, ATC Project Technical Committee and staff, participants at the first project workshop and other stakeholders from an array of governmental, private sector, academic, and other organizations. The main aim of the second workshop was to review, revise, and rank the draft recommendations and the preliminary project report.

Workshop participants were guided through a discussion of each of the 32 draft recommendations and asked to suggest additions or changes to each of the recommendations and to also offer new recommendations and topic areas for consideration. Through this process, one draft recommendation was dropped and three new draft recommendations were added.

Also, to help inform the discussions on the draft recommendations, two case studies on building code adoption were also presented at the workshop. One case study looked at the status of building code adoption in the State of Louisiana before and after Hurricane Katrina. The other looked at building code adoption in Memphis/Shelby County, Tennessee and the State of Tennessee. The case studies explored code adoption issues, actions taken to address the issues, results and lessons learned.

The workshop participants were then guided through a structured process to rate each of the 34 draft recommendations from the following perspectives: ***Priority*** to implement, ***Effectiveness*** if implemented, ***Difficulty*** to implement, and ***Time*** to implement. It was clarified during the voting process that Time should consider how long it might take to develop and initiate strategies and programs related to a particular recommendation, and not how long it would take to complete or achieve a particular recommendation. Table 2-1 provides an overview of the voting process used at the second workshop.

In addition to the verbal input gathered during the workshop, participants were also invited to submit written comments on the draft recommendations and the preliminary report for the Project Technical Committee to use in finalizing the report.

Table 2-1 Voting Process at the Second Project Workshop

Criteria that participants at the second project workshop used in evaluating the draft recommendations.	
Priority	
Highest (5 points)	Essential, the most important recommendation(s) to implement
Very High (4 points)	Very important, but not at the top of the list
High (3 points)	Important
Medium (2 points)	Good to do if time and resources allow
Low (1 point)	Do only if all other recommendations have been addressed
Effectiveness	
Highest (5 points)	One of the most effective actions that can be undertaken
Very High (4 points)	Effective, almost all goals will be accomplished
High (3 points)	Moderately effective, most goals will be accomplished
Medium (2 points)	Partially effective, a few goals will be accomplished
Low (1 point)	Not effective
Difficulty	
Easy (5 points)	Can be accomplished with little effort and using off-the-shelf materials, available resources, existing ties between partners and target groups
Minor (4 points)	Will require modest effort to develop content and to coordinate between partners and target groups
Moderate (3 points)	Will require moderate effort to develop content and to coordinate between partners and target groups
Difficult (2 points)	Will require significant effort to develop, coordinate and implement
Very Difficult (1 point)	Very hard to accomplish, will require lots of effort, development of new content, lots of partners, and complex coordination
Time to Implement	
5 points	Less than 1 year
4 points	1-2 years
3 points	2-5 years
2 points	5-10 years
1 point	10 years

2.5 Final Report and Project Recommendations

Immediately following the second workshop, the Project Technical Committee held its second project meeting at the ATC Office in Arlington, Virginia. The PTC reviewed the draft recommendations, results of the voting process, and comments made during the workshop as well as comments submitted in writing. The PTC agreed to restate some recommendations as overarching considerations, to combine some recommendations, and (in a few instances) to eliminate recommendations with low voting results. Fifteen final draft recommendations emerged from the Committee's work. PTC members were then asked to prepare brief descriptions for each of the 15 recommendations incorporating the discussion points and documentation gathered through the project seminars and workshops.

Chapter 3 contains the finalized set of 15 priority strategies and approaches recommended for the Federal government to pursue in encouraging and/or aiding States and localities in building code adoption and implementation. They are organized into the following three topical areas:

- Building Code Education, Training and Outreach,
- Technical and Economic Studies by (or Sponsored by) Federal Agencies, and
- Agency Leadership, Cooperation and Coordination.

Chapter 3 also identifies five overarching considerations for Federal agencies to be mindful of in undertaking the recommended strategies and approaches.

Utilizing the voting results from the second workshop, the PTC sorted and ranked the final 15 recommendations. The prioritization is provided in Chapter 4 of this report. While some of the final 15 recommendations were not voted on at Workshop 2, the voting tallies for their constituent parts were used to infer Workshop 2 opinions regarding priority and effectiveness of the final recommendations. Distinctions are made between the prioritization of recommendations that can only be implemented by and between Federal agencies and those recommendations that will involve non-Federal stakeholders and may or may not involve Federal agencies. Within each category, recommendations are listed in order of priority.

