engineering laboratory

Technical Investigation of the May 22, 2011, Tornado in Joplin, MO

December 10, 2012
NCST Advisory
Committee Meeting

Current NCST Investigation Progress Report

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

Joplin Tornado Investigation Presentation Outline

- Background and Progress – *Marc Levitan*
- Tornado Hazard Characteristics – *Frank Lombardo*
- Emergency Communications and Public Response – *Erica Kuligowski*
- Structural Response – *Long Phan*

NOTE: The information contained in this presentation is preliminary and subject to change as additional data is collected and analysis is performed.

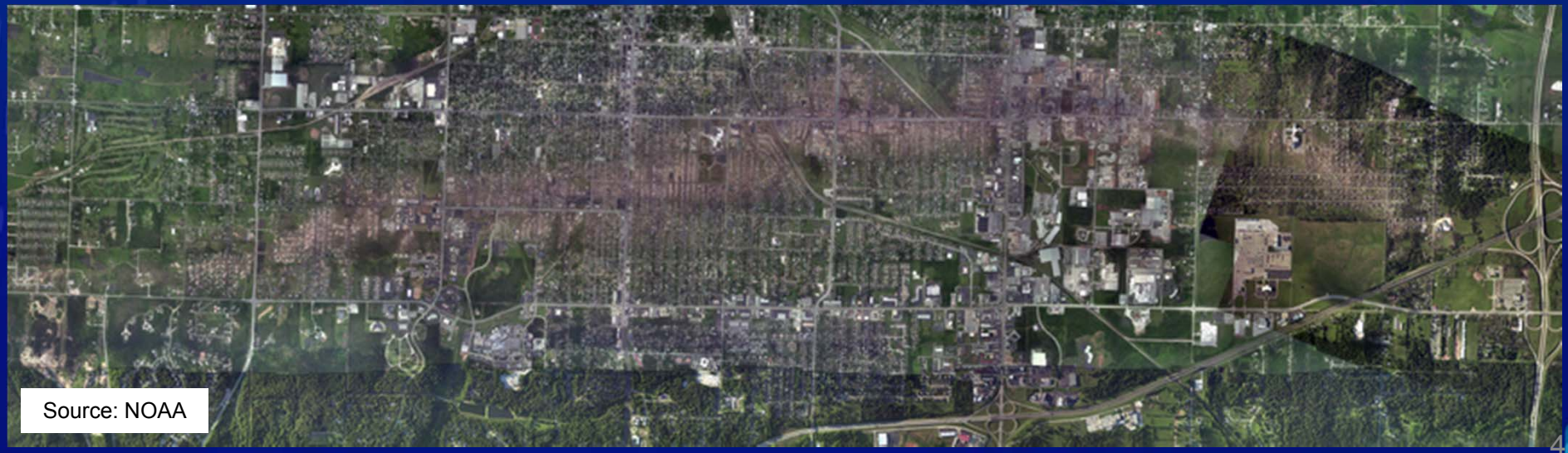
Background and Progress Outline

- Joplin Tornado and Investigation Overview
- Progress Summary
- Moving Forward

Joplin Tornado Overview

- Touched down in Joplin beginning at 5:34 PM CDT, Sunday, May 22, 2011[1]
- Enhanced Fujita Scale EF-5 tornado[1] (highest category)
- Maximum estimated wind speeds: 200+ mph[1]
- Path: up to 1 mile wide, 22.1 miles long[1] (6 miles in Joplin)
- Track: generally West to East across Joplin (Newton and Jasper counties)
- ≈ 8,000 structures damaged or destroyed[2] (≈30% of Joplin)
- 161 fatalities[2], >1,000 injuries (Joplin Population: 49,024)

Sources: [1]National Weather Service (NWS), [2]City of Joplin



Source: NOAA

National Construction Safety Team

Following a preliminary reconnaissance that began on May 24, 2011, the NIST Director established a Team under the NCST Act on June 29, 2011, to conduct a technical investigation of the Joplin Tornado.

- Team Members
  - NIST Engineering Laboratory employees
    - Dr. Marc Levitan: Investigation Team Leader, Wind Engineer, Leader of NIST NWIRP R&D
    - Dr. Erica Kuligowski: Fire Protection Engineer and Sociologist
    - Dr. Frank Lombardo: Wind Engineer and Meteorologist
    - Dr. Long Phan: P.E., Structural Engineer
  - National Oceanic and Atmospheric Administration (NOAA) employee
    - Dr. David Jorgensen: Research Meteorologist and Chief, National Severe Storms Lab (NSSL)/Warning R&D Div.

Goals

- To investigate the wind environment and technical conditions that caused fatalities and injuries; the performance of emergency communications systems and the public response to such communications; and the performance of residential, commercial, and critical buildings, designated safe areas in buildings, and lifelines.
- To develop findings and recommendations that can serve as the basis for:
  - Potential improvements to requirements for design and construction of buildings, designated safe areas, and lifeline facilities in tornado-prone regions;
  - Potential improvements to guidance for tornado warning systems and emergency response procedures;
  - Potential revisions to building, fire, and emergency communications codes, standards, and practices; and
  - Potential improvements to public safety.

