



September 13, 2023

NIST Update on Champlain Towers Collapse Investigation

Overview

On June 24, 2021, part of the Champlain Towers South, a 12-story residential building, collapsed in Surfside, FL, killing 98 people. On June 25, the National Institute of Standards and Technology (NIST) National Construction Safety Team (NCST) sent investigators to the site to identify factors contributing to the collapse. On June 30, NIST launched a full technical investigation of the collapse.

Still underway, the NCST investigation is exploring a number of factors that might have contributed to the collapse, including sinkholes, excessive settling of the building's pile foundations, and other factors.

On September 7, 2023, the NCST reported on the investigation's findings to date. The update included preliminary evaluations of the data collected on site conditions and deviations from design in the construction of the building's pool deck.

Preliminary Findings

According to NIST,

The [NCST's] preliminary evaluation of the data collected indicates that approximately one quarter of an inch or less of settling occurred in the pile foundations supporting the pool deck structure and basement, which would have had minimal impact on the pool deck structure. The preliminary evaluation did not reveal evidence of sinkholes that could have created voids under the foundation.

The team's preliminary evaluation of physical and historical evidence also revealed how the construction of the pool deck deviated from design requirements. This adds to the low margins against failure that were [previously identified].

Specifically, the team found that the number of slab reinforcing bars centered over vertical columns was inadequate and that the reinforcing bars in the top of the slab in the vicinity of the columns were spaced farther apart than the design required. These deviations weakened the slab-column connections.

In the course of its investigation, the NCST has extracted more than 300 concrete cores and rebar samples from the site and begun materials testing. Thus far, according to the NCST, "the average tested concrete strength for various types of structural elements such as slabs and columns exceeds the specified design strength for those elements."

The NCST also reported progress in building a computer model to simulate the collapse initiation and progression.

In addition, the NCST team is actively seeking additional photos or videos of the building during the collapse to aid in its analysis.

NIST anticipates that the NCST will complete its technical work in June 2024 with release of its final report, including findings and recommendations, in June 2025.

NIST, NCST Authorities Under the National Construction Safety Team Act

Congress enacted the National Construction Safety Team (NCST) Act (P.L. 107-231) in October 2002 authorizing the NIST, a non-regulatory agency of the Department of Commerce, to establish teams to investigate building failures. NCST Act authorities are similar to those of the National Transportation Safety Board (NTSB), the federal agency that investigates transportation accidents.

Under the act, the NCST is charged with "improv[ing] the safety and structural integrity of buildings in the United States" by providing "for the establishment of investigative teams to assess building performance and emergency response and evacuation procedures in the wake of any building failure that has resulted in substantial loss of life or that posed the potential for substantial loss of life."

The NCST Act authorizes NIST to dispatch teams of experts, where appropriate and practical, within 48 hours after major building disasters. Each team must have at least one NIST employee. Teams may include private sector and university experts, representatives of professional organizations, and appropriate federal, state, and local officials. Under the act, NSCT teams are to:

- establish the likely technical cause or causes of building failures;
- evaluate the technical aspects of evacuation and emergency response procedures;
- recommend, as necessary, specific improvements to building standards, codes, and practices;
- recommend any research and other appropriate actions needed to improve the structural safety of buildings, and to improve evacuation and emergency response procedures; and
- within 90 days of completing an investigation, issue a public report of findings and recommendations.

The NCST Act authorizes NIST and its investigative teams to access the site of a building disaster; subpoena evidence;

access key pieces of evidence, such as records and documents; and move and preserve evidence. Under the act, NIST may not interfere with active search, rescue, or recovery operations at the failure site. In addition, NIST investigative authorities are secondary to any criminal or terrorist investigation.

NIST does not consider findings of fault, responsibility, or negligence. No part of any report resulting from an NCST investigation may be admitted as evidence or used in any suit or action for damages arising out of any matter mentioned in such report.

Under the act, NIST is to brief the public regularly on the status of investigative proceedings and findings.

The act also authorizes the Director of NIST to establish a standing NCST Advisory Committee of up to 10 persons with broad technical expertise and experience to provide advice. Each year, the advisory committee is to transmit a report to Congress that includes an evaluation of NCST Act activities, recommendations to improve the operation and effectiveness of investigation teams, and an assessment of the implementation of team and advisory committee recommendations.

Decision to Conduct an NCST Investigation

According to NIST, before deciding whether to conduct a full NSTC technical investigation, NIST sends experts to the site of the building failure to collect initial information about the event. The NIST Director may order a full NCST Act technical investigation after ensuring that the event is within the jurisdiction of the National Construction Safety Team Act, and that the building material and construction type exist broadly in a region or across the country. Previous NSTC Act investigations have taken two years or more to complete.

Prior and Current NIST NCST Investigations

NIST has completed three NCST Act investigations:

- World Trade Center (WTC) collapses (final report on the collapse of the Twin Towers issued in 2005, final report on collapse of WTC 7 building issued in 2008);
- Station Nightclub Fire in West Warwick, RI (final report issued in 2005); and
- Joplin, MO, Tornado in May 2011, the single deadliest and costliest tornado in U.S. history (final report issued in 2014).

NIST is currently conducting an NCST Act investigation of the effects of Hurricane Maria on Puerto Rico in September 2017. NIST issued a progress report in January 2021. The draft final report for public comment on the Hurricane Maria investigation is expected in 2025.

NIST and Building Codes, Standards, and Practices

NIST is not a regulatory agency; it does not determine which building and fire safety codes, standards, and practices get adopted by state and local governments. In particular, the NCST Act specifically states that it does not confer any authority on NIST to require the adoption of building codes, standards, or practices.

NIST does support the development of building codes and standards in a variety of ways, however. For example, NIST research supports the development of codes and standards, including measures of building resilience and structural robustness related to disasters, such as hurricanes, earthquakes, tornadoes, and blast and impact events; hazard characterization and structural design; materials research; understanding fire behavior and structural response to fire; and construction and in-service failures.

In particular, the NIST Engineering Laboratory's Materials and Structural Systems Division develops and promotes the use of science-based tools—including measurements, data, models, protocols, and reference standards—to improve the global competitiveness of U.S. industry through innovations in building materials and construction technology, and to improve the safety, security, and sustainability of the nation's buildings and physical infrastructure.

The laboratory's work aims to address a gap between basic research and building codes, standards, and practices through measurement science research. This research is intended to contribute to the development and improvement of standards and building codes.

Options for Congress

Given public concerns that the conditions leading to the collapse of the Champlain Towers South building might be present in other buildings, Congress might consider whether to hold public hearings on the results of the investigation thus far, and implications, if any, for existing buildings and the design, construction, and regulation of future buildings.

Other Resources

NIST Building Codes and Standards
NIST Construction and In-Service Failure
NIST Materials and Structural Systems Division
NIST National Fire Research Laboratory
NCST Advisory Committee

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IF12496

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