Chapter 3
Recommendations

The extensive stakeholder input gathered as part of this project affirms Recommendation 25 of the Hurricane Sandy Rebuilding Strategy calling upon States and localities to adopt and implement the latest versions of the model building codes.

Fifteen priority strategies and approaches are recommended for the Federal government to pursue in encouraging and/or aiding States and localities in building code adoption and implementation. They are organized into the following three topical areas in Sections 3.1, 3.2 and 3.3. Note that recommendation numbers do *not* correspond to priorities; Chapter 4 provides priorities.

- Building Code Education, Training and Outreach (Section 3.1, six recommendations),
- Technical and Economic Studies by (or Sponsored by) Federal Agencies (Section 3.2, three recommendations), and
- Agency Leadership, Cooperation and Coordination (Section 3.3, six recommendations).

3.1 Overarching Considerations

In undertaking these recommended strategies and approaches, Federal agencies are also encouraged to be persistently mindful of the following overarching considerations:

1. The Federal government has an obligation to "lead by example" in adopting and utilizing the most current model building codes.
2. Existing Federal programs should be used first (ahead of creating new programs).
3. Federal agencies must proactively engage personnel and program resources whenever and wherever possible, including those from their headquarters and regional offices closest to State and local governments.
4. Sustained interagency collaboration and coordination is necessary to harmonize Federal policy and program requirements related to building

code adoption and implementation, within and between Federal agencies, both pre- and post-disaster.

5. Although outside the scope of the Hurricane Sandy Rebuilding Task Force's Recommendation 25, in addition to promoting the adoption of the most recent building codes, the Federal government should also use its substantial leverage in promoting good land use planning and building code enforcement and compliance practices. These activities should be focused at both the State and local levels and should include both pre- and post-disaster timeframes.

3.2 Recommendations for Building Code Education, Training and Outreach

These recommendations address the need to enhance outreach, training and education to targeted groups about the importance of building code adoption and implementation.

Recommendation 1: Support and assist the process of educating State lawmakers and local elected officials about the importance of building codes, including their adoption and proper implementation.

Description. State and local lawmakers and other elected officials, with limited staff, typically face a wide array of issues and demands from constituents. They are often not personally acquainted with building codes, and how they are developed, maintained and updated. When special interest groups advocate their concerns about the cost of building code compliance, they do not necessarily mention how adoption and enforcement of up-to-date building codes help make buildings and, therefore, communities and residents more resilient to natural and man-made hazards, such as flooding, earthquakes, high winds and fire.

Federal agencies and officials may not be directly involved in the adoption and enforcement of State and local building regulations. However, there are many points of interaction and many opportunities (pre- and post-disaster) for Federal agencies and officials to educate officials about the value of building codes in providing a baseline of safety, as well as benefits in lowering costs for fire and emergency services, reducing insurance rates for citizens, and creating more resilient development offerings for key employers.

As an example of concern, some local jurisdictions have recently rejected building code updates because the organization publishing the codes has the word "international" in its name. The International Code Council is a U.S.

membership association, and the codes they produce are specifically designed and intended for use in the United States, with distinct differences built in to reflect various climate zones and levels of hazard throughout the country. Federal officials should not hesitate to point out the fact that codes from this "international" group are actually American codes, developed by a broad-ranging group of participants from State and local jurisdictions.

Federal agencies should examine their operations to identify potential points of opportunity to educate state and local officials, as well as areas of Federal policy and/or requirements where adoption and enforcement of building, fire and energy codes at the State and local levels not only achieves Federal objectives, but also benefits communities, residents, and development efforts. Emphasizing such benefits to State and local officials can enhance their understanding and support for up-to-date building code adoption and enforcement.

Recommendation 2. **Support the training of building design professionals, building department staff, and construction contractors on the proper use and implementation of building codes and, as appropriate, integrate training with licensing and registration where they are required.**

Description. The adoption of building codes is a first and necessary step to achieving a higher degree of building and community resilience. Adoption alone is not sufficient without significant investment in training. Training is necessary not only for the officials charged with enforcing the building, fire and energy codes, but also for the designers, contractors, tradesmen and laborers who must comply with the codes on a daily basis. While enforcement is important, the system of building code implementation is a cooperative one, with private sector builders, contractors and laborers striving to meet the codes during construction, in order to avoid costly demolition and reconstruction following a failed inspection. The process works best when those in the field understand code requirements and the reasoning for the requirements, and incorporate code-compliance into every step of construction.

