

National Construction Safety Team (NCST) Advisory Committee Report to Congress

Advisory Committee Members

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Biographical information is available at

www.nist.gov/el/disasterstudies/ncst/ncstac_members.cfm

Introduction

The first meeting of this Advisory Committee in several years was held in Gaithersburg, MD on November 7, 2011. All members are new to the Committee, and much of the one-day meeting was devoted to informing the members of the organization and current activities of the NCST program.

Eric Letvin, Director of the Disaster and Failure Studies Program at the National Institute of Standards and Technology (NIST), welcomed the members to the NCST Advisory Committee meeting. Jeffrey Harrington, Senior Counsel in the Ethics Law and Programs Division of the U.S. Department of Commerce, briefed members on ethics rules for Special Government Employees. After introductions, the Chair reviewed the charge to the Committee, as set forth in the Committee charter (www.nist.gov/el/disasterstudies/ncst/ncst_charter.cfm). Shyam Sunder, Director, NIST Engineering Laboratory, discussed the work of the previous Committee, which was convened in 2002 to advise NIST and the NCST on the development of the World Trade Center (WTC) report. Another NCST was convened to investigate the Station Night Club fire in Rhode Island. Since the completion of these two reports in 2008, the Committee has been dormant.

In response to a request from the Chair, Sunder provided his thoughts on the most important questions to be answered by the Committee:

1. Does NIST have the correct go, no-go decision criteria in place for launching NCST studies?
2. Is the study of the Joplin, Missouri tornado proceeding as it should?

3. Is the NIST approach for implementing and executing NCST studies appropriate?
4. How can NIST improve its processes for the archiving and dissemination of data?

Patrick Gallagher, Under Secretary of Commerce for Standards and Technology and Director of NIST, also welcomed the members. He discussed the decision to reinstate the Advisory Committee and reviewed the Committee's charge. Dr. Gallagher noted the charge to the present Committee is to assist NIST in determining how to design and run the Program. Committee members were urged to bear in mind that NIST is fundamentally a science-based organization whose investigations should provide the scientific information required to improve codes and standards.

The major topics of discussion were:

- Procedures for determining when to initiate a NIST investigation
- Procedures for deploying a NIST investigation team
- The initiation of a project to create a data repository
- The investigation of the Joplin, MO tornado

Background

In October 2002, the President signed into law the National Construction Safety Team Act (P.L. 107-231) which authorized the Director of NIST to establish National Construction Safety Teams for deployment after natural and man-made events that cause the failure of a building or building systems and result in substantial loss of life or that pose significant potential for substantial loss of life.

The purpose of these investigations is to improve the safety and structural integrity of buildings in the United States. Infrastructure is included in the pending NCST Act reauthorization S.646, which is interpreted as authorizing the NCST to investigate the performance of lifelines in the context of structural integrity and community resilience following a disaster. An investigation team shall:

- Establish the likely technical cause or causes of the building failure;
- Evaluate the technical aspects of evacuation and emergency response procedures;
- Recommend, as necessary, specific improvements to building standards, codes and practices based on the findings; and,
- Recommend any research and other appropriate actions needed to improve the structural safety of buildings and improve the evacuation and emergency response procedures, based on the findings and recommendations of the investigation.

This report summarizes NIST activities under the NCST Act for FY 2011 and the Committee's evaluation and recommendations regarding those activities.

NIST Activities in 2011 under the NCST Act

1. Investigation Conducted in 2011

An EF-5 (enhanced Fujita scale) tornado touched down in Joplin, MO at 5:34 p.m. Central Daylight Time on May 22, 2011. Approximately 8000 structures (30% of the city) were damaged or destroyed. There were 162 fatalities and more than 1000 injuries.

A four-person preliminary NIST reconnaissance team was deployed on the afternoon of May 24, returning May 28. Information and data were collected on the tornado hazard; the patterns, locations and causes of fatalities and injuries; the warning system, evacuation, emergency response and occupant behavior; responses of buildings, shelters and safe areas; and damage to lifelines. Based on results of the preliminary reconnaissance, a Team was established under the NCST Act on June 29, 2011 and the Team was augmented to include a representative from the National Oceanic and Atmospheric Administration.

