Overview of Recent Changes to the NIST Implementation of the NCST Act

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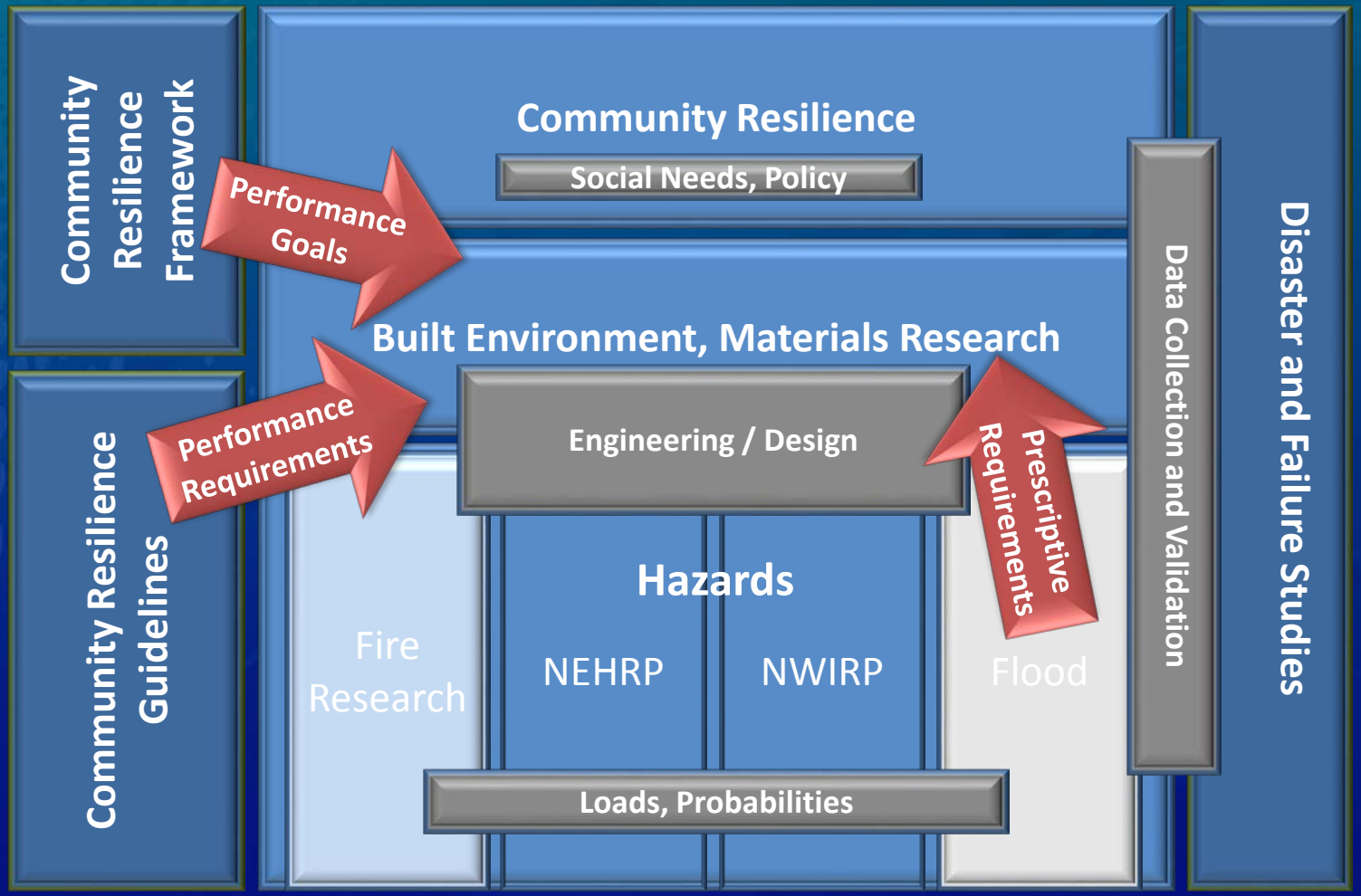
Outline

- Organizational Changes to Strengthen D&FSP
- Deployment Scoring and Capacity
- Safety of Teams in the Field
- Discussion

Reminder: Statutory Authorities

- **National Construction Safety Team (NCST)**
- National Earthquake Hazard Reduction Program (NEHRP)
- National Windstorm Impact Reduction Program (NWIRP)
- NIST Organic Act Authorities for Building Failure and Fire Studies


