NCST Investigation of the Champlain Towers Collapse

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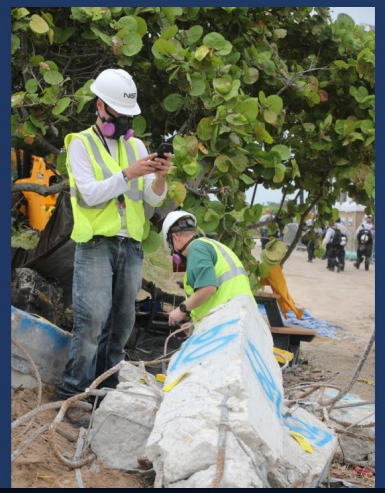
National Institute of Standards and Technology
U.S. Department of Commerce

June 14, 2022

NIST establishes evidence tagging protocols with the Miami-Dade Police Department and US&R Task Forces



Our Charge

National Construction Safety Team Act

Technical Cause(s) + Recommendations

SEC. 8. NATIONAL CONSTRUCTION SAFETY TEAM REPORT.

Not later than 90 days after completing an investigation, a Team shall issue a public report which includes—

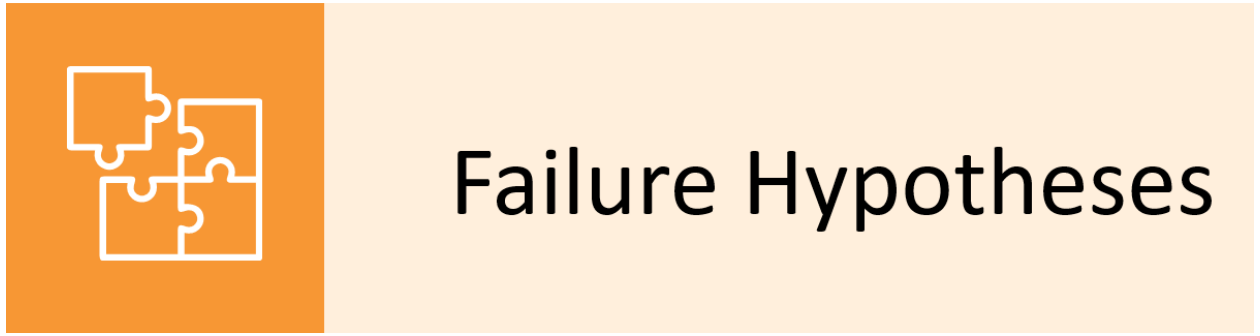
(1) an analysis of the likely technical cause or causes of the building failure investigated;

(2) any technical recommendations for changes to or the establishment of evacuation and emergency response procedures;

(3) any recommended specific improvements to building standards, codes, and practices; and

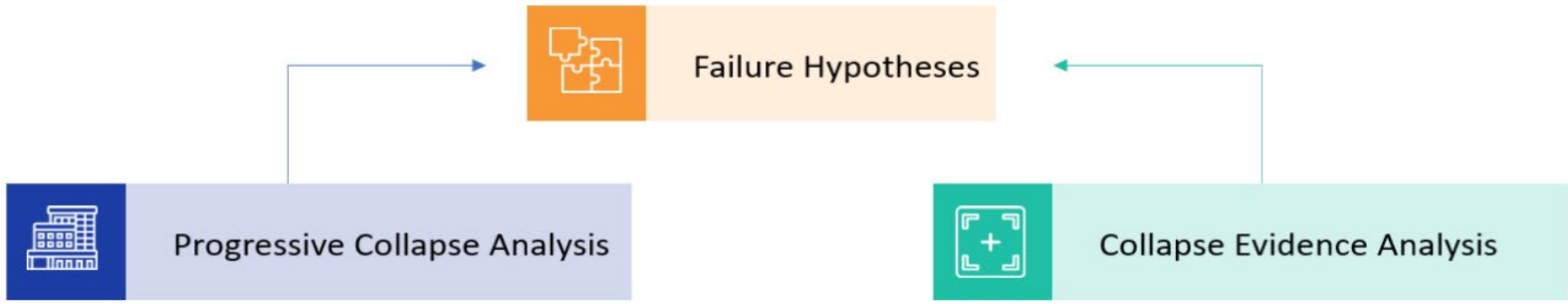
(4) recommendations for research and other appropriate actions needed to help prevent future building failures.

Approach

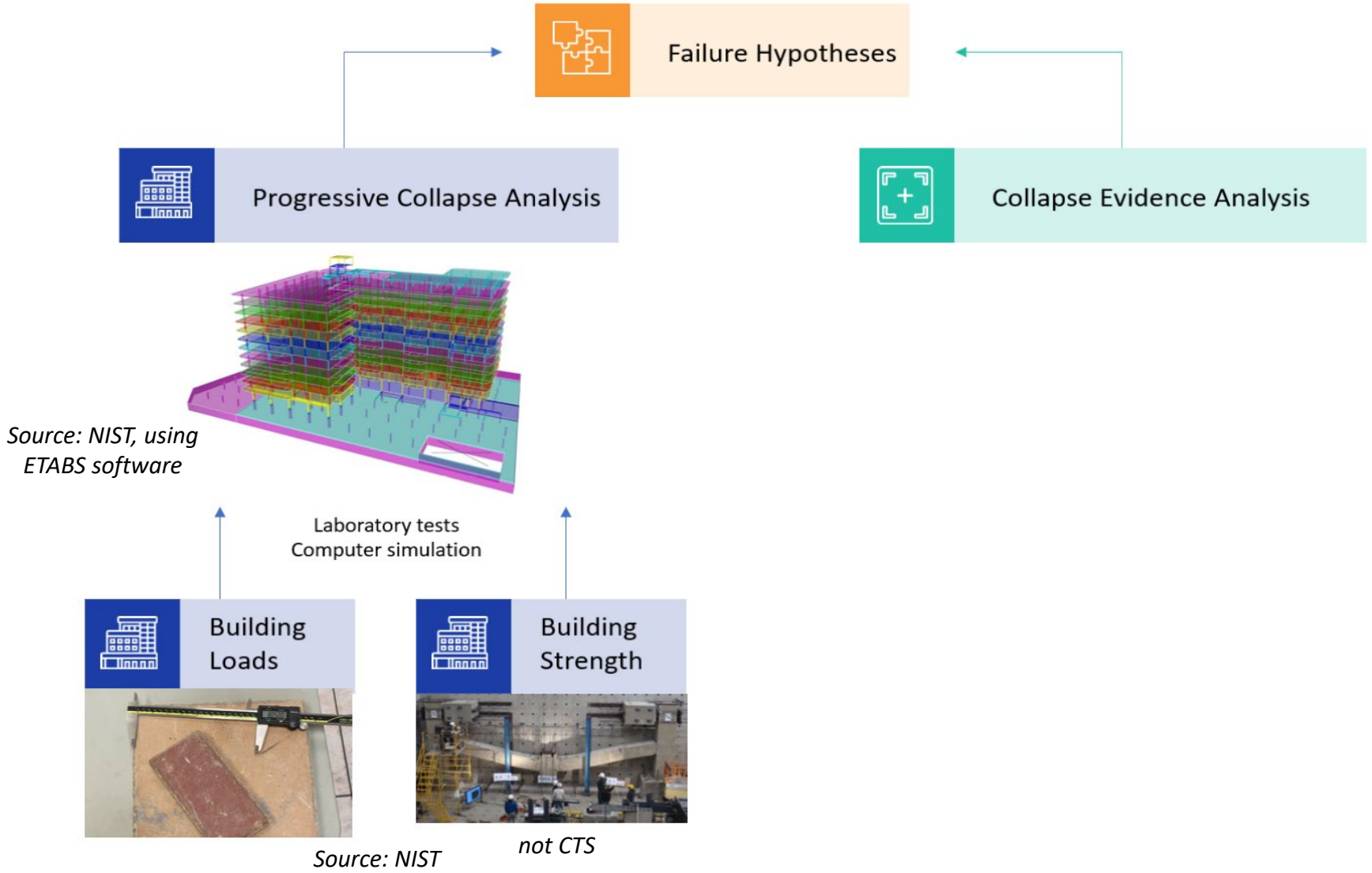


A *failure hypothesis* is an investigative supposition about where and how the failure occurred with likely contributing causes.