Therefore, it is important for Federal agencies to identify opportunities in their interactions with the private sector, as well as with State and local code officials, to include building code training and, as appropriate, certification, in guidance for Federal programs directed toward the construction and home-building sectors.

A useful example of a well-coupled relationship between a Federal requirement and local code use and training is the Occupational Safety and Health Administration (OSHA) requirement that employers demonstrate compliance with the Emergency Exit requirements of the OSHA Sec. 1910. (See Code of Federal Regulations (CFR) Sec.1910.35 [subpart E]). Reference to a specific code section or sections, as a means of compliance, or a recommended "best practice" is also consistent with Office of Management and Budget (OMB) Circular A-119, which recommends agency use of, and reliance on, voluntary private sector standards—which includes the model building codes.

Because Federal agencies already provide significant support for training and education activities aimed at achieving agency goals, training and education related to building codes and standards can easily be incorporated into such activities in a manner consistent with other overarching Federal policies. All building code officials, and most construction industry participants, especially those associated with organized labor, are well aware of building codes, and should welcome additional training opportunities related to achieving code compliance in the field.

Recommendation 3. Support the development and delivery of building code educational content (e.g., hazard science, code purpose, code development process, code use, and code enforcement) at secondary and collegiate educational levels consistent with levels attained by various other related disciplines and groups (e.g., construction trades, engineering, architecture, building science, construction management, public administration, finance, and real estate).

Description. This recommendation covers a broad range of information, but to be effective these recommend activities must also have depth. The potential audience is very diverse. Thus, one targeted effort will not achieve the desired knowledge dissemination. Demands by educators for less prescribed content and by administrators for fewer class hours to meet graduation requirements creates a significant challenge to introduce new courses or new information into existing courses.

Many primary, secondary, college-level, post-graduate and technician training programs and information distribution activities currently exist or are being planned by governmental, association, and industry groups. For example, among these active groups are the American Society of Civil

Engineers, Federal Alliance for Safe Homes, Federal Emergency Management Agency, International Code Council, National Institute of Building Sciences, National Oceanic and Atmospheric Administration, National Science Foundation, United States Geological Survey, and various union apprenticeship training programs. A review of these past and ongoing educational efforts needs to be studied to glean the most successful approaches and avoid the unsuccessful ones.

Two of many possible examples are:

- Illustrate how the impacts of a disaster are multi-disciplinary. Preparedness, financial protection and competent leadership are essential to limit the potential catastrophic economic consequences of a disaster. Competent leaders must understand the scientific, technical, social, and political consequences of disasters and have the management skills and tools to make good decisions in a stressful post-disaster environment. Public officials at all levels of government must be ready to make these decisions with the appropriate input from the experts knowledgeable in the specific disaster and its consequences (and ignore advice from dubious sources). They need a fundamental understanding of disasters—their causes, effects and possible subsequent consequences—to make informed decisions.
- It may be possible to add information modules to the Science Technology, Mathematics and Science (STEM) program that is being successfully promoted in primary and secondary schools. A perspective of the building code development process from research, observations of the built environment (pre- and post-disaster), construction materials development, code changes, construction, inspections and occupancy permits could lead students to a career in a disaster-related field.

Recommendation 4. Develop and conduct tailored briefings and education for Congressional leaders and staff, Federal agency legislative affairs offices, and Federal agency leaders and key staff, on the importance of building codes and Federal support for State and local building code adoption and implementation.

Description. Communication between Federal, State, and local governments is challenging—no matter what the subject of concern. Technical issues that impact all three levels of government present a different challenge than those that involve general policy concerns. As an example, California's major drought has forced all three levels of government to rapidly develop and

implement drastic new polices on how water will be stored, delivered, allocated, and rationed.

Building code adoption and implementation takes time, varies widely among the fifty States, and presents a cost to building owners. States and local governments will most certainly view new codes intended to reduce risk from different perspectives. Many will no doubt make decisions based on the state of their economies.

Strong communication between the Federal Government and State and local governments is more important now than ever. For example, long recurrence intervals between destructive earthquakes have made earthquake mitigation and recovery policies difficult to implement. Federal decision makers are dealing with a multitude of social needs that have to be addressed immediately. Therefore, constant briefings to Congressional leaders are crucial to ensuring continued support for building code development activities.

