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NIST NCSTAR 3 Technical Report on the May 22, 2011 Tornado in Joplin, Missouri

COMMENTS OF:
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The International Code Council (ICC) is a membership association dedicated to building safety, fire prevention, and energy efficiency. The International Codes, or I-Codes, published by ICC, provide minimum safeguards for people at home, at school and in the workplace. Building codes benefit public safety and support the industry's need for one set of codes without regional limitations.

Fifty states and the District of Columbia have adopted the I-Codes at the state or jurisdictional level. Federal agencies including the Architect of the Capitol, General Services Administration, National Park Service, Department of State, U.S. Forest Service and the Veterans Administration also enforce the I-Codes for the facilities that they own or manage. The Department of Defense references the International Building Code for constructing military facilities, including those that house U.S. troops, domestically and abroad.

ICC was established in 1994 as a non-profit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The founders of the ICC are Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International, Inc. (SBCCI). Since the early part of the last century, these non-profit organizations developed three separate sets of model codes used throughout the United States. Although regional code development was effective and responsive to our country's needs, the time came for a single set of codes. The nation's three model code groups responded by creating the International Code Council and by developing codes without regional limitations; the International Codes.

The International Code Council (ICC) offers the following comments on the NIST NCSTAR 3 (Draft) Technical Report on the May 22, 2011 Tornado in Joplin, Missouri.

The International Code Council (ICC) appreciates the comprehensive and highly professional report on the Joplin Tornado, representing over 2 years of work by NIST professionals and other technical experts. The report explains and provides useful scientific data on the tornado event, the warnings that preceded and accompanied

the tornado, and an analysis of how various systems performed during the event. As the developer of model building codes that are widely adopted by most U.S state and local jurisdictions that adopt building codes to govern minimum standards of construction, ICC is concerned with how buildings, both commercial and residential, performed, and in many cases failed, during the tornado, and looks forward to working with NIST and other experts in the area of construction and standards to make sure that the information and recommendations developed by NIST can find their way into the model building safety codes that ICC publishes, and far more importantly, into the actual adopted building codes enforced in jurisdictions at risk from tornados and other high wind events.

Perhaps the most important lines in the report are the ones found just before NIST outlined the individual recommendations. It is a recommendation aimed squarely at state and local governments that ICC serves with its model codes: "NIST strongly urges State and local authorities having jurisdiction to adopt and enforce model building codes and standards. Enforcement is critical to ensuring expected levels of safety. Following good building practices also is critical to achieving better performance of structures during extreme events like tornadoes."

We note that of the 16 recommendations, NIST has listed ICC as an interested party on 10 of the 16 recommendations, and as the suggested lead, or co-lead, on 4 of the recommendations. We do agree that ICC should serve as the lead organization to move implementation of the recommendations forward on three of the recommendations: number 7, (model building codes for areas of refuge, storm shelters and requirements for shelter in certain building types); recommendation 10 (aggregate roofing materials); and recommendation 11 (strengthening building egress systems).

Regarding recommendation 7(a) that is already the requirement in the 2012 International Building Code (IBC) (Sec. 423) and 2012 International Residential Code (IRC) (Sec. 323)

Regarding recommendation 7(c), **t**he next version of the ICC International Building Code, the 2015 edition, to be published in 2014, has already been amended to include requirements for storm shelters meeting the ICC 500 standard in the categories recommended in recommendation 7(c). Code change G94 requires that a storm shelter be incorporated into new buildings with a Group E occupancy, with occupant load of 50 or more, such as day care facilities and churches. Code Change G95 requires that emergency operations centers, fire, rescue, ambulance and police stations shall have a storm shelter in accordance with ICC 500.

Regarding recommendation 13, for a clear and accurate national emergency communication standard to provide advance and current warnings, ICC believes it is more appropriate for NFPA to take the lead, and we have so informed NFPA leadership.

For recommendations where ICC is designated as lead, ICC will assign the development of specific code change proposals for their 2018 editions of the IBC and IRC to the appropriate membership committees created for this purpose (Codes and Technology Committee [CTC] or Building Code Action Committee [BCAC]).

All code change proposals for the model I-Codes are developed, vetted and ultimately approved through the CC Governmental Consensus Process, and all such proposals must be made by members of ICC, other interested parties, or by the public. It should be understood that ICC staff is prohibited by ICC policies from making any code change proposals, or taking any position on proposals, to modify the codes developed by ICC.

The I-Codes and the Process

Municipalities and states across America adopt and implement, and countries around the world adapt and use the International Codes® (I-Codes®). The I-Codes are the first and only set of coordinated, consistent, and comprehensive construction, fire, and energy codes.

