Overview of the National Fire Research Laboratory

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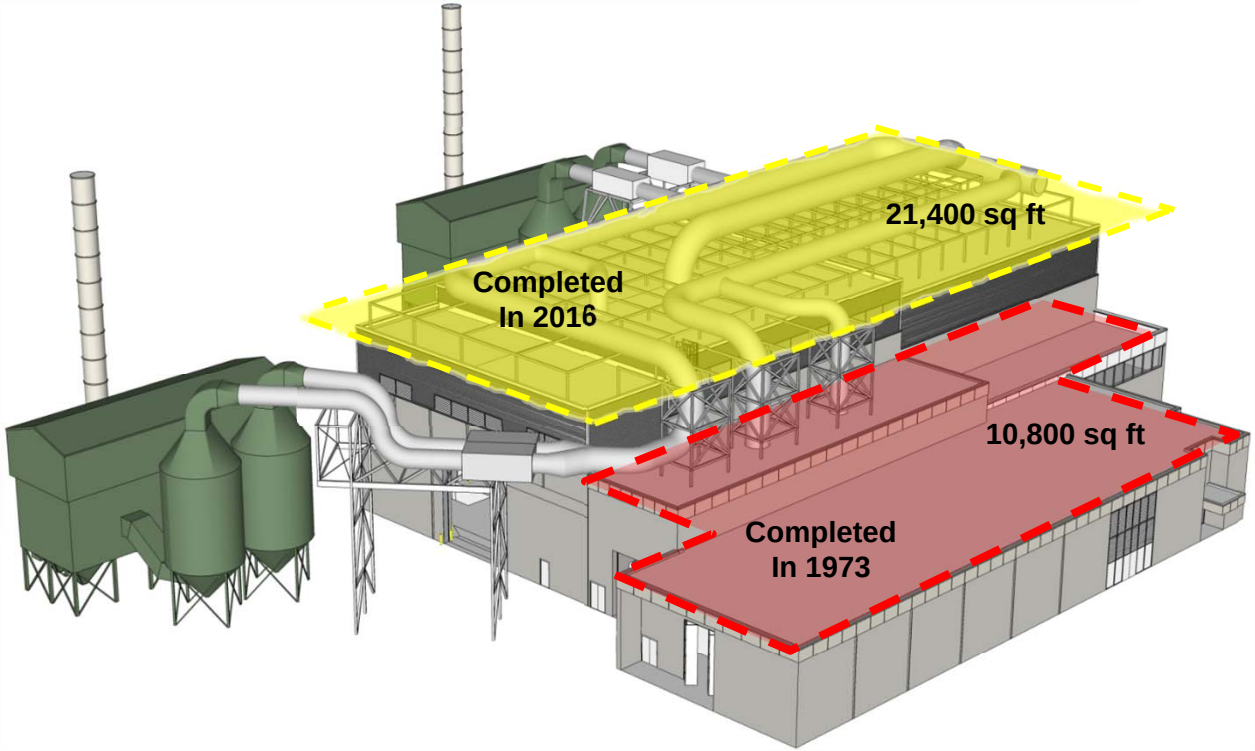
Fire Research Division
July 19, 2018

Local Emergency Planning Council (LEPC)