The education of Congressional leaders and their staffs must be made in ways that are easy to understand, logical, and present solutions that are cost-effective to implement. This has been a difficult task for the natural hazards community, in general, to overcome. Specifically, many decision makers in all three levels of government do not fully understand what building codes really do or how buildings will be impacted by a design level event. An aggressive outreach/education program for the sole purpose of educating Federal decision makers can help to build Federal support for State and local building code adoption and implementation.

Recommendation 5. Work with the real estate, property appraisal, insurance and mortgage banking industries, as well as building owners and managers and other key stakeholders to achieve building valuations that reflect the appropriate benefits of hazard resistance and code-compliance.

Description. Market values of otherwise similar buildings—that are designed and constructed to different levels of hazard resistance and code compliance—generally do not vary. Residential building valuations tend to be based on building size and amenities, with some adjustment for age and condition. Nonresidential building valuations are similar, but take operating expenses into consideration. Explicit adjustments for code compliance and above code characteristics generally are not made, even though a more

hazard-resistant building will sustain less damage and provide for more immediate re-occupancy following a design level event.

Unfortunately, the current market situation does not provide owners, tenants and potential purchasers with information on building code and hazard resistance considerations as part of their decision making. It does not provide lenders complete information about the viability of the buildings in which they are investing; it does not allow insurers and re-insurers to better manage their risk exposure; and it does not allow real estate and appraisal industry professionals to better communicate true building value to clients.

The Federal government should work with these groups to achieve valuations that properly reflect code compliance and hazard resistance. Ultimately, more realistic valuations could affect property purchase/lease and development decisions, facilitating a shift to more resilient communities.

The form of this cooperation is yet to be determined, but could include support of a private building rating system, additional losses avoidance studies, other technical or economic studies, evaluation of appraisal standards, and education.

Recommendation 6. Target education and outreach opportunities during the "windows of opportunity" that arise following disasters and with disaster anniversaries and other calendar dates such as the start of hurricane season.

Description. A broad distribution of disaster scenarios on the anniversary of past disasters that illustrate the anticipated consequences of the next disaster event and how pre-disaster preparation, planning and mitigation actions taken now will be beneficial in the future. Past scenarios have included the development of earthquake loss scenarios for the San Francisco Bay area, Los Angeles, Memphis, Seattle, and other earthquake prone regions of the country as well as the annual earthquake ShakeOut events. Large-scale hurricane and flooding scenarios could be similarly effective for the Atlantic and Gulf coastal regions. The scenario materials need to include code compliant construction upgrade techniques, social disruption consequences, economic losses, and essential service losses. The benefit of construction to current code requirements will be easily demonstrated. Care should be taken to keep the scenarios realistic and reasonable, and avoid sensationalization.

Preparation of guidance on repair techniques, building code improvement proposals, and other beneficial post-disaster actions should be prepared in advance or quickly following a disaster to accelerate community recovery.

Using both lessons learned from a current disaster or from previous disasters could receive quick acceptance and implementation. Human-interest stories and examples of good and bad performance that reinforce the need for strong building code compliance will be beneficial. Lessons from one community surviving a disaster can be effectively transmitted to other communities facing similar potential disasters. This community-to-community exchange needs to be encouraged, supported and enhanced.

Information for distribution on disaster anniversaries or following a disaster event needs to be available in multiple media formats to meet the needs of a broad range of public interests and targeted groups. Emphasis should be placed on the benefits of strong building codes, and the importance of building code adoption and implementation to reduce damage and financial costs and social disruption, and to improve community resilience.

3.3 Recommendations for Technical and Economic Studies by (or Sponsored by) Federal Agencies

The Federal government may be uniquely situated to collect and/or analyze information, assemble nationwide experts, and undertake studies that are beyond the capabilities of most States and localities. These recommendations pertain to such situations.

Recommendation 7. Identify and support the research and development (or update) of technical and socio-economic studies crucial to building code adoption and implementation that may be beyond the resources of most States and localities.

Description. Oftentimes, the most effective policies are based upon strong, practical, and cost-effective studies that can be understood by non-technical decision makers at all levels of government. Some Federal studies intended for use by States and local governments can be so generic that they are basically impractical or unrealistic, lacking socio-economic analyses specific to the regions in which a particular policy or recommendation is to be implemented.

The Federal government should fund region-specific socio-economic studies of hazard-related impacts and benefits of hazard-resilient building code adoption and implementation. Many local governments throughout the United States are still in recession, which can lead to local government opposition to new building codes. Federally supported socio-economic studies need the input of local governments well before the study has begun

in order to ensure their sensitivity to the code issues local governments face every day.

