AUTOMOBILE PARTS STORE FIRE
Chesapeake, VA
March 18, 1996

FIRE INVESTIGATIONS
NATIONAL FIRE PROTECTION ASSOCIATION

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FIRE INVESTIGATION REPORT

Automobile Parts Store Fire
Two Fire Fighter Fatalities
Chesapeake, Virginia
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ABSTRACT

At approximately 11:30 a.m. on Monday, March 18, 1996, fire fighters in Chesapeake, VA, responded to a fire in an auto parts store. No fire was visible from the exterior of the building when the fire fighters arrived. Two fire fighters entered the building and located a small fire at the rear of the store. The fire fighters extinguished the fire and began checking for fire extension. Approximately 20 minutes after their arrival, the roof of the building collapsed and the two fire fighters were trapped inside. The fire fighters both died of burns, with smoke inhalation being a contributory factor.

The building involved was approximately 12 years old. Two of the building’s exterior bearing walls were constructed with unprotected steel frames and two were constructed with masonry block. Lightweight wood trusses with a clear span of 50 ft (15.2 m) supported the store’s roof. Because the facility was an auto parts store, it contained a wide variety of combustible and noncombustible materials, flammable auto paints (liquid and aerosol), and other flammable and combustible liquids. Most packaging materials and some shelving materials were also combustible.

The fire occurred when a utility worker damaged the electrical service drop conductors on the outside of the store. Electrical arcing inside the store ignited fires that quickly involved the wood trusses supporting the roof and ignited a fire in the area of an electric hot water heater. Though some of the fire was visible to anyone in the occupied area of the building, much of the fire was hidden in the concealed space above the store’s ceiling, and the fire was able to spread in that area.

The fire fighters who died in this fire probably did not know that the building was constructed with lightweight wood roof trusses. Approximately seven minutes after they had arrived on the scene, the crew inside the building radioed their battalion chief to report that they had found the fire. They asked for a second crew to come into the building and requested a pike pole. Approximately 13 minutes after this transmission, the roof collapsed, intensifying the fire and trapping the fire fighters inside the building. The trapped fire fighters radioed for assistance but, for an undetermined reason, the incident commander did not understand the transmission. Two other chief officers who were responding to the scene did hear the transmission and relayed the information to the on-scene commander. By the time the on-scene commander realized that fire fighters were possibly trapped inside the building, the fire had become too intense to attempt rescue operations.

On the basis of the NFPA’s investigation and analysis of this fire, the following factors contributed significantly to the loss of the two Chesapeake fire fighters:

- The presence of lightweight wood roof trusses.

- Fire officers and fire fighters unaware that the roof of the Chesapeake auto parts store was constructed with lightweight wood trusses.

- The lack of a fire attack strategy that could minimize the risk to fire fighters while suppressing a fire involving lightweight wood trusses.

- The lack of automatic sprinklers.
I. INTRODUCTION

At the request of the Chesapeake, Virginia, Fire Department, the National Fire Protection Association (NFPA) investigated the Chesapeake auto parts store fire. NFPA has a long-standing fire investigations program. Under this program, NFPA documents incident facts and analyzes significant factors that result in the loss of life and property.

The study was conducted by the NFPA as part of its on-going program to investigate technically significant incidents. The NFPA's Fire Investigations Department documents and analyzes incident details so that it may report lessons learned for life safety and property loss prevention purposes.

The NFPA became aware of the Chesapeake fire on the day it occurred, and Michael S. Isner, Senior Fire Investigator in the NFPA Fire Investigations Department, traveled to Chesapeake, Virginia, to perform an on-site study of this incident. That four-day, on-site study and subsequent analysis of the event were the basis for this report. Entry to the fire scene and data collection activities were made possible through the cooperation of the Chesapeake Fire Department.

This report is another of the NFPA's studies of fires having particular important educational or technical interest. All information and details regarding fire safety conditions are based on the best available data and observations made during the on-site data collection phase and on any additional information provided during the report development process. It is not the NFPA's intention that this report pass judgment on, or fix liability for, the loss of life and property resulting from the Chesapeake fire. Rather, the NFPA intends that its report present the findings of the NFPA data collection and analysis effort and highlight factors that contributed to the loss of life and property.

Current NFPA codes and standards were used as criteria for this analysis so that conditions at the auto parts store on the day of the fire could be compared with state-of-the-art fire protection practices. It is recognized, however, that these codes and standards may not have been in effect during construction or operation of the store. The NFPA has not analyzed the Chesapeake auto parts store regarding its compliance with local codes and standards that were in existence when the store was built and during its operation.

The cooperation and assistance of the Chesapeake Fire Department are greatly appreciated.
II. BACKGROUND

Occupancy Classification

The auto parts store was in a 6000 sq ft (560 sq m) area that was part of a much larger strip shopping center. The shopping center contained approximately 25 other stores and businesses. (See Figure 1.) The auto parts store shared a common wall with only one other store in the shopping center. That other store was a restaurant on the west side of the auto parts store. The common wall was an unpenetrated masonry bearing wall that was the exterior wall for the restaurant before the auto parts store was constructed. The stores to the east of the auto parts store were constructed in a way that one store had a common corner and no common wall with the auto parts store. As a result, the auto parts store was functioning as an independent store.