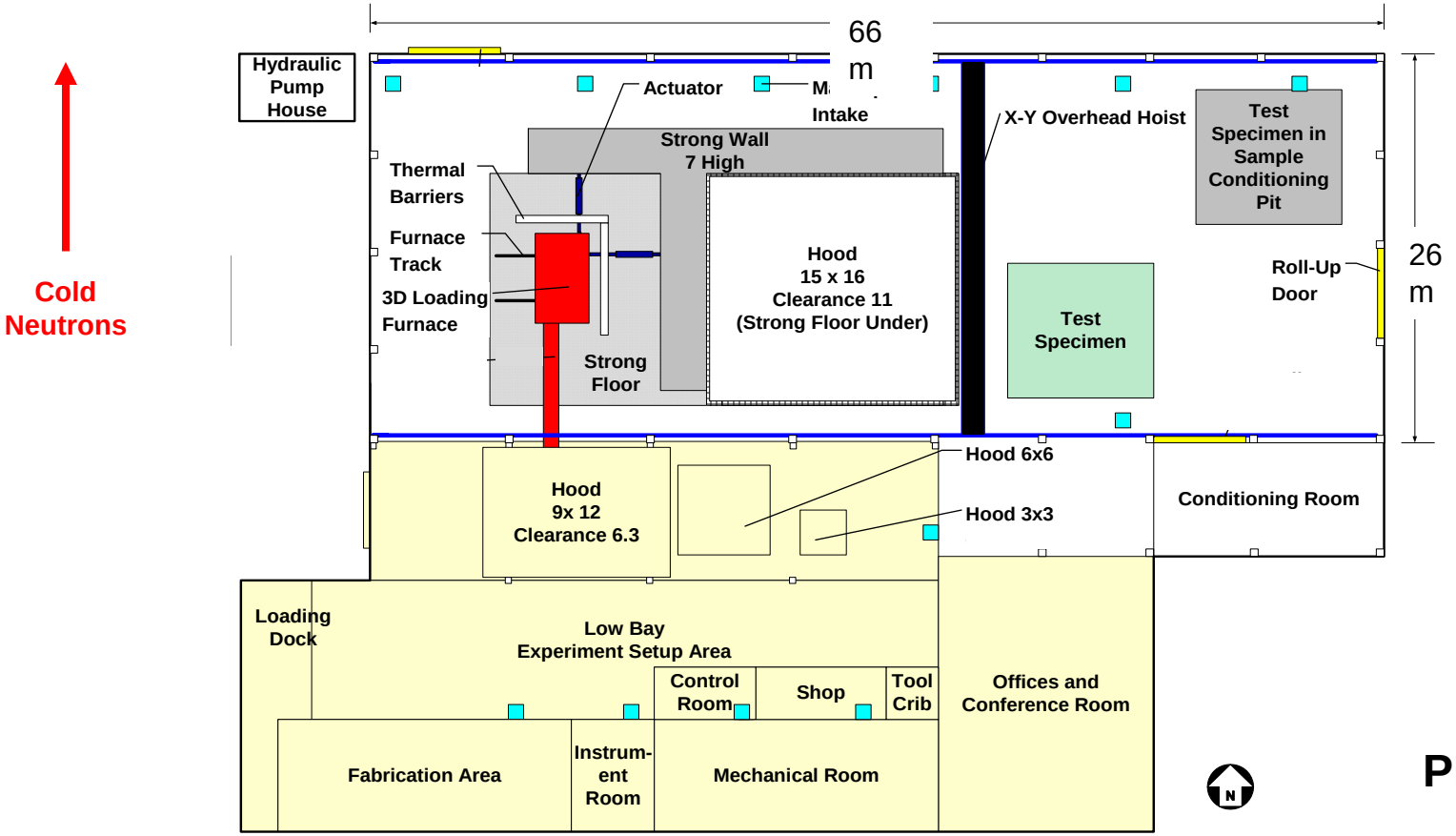
MontgomeryCountyMD.GOV
Office of Emergency Management and Homeland Security

National Fire Research Laboratory (NFRL)

A unique facility dedicated to understanding fire behavior and structural response to fire



Bundy et al. "Structural Fire Experimental Capabilities at the NIST National Fire Research Laboratory." *Fire Technology*, 52(4), July, 2016, pp 959–966.