Examining Failure Hypotheses



Examining Failure Hypotheses

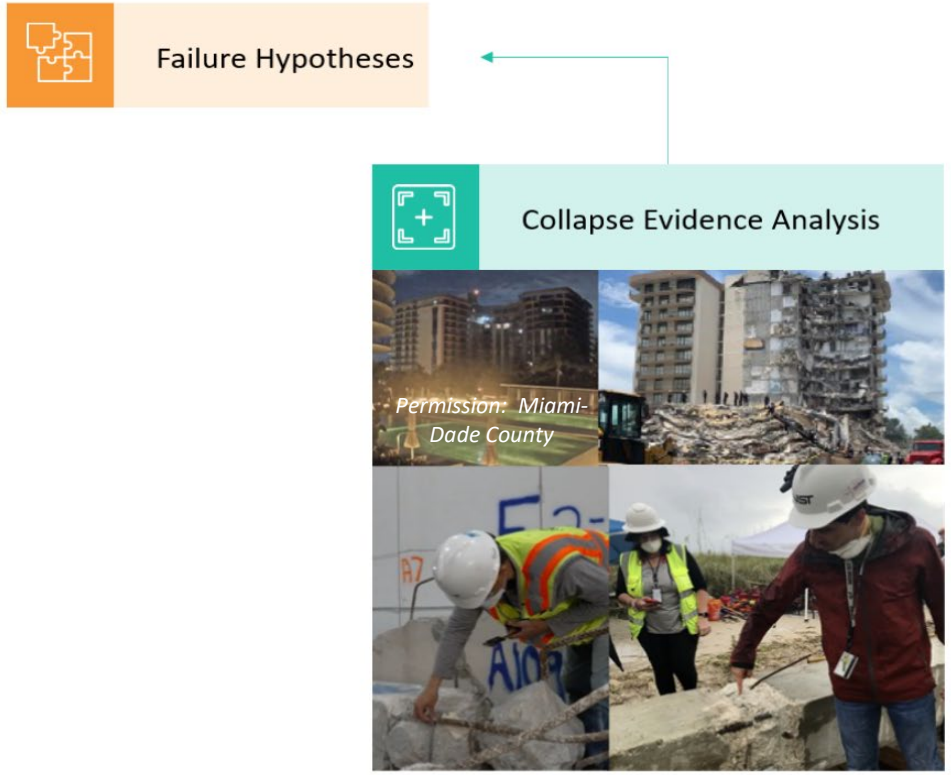


Source: NIST, using ETABS software

Source: NIST

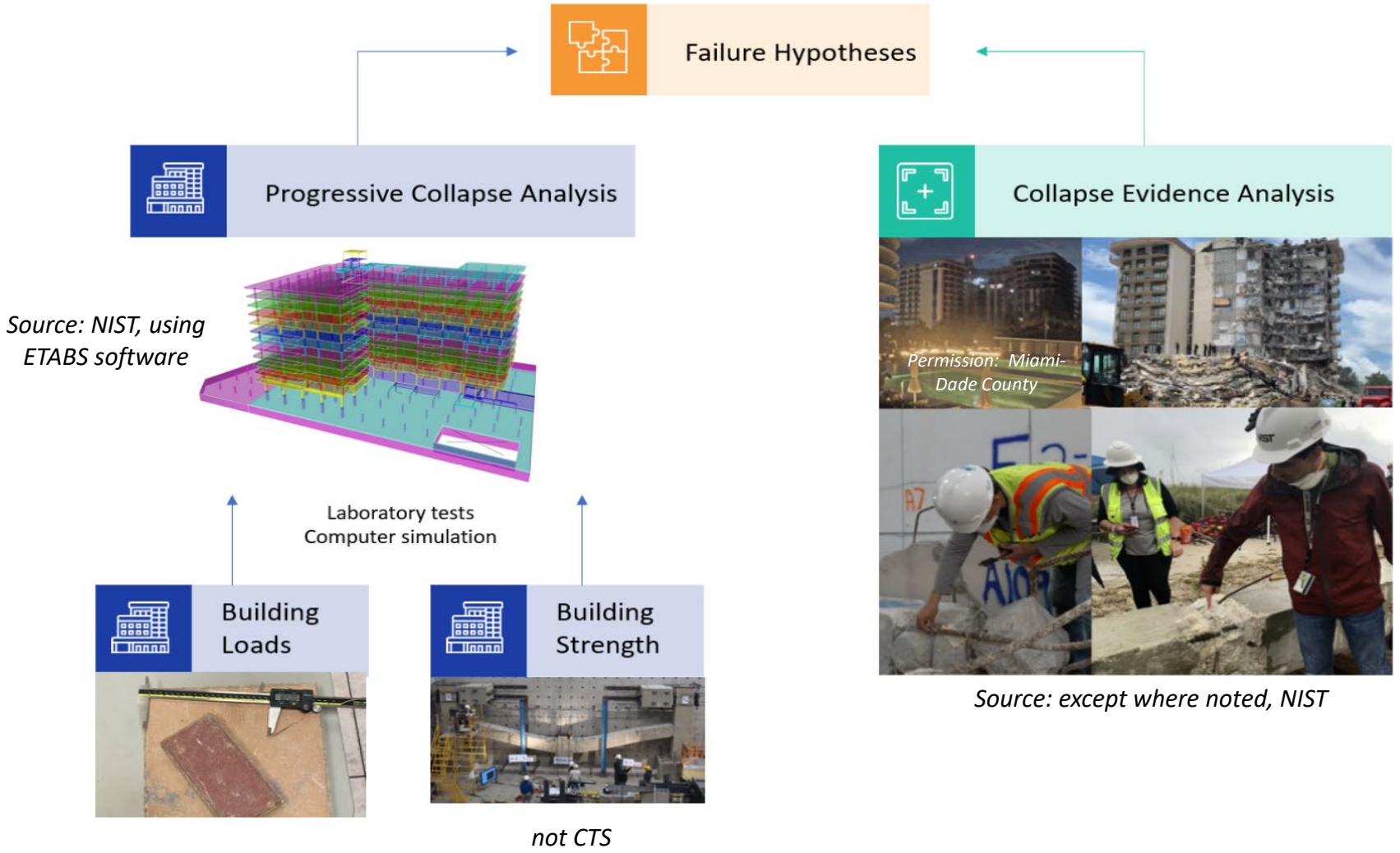
not CTS

Examining Failure Hypotheses



Source: except where noted, NIST

Examining Failure Hypotheses



Source: NIST, using ETABS software

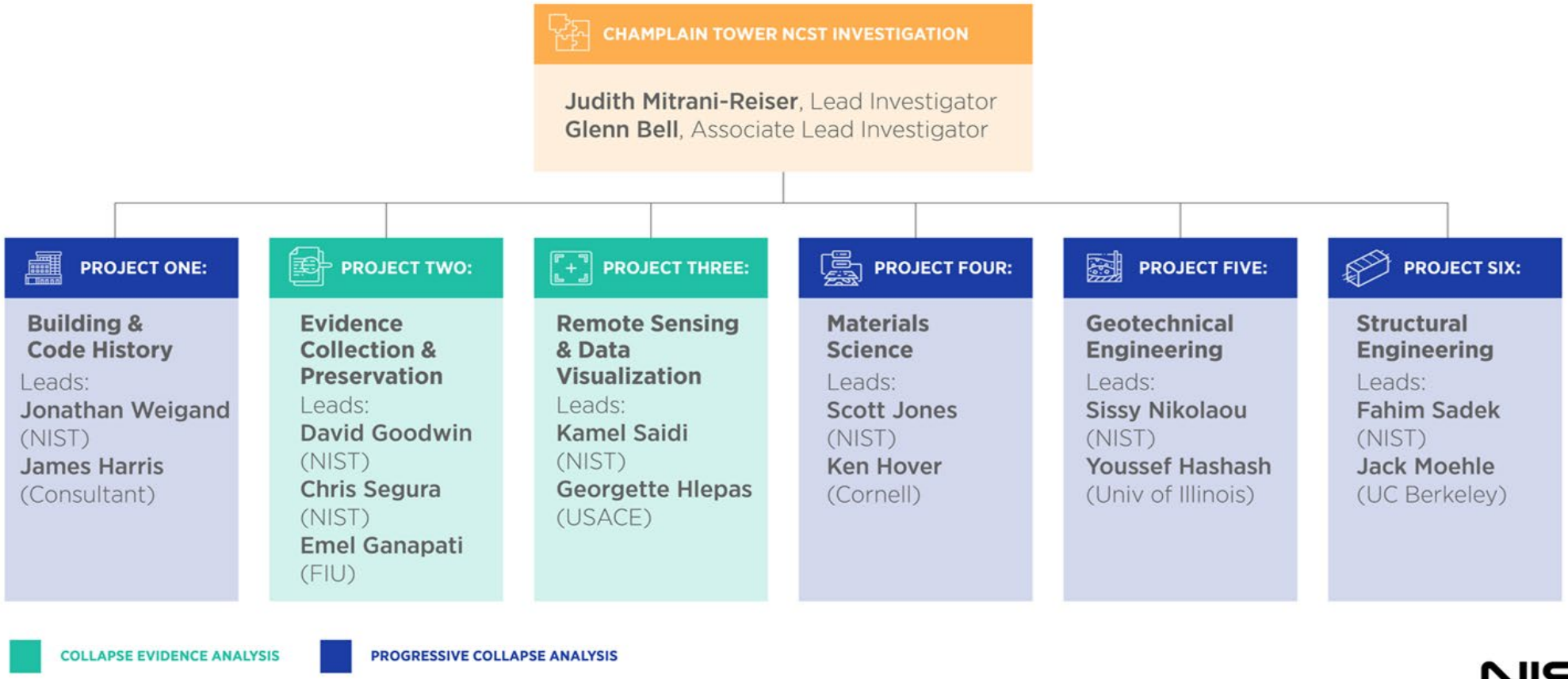