Community Resilience Framework
Community Resilience
Social Needs, Policy
Performance Goals
Built Environment, Materials Research
Performance Requirements
Engineering / Design
Prescriptive Requirements
Data Collection and Validation
Disaster and Failure Studies
Community Resilience Guidelines
Hazards
Fire Research
NEHRP
NWIRP
Flood
Loads, Probabilities

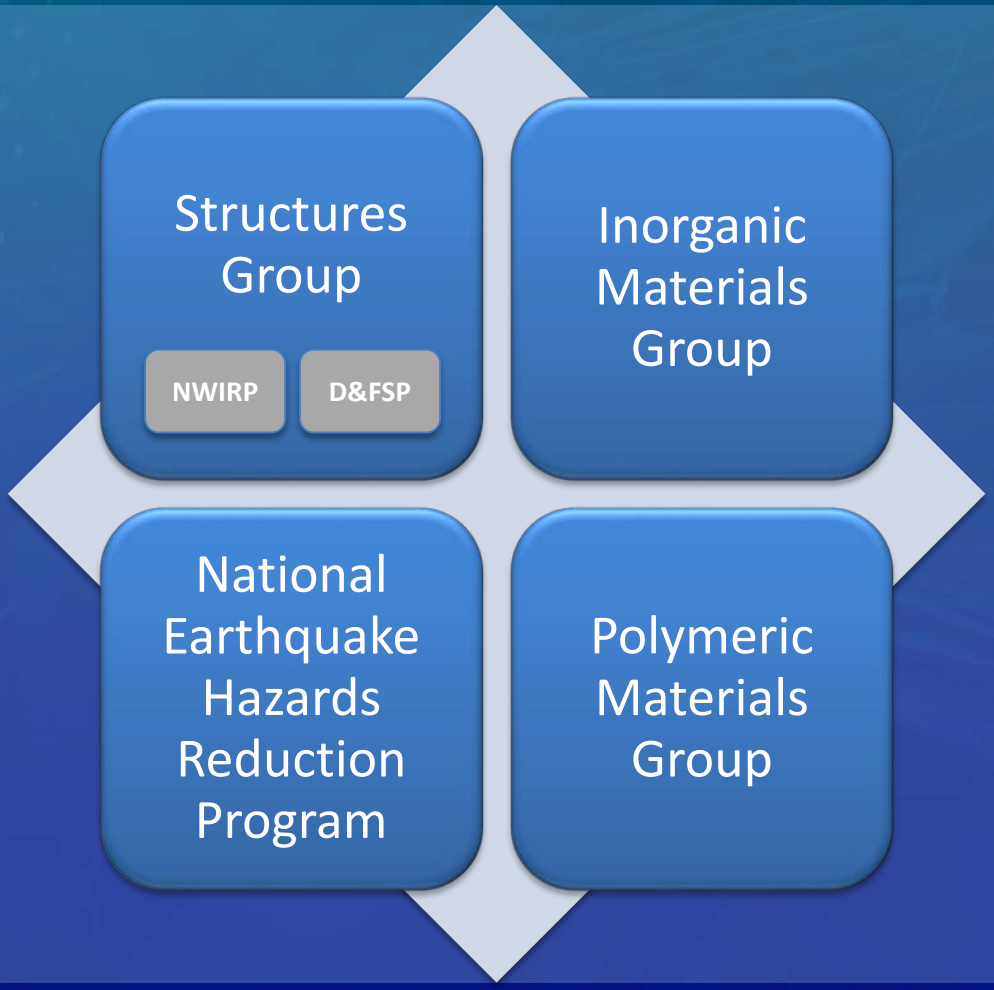
Organizational Changes
Materials and Structural Systems Division

- Effective October 1, 2014, NIST created the Community Resilience Group within the Materials and Structural Systems Division

- Relocated the Disaster and Failure Studies Program (D&FSP) from the Structures Group into the Community Resilience Group

Organizational Overview: FY14

Materials and Structural Systems Division



Organizational Changes: FY15

Materials and Structural Systems Division

Benefits of Realignment

- Brings Community Resilience work together into a single group structure.
- Formalizes the move beyond a focus on life safety and into function as a driving consideration.
- Programmatic and investigative objectives within same management structure enhances alignment for staff, particularly for future growth of D&FS program.
- Resilience Program requires data to establish the technical basis, inputs, and validation for modeling and D&FS is a significant mechanism, along with the Resilience COE.

