

**Federal Building and Fire Safety Investigation
of the World Trade Center Disaster**

**Investigation of Active Fire Protective Systems
Project 4**

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Objective

NIST is investigating the design, capabilities, and performance of the installed active fire-protection systems in WTC 1, 2, and 7 and their role in fire control, emergency response, and fate of occupants and responders.

Scope

Three systems are being investigated: the fire sprinkler system, including the fire standpipes and pre-connected hoses; fire alarm system; and the smoke management systems.

Areas of Focus

- What were the performance limitations of the WTC 1 and 2 sprinkler systems after rupture of the water supply riser?
- What was the capacity of the sprinkler system in building 7 to retard fire spread?
- What, if any, are the default alarm signals or messages from a damaged WTC 1 and 2 system?
- Was the manual smoke purging system used in the towers?

Organization of Project 4

- NIST investigators leading three groups of fire protection system contract experts.
- The engineering groups are organized by fire protection system specialty.
- Each group is examining the one type of fire protection system in all three WTC buildings.

Expert Contractors

- Sprinklers, Standpipes and Pre-connected Hoses
Hughes Associates, Inc. of Baltimore, MD
- Fire Alarms
Rolf Jensen and Associates, Inc. of Fairfax, VA
- Smoke Management
Hughes Associates, Inc. of Baltimore, MD

Sprinklers, Standpipes and Pre-connected Hoses - Tasks

- Document the design and installation
- Document the design and capacity of the water supply including provisions for redundancy
- Identify differences in the designs between WTC 1, 2, and 7
- Document the normal operation and effect of the fully functional systems for fire control
- Assess the probable performance of the systems on September 11, 2001

Fire Alarms - Tasks

- Document the design and installation of the systems
- Document the normal expected operation and effect of the fully functional systems, including provisions for redundancy
- Document modifications made to fire alarm systems in WTC 1 and 2 after the 1993 bombing
- Assess the probable performance of the systems on September 11, 2001

Smoke Management - Tasks

- Document the design and installation of the systems
- Describe the normal operation in fire emergencies
- Assess the probable performance of the systems on September 11, 2001

Fire History of WTC Buildings 1, 2 and 7

- NIST gathered information on significant fires in the buildings after occupancy and prior to 9-11-01
- The extensive records of fire incidents kept in the WTC 1 offices of the PANYNJ were lost
- Information was collected from FDNY [434 Bureau of Operations Fire Reports (1970-2001) and 87 Bureau of Fire Investigation Records (1977-2001)]
- There were 12 significant fires defined by NIST as those activating multiple sprinklers or equivalent in addition to the well known 1975 fire starting on floor 11 of WTC 1 and 1993 parking garage bombing

12 Significant Fires in WTC 1, 2, and 7

Date	Bldg #	Fire Location	# Sprinklers	Cause of Fire	Material Ignited
9/9/77	1	B-6 level storage room	2 heads	None listed	Not listed
9/23/77	1	Dumpster on B-4 level	2 heads	Not classified	Trash/waste
12/23/83	1	2 dumpsters on B-4 level	2 heads	Suspicious	Trash/waste
1/27/85	1	Office space on mezzanine level (Floor 2)	2 heads	Incendiary	Trash/waste
9/10/85	1	Garbage dumpster in service elevator lobby on floor 43	2 heads	Suspicious	Trash/waste
11/1/85	1	Storage closet on B-4 level	3 heads	Suspicious	Supplies/stock
6/7/86	1	Dumpster fire on floor 106, compactor room on floor 107	2 heads	None listed	Trash/waste
11/10/99	1	Computer room on floor 104	3 heads	None listed	Plastics, electronic equip
4/12/77	2	Duct work over grill in restaurant on floor 107	2 heads	None listed	Duct work
3/22/93	2	Fan motor room on floor 108	2 heads	Mechanical failure	Not classified
5/19/75	2	Core Area on floor 32	3 standpipe lines	Incendiary	Trash/waste
5/20/88	7	Construction shanties on floor 3	Multiple, # not listed	Suspicious	Shanties

Fire Alarm Information from Building 7

- WTC Building 7 fire alarm system was monitored by AFA Protective Systems, Inc. outside of the WTC site
- The fire alarm record was reviewed to find information about the fire conditions in building 7 on 9/11/01
- Although a great amount of information is collected from fire detectors throughout a building and stored by the fire alarm system, typically, and in this case, no specific fire information is sent out of the building

WTC Building 7 Fire Alarm System Central Station Monitoring Record - 09 / 11 / 01

09/11/01 10:00:52 1 1510 CO TO CLASS E AREA:1 *T

09/11/01 06:47:43 COMMENT: RIC: WILLIAMS

09/11/01 06:47:03 RIC 4210 PLACE ON TEST CAT:11

09/11/01 06:47:03 COMMENT: 091101 647 091101 1447

09/11/01 06:47:02 COMMENT: TEST: ALL

09/11/01 06:05:01 RP 20 TIMER TEST