



PRUDENTIAL BUILDING FIRE

Boston, MA

January 2, 1986



**FIRE
INVESTIGATIONS**

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Preliminary Investigation Report

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Abstract

On January 2, 1986, at approximately 5:13 p.m., a fire was detected on the fourteenth floor of the 52-story Prudential Building in the Back Bay section of Boston. The Prudential Building, built in 1965, is an office complex with a capacity for approximately 5,000 persons; however, because of the holiday season, the unoccupied leasable space, and the close of the business day, an estimated 1,500 persons were present in the building on the day of the fire.

Investigators from the Boston Fire Department determined that the fire began in stored building materials on the unoccupied fourteenth floor. The developing fire apparently was detected first by a smoke detector in the elevator lobby area. The intense fire caused by the burning of accumulated combustible materials resulted in smoke spread through a service elevator shaft, a stairway, a utility shaft opening and the building's heating, ventilating and air conditioning (HVAC) system. Various levels of smoke spread quickly to upper floors of the building, and smoke in the stairway hampered the evacuation of occupants. An emergency evacuation plan for the building was used effectively by the building's security force, to aid in the evacuation process, while fire fighters implemented their high rise building emergency procedures to extinguish the fire and assist occupants from the building.

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The non-profit technical and educational organization: To promote the science and improve the methods of fire protection and prevention; to obtain and circulate information on these subjects and to secure the co-operation of its members and the public in establishing proper safeguards against loss of life and property by fire.

Acknowledgements

The National Fire Protection Association is conducting an investigation of the Prudential Building Fire in Boston, Mass., which occurred on January 2, 1986. The investigation is being conducted with the cooperation of the Boston Fire Department. This preliminary report was prepared by members of NFPA's Fire Investigations and Applied Research Division. The assistance and cooperation of Boston Fire Commissioner and Chief of Department Leo Stapleton, Fire Marshal John White and former Fire Commissioner George Paul is greatly appreciated.

Background

As a result of several severe high rise building fires during the early 1970s, past Boston Fire Commissioner James H. Kelly recommended legislation that would require all structures more than 70 feet high built after 1973 to be protected with a complete automatic sprinkler system. This modification of the state building code was adopted as law in 1972 and has resulted in many of the city's high rise buildings being protected by automatic sprinklers. During this same time period, under the authority of Boston's Fire Prevention Code, the Boston Fire Department issued Fire Prevention Order 72-1, "Regulation and Procedure for Building Evacuation." The Order required certain occupancies, including high rise buildings, to have a "plan of evacuation, and for the maintenance of facilities and to plan the training of personnel essential to the plan." The emergency plan, to be prepared by the building management, was subject to the approval of the head of the fire department. The Fire Prevention Order specifically required such features as a voice communication system, elevators for fire fighters' emergency use, a fire alarm system and an emergency operations protocol. Once plans were

submitted, fire prevention officers worked closely with building representatives on improving the level of protection within the building and ensuring that the intent of the order was met. The Prudential Building evacuation plan had been modified over the years as improvements were made to its fire protection features; however, it did not have an automatic sprinkler system since it was built before the mandatory legislation.

The Building

The 52-story Prudential Building is located in the Back Bay section of Boston. The building rises 750 feet above a landscaped plaza and is set in a wide moat spanned at four points by access bridges. Built in 1965, the 21-year-old structure measures approximately 174 feet by 150 feet and contains an average of 26,100 square feet per floor. The facility is built of protected, noncombustible construction consisting of concrete and steel structural members protected with sprayed-on fireproofing material. The facility is rectangularly shaped with a central core section. The central core consists of 23 elevators, 2 stairways, restrooms, pipe chases, shafts and utility closets. Two freight elevators, which serve all floor levels, are designated for fire department use. The activation of any fire alarm signal in the building automatically sends the service elevators to the loading area for fire department use.

Stairway A for the building is a smokeproof tower. Before entering this stairway, one must pass through a vestibule that is open to the outside. This design is intended to prohibit smoke on a floor from entering the exit stairway. Stairway B is a typical fire-resistive enclosure. Both exit stairs are 48 inches wide and have emergency lighting at intermediate landings.

Located on each stairway landing is a 2 1/2-inch fire department hose connection fed by a 6-inch standpipe riser, a hard-wired fire department communication jack, and public address speakers. Manual pull stations are

located at all stairway entrances. Smoke detectors are positioned at each elevator lobby and inside electrical closets. Automatic sprinklers are located in portions of the building situated below grade. Duct smoke detectors are located in the return/exhaust HVAC ductwork. Some entire floors are dedicated to mechanical equipment rooms, which service several floors that comprise a zone. Each zone has a 5000 gallon water storage tank to supply pressure for the standpipe system. In addition, the entire standpipe system is supplied by two manually operated 250-hp, 8-stage fire pumps. Because of the building height, this is a high-pressure system; each pump has an output rating of 750 gpm at 381 psi. First aid hose stations supplied by the 6-inch standpipe risers are properly spaced along core perimeters for occupant use.