Objectives

1. Determine the tornado hazard characteristics and associated wind fields in the context of historical data
2. Determine the pattern, location, and cause of fatalities and injuries, and associated emergency communications and public response
3. Determine the response of residential, commercial, and critical buildings, including the performance of designated safe areas
4. Determine the performance of lifelines as it relates to the continuity of operations of residential, commercial, and critical buildings
5. Identify, as specifically as possible, areas in current building, fire, and emergency communications codes, standards, and practices that warrant revision

Technical Approach and Status

Complete

1. Identification of Issues Requiring Technical Investigation

Nearly Complete

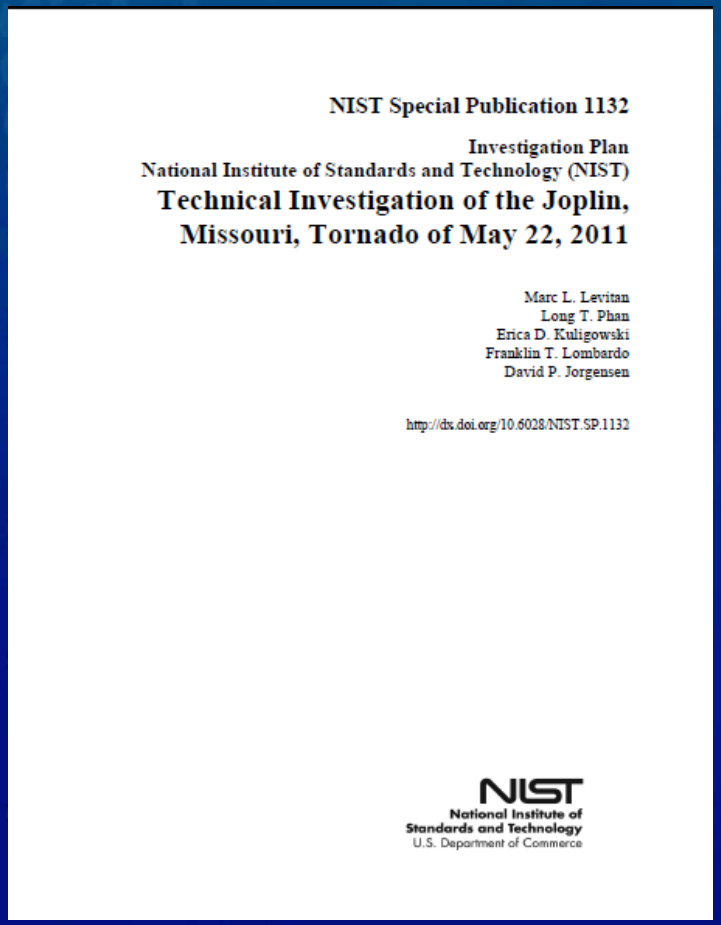
2. Data Collection
3. Analysis and Comparison of Designs, Codes and Practices for Buildings and Emergency Communications Systems

Underway

4. Formulation of Technical Findings and Recommendations
5. Identification of Needs for Revisions to Codes, Standards, and Practices

Publications

- Investigation Plan published May 2012
- Progress Report published November 2012



NIST Special Publication 1132

Investigation Plan
National Institute of Standards and Technology (NIST)
Technical Investigation of the Joplin, Missouri, Tornado of May 22, 2011

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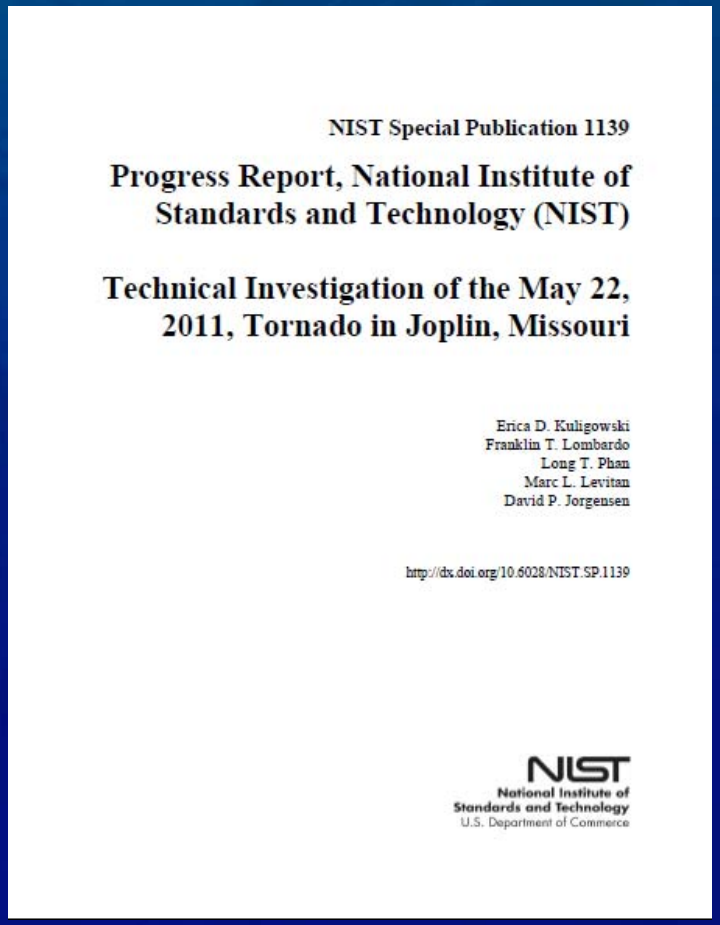

NIST Special Publication 1139

Progress Report, National Institute of Standards and Technology (NIST)

Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri

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http://dx.doi.org/10.6028/NIST.SP.1139

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Data Collection Status

- Nearly complete
- Still seeking
  - Design information for some of the buildings at St. John's Regional Medical Center, including the original hospital building
  - Additional injury information
  - Additional data on fires following the tornado

Moving Forward

- Wrap up data collection
- Complete the research tasks from Objectives 1-4, including
  - Integration of results from meteorological, communications, behavioral, and building and lifeline performance studies
- Evaluate results of Objectives 1-4 research and develop recommendations, as warranted, for potential changes to codes, standards, and practices (Objective 5)
- Prepare and publish draft report for public comment
- Publish final report