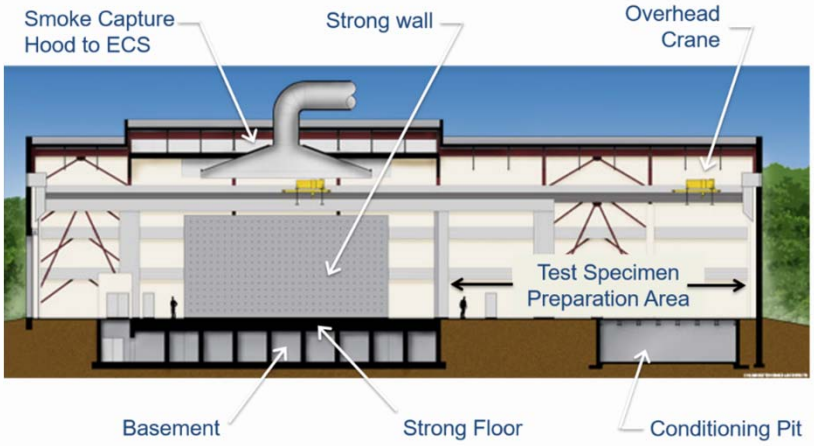


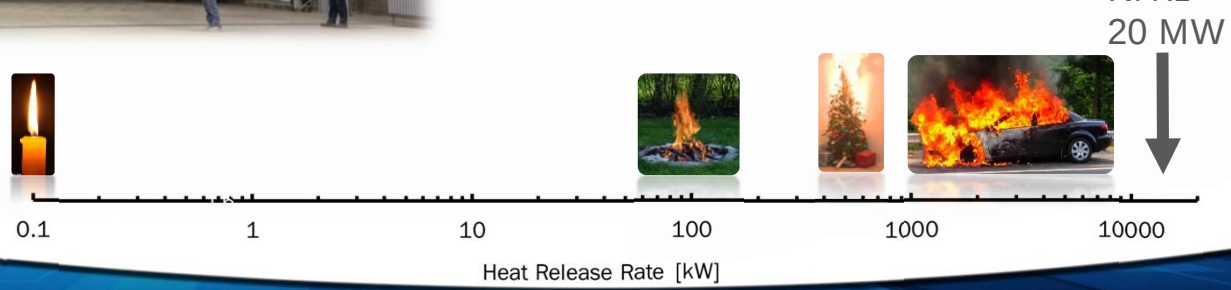
Plan view of NFRL

Completed in 1973

Capabilities of the NFRL

A combined structural and large fire experimental facility that can be used to study a variety of scenarios