NCST: Our Capacity to Respond

- NIST receives regular enquiries from interested parties about events, the majority of which we do not initiate plan to conduct an investigation for.

- In FY13, NIST modified the deployment criteria to combine quantitative and qualitative dimensions of disaster events

Decision-making for Deployment and Investigations

Implementation of Recommendations

Monitoring

Training

Disaster or Failure

Assessment / Decision Criteria

Yes

Recommendation to NIST Director

No

Assessment Record

Yes

Preliminary Reconnaissance

Yes

Recommendation to NIST Director

No

Recon Report

Yes

Technical Investigation

Technical Report / Recommendations

Implementation of Recommendations

Standard Operating Procedure for Disaster and Failure Studies
Table of Contents

Decision Criteria and Guidelines

- Provide a rational basis for evaluating the need for an investigation and considers many factors, including:
  - substantial loss of life or disabling injury;
  - significant potential for loss of life (exposed population);
  - level of hazard;
  - consequences to resilience;
  - evacuation/emergency response challenges;
  - applicability of international events (code enforcement; similarity of practices);
  - unique new knowledge that may potentially be gained;
  - potential impact on standards, codes, and practices;
  - safety of field personnel.

Preliminary Reconnaissance Screening Criteria

Date and Event Description			
Preliminary Reconnaissance Criteria	Low (1)	Med (3)	High (5)
1. Substantial Loss of Life or Disabling Injury			
A. Facility context	0	1 to 2	>2
B. Community context	0 to 3	4 to 9	>10
C. Regional context	0 to 5	6 to 19	>20
2. Significant Potential for Substantial Loss of Life: Exposed Population			
A. Facility context	<100	100 to 499	≥500
B. Community context	<1 000	1 000 to 9 999	≥10 000
C. Regional context	<100 000	100 000 to 999 999	≥1 000 000
3. Hazard and/or Failure Event(s)			
A. Earthquake	≤ MMI IV	MMI V to VII	≥MMI VIII
B. Hurricane at Landfall	≤Cat 3	Cat 4	Cat 5
C. Tornado	≤EF3	EF4	EF5
D. Coastal Inundation	< 3 ft	3 to 9 ft	≥ 10 ft
E. Fire Spread in Structures	Fire spread not beyond area of origin	Fire spread throughout a structure	Fire spread beyond structure of origin
F. Wildland Urban Interface Fire (WUI)	High Forest Service Fire Danger Rating	Very High Forest Service Fire Danger Rating	Extreme Forest Service Fire Danger Rating
G. Blast	< 99 lbs. TNT-equivalent	100 - 999 lbs. TNT-equivalent	> 1000 lbs. TNT-equivalent
H. Impact	< 1 x 10^6 ft lb/sec	1 x 10^6 to 1 x 10^7 ft lb/sec	> 1 x 10^7 ft lb/sec
4. Consequences to Resilience			
A. Failure during Construction or in Service	Minimal physical damage and/or loss of function	Moderate physical damage and/or loss of function	Severe physical damage and/or loss of function
B. Engineered Building Systems	Minimal physical damage and/or loss of function	Moderate physical damage and/or loss of function	Severe physical damage and/or loss of function
C. Transportation & Utility Systems	Minimal physical damage and/or loss of function	Moderate physical damage and/or loss of function	Severe physical damage and/or loss of function
D. Non-Engineered Building Systems	Minimal physical damage and/or loss of function	Moderate physical damage and/or loss of function	Severe physical damage and/or loss of function
Score: __/__ = __ Sum	__ x 1	__ x 3	__ x 5
5. Evacuation and Emergency Response			
A. Evacuation	Normal evacuation	Moderate evacuation challenges	Severe evacuation challenges
B. Emergency Response	Normal operations	Moderate operational challenges	Severe operational challenges

Application of Decision Criteria for NIST Studies

- Weighted score ≥ 4.0:
  - Above threshold for conducting a preliminary reconnaissance
  - Answers to six general principles questions and summary assessment will be used to determine whether a preliminary reconnaissance will be conducted.
- Weighted score ≤ 3.0:
  - Below threshold for conducting a preliminary reconnaissance.
- 3.0 ≤ Weighted score ≤ 4.0:
  - Answers to the six general principles questions and the summary assessment along with the weighted score will be considered to whether the screening threshold for a preliminary reconnaissance is met.