Fire Incident

At 5:13 p.m. on Thursday, January 2, 1986, a fire alarm signal was received in the Prudential Building's fire control area, apparently initiated by a smoke detector located on the fourteenth floor. The alarm was automatically transmitted to the Boston Fire Department, which dispatched one engine, one truck and a district chief. In accordance with the building's emergency evacuation procedures, security personnel took the following actions:

- Made a general announcement via the public address system notifying all building occupants that a fire alarm had been received from the fourteenth floor and was being investigated.
- Unlocked doors in the loading dock area to provide incoming fire units access to the building.
- Sent personnel to investigate the source of the alarm.
- Contacted the fire department via telephone to confirm a fire condition.

The fire alarm system for the building was arranged so that, upon the receipt of an automatic alarm or the activation of a manual pull station, an audible alarm signal sounded on the floor of activation and the floor

immediately above. Thus, as smoke spread above the fire floor (mainly through the service elevators), additional audible alarms began to sound throughout most of the building.

At 5:16 p.m., the responding district chief ordered a box alarm, which brought two additional engines, one truck, a tower ladder, a rescue truck and the division chief.

Later, the responding division chief observed fire showing on the fourteenth floor, although it had not yet vented to the outside.

Fire officers, guided by the department's high rise fire fighting procedures, decided to stage an attack from the tenth floor, since a security officer had reported encountering smoke on the twelfth floor. The district chief directed security to continue implementing emergency evacuation procedures. Using the building's public address system, security personnel initiated a complete evacuation of the building, directing occupants to go to the nearest stairway and leave the building. This message, along with the information that a confirmed fire was in progress on the fourteenth floor, was repeated at frequent intervals.

Several fire fighters took the freight elevator to the tenth floor and entered Stairway B to begin their ascent to the fire. As the group in Stairway B approached the fire floor, they encountered increasing concentrations of smoke. When they reached the thirteenth floor, conditions in the stairway were untenable. The intense fire on the fourteenth floor apparently had caused the stairway door to allow the passage of smoke into Stairway B.

The fire fighters left Stairway B and entered the thirteenth floor to make their way over to the smokeproof tower, Stairway A. Those tenants in the process of leaving the building via Stairway B also were having difficulty because of the smoke buildup. Because of the severe fire conditions in

Stairway B, the chief radioed the command post to direct building occupants, via the public address systems, to use only Stairway A for evacuation. Upon reaching the fourteenth floor, fire fighters found an estimated two-thirds of the floor involved with fire and charged with dense, super-heated smoke.

Upon his arrival, Fire Commissioner Stapleton ordered additional alarms, based on the severity of conditions found in the initial size-up. Incoming crews were deployed to the tenth floor staging area, then sent to upper floors to assist in evacuation operations. Fire personnel were stationed inside Stairway A intermittently to assist in the evacuation. Security personnel using fire department keys safely removed several handicapped occupants in passenger elevators. Some groups of building occupants were moved safely to floors with little or no smoke infiltration. They were held there until final extinguishment of the fire.

Fire fighters extended two 2 1/2-inch attack lines, supplied by the building standpipe, from the twelfth and thirteenth floors to begin the fire attack via Stairway A. However, due to the number of occupants using Stairway A to leave the building, suppression activities had to be delayed for fear of creating untenable conditions inside the stairway. As soon as evacuation had been completed, fire fighting crews, wearing full protective gear and self-contained breathing apparatus (SCBA), advanced onto the fourteenth floor and began to suppress the fire.

By 6:30 p.m., the fire was under control. In all, an estimated 1,500 building occupants were evacuated successfully. Twelve persons, 4 of whom were fire fighters, were transported to area hospitals for treatment.

Thirty-one of the city's 52 fire companies responded to the eight-alarm fire. The response included 21 engines, 8 ladders, 1 rescue, 1 aerial tower and 130 fire personnel.

Summary

Review of the Prudential Building's Evacuation Plan and associated documentation shows that the building occupants receive fire evacuation training and participate in biannual fire drills. The information received and their knowledge of stairway locations apparently helped in the evacuation on January 2. The security force also receives fire training and is familiar with the emergency evacuation procedures. The severity of the fire and the spread of smoke throughout the upper levels of the building and into stairways presented a potentially life threatening situation. Fire department personnel, assisted by building security personnel, were able to communicate with one another regarding these conditions and to use the building's fire protection features to evacuate occupants safely and extinguish the fire.