Source: except where noted, NIST

not CTS

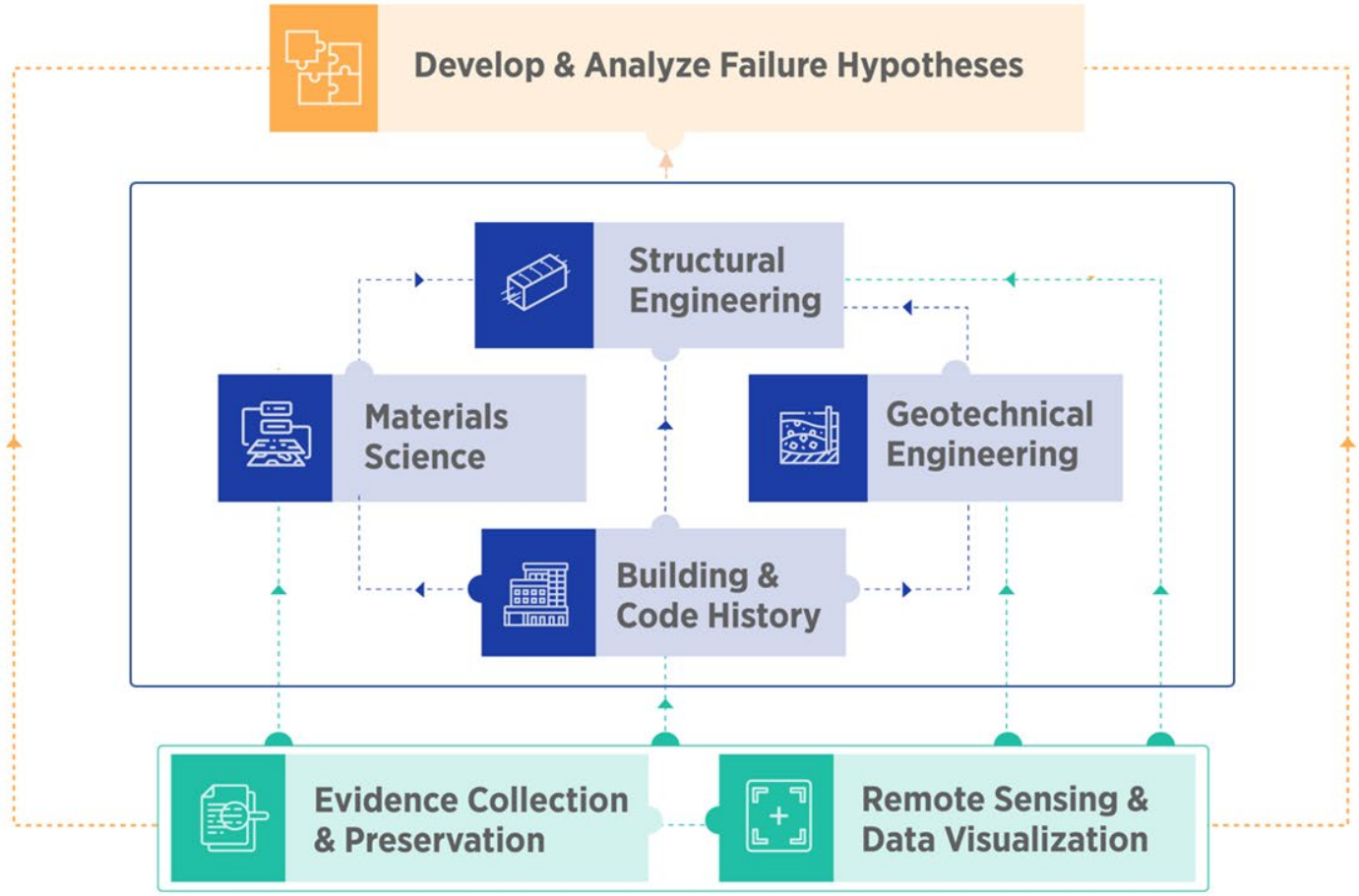
Source: NIST

National Construction Safety Team

Champlain Towers South NCST Investigation Leaders



Team Organization



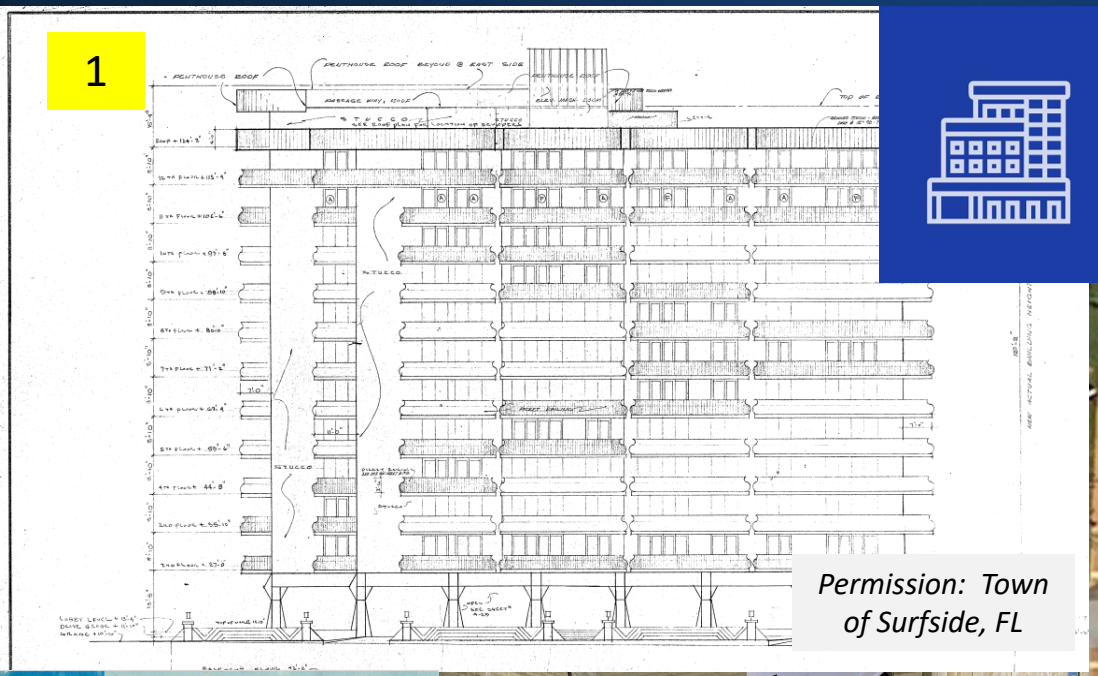
COLLAPSE EVIDENCE ANALYSIS

PROGRESSIVE COLLAPSE ANALYSIS

Project Overview

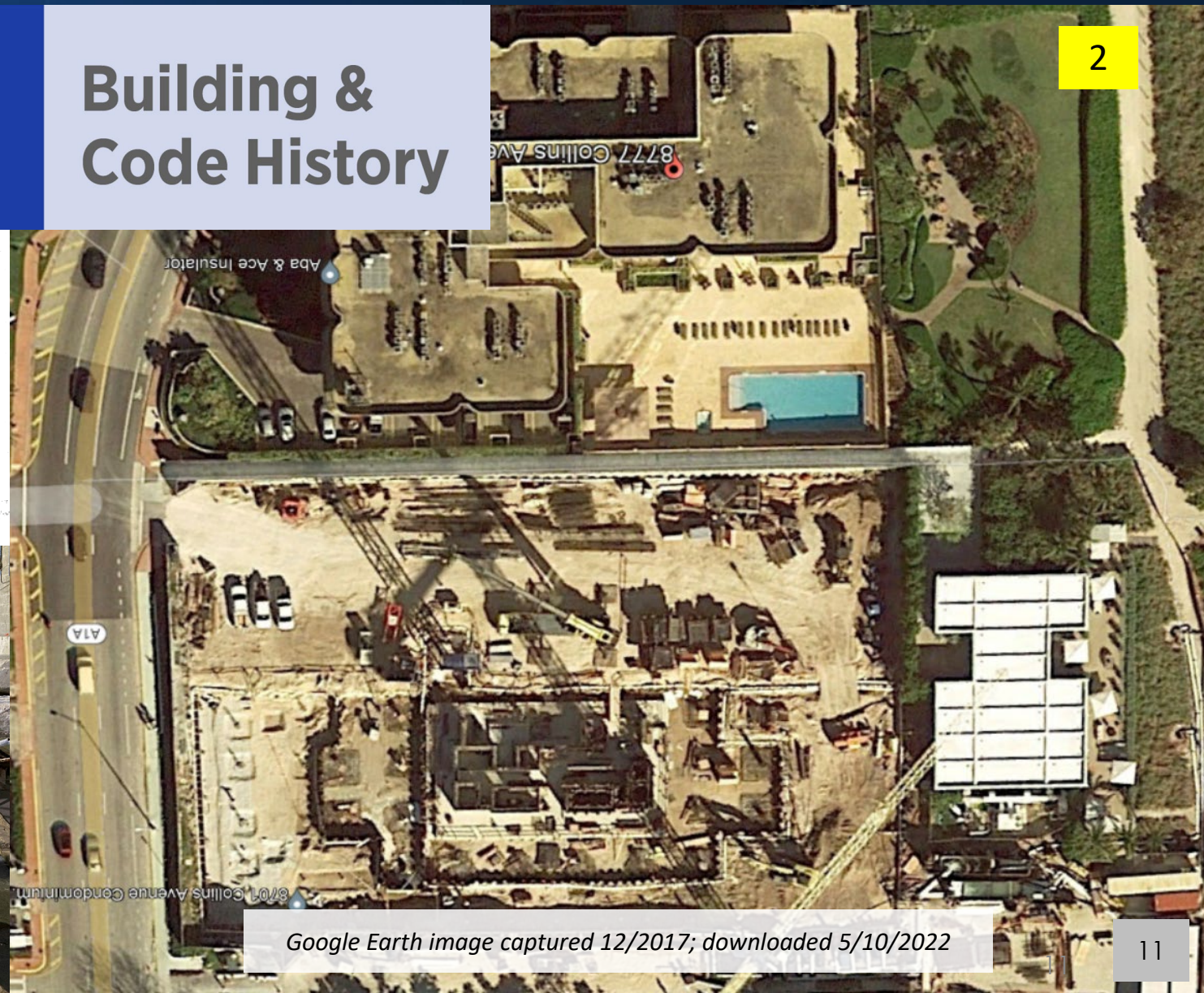
