NCSTAC Discussion: Requested Information from the Committee

Sept. 28, , 2017
NCST Advisory
Committee Meeting

Judy Mitrani-Reiser *Director, DFS Program*

Benjamin Davis *Program Analyst, Community Resilience Group*

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Requests made by the NCST AC at the 2016 Meeting

Committee Requests
1. Criteria for Deployment Teams and Potential Growth Committee Members had several questions and initial observations regarding recommending criteria for deployment teams: What are the difficulties in getting people on the team now, and are there gaps in expertise? Does NIST see areas where investigations could “grow” and where they could make a greater impact?
2. A Look Back at NIST Deployments Can the deployment process be improved by studying past investigations before NCST was in place? Reviewing about a dozen investigations might be appropriate in terms of assessing scope and expertise. The Committee requested a very high-level listing of the principal investigators of prior investigations which are the type that NIST would evaluate seriously for NCST investigations if those incidents were to occur in the future.
3. Review of Safety Procedures The Committee has asked to be provided a copy of the FLHR for failure study deployments in order to review and comment on the current NIST safety procedures for National Construction Safety Teams per the DFOs asks. This should include the D&FS SOP as it is a apart of the FLHR.

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Criteria for Deployment Teams and Potential Growth

- The decision to deploy an NCST Team is not dependent on the expertise that already exists at NIST.
- The NCST Act requires that at least one member of the Team be a NIST employee. Other team members can be experts from the private sector, universities, representatives of professional organizations with appropriate expertise, and appropriate Federal, State, or local officials.
- The NCST Act allows for the procurement of temporary or intermittent services by experts and consultants.

Criteria for Deployment Teams and Potential Growth

- DFS Director has re-established a Disaster Working Group at NIST, which draws from various Groups, Divisions, and Laboratories.
- Frequent meetings of the DWG allow for cross pollination of deployment practices across disciplines. It also allows an opportunity to identify knowledge gaps (pre-event) from various perspectives (fire, earthquake, wind, air quality, smart grid, etc.) that can be addressed with future reconnaissance missions.
- Virtual Teams provide an opportunity to train junior staff of field deployments; the structure also provides an opportunity to tackle multidisciplinary questions across various Groups, Divisions, and Laboratories and have greater impact.
- Fuse-47 Fire deployment is an example of a pilot study for a potential NCST area of growth: *chronic events*. The individual fire did not cause significant loss of life, but the aggregate of these types of events may pose a potential for significant loss of life.

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Airliner Crash Into the Pentagon Building

Date: September 11, 2001

Location: Washington, DC

Impact on Lives and Infrastructure: As a result of the hijacked commercial airliner that was intentionally crashed into the Pentagon building 189 people were killed and a portion of the Pentagon building was damaged by the associated impact, deflagration, and fire. However, only a very small segment of the affected structure collapsed, approximately 20 minutes after impact. The collapse, fatalities, and damage were mitigated by the Pentagon's resilient structural system.

Exterior view of the extent of damage from the plane crash and subsequent fire.

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Principal Investigator: Dr. Long Phan

Background: Dr. Long Phan received his **Ph.D. in Civil Engineering** has been working at NIST as a member of the Materials and Structural Systems Division (MSSD) since 1984. At NIST, Dr. Phan has conducted research on a wide range of topics, in both analytical and experimental fields including the **performance of high-performance concrete under extreme loadings** (fire and ice-floes impact), field measurements of structural responses to ambient and strong-motion vibrations (earthquake and wind), and investigations of damage to the built environment caused by natural or man-made disasters, including earthquakes, hurricanes, and tornadoes.

Oklahoma City Tornado

Date: May 3, 1999

Location: Oklahoma City, OK

Impact on Lives and Infrastructure: The tornadoes that occurred during this event resulted in more than 50 deaths. The Oklahoma City metropolitan area was the hardest hit by the tornadoes, with 43 fatalities, and 10,000 homes destroyed or severely damaged.

Aerial view of the damage done to Westmoore High School in Oklahoma, OK

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Principal Investigator: Dr. Michael A. Riley

Background: Dr. Riley received his **Ph.D. in Civil Engineering** from the State University of New York at Buffalo in 1996, where he studied **earthquake engineering, structural dynamics, and structural control**. His research specialties include structural control and experimental methods. His research work with active and hybrid controllers for civil engineering structures has included laboratory studies and full-scale experimental implementation. Dr. Riley joined the Building and Fire Research Laboratory (later renamed the Engineering Laboratory) Earthquake Engineering Group at NIST in October 1997. His work included qualification tests of structural control devices, testing of wood-frame building components, the development of procedures for testing and evaluating structural control devices, and investigation of the response of structures subjected to extreme loads.

Jarrell Texas Tornado

Date: May 27, 1997

Location: Jarrell, Texas

Impact on Lives and Infrastructure: The city of Jarrell suffered 27 deaths and more than 40 structures were destroyed, including several single-family homes.

Aerial view of the collapsed culvert plant damaged by the Jarrell Tornado

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Hurricane Fran

Date: September 5-6, 1996

Location: Kure Beach, North Carolina

Impact on Lives and Infrastructure: Hurricane Fran, which was rated as a category 3 hurricane on the Saffir/Simpson scale, resulted in 36 deaths. 23 of them in North Carolina. Fran caused extensive flooding in North Carolina, Virginia, West Virginia, Maryland, Pennsylvania, and Ohio. Damage in Virginia and adjacent states was due, in large part, to local flooding rather than to the direct effects of wind.