According to paragraph 25-1.4.2.1 of the 1994 edition of NFPA 101®, Life Safety Code®, the auto parts store would be Class B, Mercantile Occupancy.1,2

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1 Life Safety Code and 101 are registered trademarks of the National Fire Protection Association, Quincy, Massachusetts.
2 The Life Safety Code defines a Class B Merchantile Occupancy as a store having an aggregate gross area of more than 3000 sq ft (280 sq m) but not more than 30,000 sq ft (2800 sq m).

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Figure 1: Plan view showing auto parts store in the strip
Applicable Codes and Enforcement

At the time of this fire, the City of Chesapeake, Virginia, was enforcing the 1993 edition of the Virginia Uniform Statewide Building Code. This code was based on the 1993 edition of the National Building Code prepared by Building Officials and Code Administrators International (BOCA). The city was also enforcing the 1993 edition of the Virginia State Fire Prevention Code, which was based on the 1993 BOCA Fire Prevention Code including local amendments which are modifications added to the Fire Prevention Code.

The Building

The shopping center was constructed in two phases. All areas of the shopping center west of the auto parts store were constructed in approximately 1975, during the first phase of construction. The auto parts store and all stores to its east were constructed in approximately 1983, during the second phase.

The section of the shopping center containing the auto parts store was Type V (000) construction according to NFPA 220, Standard on Types of Building Construction, 1992 edition. The store’s north (front) wall had unprotected steel structural members and was composed mostly of full-height glass panels. (See Figure 2, next page.) The store’s main entrance and exit were located in this wall. Half of the store’s west wall was the exterior wall of a restaurant next door and the rest was a load-bearing masonry block wall. The west wall had no openings to the building’s exterior. The store’s south wall was also a load-bearing masonry block wall. This wall, however, had a double-wide door opening on the loading dock at the store’s southeast corner. The east wall had unprotected steel structural members and wood-frame structural members. The unprotected-steel frame was located in the center third of the wall and the remaining two-thirds were wood frame. Most of the east wall was covered with gypsum wall board on the interior surfaces and plywood covered with stucco for its exterior surfaces. However, the east wall also had sections of full-height glass panels.

The store’s roof was constructed with wood trusses that ran east to west. The trusses were supported by the store’s east and west walls only so the trusses had a clear span of 50 ft (15.2 m). The roof assembly, including the trusses, were destroyed during the fire and no building construction plans were available so investigators could not confirm construction details of the roof assembly. The property owner stated that similar techniques were used during the construction of all stores in the second phase. Therefore, local investigators believed that the roof assembly above the stores in the east part of the shopping center served as a reasonable example of the roof assembly above the auto parts store.

The wood trusses above the east section of the shopping center were 40-ft (13.3 m) long mono-slope trusses. They were supported only by exterior bearing walls and were installed on 24-in. (610 mm) centers. The front end of the trusses was 64-in. (1625-mm) high, and the rear end was 18-in. (457-mm) high. The top and bottom

3 A Type V (000) structure will have a 0-hour fire rating for the exterior bearing walls (first digit); a 0-hour fire rating for structural frame columns and girders supporting loads for more than one story (second digit); and a 0-hour fire rating for the story assembly (third digit).
chords were 2-in. x 6-in. members and the webs between the chords were 2-in. x 4 in. members. Metal gusset plates were used as connectors between the truss members. (See Figure 3, next page.) At least one broken web member was observed. A 2-in. x 4-in. board that was approximately 16-in. (406-mm) long was nailed across the break in order to hold the member together. The trusses were covered by 1/2-in. (12.7-mm) plywood sheathing. The roof’s waterseal was provided by a single-layer, rubber-like membrane that covered the plywood sheathing.

According to the Chesapeake Fire Marshal, the roof trusses on this building had collapsed during construction. The collapse occurred about the time that the plywood
sheathing was being installed on the roof and involved several trusses. Three construction workers were injured. On the basis of this history and an observed crack in a web member, the Chesapeake Fire Marshal believes that the trusses may have had inherent weaknesses and these weaknesses may have contributed to the collapse.

Investigators believed that the suspended ceilings observed in stores at the east end of the shopping center were similar to the ceilings that had been installed in the auto parts store. The observed ceilings were approximately 8 in. (200 mm) to 10 in. (250 mm) below the bottom chord. In some areas, fiberglass batt insulation with a kraft-paper backing was stapled to the bottom chord of the trusses; and, in other areas, fiberglass insulation without a backing was laid on top of the suspended ceiling tiles. In both installations, the layer of insulation had few, if any gaps, so there was little air movement between the concealed space above the ceiling and the occupant spaces below. Remnants of the metal track for the suspended ceiling were found on the walls in the auto parts store, and pieces of fiberglass insulation were found in the rubble on the floor. These two findings served as evidence confirming that the ceiling in this store was probably constructed in a manner similar to that observed in other stores. Investigators could not determine if the fiberglass insulation had the kraft-paper backing before the fire. As a result, investigators could not determine which of the two insulation installation methods was used in the auto parts store.

The combustible concealed space above the auto parts store's suspended ceiling had an area of approximately 6000 sq ft (560 sq m). Gypsum wall board was installed on one of the trusses and was apparently intended to divide the combustible concealed space into two sections with approximate areas of 3000 sq ft (280 sq m). Due to the extent of damage to the building, it could not be determined if the gypsum
wall board was continuous from the underside of the roof sheathing down to the suspended ceiling assembly and formed a complete separation between the concealed space areas.