Building & Code History

1



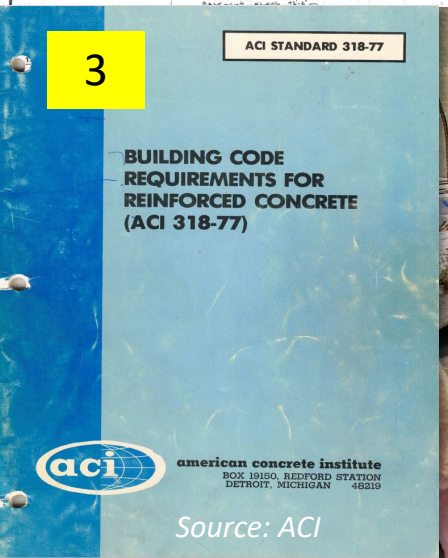
Permission: Town of Surfside, FL

2



Google Earth image captured 12/2017; downloaded 5/10/2022

3



Source: ACI

4

Source: NIST

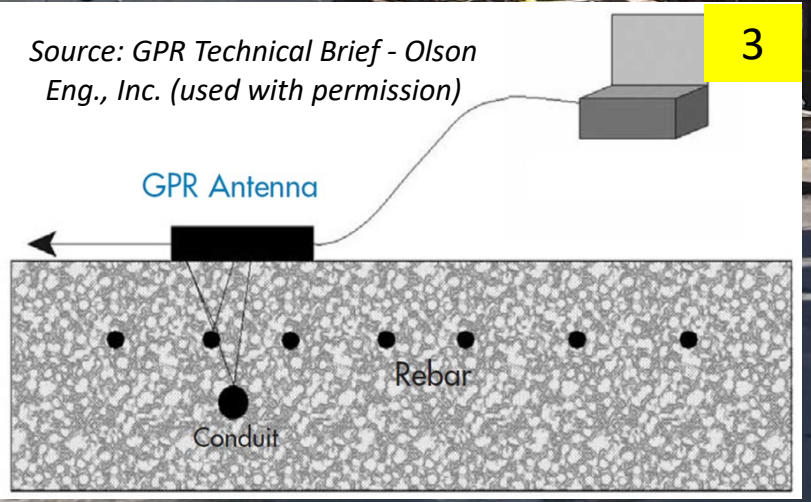
Project Overview

1

Geotechnical Engineering

2

3



Source: GPR Technical Brief - Olson Eng., Inc. (used with permission)