Developed by the International Code Council® (ICC®) through the governmental consensus process, this single set of codes offers substantial advantages to all building professionals and the public.

Code officials, architects, engineers, designers, and contractors can work with a consistent set of requirements throughout the United States. Manufacturers can put their efforts into research and development rather than designing to different sets of standards and can focus on being more competitive in worldwide markets. Uniform education and certification programs can be used internationally. The code development process is key in gaining the trust and confidence of the global building and construction industry. This consensus process through which ICC develops and maintains the comprehensive and balanced codes is designed to protect the health, safety, and welfare of people around the world as well as protect our planet by encouraging sustainability, water, and energy conservation. Finally, the ICC process allows all jurisdictions, regardless of size, to benefit from the expertise of thousands of professionals in the development of the model codes, available for local adoption. The cost to include this expertise and manage this process would be prohibitive for any single jurisdiction.

Preliminary to our comments on individual recommendations, we believe it is useful to describe the process used by ICC in the development of our model codes.

Similar to the development of laws, the ICC code development follows a governmental consensus process that includes open forums of debate and refinement. It is an open, inclusive, and balanced consensus process with built-in safeguards designed to prevent domination by a single vested interest. The system ensures fairness in the process, controls against conflicts of interest, and prevents vested economic interests from determining the outcome of all code change proposals. This system of code development has provided the citizens of the U.S. the highest level of building safety in the world for more than 80 years. The ICC governmental consensus process meets the principles defined by the U.S. Standards Strategy of 2005; the OMB Circular A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities (1998), codified by Public Law 104-113, National Technology Transfer and Advancement Act of 1995. The key mechanisms that govern the ICC governmental consensus process include:

Open Public Forums

- All forums are open to the public at no cost
- Anyone can submit a code change proposal and testify at the hearings
- All views are considered by the code committees prior to a vote

Decision Transparency

- All testimony and committee recommendations are made in open public hearings
- All final code change proposal decisions are made by public safety officials in an open hearing

Representation of Interests

- Wide-ranging representation
- Full disclosure of conflicts of interest
- One-third of the committee's members must be governmental members with no financial vested interests
- Membership on a committee is not conditional on membership in ICC

Due Process

• Equal opportunities for rebuttal
• Committees consider all views, objections, and the cost impact of all code change proposals
• All who attend can testify

Appeals Process
• Open appeal process
• Appeals considered per due process

Majority Consensus

A simple majority from the committee decides the initial action of the proposed code change
ICC assembly action allows members to challenge the action of the committee
All final code change proposal decisions are made by public safety officials

Every ICC Code Development Committee is comprised of people who have specific knowledge and competence in the fields under discussion. They may include:
• Building, plumbing, electrical, mechanical, fire, energy officials
• Design professionals/consultants
• Trade association representatives
• Builders/contractors
• Manufacturers/suppliers
• Government agency representatives
• Any qualified individual with a vested interest

A minimum of 33.3% of a committee's members are required to be regulators who are experts in their fields. The final determination of code provisions is primarily in the hands of public safety officials who hold a public trust, have no vested interest, and can legitimately represent the public interest

Here is our initial summary of the recommendations that are related to ICC's role and competence.

Recommendation 3—

NIST recommends that tornado hazard maps for use in the engineering design of buildings and infrastructure be developed considering spatially based estimates of the tornado hazard instead of point– based estimates.
ICC involvement: Existing standard ICC 500 contains a map at Figure 304.2(1) showing four zones of wind speeds for tornado shelter design. This map should be a starting point for the recommendation in the report. This hazard map could be incorporated into the IBC and IRC as are other hurricane wind maps; snow maps, etc.
Possible assignment to CTC or Building-CAC

Recommendation 5—

NIST recommends that nationally accepted performance–based standards for the tornado–resistant design of buildings and infrastructure be developed in model codes and adopted in local regulations to ensure the resiliency of communities to tornado hazards. The standards should encompass tornado hazard characterization, performance objectives, and evaluation tools. The standards shall require that critical buildings and infrastructure such as hospitals and emergency operations centers are designed so as to remain operational in the event of a tornado.
ASCE designated as lead. It may well be advisable for ASCE to propose any standards developed be referenced as recommended standards in the I-codes.

Recommendation 6—

NIST recommends the development of risk–consistent, performance–based tornado design methodologies to ensure that all building components and systems meet the same performance objectives when subjected to tornado hazards.
NIST/FEMA designated as lead. It may well be advisable for NIST/FEMA to propose any standards developed be referenced as recommended standards within the appropriate I-codes.