NIST staff members who participated in the ongoing investigation briefed the NCST Advisory Committee (“Panel”) on the study plan, including objectives, approach, and implementation. They also made technical presentations on the Tornado Hazard Characteristics; Emergency Communications and Public Response; and Performance of Buildings, Designated Safe Areas, and Lifelines.

2. Other Actions Taken to Improve Building Safety

None

NIST Activities in 2011 under Other Authorities

1. Sofa Super Store Fire, Charleston, SC—A fire started near a loading dock and then spread into the drop ceiling area of a large showroom. A fast fire trapped and killed nine Charleston firefighters. A report, *NIST SP-1118, Vol. 1* “Technical Study of the Sofa Super Store Fire-South Carolina, June 18, 2007” was published. NIST briefed the Charleston community and other organizations such as the International Code Council (ICC) Code Technology Committee, National Fire Protection Association (NFPA), US Fire Administration, Society of Fire Protection Engineers (SFPE), International Association of Fire Fighters (IAFF), and Door and Access Systems Manufacturers Association (DASMA) on the findings and recommendations of the study. The International Fire Code Committee (IFCC) is considering a proposal to change the furniture store Use and Occupancy Classification to High Hazard.
2. Collapse of Dallas Cowboys Indoor Practice Facility, May 2, 2009—A fabric-covered steel-framed building of common design collapsed under conditions of below-design

wind speeds. NIST briefed the ICC Code Technology Committee on the findings and recommendation of the study. NIST has prepared a draft code change proposal for consideration and implementation in the International Building Code (IBC), which will be submitted in the upcoming code cycle.

3. Amarillo Wildland-Urban Interface (WUI) Fires, March, 2011—Communities were impacted by wildland fires. NIST briefed Texas Forest Service, US Forest Service and American Society for Testing and Materials on the findings and recommendations of the preliminary reconnaissance report. The NIST WUI data collection methodology was adopted by the US Forest Service Region 8 (Southern US), by the National State Foresters Association and Texas Forest Service. A draft exposure scale for WUI fires was completed.
4. Mineral, Virginia Earthquake, August 2011—NIST/National Earthquake Hazards Reduction Program (NEHRP) staff traveled to Mineral, VA to investigate damage at the Louisa County High School and at one elementary school. Significant nonstructural damage was found as well as damage to unreinforced masonry (URM) construction in both schools. URM construction, which is widespread in the eastern two-thirds of the US and is the subject and is of concern. NIST/NEHRP is developing research options for providing mitigation guidance to practitioners and policy makers for this kind of construction.
5. International Earthquake Reconnaissance and Damage Assessments—NIST/NEHRP staff members investigated earthquake damage as review team members in Chile (Earthquake Engineering Research Institute (EERI) team and American Society of Civil Engineers (ASCE) team); New Zealand (ASCE team); and Japan (United States-Japan Cooperative Program in Natural Resources (UJNR) team).

Development of NCST Infrastructure

1. Data Repository

The Committee received a briefing on the Disaster and Failure Events Data Repository, a crosscutting program, which will serve as a national archival database where NIST and other organizations can store data collected from disaster and failure event investigations, studies, and analyses. The collected data will greatly assist with improvements to codes, standards, practices and new knowledge and will be made widely available. The data base will include data on significant hazard events including wind events, earthquakes, fires, collapses and explosions among others; how buildings, other structures, and lifelines performed; emergency response and evacuation procedures; and technical, societal, economic, and human factors affecting pre-disaster mitigation and post-disaster response.

The repository is being developed in phases, beginning with a World Trade Center investigation database. Phase 2 will be a pilot project initiated through NIST/NEHRP to capture and curate data from the 2010 Chile earthquake. Data gathered by other organizations and assembled by the Applied Technology Council (ATC) as consultant to NIST will be incorporated in the database using state-of-the-art hub technology, which will also support the NEHRP program. System design, development and assessment is underway and will be finalized by August 2012. Phase 3 will be full-scale implementation. When implemented, the data repository will reside on a NIST server and will be managed by NIST. This repository will include data from NCST investigations and other disaster and failure studies.