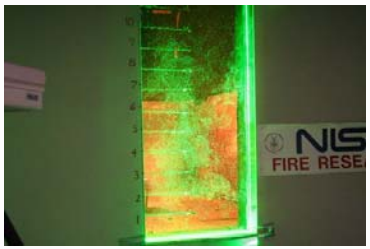




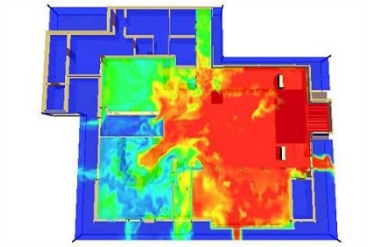
NFRL Thrust Areas

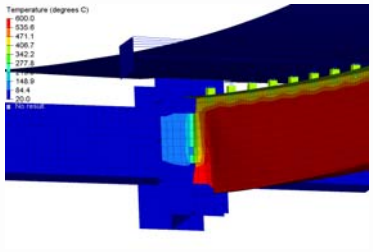
Support Post-Fire Investigation

Advance Metrology Tools



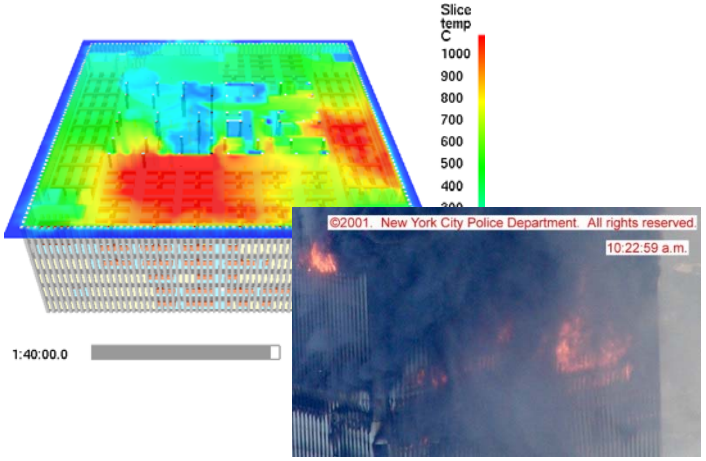
Validate Computational Models





Conduct Large-Scale Testing

Supporting NIST Fire Investigations



World Trade Center Investigation

Kevin McGrattan, Chuck Bouldin, Glenn Forney

Figure 5-43. Initial growth of fire on foam at corner of the alcove (10 seconds)

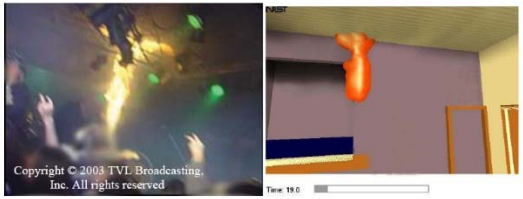
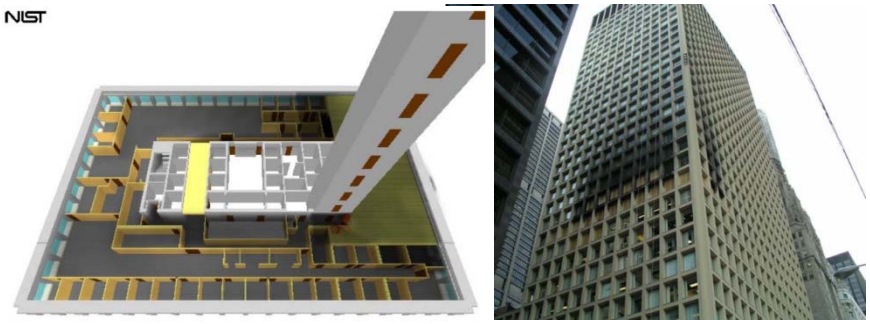


Figure 5-44. Flames impinging on ceiling (19 seconds)

The Station Nightclub Fire

Dan Madrzykowski and Steve Kerber



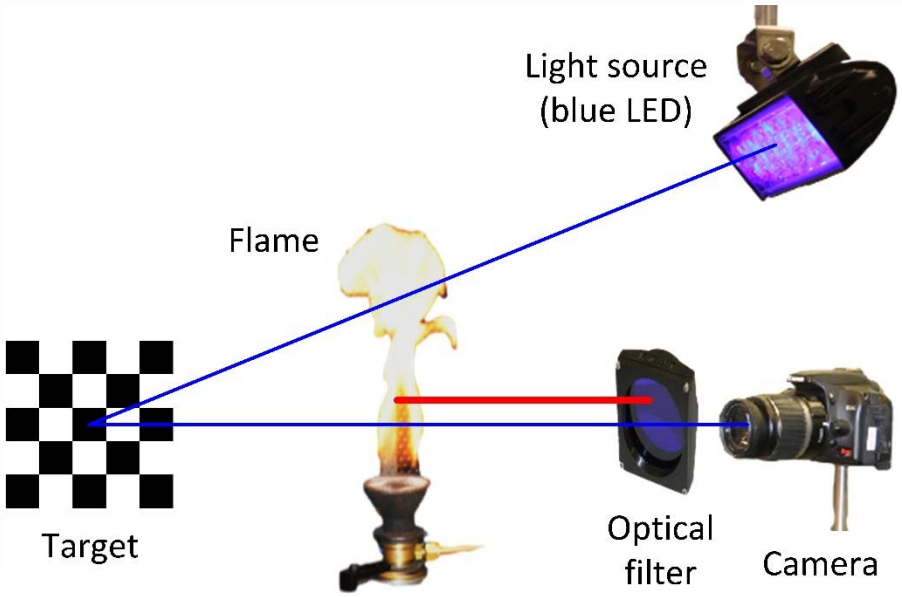
Cook County Administration Building Fire