Recent Disaster Events and NIST Criteria Scores

- Disasters that were evaluated against the criteria since last Advisory Committee meeting (December 2013)

- Calculated preliminary reconnaissance criteria scores

Apollo Theatre (London's West End) Partial Collapse (12/19/13) – 3.0

- Partial collapse of ceiling, and subsequently balcony, caused by age-related deterioration of century-old cloth and plaster ties used to lash together timber frames to support the ceiling

- 88 of more than 700 occupants injured
- Led to call to improve British technical standards on inspection of historical buildings

San Jose, California, Warehouse Fire (01/09/14) – 2.0

- Five-Alarm fire in large complex of connected warehouse buildings, with commercial fire walls and composite roofs, totaling approximately 125,000 ft^2
- Explosions and roof collapse. Required 3 hours to contain fire
- Two occupants successfully evacuated. No injuries or fatalities to occupants or fire fighters
- Warehouse did not have automatic sprinklers

Collapse of Apartment Building in East Harlem, NY (03/12/14) – 3.5

- Collapse of 2 century-old five-story buildings (wood/light steel members with brick facades) at 116th Street and Park Avenue in Upper Manhattan, New York City, due to gas leak explosion.

- 8 fatalities, 16 injuries

- Investigated by the NTSB

Oso, Washington, Landslide (03/22/14) – 4.0

- Massive landslide covering 1 square mile area impacted Oso/Darrington, Washington (55 miles Northeast of Seattle), destroying 49 homes and roads, blocking the Stillaguamish River, which caused rapid flooding upstream
- 43 fatalities
- Rescue efforts involved digging through roughly 30 feet of ‘unstable’ debris having the consistency of ‘wet concrete.’
- USGS warned of landslide potential in a 2010 report.

Iquique, Chile, Earthquake (04/01/14) – 2.4

- M_w 8.2 earthquake, depth of 25.0 km (15.5 mi). Estimated levels of ground shaking on land are in the range of MMI 6-7
- 6 fatalities, 9 injuries
- Chile has modern building codes and seismic design provisions. Most buildings in urban centers are designed for seismic loading
- Damage not extensive

Arkansas Tornadoes (04/27/14) – 4.0

- Large EF3 tornado impacted Mayflower, Arkansas (pop. 2,300)
- 16 fatalities
- 60 to 70 homes (conventional and mobile), about 20 businesses, and 1 school damaged or destroyed.

Pilger, Nebraska, Tornado (06/17/14) – 2.7

- EF4 twin tornadoes touched down within a mile of each other in Pilger, Nebraska (population of 378, roughly 100 miles northwest of Omaha)
- 2 fatalities and 31 injuries (16 in critical condition)
- Up to 75% of the town's buildings were either heavily damaged or destroyed. Buildings damaged were non-engineered, low-rise wood frame or concrete masonry, including residential, post office, bank, school, church, and fire department.

Napa County, CA, Earthquake (8/24/14) – 2.3

- 6.1-magnitude earthquake occurred 4.2 miles northwest of American Canyon, in Napa County, CA (pop. 139,045)

- Damage:
  - Bridges/overpass crossings: minor, nonstructural, mostly cosmetic.
  - URM buildings: not structural, mostly due to lack of parapet bracing or poor connection from diaphragm to URM walls.

- NIST staff joined FEMA's National Earthquake Technical Assistance Program for reconnaissance of Napa in 9/14

Bridgeport, CT, Factory Fire (9/11/2014) – 2.2

- Five-Alarm fire destroyed two businesses (recycled perfume container warehouse and roofing company) and caused partial collapse of the unreinforced brick building

- No fatalities, 2 firefighters sustained minor injuries

WUI Fire, Weed, California (9/15/14) – 2.2

- Wildland fire developed south of Weed, CA (pop. approximately 1,000 near the California - Oregon border), pushed by high winds in excess of 40 mph, destroyed between 100 and 150 homes (about a quarter of the homes in Weed)