Many local governments cannot afford to fund expensive socio-economic studies on their own. The Federal government should take the lead in helping local governments work together, within regions of economic similarities, and propose code changes that are realistic and implementable. Many local governments do not have building departments or are seriously understaffed. Therefore, they would benefit greatly by participating in a Federally-led study partnership.

Recommendation 8. Develop code-compliant, engineered and performance-based solutions to fill knowledge gaps in the building design industry, construction trades and building code implementation.

Description. There are many needs for simple and easy to implement solutions to the complex problems of code-compliant construction. The *Tech Brief* series developed by the Applied Technology Council (ATC) for the National Institute of Standards and Technology (NIST) illustrates proper application of selected seismic design provisions for new construction and is one example of how knowledge gaps in the building design industry can be addressed. This *Tech Brief* series was driven by the need to transfer new and detailed technical knowledge that simply was not available when the vast majority of today's building designers were educated and trained. Another pertinent example is the recent FEMA Recovery Advisories on both masonry chimney and cripple wall repair strategies based on observed damage during the 2014 South Napa, California earthquake.

The existence of these solutions is extremely critical during post-disaster recovery when building owners are quickly engaging contractors to make repairs. There is an important post-disaster opportunity to rebuild to a higher standard to mitigate losses from a similar event in the future. During many recovery periods from previous natural disasters, there was a relaxation of the rules for acquiring building permits and submitting plans for review. The desire of building owners to quickly repair the damage to avoid collateral losses and a quick return to normalcy was the driving force for such relaxations. Quickly providing "how-to" information to building owners following a disaster should illustrate the benefits of rebuilding to a higher standard. Some insurance policies may only cover costs to rebuild "as is", but with reasonable encouragement, and, perhaps, grant funding, building owners may be receptive to utilize better construction techniques and materials as long as they can proceed with rebuilding in a timely manner.

Recommendation 9. Assess the status of prior building code recommendations made by Federal agencies, whether these recommendations were incorporated into the model codes and standards, and what lessons can be gleaned to improve the adoption of future agency recommendations.

Description. Federal agencies play an active role in the development of building codes. Research on key technical issues revealed by assessment of performance in various disasters has been conducted or supported by many agencies. Examples range from the response to the 1964 Great Alaska earthquake and the 1971 San Fernando Valley, California, earthquake to the present. The combination of the 1964 and the 1971 earthquakes, especially the latter, led to the Earthquake Hazards Reduction Act of 1977 and the establishment of the National Earthquake Hazards Reduction Program (NEHRP). More recently the 9/11 attacks and Hurricane Katrina have raised the nation's consciousness about resiliency. Research programs often have an objective aimed at improvement in building codes and practices, and the conducting or sponsoring agencies then frequently advocate in various arenas for adoption of new provisions into the model building codes and standards.

There are many success stories. For example, the ATC-3 project to develop tentative provisions for the development of seismic regulations for buildings, which was supported by the National Science Foundation (NSF) and the then National Bureau of Standards (now NIST) in the 1970s, followed by FEMA's support of the Building Seismic Safety Council (BSSC), eventually lead to major improvements in the seismic provisions of building codes. Findings from FEMA's Mitigation Assessment Team (MAT) reports on several recent tornado disasters led to a change in the 2015 IBC that now requires tornado safe rooms for all new schools and emergency response centers located in high-wind areas. The current NIST effort to improve the windspeed maps appears to be another substantial success.

There are examples where agency recommendations were not fully successful, such as the recommendations from NIST following their studies of the World Trade Center collapse. There are undoubtedly instances where agencies studied an issue and decided against actively recommending changes. These past activities should be summarized and distilled so that the lessons learned can be shared among agencies. It is not envisioned that the result would be a "best practices" document, but it could approach that level of standing.

3.4 Recommendations for Agency Leadership, Cooperation and Coordination

Federal agencies have different missions and authorities, and some have different requirements for similar activities. Federal agencies may interact with each other and outside groups in different ways, both pre- and post-disaster. These recommendations address how Federal agencies can enhance leadership and interagency coordination and collaboration to assist in the building code development process, improve the hazard resistance of structures built to those codes, and promote building code adoption and implementation.

Recommendation 10. Support the development of technical guidelines, pre-standards and consensus standards that can be incorporated into or adopted by reference by the model building codes.

Description. Some improvements in building codes emanating from a Federal agency are remarkably brief, direct, and effective, such as the development and implementation of requirements for the use of smoke detectors. Others involve complex engineering procedures, such as the provisions for design of seismic-resistant new buildings and methods for identification and retrofitting of seismically hazardous buildings.

