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Five Fall in Hackensack

An early report of the tragic fire at a New Jersey auto dealership gives up some critical lessons about bowstring truss failure and rescue operations at large-scale collapse sites.

BY GLENN P. CORBETT

FIRST-ARRIVING fire companies responding to a report of a fire at the Hackensack, New Jersey Ford dealership found only a minor smoke condition near one of the overhead bay doors in the auto service area. In just over half an hour, five veteran firefighters were trapped and killed under a massive pile of stored auto parts and collapsed roof, ceiling, and truss assemblies.

The July 1, 1988 Hackensack fire was, in terms of firefighter deaths, the worst in northern New Jersey since the 1967 Cliffside Park bowling alley fire that also claimed the lives of five firefighters.

THE INITIAL REPORT

From building occupant reports, it appears that the first indication of fire at the Ford dealership was noticed approximately ten minutes before the call was made to Hackensack's fire alarm office. Workers detected smoke in the attic space above the building's auto service bays and at the same time noticed that the light fixtures at the garage ceiling had begun to flicker. Building

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occupants also noticed flame issuing from one of the automobile exhaust "hoses" at the ceiling level. The hose burned through and dropped to the floor.

The Hackensack fire alarm office received the report of fire from the Ford dealership at 3:01 p.m. Two engines, a tower ladder company, and a battalion chief were dispatched. A total of 13 firefighters responded to the building at 322 River Street.

The Ford dealership, built in 1948, was a 100-foot by 180-foot, irregular-shaped building. The office/sales and shipping/receiving areas at the front of the building were of

Fire in the truss loft above the service bay area (above) extends through the roof and flashes over roofing material moments before collapse of the bowstring truss assemblies (photo at left), trapping firefighters. Photos by Arthur Knobloch.

FIRE REPORT

FIVE FALL IN HACKENSACK

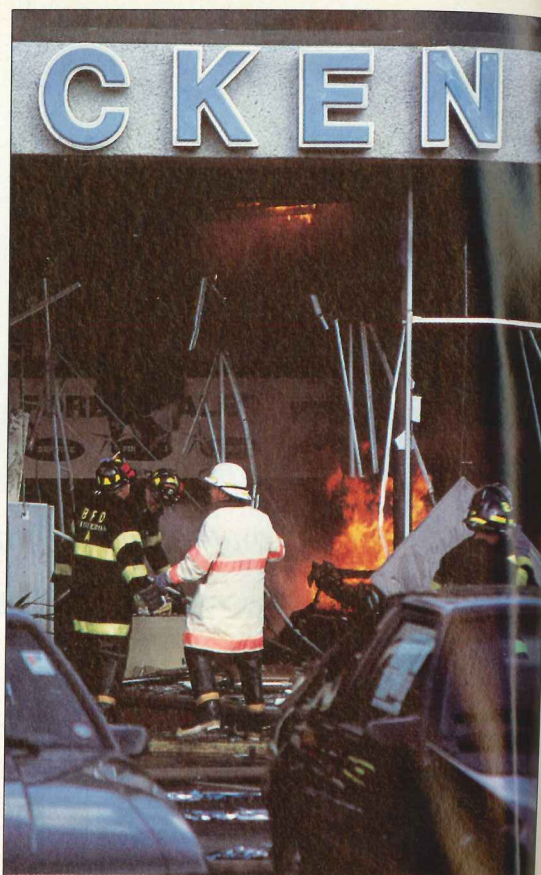
wood-frame construction. A small second-story office was located above. The mechanic's service bay/storage area was of concrete block with wooden bowstring trusses that formed the attic/roof structure. An auto body shop area, at the rear of the building, was of concrete block and steel I-beam construction. (See map on following page.)

First-arriving firefighters noted a slight smoke condition coming from an overhead door on the building's south side. The smoke emanated from an auto parts storage area located above the service bays in the bowstring-truss attic area. This "truss loft," comprised of five wooden bowstring trusses, was concealed by a heavy ceiling of cementitious material on wire lath.

Initial strategy was to offensively attack the fire in the truss loft. Engines 304 and 301, the first- and second-due engine companies, stretched a 1½-inch line into the building. Attempts to gain access into the truss loft through a scuttle opening in the ceiling failed because debris on top of the scuttle

After collapse, rescue efforts were mounted from exposure 1 (photo at right) and exposure 4 (below).

Additional entry was being attempted from the rear (exposure 3) by breaking the enclosure wall. Photos by Ronald Jeffers. Next page: layout of the Hackensack Ford dealership.



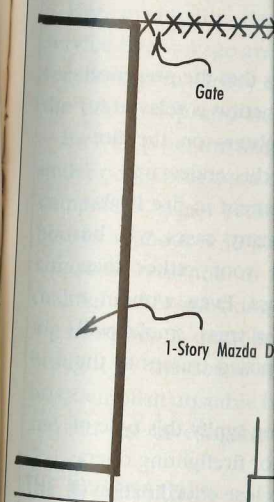
door prevented it. Another scuttle door was opened with the use of a 24-foot extension ladder, then advanced into the store.