69 West Washington, Chicago, Illinois, October 17, 2003

Doug Walton and Dan Madrzykowski

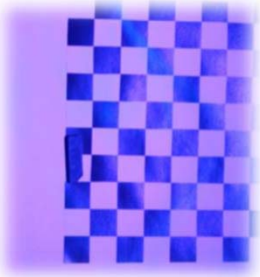
Advanced Metrology Tools

To lead and foster the development and validation of advanced structural fire measurement technologies (PIs: Matthew Bundy, Matthew Hoehler)



Target obstructed

Addition of blue
450nm light



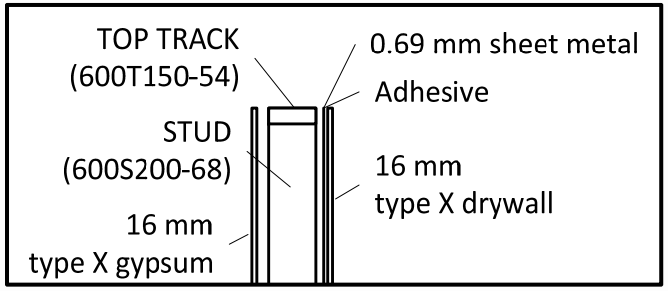
Red light removed with
narrow band filter

Smith & Hoehler "Imaging Through Fire Using Narrow-Spectrum Illumination." *Fire Technology*, publication pending.

Large Scale Tests - Measurement of Structural Performance: Cold Formed Steel

To study the influence of fire on the lateral load resistance of cold formed steel shear walls (PI: Matthew Hoehler)

Hoehler & Smith *Influence of Fire on the Lateral Load Capacity of Steel-sheathed Cold-Formed Steel Shear Walls - Report of Test*, NIST Internal Report (NISTIR) – 8160, 2016.



Test specimens: 2.7 m × 3.7 m

[redacted]

Cycle to 3% w/o burn

Cycle to 1% → burn → cycle to 3%

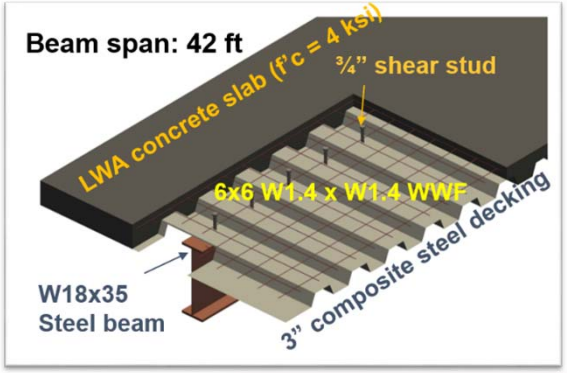
Large Scale Experiments of Cross-Laminated Timber

To quantify the contribution of CLT elements to compartment fires with varied ventilation, encapsulation and exposure (PIs: Joseph Su [NRC-Canada], Matthew Hoehler [NIST])

Su et al. "Fire Safety Challenges of Tall Wood Buildings – Phase 2: Task 2 & 3 – Cross Laminated Timber Compartment Fire Tests", Fire Protection Research Foundation Report, FPRF-2018-01, February 2018

Composite Floor Systems: Long-Span Beam Tests

To advance performance-based design through experimental tests on real-scale composite floor systems under fire exposures (PI: Lisa Choe)



Choe et al. "Fire Performance of Long-span Composite Beams with Gravity Connections" Proc. Int. Conf. Structures in Fire, Belfast, UK, June 6-8, 2018