The auto parts store had self-service and employee areas. (See Figure 4.) Customers entered the building through the front doors on the north side of the store, and they had access to the self-service area on the east side. The west side of the store had the parts counter and a rack storage area that only employees could access. A storage area and two rest rooms were located at the south end (rear) of the building.

Figure 4: Plan view of the auto parts store
The store contained a wide variety of automobile and truck parts. These parts were comprised of non combustible materials and combustible materials that added to the available fuel load. Other fuels included auto paints (liquid and aerosol), lubricating oils, cleaning fluids, and many other flammable and combustible liquids. Most packaging materials and some shelving materials were also combustible.

**Heating, Ventilation, and Air Conditioning (HVAC) Systems**
Three heating and air conditioning units were mounted on the roof. One was above the parts counter; one was near the center of the roof; and one was approximately 30 feet from the front of the building. One of the three units had a rated capacity of 10 tons; another unit had a 7-ton capacity and the third had a 5-ton capacity. The estimated combined weight of these units was 3000 lb (1360 kg).

**Fire Protection Systems**
The building had no built-in fire suppression, detection, or alarm systems. However, fire extinguishers were provided.

**The Fire Department**
The Chesapeake Fire Department is a career department, and, at the time of the fire, it had approximately 320 uniformed fire and emergency medical service (EMS) personnel. The department had 68 vehicles and trailers which included 19 engines, 3 ladder trucks, 4 rescue vehicles, and 10 medic units. The engines were typically staffed with 2 fire fighters and an officer, and the ladder companies were typically staffed with 3 fire fighters and an officer. In the 1994/95 fiscal year, the Chesapeake Fire Department responded to 11,204 fire calls and 14,036 medical calls.

**Fire Fighter Protective Gear**
According to a Chesapeake Fire Department report regarding this fire, all Chesapeake fire fighters were equipped with either polycarbonate or thermoplastic helmets, Nomex® III turn-out coats and pants, 1/4 length rubber boots, leather gloves, MSA-4500 positive pressure self-contained breathing apparatus, personal alert safety system (PASS) devices, and Nomex® protective hoods. The Chesapeake Fire Department reported that the equipment worn by the two deceased fire fighters met or exceeded NFPA requirements.

Both fire fighters also had radios issued by the fire department. The officer’s radio was heavily damaged by the fire and was not operational. Local investigators believed, however, that this radio was used by the officer for all of his transmissions. The radio carried by the fire fighter was in operational condition after the fire.
Fire Fighter Training and Experience

At the time of this fire, the Chesapeake Fire Department was under a state fire-fighting training and qualification program administered by the Virginia State Department Fire Program. This program provided training that was intended to be consistent with current NFPA fire fighter professional qualification standards. The fire department also mandated that 2 hours of in-service training be provided on each shift. This required in-service training was part of a program designed to ensure that fire fighters maintained their knowledge, skill, and abilities.

The fire department had a career progression program which allowed professional advancement outside of the supervisory rank structure. Levels of qualification under this program were Fire Fighter Specialist, Senior Fire Fighter, and Master Fire Fighter. In order to attain a higher level of qualification fire fighters had to meet the following minimum requirements:

- No preventable accidents within the last 12 months
- Meet all physical and medical standards
- At least 3 continuous years of service in current rank
- Received specific scores on performance evaluations

In addition to these requirements, fire fighters must meet specific requirements for the grade that he/she currently holds before being eligible for advancement to the next higher grade. The grade-specific requirements include the following:

- Fire Fighter Specialist
  - thirty semester hours or 45 quarter-credit hours at an accredited college in Fire Administration, Fire Engineering, Public Administration, Business Administration, or Emergency Medicine, or other approved curricula
  - state certification as
    — Fire Fighter III/EMT
    — Driver/Operator certification

- Senior Fire Fighter
  - sixty semester hours or 90 quarter-hours in an approved curricula
  - state certification as
    — Fire Fighter III/EMT
    — Driver/Operator
    — Fire Officer I

- Master Fire Fighter
  - Bachelor of Arts or Bachelor of Science in an approved curricula
  - state certification as
    — Fire Fighter III/EMT
    — Driver/Operator
    — Fire Officer I or Fire Officer II
The two deceased fire fighters held the department’s Fire Fighter Specialist certification. The deceased fire fighter who was the acting officer on the day of this fire had 10 years of experience. He also held state certifications as Instructor I, Confined Space Awareness, Emergency Vehicle Operations, Radiological Monitoring, Driver/Pump Operation, Hazardous-Materials Emergency Level II, and Airport Fire Fighter. The deceased fire fighter who was filling a position on Engine 3 held the following state certificates: Instructor I and II, Hazardous Materials First Responder Awareness (this state certification reportedly met the requirements of NFPA 472, Standard for Professional Competence of Responders to Hazardous Materials Incidents, for first responders at the awareness level), Hazardous-Materials Operations (again, a certification meeting NFPA 472 requirements), Ropes and Initiative, Emergency Vehicle Operation, Confined Space Awareness, Hazardous-Materials Emergencies Level II, Radiological Monitoring, Driver/Pump Operator, and Heavy and Tactical Rescue. The two deceased fire fighters were well trained and had a high level of fire-fighting experience.

In-service training records from the two fire fighters’ respective stations indicated that they had instructed many in-service training classes.