Surge and Wave Damage, North Carolina Coastal Area (Source: FEMA)

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Principal Investigator: Dr. Richard D. Marshall

Background: Dr. Marshall received his **Ph.D. in Civil Engineering** from Colorado State University. He is credited with over 100 technical publications in structural and wind engineering, with **significant contributions in the estimation of hurricane wind speeds, the effects of wind loads on buildings and other structures**, and the improvement of national building codes and construction practices. He began his 28-year tenure with NIST as a research structural engineer, and eventually became a group leader of the Structural Evaluation Group within the Building and Fire Research Laboratory (which later became the Engineering Laboratory).

Northridge Earthquake

Date: January 17, 1994

Location: Los Angeles, California

Impact on Lives and Infrastructure: A total of 58 deaths were attributed to the 6.8 magnitude earthquake. Over 60,000 buildings were damaged. While most structural damage occurred in buildings and bridges known to be vulnerable to earthquake shaking, there were some unexpected failures. Notably the collapses of relatively modern parking structures and bridges that appeared to be adequate by standards current at the time of the event.

The concrete frame Kaiser Permanente office building on Balboa Boulevard in Granada Hills was badly damaged. The second story columns disintegrated, causing the upper stories to collapse onto the first story.

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Principal Investigator: Dr. H.S Lew

Background: Dr. Lew received his **Ph.D. in Civil Engineering** from the University of Texas. He joined the National Bureau of Standards (NBS) in 1968 as a structural research engineer. He successively became Chief of the Construction Safety Section (1978-1985), Chief of the Structural Evaluation Section (1985-1989), and **Chief of the Structures Division (1989-1998).** Dr. Lew is a Fellow of the American Society of Civil Engineers (ASCE), an honorary member of the American Concrete Institute (ACI), a member of the Earthquake Engineering Research Institute, and the Structural Stability Research Council. He is an honorary member of the Architectural Institute of Korea and a member of the National Academy of Engineering of Korea. He was a member of the Board of Governors of the ASCE/Structural Engineering Institute, and the Board of Directors of the Building Seismic Safety Council (BSSC)/the National Institute of Building Sciences.

Happyland Social Club Fire

Date: March 25, 1990

Location: Bronx, New York

Impact on Lives and Infrastructure: The fire at the Happyland Social Club took the lives of 87 people. The first and second floor of the building were severely damaged, further spread of the fire could have led to a significantly higher loss of life due to the densely-populated area of the event.

Principal Investigator: Richard W. Bukowski

Background: Mr. Bukowski received a **B.S. in Electrical Engineering** from the Illinois Institute of Technology. While at NIST Mr. Bukowski began research on residential smoke detectors culminating in a draft performance standard which later **formed the basis for the UL and International Standards Organization (ISO) standards for residential smoke detectors.** Mr. Bukowski also conducted research on residential and commercial detection systems, test instrumentation, and test method development. Mr. Bukowski and his team were awarded the Department of Commerce Silver Medal for the development of the HAZARD I fire assessment software.

Loma Prieta Earthquake

Date: October 17, 1989

Location: Loma Prieta, California

Impact on Lives and Infrastructure: Loma Prieta registered as a 7.1 magnitude earthqauake. Except for two deaths from landslides and one from fire, the remainder of the 62 deaths from the earthquake were due to the partial or total collapse of older structures.

Two four-story buildings which suffered total collapse of their first stories

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L’Ambiance Plaza Building Collapse

Date: April 23, 1987

Location: Hartford, Connecticut

Impact on Lives and Infrastructure: The L’Ambiance Plaza collapse occurred while the building was still under construction. It resulted in the death of 28 construction workers. The event brought greater focus to issues of public safety and led to a moratorium on “lift-slab” construction method.

Overview of collapsed structure - View to the Northeast

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Principal Investigator: Dr. Charles G. Culver

Background: Dr. Charles Culver received his **Ph. D in Civil Engineering** from Lehigh University. While at NIST he served as the **Deputy Director of the Center for Building Technology**. The Center's work contributes to upgrading building codes, specifications, standards, test methods, guidelines, and design criteria to better meet the needs of occupants. Dr. Culver worked with other federal agencies and professional organizations, at the national, state, and local level to ensure the implementation of research results. Prior to joining NBS in 1972, he was on the Carnegie-Mellon University faculty in the Department of Engineering where his research led to the establishment of a national specification for the design of highway bridges.

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Review of Safety Procedures

- NIST employees that deploy as part of an NCST preliminary reconnaissance or an NCST investigation must complete a set of safety training courses.
- The set of safety training courses are updated, as needed, with guidance from EL's Safety Professional and OSHE, borrowing material whenever needed from other agencies.
- NIST employees that have NCST credentials issued by the NIST Director will discuss the status of their safety training with their managers twice per year during biannual and annual reviews.
- In our DFS standard operating procedures, we have 14 potential hazards identified that could pose a threat to members in the fields. There are mitigation controls identified for these 14 hazards that can be refined for a specific hazard. NIST Safety Professionals provide deploying teams with a one-pager of threats they may encounter for their specific mission.

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Questions?

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