An additional 1½-inch handline and 2½-inch line were stretched as backup lines. A 3-inch line was laid to Engine 304 for supply for the attack.

As firefighters advanced into the building, member of company 307 climbed to the roof to perform ventilation. Moderate smoke was forced out. A power saw was used to open up



Wooden Bowstring Truss
(Storage in Truss Loft)



Location of Trapped Firefighter

door prevented it from being opened. Another scuttle door was located and, with the use of a 24-foot fire department extension ladder, the handline was advanced into the storage loft.

An additional 1½-inch handline and a 2½-inch handline broken down to a 1½-inch line were stretched into the building as backup lines. A 3-inch supply line from a hydrant at East Berry and River Streets laid to Engine 304 provided the water supply for the attack lines.

As firefighters advanced the attack lines into the building, members of Truck Company 307 climbed to the roof of the building to perform vertical ventilation. Moderate smoke was found emitting from a roof ventilator. A power saw and axes were used to open up the roof. A precau-

tionary 1½-inch handline was used to protect exposures on and around the roof of the building.

A second alarm was sounded at 3:07 p.m. An additional engine company (302) with three firefighters responded. This engine company provided manpower to assist in stretching handlines. A rescue company responded at 3:19 p.m.

Inside the truss loft area, firefighters advancing the 1½-inch attack line were having great difficulty making penetration. Extreme heat kept them from moving the line to the seat of the fire.

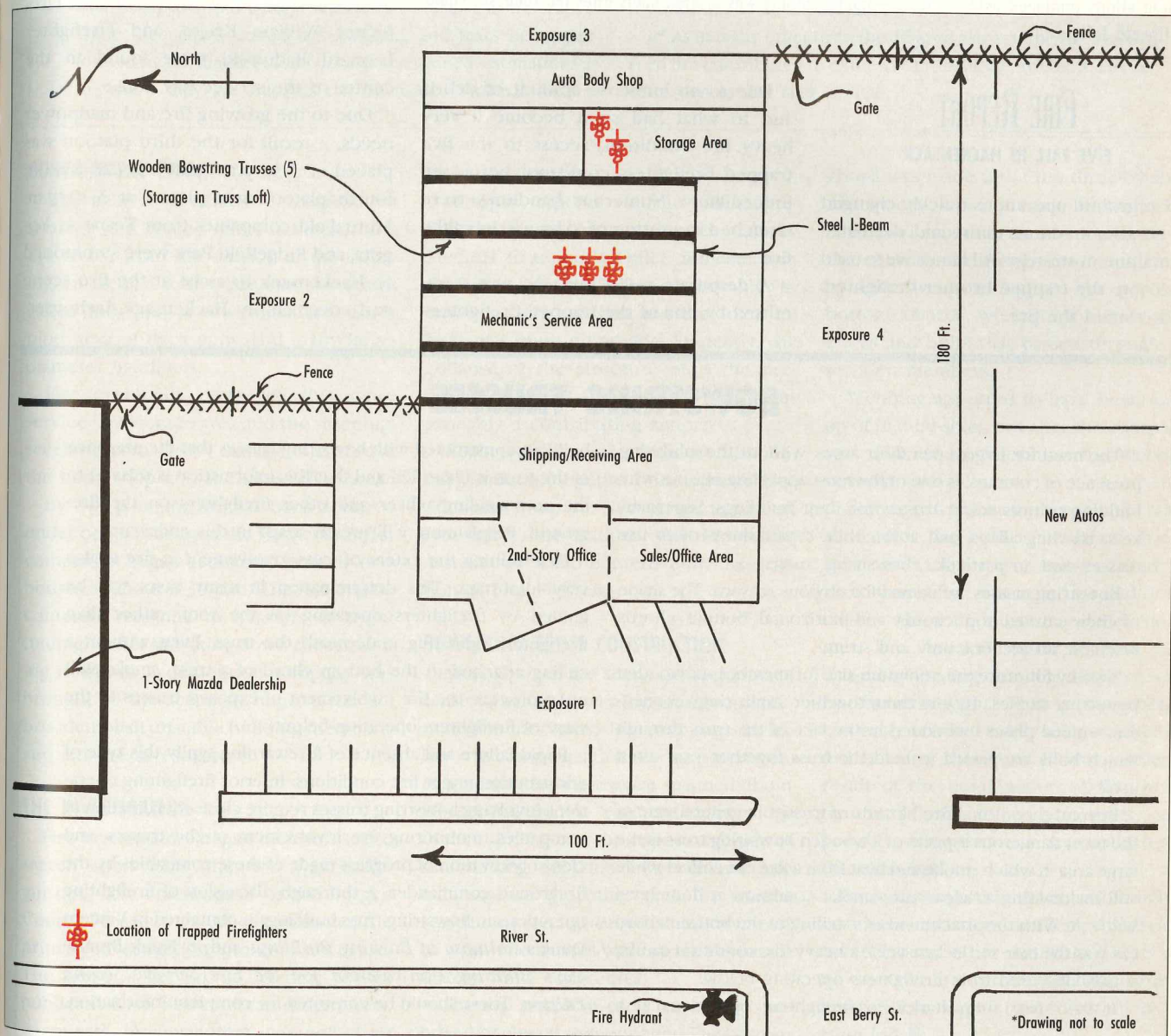
Chief of Department Anthony Aiello responded to the scene and assumed command. A request for an engine and truck recall was made at 3:27 p.m. Two minutes later, a third alarm was transmit-