Fire Inspections/Pre-fire Planning

The Chesapeake Fire Department had a comprehensive commercial-building inspection program. Engine companies from all 14 fire stations inspected the commercial properties within their “first-run” area at least once annually. The fire companies conducted the fire safety inspections to insure that no violations of the State Fire Prevention Code were occurring within these properties. When violations were found, the fire companies noted the violations on a “Notice of Violation” form, and the property owner had seven to fourteen days to correct the noted problems. A matter of inspection policy, engine companies scheduled reinspection at least two times. Routinely, if fire safety problems were not corrected on the second reinspection, this information was recorded on the Notice of Violation form and the form was forwarded to the Fire Prevention Bureau. The incident was then assigned to a fire inspector who would take whatever actions that were appropriate.

According to fire department records, the auto parts store had been annually inspected from April 1985 to April 1995 and only minor discrepancies had been noted during all of the inspections. The deceased fire fighter who was the acting officer on Engine 3 on the day of the fire was part of the engine company that had inspected the auto parts store in 1994.

The company inspections process also served as an excellent opportunity for fire companies to prepare and update pre-fire plans. The pre-fire plan for this auto parts store had diagrams showing the store’s location in the shopping center, had a plan showing the interior arrangement of the store, and the location of utilities. The pre-fire plan also showed the location, distance, and flow of the three closest fire hydrants. The pre-plan was last reviewed in April 1994.
Weather Conditions

On the day of the fire, the City of Chesapeake, Virginia, was experiencing normal March weather conditions. The high that day was 47°F (8°C) and the low was 44°F (6.7°C). The sky was cloudy and there was a 7 mph (11.2 km/h) wind out of the east with gusts of 14 mph (22.5 km/h).
III. THE FIRE 4

Discovery and Occupant Activities
11:00 a.m.¹

On the morning of March 18, 1996, a power company employee arrived at the shopping center to disconnect the power to the restaurant next to the auto parts store involved in this fire. The power was to be disconnected for non payment. After informing a restaurant employee of his intentions, the power company employee drove his vehicle to the south side (rear) of the shopping center to the location of the restaurant's service drop conductors.

While the power company employee was preparing to disconnect the power, the restaurant employee went to the supermarket in the shopping center where she could make a payment to the power company. She received a proof of payment and went back to meet with the power company employee. By the time the restaurant employee reached the power company employee, he had already elevated his truck's man-bucket and was about to disconnect the power. The restaurant employee spoke with the power company employee, and he lowered the bucket to verify the receipt. Part of the boom remained elevated at this time.

The power company employee went to his radio in the truck's cab in order to radio his supervisor and get further instructions. The supervisor told the power company employee to leave the power on. With this change in plan, the power company employee attempted to drive away from the location.

Since he had not returned the boom to the truck bed and secured it in place, the elevated boom struck the service drop conductors for the auto parts store when the truck moved. The impact broke one of four conductors in the service drop and cracked the pole holding these wires. The damage to the service drop conductors immediately caused short circuits and overloaded numerous circuits within the auto parts store, and employees in the store saw fire in the area of a hot water heater at the rear of the store. They attacked the fire with a fire extinguisher and called the fire department to report the problem.

When the power company employee struck the service drop conductors, he saw arcing of the wires at the meter base for the auto parts store so he stopped and backed up his vehicle slightly. He exited his vehicle and cut the service drop conductors at the top of the damaged pole. After this, he removed the meter base that was severely damaged and saw smoke coming from the right side of the meter base. At that time he called his office to have a supervisor and another crew respond. One of the employees from the auto parts store came out of the building and told the power company employee that they had no power in the building. The auto parts store employee also told the power company employee that they were extinguishing a fire inside the building.

¹ This section was extracted from the Chesapeake Fire Department summary report regarding the March 18, 1996, auto parts store fire, and was prepared by the department's Fire Marshal. Editorial changes for clarity have been made by the NFPA, and additional information based on the transcripts of radio transmissions have been added. The fire department report and radio transcripts were used with the permission of the Chesapeake Fire Department.

² The time entries cited in this report are approximate unless otherwise stated.
Fire Department Notification and Response

11:27 a.m.

The Chesapeake Fire and Police Emergency Operations Center (EOC) received the “911” call from the auto parts store. The female caller reported, “It's something with the fuse boxes; the wires in the back of the store.” She continued and described the problem as a “popping noise.” The caller also reported that the fuse box was inside the building and that the manager had asked for a fire extinguisher.

11:29 a.m. [Elapsed Time (ET) 00:00]*

The EOC dispatched Battalion Chief 1, Engine 3, Engine 1, and Ladder 2. These units were given the location and were told they were responding to a “sparking” fuse box.

11:32 a.m. (ET - 00:03)

Battalion 1 was in the fire department headquarters at this time. Since it would take a considerable amount of time to respond from headquarters to the fire scene, he radioed EOC and requested that Battalion Chief 2 take the call. Battalion Chief 2 agreed to take it.

11:35 a.m. (ET - 00:06)

Engine 3 arrived on scene first, and they reported that they were at the front of a single-story commercial with “nothing showing.” Engine 3 also reported that it was assuming command. The engine parked in front of the store and saw that the store employees were standing outside the front of the building at this time.

Engine 3’s officer and fire fighter left the vehicle and entered the building to make an initial assessment of the situation. They found that power was off and that the building was clear of smoke until they reached the rear of the store where smoke was visible near the electrical panel.