Source: NIST

Source: NIST

Project Overview

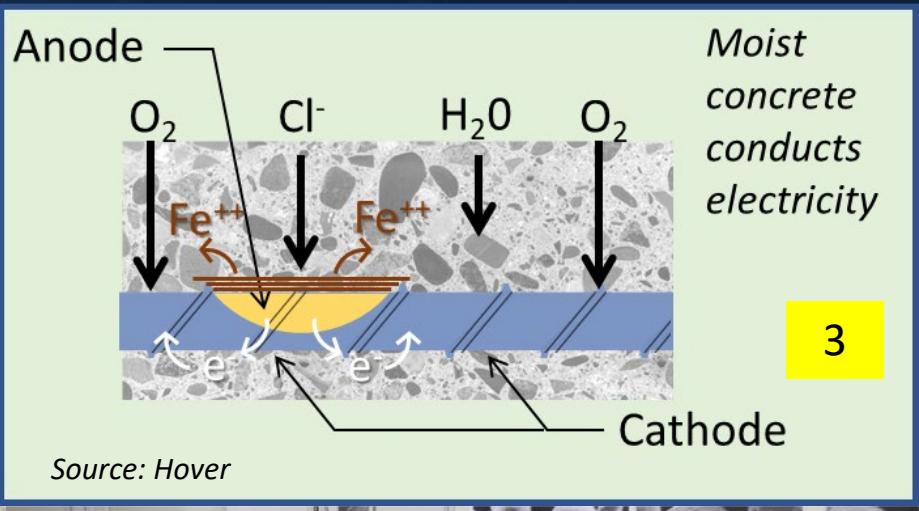
1

Source: NIST

Materials Science

2

Source: NIST, not CTS



3

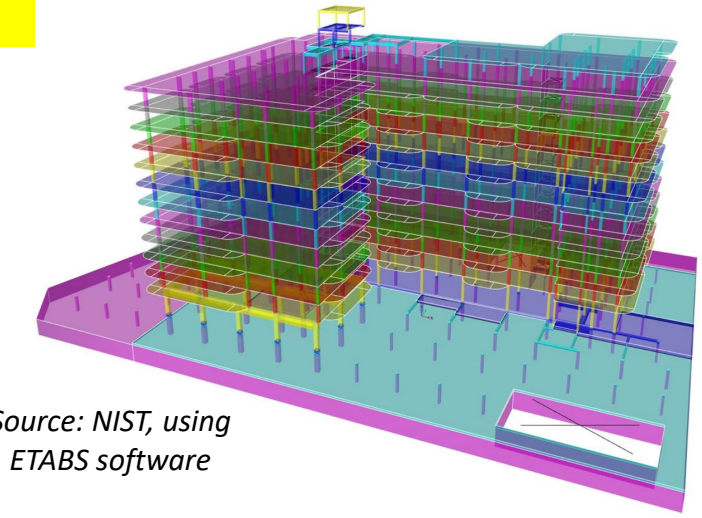
Source: Hover

4

Source: NIST, not CTS

Project Overview

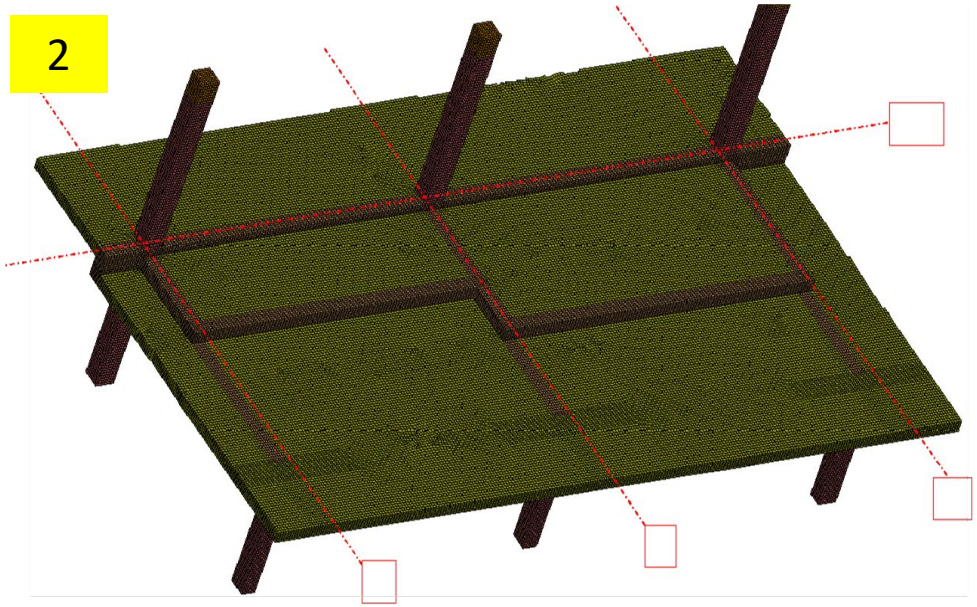
1



Source: NIST, using ETABS software

Structural Engineering

2

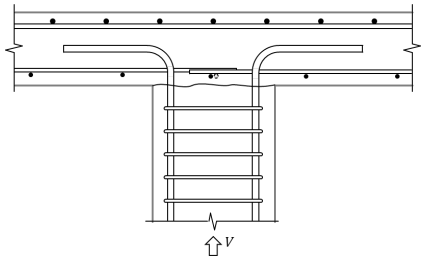