ted, bringing the last on-duty engine company (305) to the scene.

THE COLLAPSE

Sometime between 3:30 and 3:45 p.m., the cementitious-material-on-wire-lath ceiling in the service bay area collapsed, followed within seconds by collapse of the entire truss roof and the auto parts stored above. It appears that the firefighters who died in this collapse were in the process of leaving the building after orders were given to back out.

There appears to have been no warning of the impending collapse. A videotape recording taken moments before the collapse shows little if any smoke and no fire in the area of the service bay below the truss loft.





Rescue efforts continued until the last firefighter fatality was located hours after the collapse. Photo by Ronald Jeffers.

FIRE REPORT

FIVE FALL IN HACKENSACK

Fireground operations quickly changed to an all-out rescue effort and defensive containment strategy. All hands were used to locate the trapped brother firefighters and contain the fire.

Due to an immense amount of debris and to what had soon become a very heavy fire condition, access to the five trapped firefighters could not be gained immediately. Numerous handlines were stretched in an attempt to knock down the fire.

A desperate radio message was transmitted by one of the trapped firefighters,

Lieutenant Richard Reinlagen, speaking for himself and Firefighter Stephen Ennis, trapped nearby. A return radio message to Lt. Reinlagen went unanswered.

Firefighters attempted to breach a concrete block wall on the exposure 3 side of the building near the service bay with a battering ram. However, they were unable to locate the trapped firefighters immediately due to the heavy fire conditions and debris.

Rescue efforts continued throughout the operation. The first body was located and recovered at about 4:00 p.m. The last fatality was recovered more than three hours later at 7:10 p.m. The bodies of Lt. Reinlagen and Firefighter Stephen Ennis were found in a closet in a storage area on the exposure 3 side of the building. The bodies of Captain Richard Williams, Firefighter William Krejsa, and Firefighter Leonard Radumski were found in the center of the service bay area.

Due to the growing fire and manpower needs, a recall for the third platoon was placed at 3:38 p.m., and a recall for the fourth platoon was placed at 3:40 p.m. Mutual-aid companies from Teaneck, Bogota, and Ridgfield Park were summoned to Hackensack to assist at the fire scene and cover empty Hackensack firehouses.

BOWSTRING TRUSSES

The need for large, open floor areas, without the inhibiting presence of columns, is one of the most appealing reasons why building owners select trusses for their buildings. Supermarkets, bowling alleys, and automobile repair shops often use trusses, and, in particular, bowstring trusses.

Bowstring trusses are named for obvious reasons. The shape of their curved top chords and horizontal bottom chords resemble an archer's bow and string.

Two-by-fours are the minimum size for members of wooden bowstring trusses. To join them together, "split ring" connectors—metal plates embedded in the face of the truss through which bolts are passed to hold the truss together—are often used.

Beyond the normal fire hazards of trusses in general, one of the most dangerous aspects of a wooden bowstring truss is the large area in which smoke and heat from a fire can collect while still maintaining a "clear" fire/smoke condition at floor level below it. With the attachment of a ceiling to the bottom chord (as was the case in Hackensack), a heavy fire condition can be totally obscured from firefighters operating below.

It is of vital importance to firefighting operations at a

building constructed with bowstring trusses that the presence of the truss is identified and that this information is relayed to the commanding officer and other firefighters on the fireground. Preplanning will greatly assist in this endeavor.

Determining the extent of truss involvement in fire is also very important. This determination in many cases will be guided by firefighters operating on the roof, rather than firefighters operating underneath the truss. Even without a ceiling attached to the bottom chord of a truss, smoke will often obscure the fire involvement of exposed trusses to the view of firefighters operating below.