11:37 a.m. (ET - 00:08)

Using his portable radio, the Engine 3 officer called Battalion 2 and reported that there was a fire in the building. Battalion Chief 2 asked if they needed the power company, and the Engine 3 officer responded that they were already on the scene. The Engine 3 officer then radioed his driver and told him to bring the engine around to the rear of the building. The Engine 3 driver acknowledged that order and brought the engine around to the rear of the store (see Figure 5, next page).

11:38 a.m. (ET - 00:09)

Engine 3 officer called Battalion Chief 2 using his portable radio. He advised Battalion Chief 2 that Engine 3 and Ladder 2 “could handle” this alarm.

* Elapsed time shows hour and minute time values which have been rounded to the closest minute. The elapsed time starts at the beginning of the Chesapeake Fire Department’s announcement to dispatch the first alarm response.
11:39 a.m. (ET - 00:10)

Battalion Chief 2 and Engine 1 acknowledged and stated that they were “clear (of this assignment) and ready (to respond to a new assignment).” Later, in the same minute, the Engine 3 officer contacted Battalion Chief 2 on his portable radio and reported that they had discovered an extension of the fire. He also stated that he now wanted all the equipment that was originally dispatched. Battalion Chief 2 and Engine 1, again, began to respond to the scene. At about this time, the Engine 3 officer and fire fighter exited the rear of the store and met the engine being positioned in the driveway at the rear of the structure. Engine 3’s driver noted that smoke was beginning to show on the east side of the roof’s rear edge.

The driver and fire fighter on Engine 3 pulled a 1 3/4-in (44-mm) pre connected hoseline and began to straighten it out. Engine 3’s officer, with the assistance of Engine 3’s driver, deployed a second 1 3/4-in. (44-mm) preconnected hoseline, and the Engine 3 officer carried it through the rear door and left it inside the building. Engine 3’s officer then returned to Engine 3 and donned his self-contained breathing apparatus (SCBA). With his SCBA on and operating, Engine 3’s officer then re-entered the rear door of the building to investigate. The Engine 3 driver intended to support the attack line using his 750 gallon (2839 L) water tank on the engine until another company provided a water supply from the hydrant.
The Engine 3 driver noted that the Engine 3 fire fighter was spraying the exterior of the building’s rear wall with the first 1 3/4-in. (44-mm) line. The driver told the fire fighter that their officer had entered the building. Engine 3 fire fighter closed the nozzle, laid down the hose, and went into the building through the rear door. The Engine 3 officer and fire fighter advanced the 1 3/4-in. (44-mm) hoseline as they moved further into the building.

11:40 a.m. (ET - 00:11)

Battalion Chief 2 reported that he was on the scene. When Battalion Chief 2 arrived, he observed smoke showing from the roof of the auto parts store and reported this observation to dispatch. He informally accepted command without face to face contact with the Engine 3 officer. Battalion Chief 2 positioned his vehicle in the front parking lot, just to the east of the auto parts store. He left his vehicle, with a portable radio, and began walking around the building to assess the situation.

11:41 a.m. (ET - 00:12)

Battalion Chief 2 requested dispatch to strike a second alarm and, a few seconds later, reported that flames were showing. In addition, Battalion Chief 2 stated that he needed police assistance to help evacuate the other stores in the shopping mall.

In response to this request, Engine 2 and Engine 14 were dispatched.

11:42 a.m. (ET - 00:13)

Engine 3 officer radioed from inside the structure and told Battalion Chief 2 that he needed an additional crew to “mask-up” and come inside. The Engine 3 officer also stated that he had found fire in the ceiling. Battalion Chief 2 confirmed the transmission, and stated that fire was also showing on the outside of the building. Engine 3 officer returned the transmission stating that the crew coming in should bring a pike pole.

11:43 a.m. (ET - 00:14)

The Engine 3 driver radioed Battalion Chief 2 and told the battalion chief that he would need the second engine to lay a supply line. Battalion Chief 2 confirmed the transmission and asked Engine 1 if they had received it. Engine 1 acknowledged and informed that they were on the scene. Engine 1 then went to the rear of the shopping center and backed in from MacDonald Road to Engine 3’s location.

11:44 a.m. (ET - 00:15)

When Engine 1 arrived at Engine 3’s position, Engine 1’s crew pulled a 5-in. (127-mm) supply line from their hose bed. After wrapping the hose around the tire of Engine 3, the driver of Engine 1 began to reverse lay a supply line to a hydrant near the intersection of Indian River Road and MacDonald Road as instructed by his officer. The officer and fire fighter from Engine 1 stayed at Engine 3’s position intending to assist in the suppression activities from this position.
Ladder 2, with four fire fighters (officer, driver/operator, and two fire fighters), arrived and positioned near the southeast corner of the auto parts store. They intended to perform a ventilation operation from this position and began to set up for that operation.

11:45 a.m. (ET - 00:16)

Battalion Chief 2 walked past the front of the auto parts store to ensure that the occupants of the restaurant next to the fire building had evacuated and he noted that heavy smoke was starting to build inside the auto parts store. He also saw that heavy smoke and flames were starting to show from the roof of the building. At this point the decision was made by Battalion Chief 2 to move Ladder 2 to a more northerly position, to the front of the auto parts store. Ladder 2 quickly changed its position and started to “set-up” a master stream operation at the new location.