Recommendation 7—

NIST recommends that: (a) model building codes for new buildings require that tornado shelters be designed in accordance with the ICC 500 standard; (b) model building codes develop and adopt a tornado shelter standard specific for existing buildings; and (c) tornado shelters be installed in new and existing multi–family residential buildings, mercantile buildings, schools and buildings with assembly occupancies located in tornado hazard areas identified in the performance–based standards required by Recommendation 5.

ICC designated as lead. Regarding recommendation 7(a) that is already the requirement in the 2012 IBC (Sec. 423) and 2012 IRC (Sec. 323)

Regarding recommendation 7(c), **t**he next version of the ICC International Building Code, the 2015 edition, to be published in 2014, has already been amended to include requirements for storm shelters meeting the ICC 500 standard in the categories recommended in recommendation 7(c). Code change G94 requires that a storm shelter be incorporated into new buildings with a Group E occupancy, with occupant load of 50 or more, such as day care facilities and churches. Code Change G95 requires that emergency operations centers, fire, rescue, ambulance and police stations shall have a storm shelter in accordance with ICC 500. Possible assignment to CTC or Building-CAC.

Recommendation 8—

NIST recommends the development and implementation of uniform national guidelines that enable communities to create the safest and most effective public sheltering strategies. The guidelines should address planning for, siting, designing, installing, and operating public tornado shelters within the community.
This is a recommendation best addressed by other national organizations representing elected officials; city and county managers, emergency managers and fire chiefs. The organizations should consider referencing the I-Codes as resources for jurisdictional use.

Recommendation 9—

NIST recommends that uniform guidelines be developed and implemented nationwide for conducting tornado risk assessments and designating best available tornado refuge areas as an interim measure within buildings until permanent measures fully consistent with Recommendations 5 and 7 are implemented.
This is a recommendation best addressed by other national organizations representing elected officials; city and county managers, emergency managers and fire chiefs. The organizations should consider referencing the I-Codes as resources for jurisdictional use.

Recommendation 10—

NIST recommends that aggregate, gravel, or stone be prohibited as roof surfacing material or roof ballast for buildings of any height in tornado–prone areas.
ICC designated as lead. Similar requirements already exist in 2012 IBC Sec. 1504.8 2012, prohibiting use of aggregate in hurricane–prone regions as designated in IBC Sec. 202. Possible assignment to Code Technology Committee (CTC) or Building-Code Action Committee (CAC).

Recommendation 11—

NIST recommends that enclosures of egress systems (elevators, exits) in critical facilities in tornado– prone areas be designed to maintain their functional integrity when subjected to tornado hazards.
ICC designated as lead. Possible assignment to CTC or Building-CAC.

Recommendation 12—

NIST recommends that owners and operators of existing critical facilities in tornado–prone areas perform tornado vulnerability assessments and take steps to ensure the functionality of (1) backup power supplies (harden the protection of emergency backup power, as region–wide losses of power due to damage to power transmission infrastructure occur frequently in tornadoes), (2) vertical movement within the building (elevator equipment and shaft enclosures), and (3) means of egress illumination (battery– powered lighting in addition to backup power), in a tornado event.
This is a recommendation best addressed by other national organizations representing building owners, managers or real estate (i.e. BOMA). Organizations are encouraged to reference I-code provisions to avoid duplication and conflicting requirements, where appropriate.

Recommendation 13—

NIST recommends the development of national codes and standards and uniform guidance for clear, consistent, and accurate emergency communications, encompassing alerts and warnings, to ensure safe, effective, and timely responses among individuals, organizations, and communities in the path of storms having the potential to create tornadoes.

NIST also recommends that emergency managers, the NWS, and the media develop a joint plan and take steps to ensure that accurate and consistent emergency alert and warning information is communicated in a timely manner to enhance the situational awareness of community residents, visitors, and emergency responders affected by an event.
ICC and NFPA designated as lead. We believe this is an error, and that NFPA should be the designated lead. This is a recommendation appropriately addressed by FEMA in cooperation with other national organizations representing emergency managers and fire chiefs

Recommendation 14—

NIST recommends that the full range of current and next–generation emergency communication "push" technologies (e.g., GPS–based mobile alerts and warnings, reverse 9–1–1, outdoor siren systems with voice communication, NOAA weather radios) be widely deployed and utilized, to maximize each individual's opportunity to receive emergency information and respond safely, effectively, and in a timely fashion.
This is a recommendation best addressed by FEMA in cooperation with other national organizations representing emergency managers and fire chiefs

Recommendation 15—

NIST recommends research to identify the factors that will significantly enhance public perception of personal risk and how such knowledge can be better used to rapidly and effectively respond during tornadic events.
This is a recommendation best addressed by FEMA in cooperation with other national organizations representing emergency managers and fire chiefs
This could be incorporated into messaging ICC distributes for Building Safety Month