Source: NIST, using LS-DYNA software

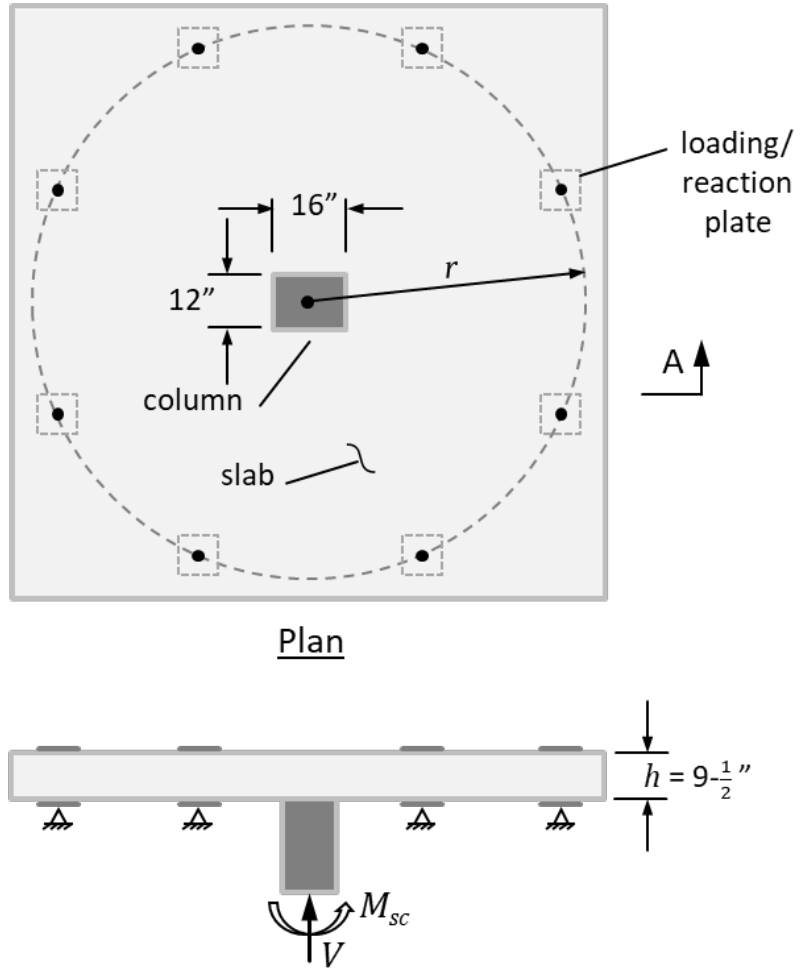
3

A

Test specimen detail



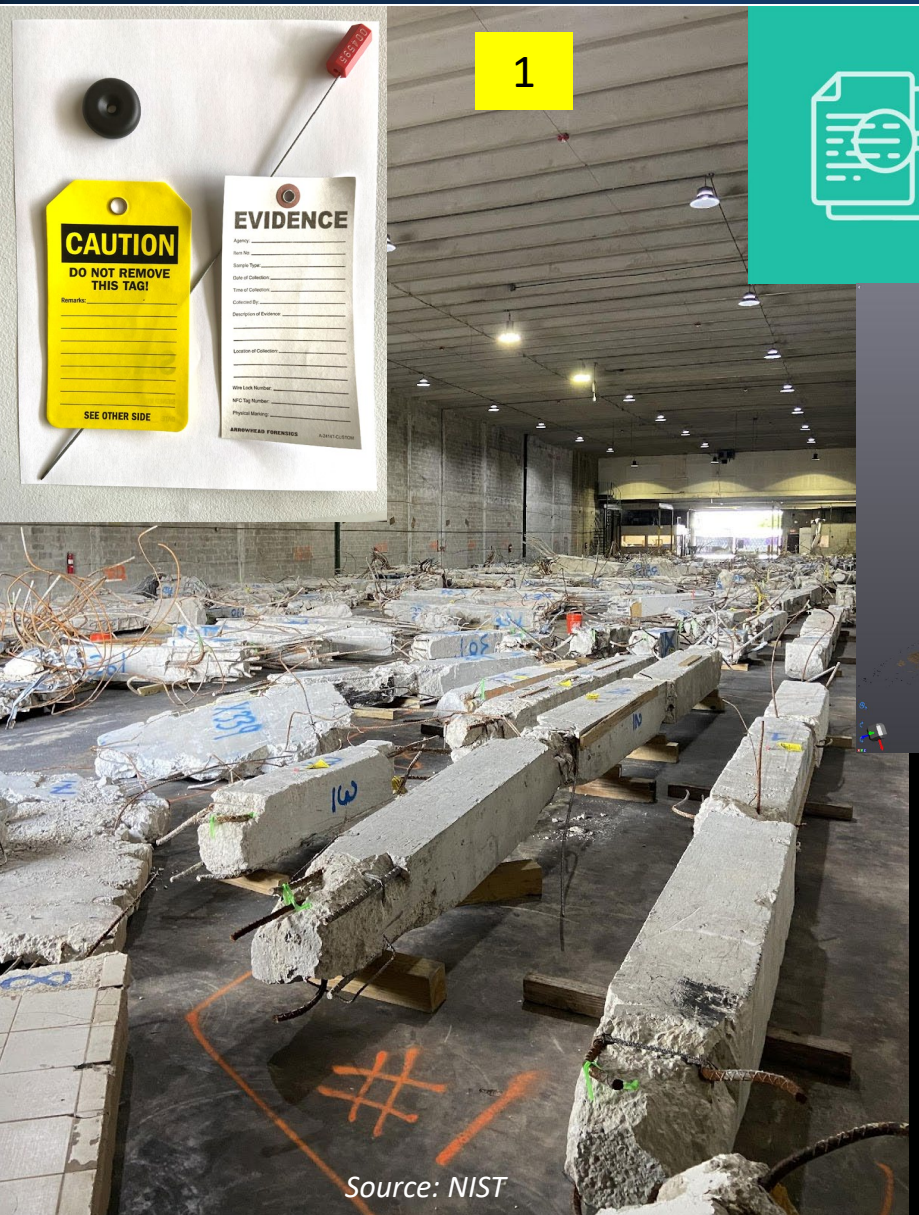
Test configuration



Source: NIST

Project Overview

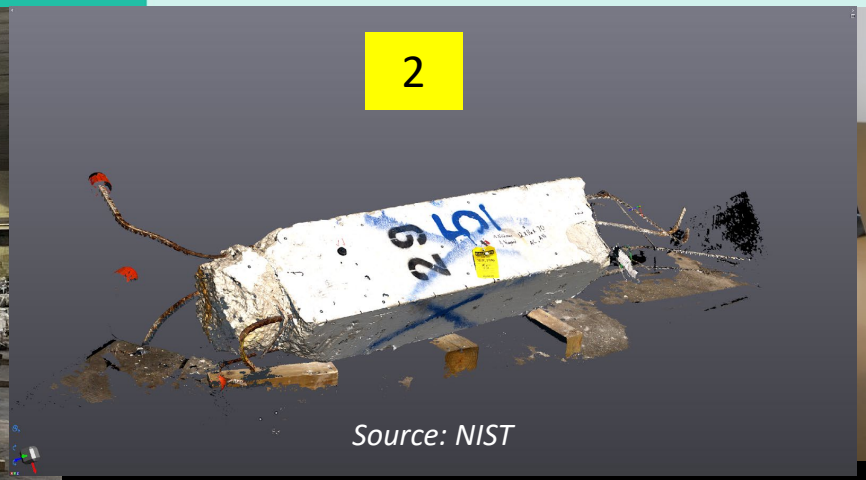
1



Source: NIST

Evidence Collection & Preservation

2



Source: NIST

3

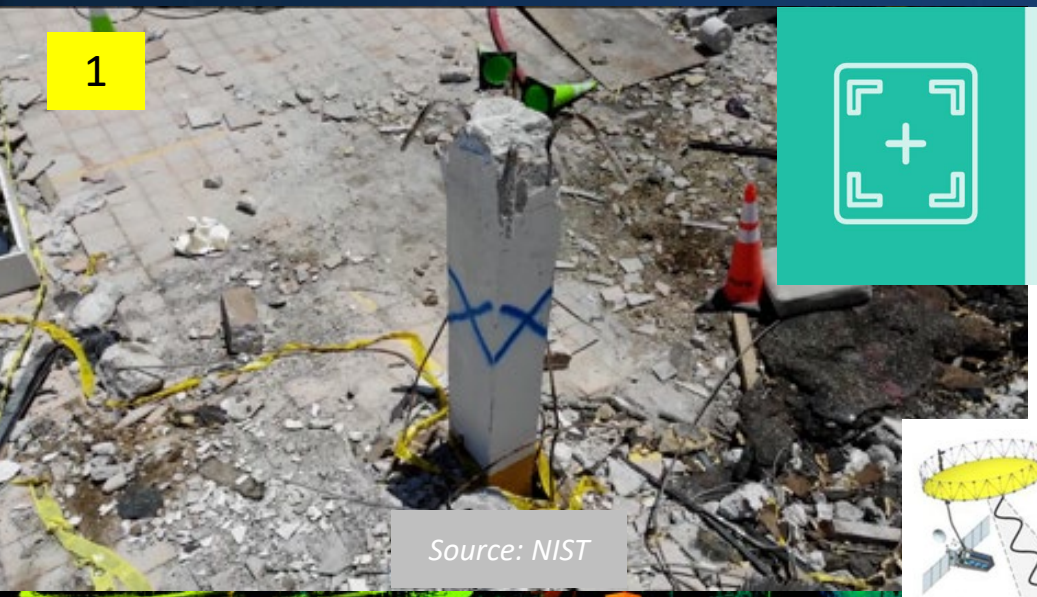
Source: NIST

4

Source: NIST