- No deaths or injuries

Garden Gate Manor Senior Home in Cheektowaga, NY Snowstorm (11/20/2014) – 1.7

- Evacuation of 130 people after building's roof system showed signs of structural damage during epic snowstorms, which resulted in up to 7ft of snow in some areas in Buffalo, New York
- Depending on the snow's moisture content, 7 ft of snow could exert up to 40 psf roof pressure (exceeding code design pressure of 35 psf)

Recent Disasters

Date	Event	Total Weighted Score
12/13	Apollo Theatre (London)	3.0
1/14	San Jose, California, Warehouse Fire	2.0
3/14	Apartment Building, East Harlem, NY	3.5
3/14	Oso, Washington, Landslide	4.0
4/14	Iquique, Chile, Earthquake	2.4
4/14	Arkansas Tornadoes	4.0
6/14	Pilger, Nebraska, Tornado	2.7
8/14	Napa County, CA, Earthquake	2.3
9/14	Bridgeport, CT, Factory Fire	2.2
9/14	Weed, CA Fire	2.2
11/14	Garden Gate Manor, Western NY	1.7

Capacity to Respond

- NCST Staffing
  - Eric Letvin, Director (Long Phan, Acting)
  - Ben Davis, Program Administration
  - Technical expertise identified within the Laboratory Program(s) and external partners depending on the scope and objectives of the study

NCST Investigation Life-Cycle

Investigation	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9+
WTC 1 & 2	Investigation				Implementation			Implementation	
WTC 7	(Investigation)				Investigation				
Station Nightclub	Investigation		Implementation						
Joplin Tornado	Investigation				Implementation (ongoing).....				

Safety of Teams in the Field

- The safety of our teams is foremost in the consideration of when (possibly if) we deploy a team.
- Unique challenge of preparing for the unknown aspects of post-disaster conditions
- Leveraging industry best practices when available
  - EERI Earthquake deployment plan, e.g.

Safety (cont'd)

- Wide variety of response events
  - Earthquakes
  - Fires
  - Floods and storm surge
  - Windstorms
  - Manmade hazards
  - Other

Expected Hazards

- Electrical
- Chemical
- Struck by….
- Noise
- Air Quality
- Sharp objects
- Biohazards
- Weather
- Road conditions
- Violence/Unrest
- Disease
- Animals
- Sanitation
- Exhaustion
- Building Collapse
- Explosion
- Mental Health

Safety (cont'd)

- Training
  - Optimize the preparedness of "hot team" members
    - Training and equipment specifically for the hazards they are likely to encounter based upon their expertise and purpose for deployment

Sample Training

- First Aid/CPR
- Infectious Diseases
- Respiratory Protection
- Hearing Protection
- Slips, Trips and Falls
- Chemical Labeling
- Vicarious Trauma

Safety (cont'd)

- Establishing operational limits
  - Prepare prior to deployment:
    - risks likely to be present,
    - how to best mitigate, and
    - when to completely avoid.

Equipment and PPE

Data Collection:

- Digital cameras with geocoder
- Laptops/portable computers/smart phones that meet NIST IT security requirements (Federal Information Processing Standard (FIPS) 199.
- Measurement devices (laser, tape)

Personal Protective Equipment (PPE):

- Basic personal safety equipment – Hard hats with identifiers, steel-toed safety shoes, gloves, eye protection, dust masks, safety vests, flash light, respirators.
- Specialized equipment
  - For example, fire: turnout gear, helmets, self-contained breathing apparatuses (SCBA), and boots
- First Aid Kits
- Insect repellants

Summary

- D&FS Program Reorganization
  - Provide depth to deployment management by embedding the D&FS Program with Community Resilience Group
  - Provide experience and resources to deployments through the Community Resilience CoE's annual field data collections

Summary (cont'd)

- Consistent set of criteria used for deployment decisions.
  - Several significant events, however, no new NCST deployments since last meeting
- Several staff members actively engaged in Joplin Final Report and Implementation of the Recommendations

Summary (cont'd)

- Safety of team members is a foremost consideration in deployment decisions

- Training and preparedness is critical in order to deploy both rapidly and safely

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Links of Interest:

Materials and Structural Systems Division:
http://www.nist.gov/el/building_materials/index.cfm

Disaster Resilient Buildings Goal:
http://www.nist.gov/el/disresgoal.cfm

Disaster and Failure Studies Program:
http://www.nist.gov/el/disasterstudies/index.cfm