The complex engineering procedures are generally not introduced directly into the text of model building codes. Instead they form the basis of technical design guidance publications that then become pre-standards. From there, they eventually find their way into accredited consensus standards, which are then directly referenced by model building codes.

Most such standards are developed and maintained by organizations that are not capable of developing substantial new provisions without assistance, and the evolution of such provisions from a research finding to a state of vetting suitable for implementation in law is a process that requires careful planning, management, and support. There are several examples where agencies have successfully nurtured substantial improvements in standards that are now cited directly by a model building code. Three particularly pertinent ones are:

- The provisions for seismic design of new buildings cited in Recommendation 9 started as a technology transfer project (ATC-3) in the 1970s, that then evolved into a pre-standard as FEMA supported further development at BSSC. Portions were directly inserted into model codes in the 1990s, and eventually the material evolved into the seismic

provisions of the standard, ASCE 7, *Minimum Design Loads for Buildings and Other Structures*.

- Flood-resistant design and construction went through several stages of development before being standardized in ASCE Standard 24, *Flood Resistant Design and Construction*
- Provisions for seismic retrofitting of hazardous existing buildings have gone through several generations of development. The current standard, ASCE 41, *Seismic Rehabilitation of Existing Buildings*, is referenced directly by the *International Existing Building Code*. Its first edition was preceded by a pre-standard, FEMA 356, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, developed by ASCE with support from FEMA. That pre-standard was preceded by a technology development and transfer report, FEMA 273, *NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, developed by ATC, BSSC, and ASCE with support from FEMA. That effort depended upon earlier projects supported by NSF, FEMA, USGS, and others.

The important point is that complex issues often require complex solutions. Guidance and assistance from Federal agencies is oftentimes the key element in achieving substantial improvements in building codes and the standards upon which they rely.

Recommendation 11. Develop a Federal "one-stop location" for States and localities to access information on grant programs and funding that may be available for building code adoption and implementation.

Description. Federal grant programs related to building codes are complex. Specific policies and requirements can be difficult to understand and reconcile for State and local entities, in both pre-disaster and post-disaster periods. Grant program requirements can be further complicated by regulatory requirements.

A one-stop location containing all grant information, including related policies and requirements, would support the effort of States and localities to adopt and implement building codes. The present difficulty in identifying and understanding all code-related requirements may contribute to potential applicants not completing applications, not adopting building codes (or at least not adopting more recent editions), and not taking advantage of post-disaster opportunities to utilize recent building codes during reconstruction.

Federal agencies should work together to identify and compare all code-related requirements of various grant programs. This comparison could be

useful to Federal agencies as well, by helping to discover code-related overlaps, omissions and conflicts between grant programs.

Recommendation 12. Review and revise, as appropriate, Federal agency policies, programs, practices and terminology, to facilitate State and local building code adoption and implementation, both pre-disaster and post-disaster.

Description. Federal agency policies, programs, and practices must be revised continually to reflect economic and societal conditions at the local government level. Local and State government decision makers are familiar with the existence of pre-disaster code provisions. However, they are not as familiar with post-disaster code provisions that are intended to save lives, reduce damage, and speed recovery.

The Federal government could provide more assistance by working closely with local governments to quickly take advantage of the "window of opportunity" immediately following a major earthquake and help revise codes and policies based on lessons learned. Providing a pre-defined mechanism/assistance for local and State governments to rapidly provide recommendations to the Federal decision makers would ultimately lead to a quicker means for incorporating "real world" experience into Federal programs and policies than what currently exists.

Improved cooperation and coordination between all levels of government should be established, implemented, and allowed to evolve through a "living" partnership. The Federal government should fund these partnerships and allow the local and State governments to take the lead in developing recommendations to modify Federal policies and programs. This arrangement will establish more trust and can only lead to improved working relationships for all who participate in the partnerships.

Recommendation 13. Consider modifications to the regulations governing the application of Federal Disaster Assistance Programs, including Public Assistance (PA), Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP), to promote State and local building code adoption and implementation. This should include both pre- and post-disaster actions and for both new and existing facilities.