2. Decision Criteria and Guidelines

NIST has developed decision criteria and guidelines that provide a rational basis for establishing the value of implementing and conducting a NIST study. Factors considered include staff and resource availability, staff safety, and the quality and adequacy of information and artifacts that may be obtained by the study. Factors are weighted based on NIST experience and objectives and an algorithm has been developed to objectify decision making. Directives by the Congress or Administration will also be considered. Categories of decision criteria include: actual or potential substantial loss of life or disabling injury; level of hazard; extent of damage and loss of functionality; need for NIST involvement; stakeholder concern; evacuation/emergency response challenges; and for international events, similarity of practices or code enforcement.

Panel Evaluation and Recommendations

1. The decision criteria are generally supported by the Panel, and the process appears to lead to pertinent investigations and proper resource allocation. However,
 - a. The Panel recognizes that investigations must, as a primary goal, serve code improvement efforts, the fundamental responsibility of the Teams. In addition, the criteria should also recognize that the investigations are scientific in nature and may increase the body of scientific knowledge
 - b. An additional criterion should be considered to account for events with non-apparent or unfamiliar hazards, perhaps stressing the absence of a prior similar event or the novelty of a particular event, which could both cover unusual events and be applied objectively to terrorist events.
 - c. Investigations should be launched immediately; a 72-hour delay was deemed too long for some incidents. It was recommended to remove bureaucratic obstacles to rapid response, and to have two or three current staff trained in accident investigation and able to depart within the 48-hour window, with others joining later if appropriate.

2. The Act should be broadened to include lifeline incidents. Lifeline incidents should be afforded proper consideration on par with building incidents; hence, a balance between investigation of buildings and infrastructure should be addressed and achieved.
3. The approach to investigations, as represented by the Joplin, MO tornado investigation, is generally supported. Conduct of investigations is holistic, considering both tangible failures and human factors. The panel encourages the following:
 - a. Data gathering should identify information that can ultimately be integrated into code provisions based on risk and formal treatment of uncertainty.
 - b. Data gathering should support understanding of both building and regional impacts of incidents; codes and recovery are increasingly focused on the resilience of communities.
 - c. Data collection should be performed with the understanding that data will be archived in the data repository; specific attention should be given in the field to filling gaps in the database.
4. The data repository is unanimously encouraged and supported. It is considered an excellent reporting platform and adds scientific credibility to investigations by including georeferenced data, and in electronic form data such as accelerograms and wind velocities. The panel recommends that:
 - a. NIST should ensure that the database software be continually supported and updated to the latest standards.
 - b. NIST develops criteria to decide which data will be accessible to all and which will be restricted.
 - c. NIST develops safeguards to verify and maintain the validity of the data in the repository.
 - d. Criteria for including data from non-NIST sources in the database should be clearly defined. NIST/D&FS should not be the vetting body for the quality or appropriateness of data from non-NIST sources. Professional societies having acknowledged stature and expertise (such as ASCE, SFPE, American Society of Mechanical Engineers (ASME), American Institute of Chemical Engineers (AIChE), or EERI) may help develop a workable scheme to review and vet outside candidate studies for inclusion.
5. The process for influencing code modifications, enhancements, and improvements based on data collection should be the subject for future discussion between NIST and the Panel.
 - a. The Panel encourages the efforts to establish and maintain personal connections between NIST staff and ICC and NFPA committees. Transmission of findings through verbal and written reports is, of course, also supported. The Panel looks

forward to more dialogue with NIST to determine if there are other ways to interface with the code process; an example is to initiate dialogue with the users of code provisions who have historically resisted changes.

- b. Research staff often lack the interest and necessary skills to implement code changes. NIST/EL/D&FS should consider retaining additional staff, or training existing staff, to act as liaison between NIST and the codes and standards bodies.