Rapid failure and absence of forewarning typify this type of construction under fire conditions. Interior firefighting operations involving bowstring trusses require close coordination of companies, monitoring fire involvement of the trusses, and close observation of progress made of these companies by the fireground commander. A thorough discussion of firefighting operations in bowstring truss buildings is contained in Vincent Dunn's *Collapse of Burning Buildings* and in Frank Brannigan's *Building Construction for the Fire Service, Second Edition*. These should be consulted for complete information.

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LESSONS LEARNED, LESSONS REINFORCED

✓ The Hackensack fire provides one more example of the sudden, rapid failure of trusses without warning.

✓ The presence of bowstring truss construction should be noted during inspections and transferred to prefire plans. At an actual fire incident, the presence of a bowstring truss roof must be relayed to the fireground commander.

✓ The ceiling attached to the trusses totally obscured the fire from view from the building's interior.

✓ Exterior indications of fire severity in this type of construction may not give an accurate picture of the fire's true extent.

✓ Storage of materials upon or within structural members (such as bowstring trusses) often places an additional load on the members that they were not designed to support.

✓ A rapid, complete "rundown" of personnel missing from each company on the fireground after a collapse is imperative. Once the names, companies assigned, and tasks being performed by the missing members are determined, estimations as to where they are trapped can be made. Personal distress

alarms will help locate the trapped members. Contact with the trapped firefighters via radio should be attempted.

✓ Many additional firefighters will be needed after a collapse involving trapped firefighters to help rescue the trapped members, continue normal firefighter operations, and provide relief.

✓ Rescue of trapped firefighters must be a coordinated, deliberate, and controlled effort.

✓ Stress and depression among firefighters and families will prevail after the death of firefighters. Rapid intervention by trained critical incident stress debriefers is a necessity.

✓ At a loss-of-life fire involving several firefighters, a tremendous onslaught of press coverage can be expected. The media will push for answers and specifics. Preparation for press conferences is a necessity. Dispelling unfactual, fragmented, or misinformation is important.

✓ As in many other fires, the delayed alarm at the Hackensack Ford fire contributed to extensive firefighting problems. Public education in this area is vital.

CONTAINMENT EFFORT

The shift to a defensive containment strategy and rescue effort necessitated a fire attack from the outside of the building. In tactical terms, this exterior attack called into play a tower ladder's turret pipe, several deck guns, and many large-diameter handlines.

Fire eventually destroyed the entire service bay/storage area and the shipping/receiving area. Heavy damage occurred at the body shop and the sales/office area.

By 7:00 p.m., the fire had been declared under control. Most of the Hackensack fire companies began returning to their firehouses at about 8:30 p.m. The last engine company returned to quarters at about midnight after knocking down the remaining hotspots. A demolition company was brought to the scene to remove the debris, demolish unstable building members, and aid the investigators.

THE INVESTIGATION

Fire investigators began their fire scene search soon after the fire was extinguished. The arson squad of the Bergen County Prosecutor's Office conducted the primary investigation into the fire's cause. The cause of the fire at the time of this publication has not yet been determined. It appears, however, that it is not of an

incendiary nature.

Autopsy reports on the fallen firefighters issued by the Bergen County Medical Examiner's Office indicate that firefighter deaths were attributable to multiple burn injuries and the toxic effects of carbon monoxide. Evidently, the collapse of the structure onto the firefighters was not the cause of death, but probably a contributing factor.

Reportedly, investigations are also being conducted by the United States Fire Administration, the New Jersey Bureau of Fire Safety, the National Fire Protection Association, and the International Association of Fire Fighters.

BOWSTRING TRUSS CONSTRUCTION

An analysis of fire scene debris has shed some light on bowstring truss construction. The attic truss loft over the service bay was composed of five wooden trusses. It appears that the trusses spanned about 80 feet and did not "run" the entire width of the building. On the exposure 2 side of the building, the trusses were framed into columns; on the other end, the trusses rested on a steel I-beam that ran from east to west. The trusses were spaced approximately 16' 2" on center.

The top chord of each truss was comprised of eleven two-by-fours. The bottom

chord was made up of ten three-by-sixes. Air spaces were present between the laminated wooden members making up the chords—the two-by-fours and three-by-sixes weren't "tight." The top and bottom chords were joined with steel plates and bolts that passed through the wooden members.

Webbing appeared to have been made up of two-by-sixes, but after the collapse it was difficult to determine the webbing network layout.

Videotapes and still photographs taken soon after the collapse indicate that at least three of the five trusses failed approximately five feet from one end of the trusses where the bottom and top chords met. The "breaks" appear to have been caused by loading onto the structure—not by "burn-through." That is, the collapse evidently was not solely a function of the fire burning the truss. It was, rather, a result of the combination of fire, heavy structural load (stored auto parts), and, possibly, water that may have collected in the truss loft.

Stored auto parts in the truss loft included fenders, radiators, mufflers, wheel rims, bumpers, and other materials. There was no evidence at this time that flammable or combustible liquids were stored in the truss loft. ■