At the rear of the building, the captain and fire fighter from Engine 1, after making a quick size-up of the interior rear of the auto parts store, noted heavy smoke conditions inside and a 1 3/4-in (44-mm) line going in the back door. They began to assist Engine 3 driver in deploying a 2 1/2-in (62-mm) in order to back-up the original 1 3/4-in (44-mm) hoseline with a larger hoseline. These fire fighters observed that the fire, particularly along the roof line, was beginning to spread at an extremely accelerated rate. The fire fighters positioned at the rear of the building did not inform the incident commander of these observations.

Battalion Chief 2 made a general announcement on the radio that the next due company should lay a line to the front of the building.

11:47 a.m. (ET - 00:18)

All personnel on the outside of the fire building noted that the intensity of the fire was dramatically increasing. At about the same time, radio traffic was becoming heavy, as the second alarm equipment began acknowledging their response over the air. Also at this time, Battalion Chief 2 followed standard operating procedures for multiple alarm fires and asked the dispatch center to notify the acting Fire Chief and the acting Deputy Chief of Operations. Battalion Chief 2 had dispatch to inform the administrative staff that he had a fully involved commercial building. During post-fire interviews with fire department investigators, the incident commander stated that he used the term “fully involved” as a means to describe that the fire was rapidly accelerating. He also stated that he knew the Engine 3 crew were operating at the rear of the building, but, he did not realize that they had moved deeply into the building.

11:48 a.m. (ET - 00:19)

Engine 1, which was laying the supply line for Engine 3, ran out of 5-in (127-mm) hose before it reached the hydrant at the intersection of MacDonald Road and Indian River Road. The driver/operator from Engine 1 tried to contact his captain on the radio a number of times so he could advise his captain that he had run out of supply hose before reaching a hydrant. But, the Engine 1 driver could not contact
his captain due to heavy radio traffic. The Engine 1 driver parked his vehicle, got an SCBA and portable radio, and headed toward the auto parts store to find his officer. The Engine 1 driver did not notify Engine 2 that he was out of hose. Engine 2 was approaching Engine 1’s position about the time that it ran out of supply hose. Engine 2 could have provided additional hose so that Engine 1 could have completed its hose lay.

The Engine 3 officer twice radioed from inside the building in an attempt to reach Battalion Chief 2. Battalion Chief 2 did not respond to the calls from Engine 3. Approximately 25 seconds later, Battalion Chief 2 called the dispatch center and requested a third alarm. He also asked for some support staff. The dispatch center requested mutual aid assistance from the City of Virginia Beach at about this time.

The City of Chesapeake has three district battalion chiefs working on a daily basis. Normal procedures within the department has one battalion chief manage the fireground operations and another battalion chief will assume the responsibility for back filling stations and providing the additional equipment to the incident commander as needed. In keeping with procedure, Battalion Chief 3 asked for a ladder from the City of Norfolk which was standard practice when an additional ladder company is needed in this part of the city.

11:49 a.m. (ET - 00:20)

Engine 14 was on Indian River Road approaching the scene, and they asked Battalion Chief 2 for an assignment. Battalion Chief 2 made an unintelligible radio transmission and, seconds later, Engine 1’s officer called Battalion Chief 2.

Before Battalion Chief 2 could respond, the Engine 3 officer called Battalion Chief 2 on his portable radio from the interior of the structure. The Engine 3 officer reported that he and the Engine 3 fire fighter could not get out of the building. Battalion Chief 2, who was operating on a portable radio, replied that he could not understand the transmission. The Engine 3 officer then asked the chief to have somebody go to the front of the building to get them out.

Battalion Chief 2, still not understanding the transmissions, asked over the radio if anyone on the fire scene could understand the transmission. Engine 4 acknowledged that they were unable to copy.

Ten seconds after Battalion Chief 2’s transmission, Engine 14 reported “on scene,” and Battalion Chief 2 instructed them to lay a supply line to the Ladder 2 that was setting up in front of the building.

11:50 a.m. (ET - 00:21)

Engine 14 acknowledged that instruction. When Engine 14 arrived at the intersection of Sparrow Road and Indian River Road, the crew began a hose lay from the hydrant at this intersection to Ladder 2’s position. Engine 2 arrived at about the same time, passed Engine 14, and stopped at the hydrant that Engine 1 was
attempting to reach at Indian River Road and MacDonald Road. Engine 2, which had a 1500 gpm (5678 L/min) and an extendible nozzle on a boom, laid its own supply line to the front of the shopping center so it could establish a master stream operation.

Four seconds after the Engine 14 acknowledgment, Battalion Chief 1, who was still at the fire headquarters listening to the radio transmissions, radioed to Battalion Chief 2. Battalion Chief 1 reported he thought that it sounded as if someone was trapped inside the building. This transmission was made over the clattering sounds of ringing telephones in the background. Battalion Chief 3, was en route to the fire and, upon hearing this transmission, confirmed that he was almost on the scene and would assist when he arrived. Battalion Chief 1 acknowledged and then told Battalion Chief 3 to relay to Battalion Chief 2 that someone might be trapped inside the building. Battalion Chief 1 also stated that he was going to respond and help at the scene.

The fire inside the building suddenly intensified. Fire fighters at the front and at the rear of the building stated that it appeared the entire building became fully involved at one time. On the basis of the statements of fire fighters, local investigators believed that the observed increase in the fire’s intensity marked the moment when the trusses had a catastrophic failure and collapsed.