Description. The Stafford Act and the subsequent Code of Federal Regulations (44 CFR 206) provide the authorization and implementing regulations for federal disaster assistance to States, local communities and individuals to aide in their recovery. FEMA develops policies for their interpretation of these laws for review and use by applicants in meeting the criteria before and after a disaster occurrence. In determining the eligibility for federal disaster assistance, the appropriate Federal agency reviews the documentation provided by the applicant. The request for federal disaster assistance must be in accordance with these laws and agency policies. There are several actions that agencies can take to promote the adoption and implementation of minimum standards as defined in 44 CFR Chapter I - Subpart M – Minimum Standards (10-1-02 Edition).

Two of these modifications could be:

- Insert a new requirement into the requirements for the Standard State Mitigation Plan (44 CFR Part 201.4 as modified on April 25, 2014 [79 FR 22883]) that this plan must include the establishment of a time line for the adoption, implementation and enforcement of current minimum Standards as defined in 44 CFR 206.226(d). The absence of this requirement in the Standard State Mitigation Plan would make it unacceptable. Without an accepted Plan the State (and by inference local and private non-profit applicants) would be ineligible for Stafford Act Section 404 Hazard Mitigation federal support and Stafford Act Section 406 disaster recovery and mitigation federal funds [44 CFR 206.226(b)]. If new proposed legislation for Stafford Act 2.0 goes forward, this requirement could be included in the revised Stafford Act.
- Increase the HMGP 5-percent Initiative to allow use of more than five percent of the available HMGP funds on building code adoption and implementation. The associated codes and standards need not be specific to the type of disaster generating these funds, but must be associated with mitigation elements identified in the approved Standard State Mitigation Plan.

Recommendation 14. Promote the development of a market-based, private sector-led grading system for the hazard-related performance of buildings.

Description. In recent decades, remarkable achievements have been made in improving the sustainability and efficiency of the built environment through voluntary and market-driven benchmarking and certification programs, like the Leadership in Energy & Environmental Design (LEED) green building certification program and the ENERGY STAR voluntary energy efficiency

rating system (van der Heijden, 2014). Such programs are predominantly developed by non-governmental organizations, but the Federal government can help fund the program development, incentivize the desired market take-up or use of the program, or even become a major customer of the program. Such has been the case with the General Services Administration (GSA) review of the green building rating systems, as required by the Energy and Independence and Security Act of 2007, and its formal recommendation of the LEED program for use by Federal agencies.

There are similar opportunities for Federal agencies to help fund, incentivize or utilize voluntary and market-driven programs that rate the hazard-related performance of buildings. For example, the U.S. Resiliency Council (USRC) is working with the City of Los Angeles to develop and implement a seismic resilience rating system for existing buildings, and FEMA has provided technical assistance funding for this effort. Also, FEMA recently published *Simplified Seismic Assessment of Detached Single Family, Wood-Frame Dwellings* (FEMA P-50) based upon work done by ATC for the City of Los Angeles following the 1994 Northridge earthquake. Federal agencies should specifically consider strategies for helping to foster and promote a stronger marketplace for hazard-related building performance, code adoption and implementation and engaging the key industries, such as commercial real estate brokers, insurance and financial mortgage industries, in the efforts.

Recommendation 15. Use existing Federal programs and technical assistance to improve State and local planning capacity for disaster recovery and resilience, including consideration for building code adoption and implementation.

Description. There are a number of Federal agency programs and initiatives that engage with State and local governments in planning for disaster recovery and resilience, both pre- and post-disaster. Some even provide for direct technical assistance to State and local governments for planning-related efforts, including post-disaster recovery, hazard mitigation, and disaster preparedness. It is recommended that Federal agencies identify and implement specific strategies that fit within these programs and initiatives and help to strengthen State and local enforcement mechanisms for land-use planning and building code adoption and implementation, which can reduce vulnerability to future disasters. This may include developing strategies to: support State and local community land-use planning and pre-disaster hazard mitigation and recovery planning processes that identify and implement resilient building codes; and, augmenting building code or land-use planning knowledge gaps or capacity in States and localities affected by disasters.

Some specific agencies and opportunities exist with:

- FEMA in its role as Federal coordinating agency for advance recovery planning and post-disaster activities defined in the Community Planning and Capacity Building (CPCB) Recovery Support Function (RSF) of the National Disaster Recovery Framework (FEMA, 2011).
- DHS/FEMA's Urban Area Security Initiative (UASI) program, which provides funding to address the unique risk driven and capabilities-based planning, organization, equipment, training, and exercise needs of high-threat, high-density urban areas.
- HUD in its National Disaster Resilience Competition as well as in the action planning and program approval required as part of the Congressionally-approved Community Development Block Grant – Disaster Recovery (CDBG-DR) funding provided to eligible States and localities following major disasters.