Project Overview

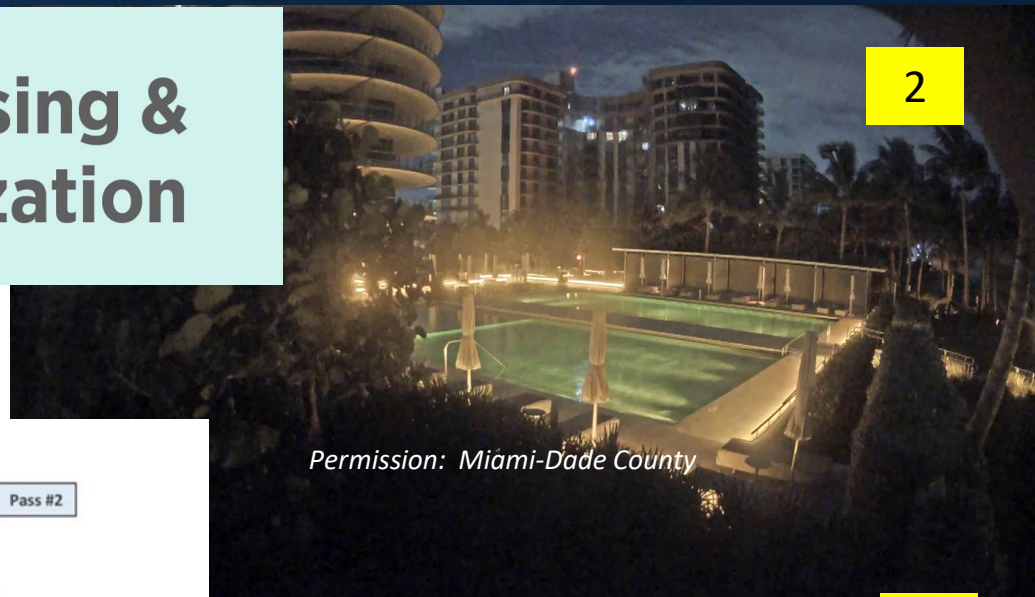
1



Source: NIST

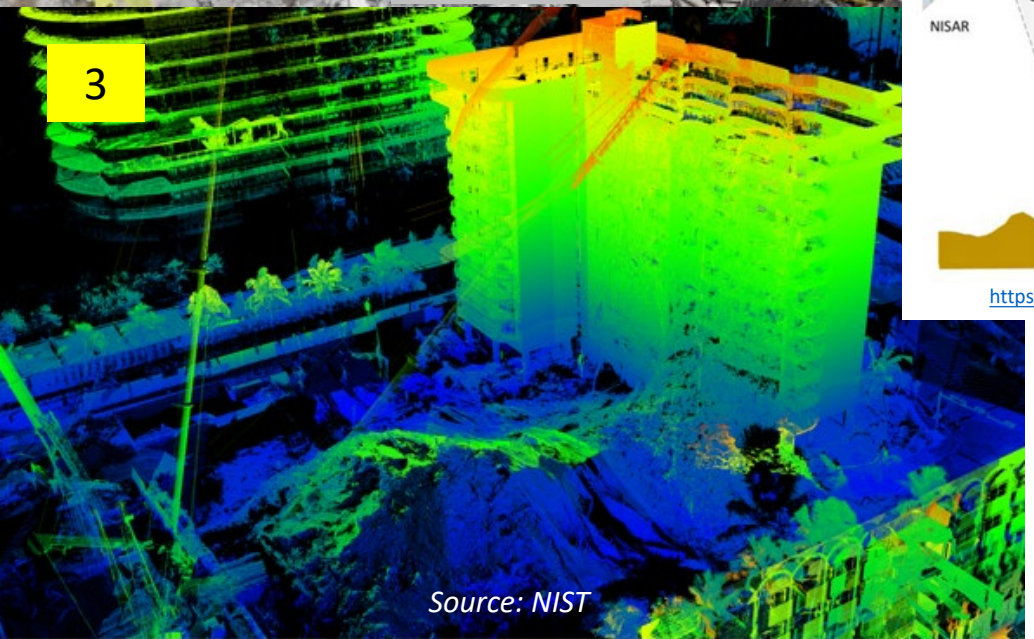
Remote Sensing & Data Visualization

2



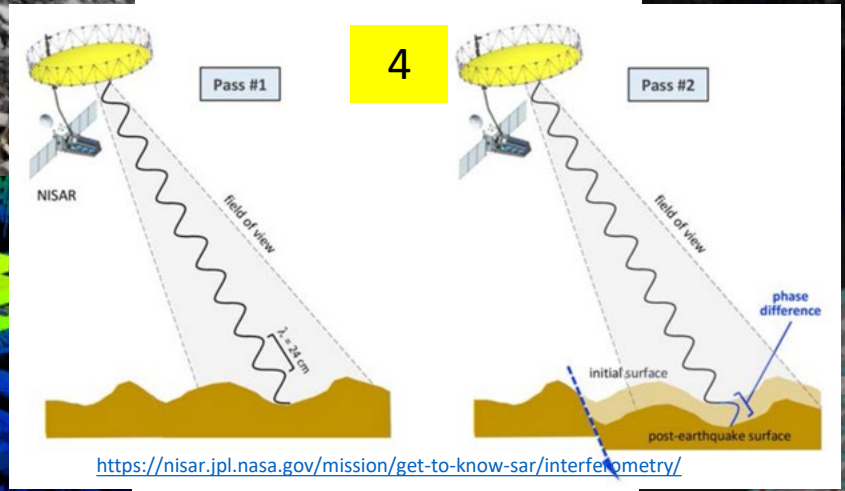
Permission: Miami-Dade County

3



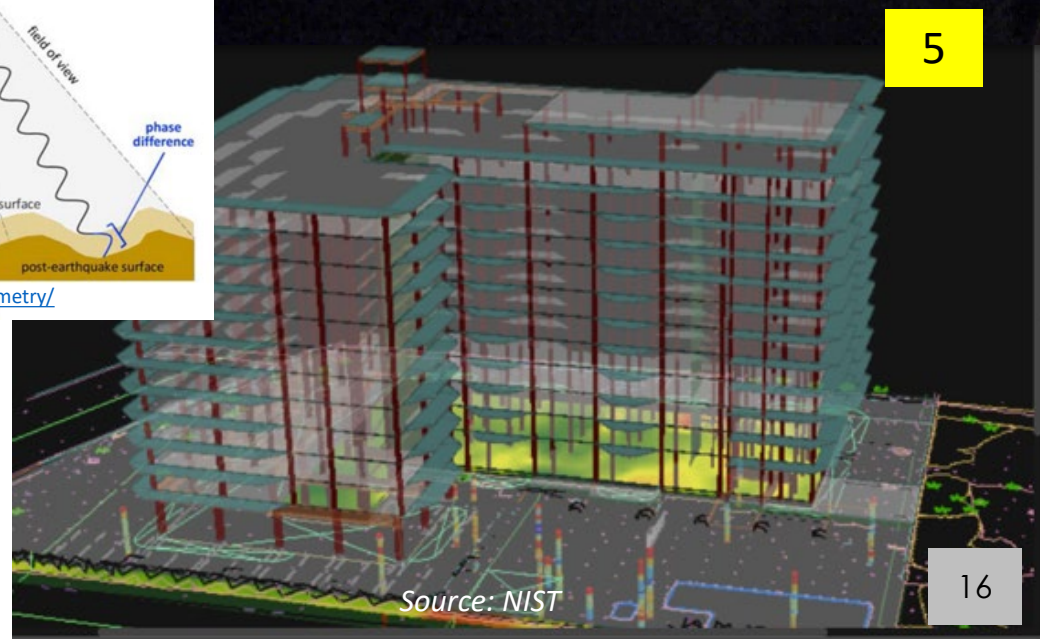
Source: NIST

4



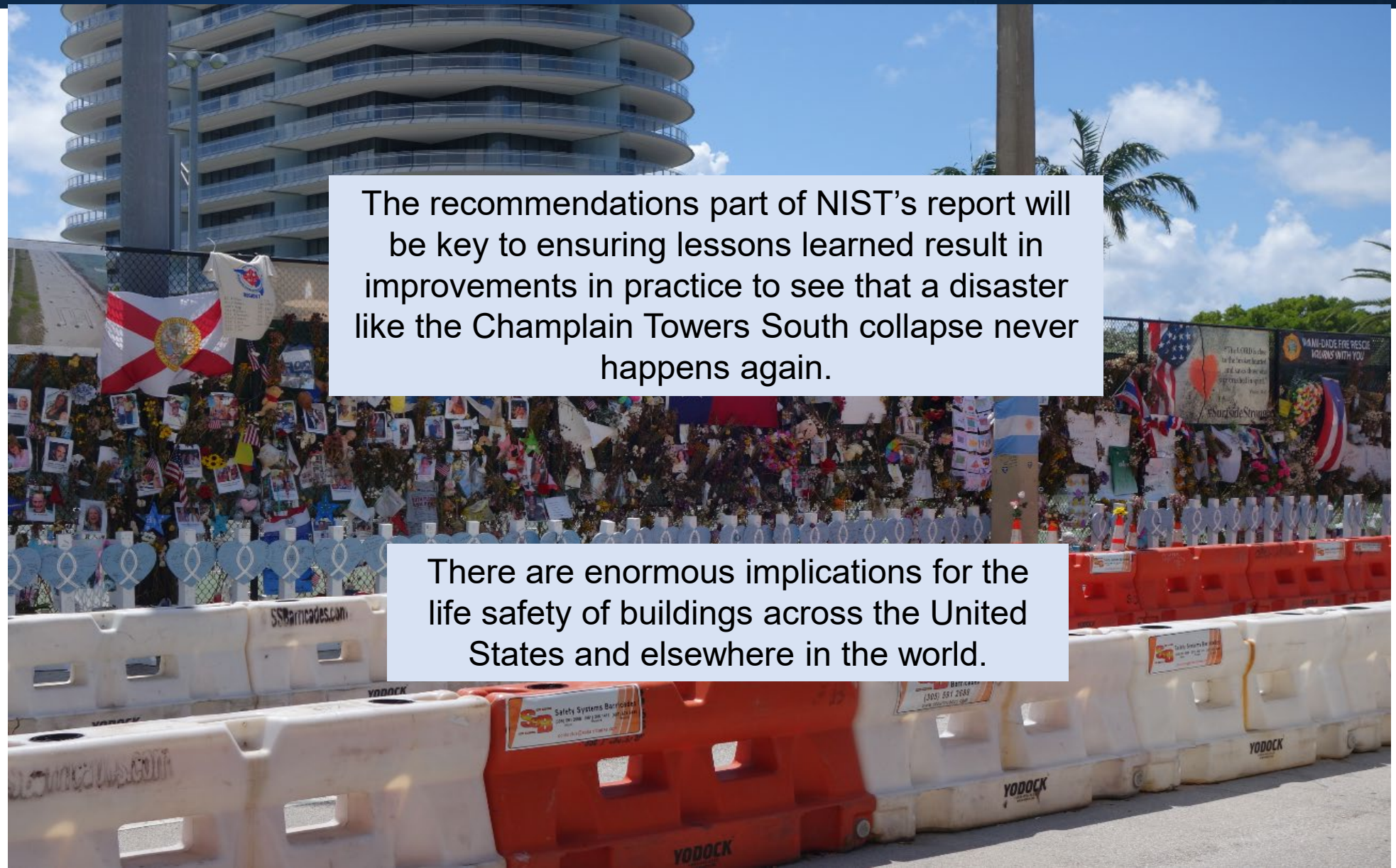
https://nisar.jpl.nasa.gov/mission/get-to-know-sar/interferometry/