Local investigators theorized that parts of the building’s ceiling and roof assembly possibly fell down in the rear of the building blocking Engine 3 crew’s egress path. When the crew realized that their path out of the building was blocked, they left their hoseline and headed for the front of the auto part’s store, the way that they had initially entered the building. It may have been about this time that they called to have someone go to the front of the building to meet or help them out of the building. After traveling a short distance from where they had left the hoseline the massive failure of the roof assembly occurred.

11:51 a.m. (ET - 00:22)

Many activities were taking place simultaneously at the front and rear of the structure. Battalion Chief 2 was directing operations at the front of the structure. Engine 2 and Engine 14 completed their respective hose lays into the shopping center. Engine 2 was setting up for a master stream operation. At the same time, Engine 14 established the water supply for Ladder 2’s ladder pipe operation. (See Figure 6, next page).

At the rear of the structure, the crew from Engine 1 and the driver from Engine 3 were having difficulty holding their positions because radiant heat from the fire was reaching the location where Engine 3 was parked. The captain and fire fighter from Engine 1 stated that they observed heavy fire rolling out of the rear entrance of the auto parts store and had begun placing a 2 1/2-in (62-mm) hoseline, that had been previously deployed, into position to possibly make entry into the building. It was at about this time that a fire fighter from Engine 1 noticed the 1
Figure 6: Plan view showing fire department vehicles

3/4-in (44-mm) line leading into the building, at the rear of the store, had been burned through and was flowing water.

Engine 3 driver stated that, at approximately this time, he was becoming extremely concerned with the amount of remaining water in Engine 3. The Engine 3 captain radioed Battalion Chief 2 that the captain from Engine 1 was going to try an interior attack and try to hold the fire “in-check.” Seconds later, Engine 3 added that he needed water as soon as he could get it.

Soon after, Engine 3 depleted its water. Engine 3 probably lost its water as a result of an uncontrolled flow through the burned 1 3/4-in (44-mm) hoseline.

A fire fighter from Engine 1, who was in the position to observe the conditions inside the building, expressed to the Engine 1 officer that he felt the two fire fighters who were inside the building may be lost.

The Engine 3 driver also became concerned about the safety of the fire officer and fire fighter from his crew. However, he felt that they may have left the building through the front exit. The Engine 3 driver believed they may have exited that way because that was the way they had entered the building.
Fire conditions at the rear of the building continued to deteriorate. The Engine 1 officer, Engine 1 fire fighter and, Engine 3 fire fighter, all of whom were still at the rear of the building, stated that they could hear numerous explosions from inside the building. The fire was being whipped over the top of Engine 3, threatening the loss of the engine.

11:52 a.m. (ET - 00:23)

Battalion Chief 3 arrived on the scene and advised all units to switch to Channel 2, which is a tactical-line-of-sight channel on fire department radios. At the time of this fire, switching to Channel 2 was a discretionary decision made by the incident commander or the Officer in Charge. After the March 18th fire, switching to Channel 2 was changed to an automatic procedure for companies as they arrive on a fire scene.

For the next minute, as additional equipment arrived on the scene, the radio traffic on Channel 1 became very congested because the fire fighters attempted to transmit set-up information.

11:54 a.m. (ET - 00:25)

Battalion Chief 3 took a position at the front of the shopping center, just to the north of the supermarket.

Battalion Chief 2, who was on foot with a portable radio, made his way to Battalion Chief 3’s position for a face-to-face conversation.

Command information was passed from Battalion Chief 2 to Battalion Chief 3, including information that Engine 3’s crew may not have gotten out of the building.

11:55 a.m. (ET - 00:26)

The captain of Engine 1 who was at the rear of the building, called Battalion Chief 2 to tell him that Engine 3 did not get water and that the fire was about to “cook” the engine.

Battalion Chief 2 asked the unit who made the transmission to identify itself, and the Engine 1 officer responded by stating, again, that they were at the rear of the building, and they had fire blowing over top of Engine 3. Seconds later, the Engine 1 officer came on the radio to report that fire was blowing over Engine 3, that they were going to move the engine, and that their hoselines were not effective.

Battalion Chief 2 asked Engine 1 officer if he had water and, before the Engine 1 officer could respond, another fire company cut in with an unrelated statement to an officer not involved in this conversation.
11:56 a.m. (ET - 00:27)

The Engine 1 officer came back on the radio and reported that he had men inside the building. He stated their lines had been burned, he did not know their status, and that they still did not have water to go in after them.

Battalion Chief 3 and Battalion Chief 2 met at the front of the building and Battalion Chief 2 transferred the incident command to Battalion Chief 3. Battalion Chief 3 radioed dispatch and reported that he was assuming command in the front of the building. At this time, two master streams, one on Ladder 2 and one on Engine 2, were in operation at the front of the building.

Battalion Chief 2 was assigned to command activities at the rear of the building and he began to walk around the east end of the shopping center.

At about this time, at the rear of the building, the captain felt that Engine 3 could no longer hold its position. Several of the power company employees assisted the captain, the fire fighter from Engine 1, and Engine 3's driver while they moved Engine 3, with its hoselines connected, about 50 ft (15.2 m) away from its position at the back of the building.