Chapter 4

Priorities

The Project Technical Committee has used the voting on priority and effectiveness of the draft recommendations considered at the Second Workshop as well as the written comments submitted by Workshop participants, to develop a prioritization of the 15 recommended strategies and approaches listed in Chapter 3. The prioritization is divided into three categories:

- Federal Recommendations: Recommendations that can only be implemented by and between Federal agencies.
- Most Important Recommendations Involving Non-Federal Stakeholders: The most important recommendations that will involve other stakeholders, and may or may not involve Federal agencies.
- Important Recommendations Involving Non-Federal Stakeholders: Other important recommendations that will involve other stakeholders, and may or may not involve Federal agencies.

Recommendations have been listed in order of priority within each of the three categories mentioned above. For easy reference, the numbering of recommendations in Chapter 3 is maintained in this chapter as well.

4.1 Federal Recommendations

These recommendations should be undertaken by Federal agencies. The success of other non-Federal stakeholder recommendations likely will depend on implementation of these Federal recommendations.

Recommendation 13. Consider modifications to the regulations governing the application of Federal Disaster Assistance Programs, including Public Assistance (PA), Individual Assistance (IA) and the Hazard Mitigation Grant Program (HMGP), to promote State and local building code adoption and implementation. This should include both pre- and post-disaster actions and for both new and existing facilities.

Recommendation 12. Review and revise, as appropriate, Federal agency policies, programs, practices and terminology, to facilitate State and local building code adoption and implementation, both pre-disaster and post-disaster.

Recommendation 4. Develop and conduct tailored briefings and education for Congressional leaders and staff, Federal agency legislative affairs offices, and Federal agency leaders and key staff, on the importance of building codes and Federal support for State and local building code adoption and implementation.

Recommendation 11. Develop a Federal "one-stop location" for States and localities to access information on grant programs and funding that may be available for building code adoption and implementation.

4.2 Most Important Recommendations Involving Non-Federal Stakeholders

These recommendations involve other stakeholders and may or may not involve Federal agencies. Sorting and ranking the voting results from the Second Workshop, the Project Technical Committee identified the following recommendations as most important to implement, giving emphasis to the workshop evaluations of priority and effectiveness.

Recommendation 5. Work with the real estate, property appraisal, insurance and mortgage banking industries, as well as building owners and managers and other key stakeholders to achieve building valuations that reflect the appropriate benefits of hazard resistance and code-compliance.

Recommendation 1. Support and assist the process of educating State lawmakers and local elected officials about the importance of building codes, including their adoption and proper implementation.

Recommendation 7. Identify and support the research and development (or update) of technical and socio-economic studies crucial to building code adoption and implementation that may be beyond the resources of most States and localities.

Recommendation 2. Support the training of building design professionals, building department staff, and construction contractors on the proper use and implementation of building codes and, as appropriate, integrate training with licensing and registration where they are required.

4.3 Important Recommendations Involving Non-Federal Stakeholders

These recommendations involve other stakeholders and may or may not involve Federal agencies. Sorting and ranking the voting results from the Second Workshop, the Project Technical Committee identified the following

recommendations as important to implement, giving emphasis to the workshop evaluations of priority and effectiveness.

Recommendation 10. Support the development of technical guidelines, pre-standards and consensus standards that can be incorporated into and adopted by reference by the model building codes.

Recommendation 15. Use existing Federal programs and technical assistance to improve State and local planning capacity for disaster recovery and resilience, including consideration for building code adoption and implementation.

Recommendation 6. Target education and outreach opportunities during the "windows of opportunity" that arise following disasters and with disaster anniversaries and other calendar dates such as the start of hurricane season.

Recommendation 3. Support the development and delivery of building code educational content (i.e., hazard science, code purpose, code development process, code use, and code enforcement) at secondary and collegiate educational levels consistent with levels attained by various other related disciplines and groups (i.e., construction trades, engineering, architecture, building science, construction management, public administration, finance, and real estate).

Recommendation 8. Develop code-compliant, engineered and performance-based solutions to fill knowledge gaps in the building design industry, construction trades and building code implementation.

Recommendation 9. Assess the status of prior building code recommendations made by Federal agencies, whether these recommendations were incorporated into the model codes and standards, and what lessons can be gleaned to improve the adoption of future agency recommendations.

Recommendation 14. Promote the development of a market-based, private sector-led grading system for the hazard-related performance of buildings.

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