5



Source: NIST

Recommendations



The recommendations part of NIST's report will be key to ensuring lessons learned result in improvements in practice to see that a disaster like the Champlain Towers South collapse never happens again.

There are enormous implications for the life safety of buildings across the United States and elsewhere in the world.

Budget and Schedule

TITLE II

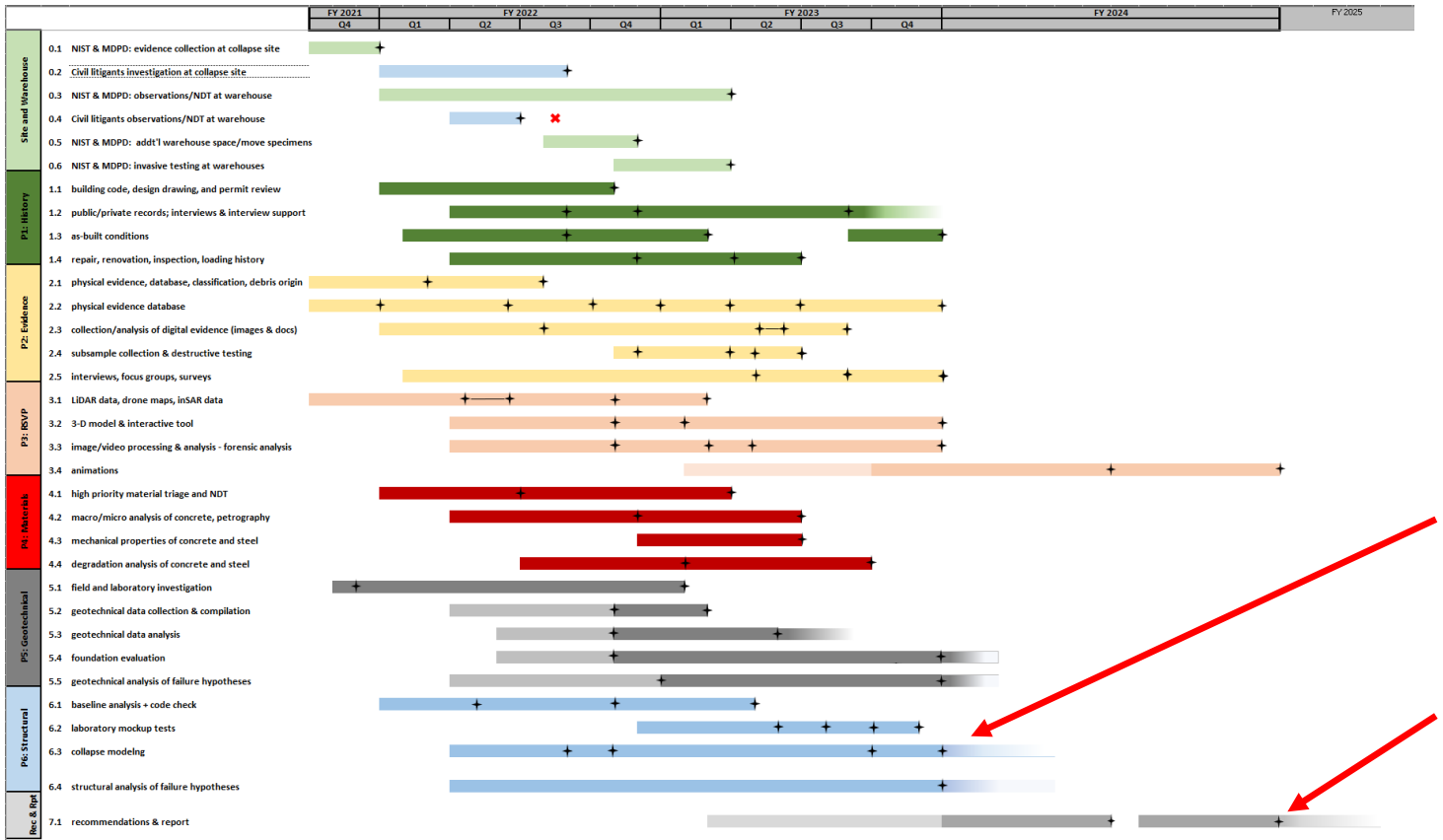
DEPARTMENT OF COMMERCE

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

SCIENTIFIC AND TECHNICAL RESEARCH AND SERVICES

For an additional amount for "Scientific and Technical Research and Services" for necessary expenses to carry out investigations of building failu
pursuant to the National Construction Safety Team Act of 2002 (15 U.S.C. 7301), $22,000,000, to remain available until September 30, 2023.

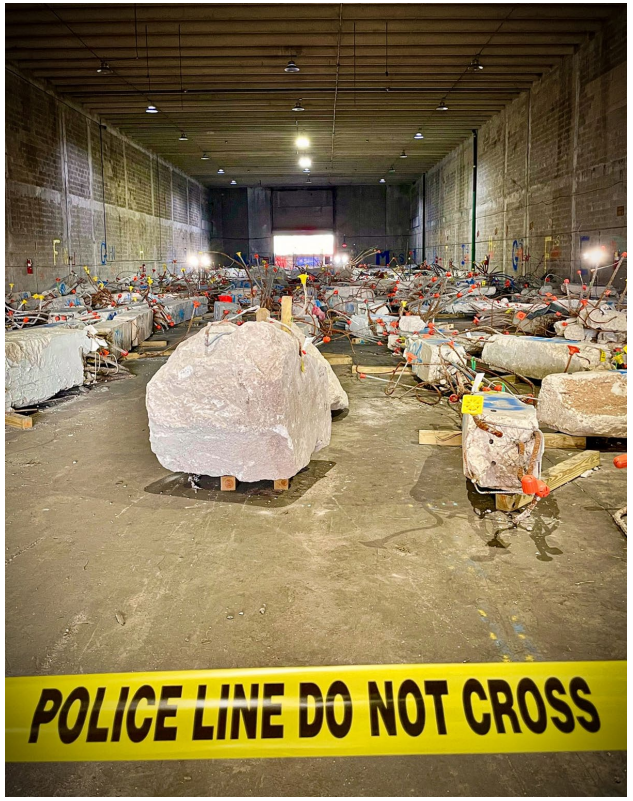
$22 million to remain available until September 30, 2023



technical work complete by end FY2023

report complete by end FY2024

Next Step: Invasive Testing



Source: NIST

over 600 pieces of physical evidence

Considerations

- Analysis of failure hypotheses
- Input for structural tests and computer modeling
- Input for material characterization and degradation mechanisms
- Evidence database > location in structure
- Non-destructive testing
- Sampling strategies for characterization (statistics/uncertainty)

Invasive testing plan

- Extract and test several hundred concrete samples
- Extract and test approximately 200 reinforcement samples

Structural/mechanical properties	• Material/chemical properties • Degradation mechanisms

DISCUSSION