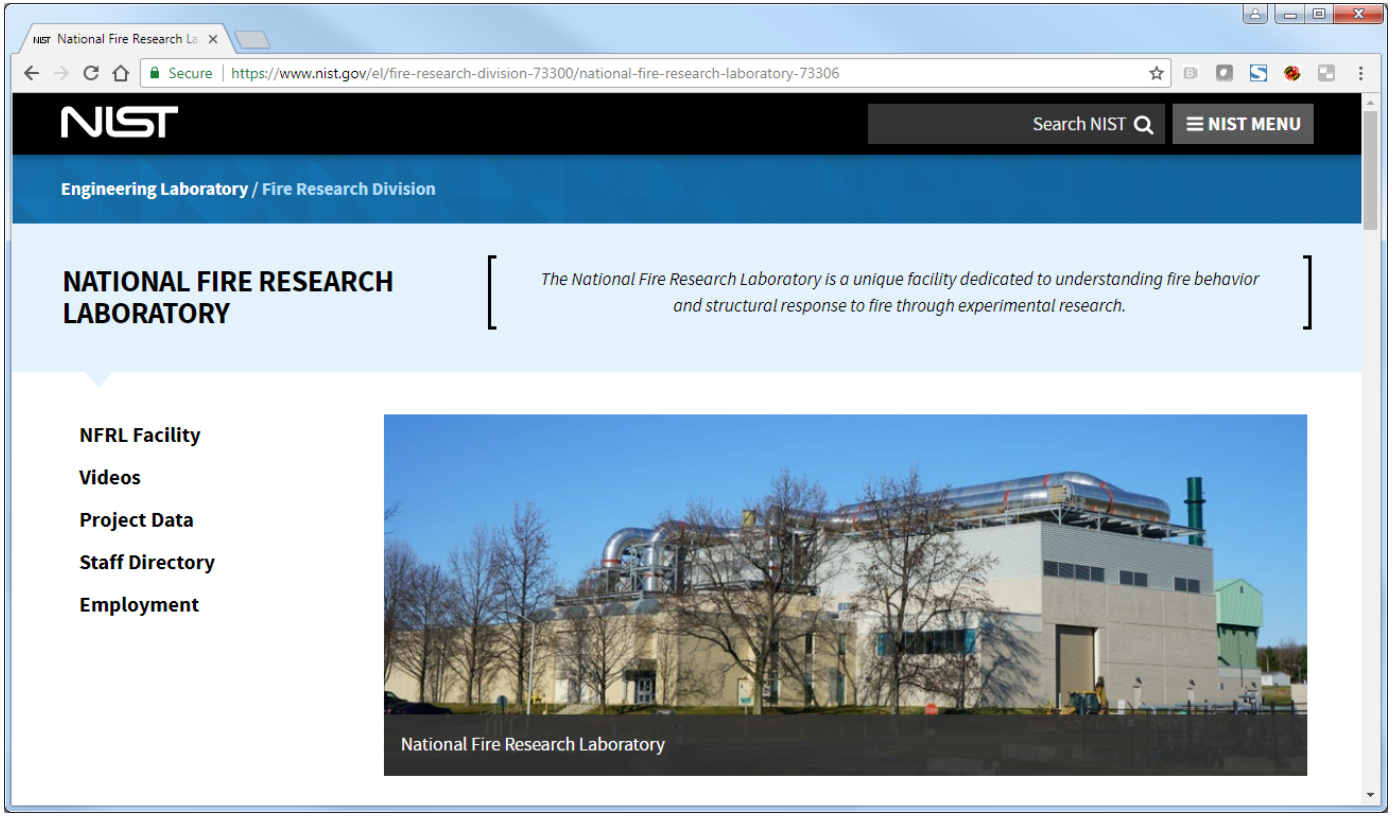
Summary

- The National Fire Research Laboratory is a unique facility dedicated to understanding fire behavior and structural response to fire through experimental research

- It provides the unique capability to measure the performance of real-scale, mechanically loaded, structural systems under real fire conditions

- We collaborate with scientists and engineers from industry, academia, and government agencies to:
  - Advance real-scale structural-fire measurements,
  - Generate technical data to improve fire & building codes,
  - Validate physics-based models, and
  - Conduct post-fire investigations

Data and Videos at: www.nist.gov



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