11:57 a.m. (ET - 00:28)

While walking around the east end of the shopping center, Battalion Chief 2 called Engine 1 to determine their status and to see if they had laid a line to the back of the building.

11:58 a.m. (ET - 00:29)

The Engine 1 officer responded that a line had been laid, but they had received no water. He added that they had dead lines.

Engine 3 driver called Engine 1 and said that he needed water. Engine 1 driver did not acknowledge this transmission.

11:59 a.m. (ET - 00:30)

Battalion Chief 2 called Dispatch and reported that he was having radio problems and that someone may still be in the building. He continued by telling Battalion Chief 3 that there was no water supply at the back of the building, and Battalion Chief 3 should determine the problem with Engine 1.

Battalion Chief 3 answered Battalion Chief 2, stating that he would get help to them.

For the next two minutes, equipment was arriving on the scene, including Engine 4 (a third alarm company) and a pumper and ladder from Virginia Beach (a company responding to a mutual aid special call). At the front of the building, two master streams and hoselines, were being used on the fire.
12:04 p.m. (ET - 00:34)

Engine 3 driver on Engine 3 was not aware of Battalion Chief 2’s position so he radioed Battalion Chief 2, again, asking for water. Battalion Chief 3 heard Engine 3’s request and told the driver to “stand tight.” It was about this time that the Engine 3 driver moved his engine a second time because it was continuing to receive tremendous heat.

During the next two to three minutes, radio traffic on Channel 1 continued to be extremely heavy as equipment was arriving on the scene; including Battalion Chief 1, Medic Units, and an EMS supervisor. The fire units began switching to Channel 2, and EMS units were switching to their statewide channel.

12:06 p.m. (ET - 00:36)

Battalion Chief 1 advised Battalion Chief 3 that he was going to the rear of the building to assist Battalion Chief 2.

12:07 p.m. (ET - 00:37)

Engine 1 officer radioed Battalion Chief 2 and told him that a connection had been made on the 5-in (127-mm) hose and water was on the way.

During this time, Engine 4 had arrived at the rear of the building. The 5-in (127 mm) hose that had been originally connected to Engine 3 was then connected to Engine 4. Engine 4 then set up a master stream at the rear of the building.

12:08 p.m. (ET - 00:38)

Battalion Chief 1 was in his car and picked up Battalion Chief 2 who was on foot and almost to the rear of the building. Battalion Chief 2 advised Battalion Chief 1 that he may have two fire fighters down inside the building. When Battalion Chief 1 and Battalion Chief 2 arrived at the rear of the building and contacted the Engine 1 officer, they discussed the situation involving missing fire fighters.

Battalion Chief 1 took command of the rear sector. Battalion Chief 2 went to the rear door of the auto parts store to determine if entry could be made.

Battalion Chief 1, with the assistance of the Captain from Engine 4, took the first fireground Personnel Accountability Report (PAR). At this point, most of the fireground units had switched to Channel 2, and equipment around the fireground had begun to respond to the requested “PAR.”

At the same time, Division Chiefs 2, 3, 4, and 5 arrived on the scene. They went to Battalion Chief 3’s vehicle position in front of the supermarket and established a permanent command post at that location. Battalion Chief 1 continued to request that all units go to Channel 2 to complete the “PAR.”
The master streams appeared to be bringing the fire, which involved the entire building, under control. In the rear of the structure, Battalion Chief 2 assembled crews to make entry into the structure. Engine 4 had become operational at the rear of the structure and was also applying water with a master stream.

**12:11 p.m. (ET - 00:41)**

Division Chief 3 assumed command at the front of the building.

For the next five minutes, intensive exterior fire-suppression operations continued, with multiple master streams being directed at the building. Mutual aid companies from Virginia Beach and Norfolk were on the scene and assisted with the operation.

**12:13 p.m. (ET - 00:43)**

The first search team entered the rear of the structure encountering heavy debris and intense heat. The search continued as teams were systematically rotated to replace one another.

Division Chief 2 assumed command of the incident and Division Chief 3 took command of fireground operations. *(See Figure 7)*
For the next 45 to 50 minutes, crews continued their search inside the building, even as large hose streams continued to be applied on the hot debris around them.

1:06 p.m. (ET - 01:37)

The Virginia Beach search team, which was lead by a Virginia Beach command officer, advised command that they had located the first body.

1:12 p.m. (ET - 01:43)

The Virginia Beach search team advised that the second body had been located.

Once the fire fighters' bodies were located, fire operations were essentially stopped. Battalion Chief 2 and the Fire Chief from Virginia Beach agreed that a team from Virginia Beach and fire inspectors from the Chesapeake Fire Marshal's Office would perform recovery and identification of the bodies.

Two Chesapeake fire inspectors began the fire scene investigation, and preliminary identification of the two fire fighters was made. The entire recovery operation was video-taped and documented.

Once the bodies of the fire fighters were placed in body bags and moved to the rear door, fire fighters from the Chesapeake Fire Department removed them from the building and placed them in a Medic Unit. The two fire fighters' bodies were transported to the Virginia Crime Laboratory in Norfolk for positive identification and determination of the exact cause of death by the Virginia State Medical Examiner.

1:52 p.m. (ET - 02:23)

Overhaul and hazardous materials containment operations resumed on the fire scene.
Casualties

Two fire fighters died in this fire. They were found in approximately the middle of the building and next to the west wall. The two fire fighters were together and covered with light debris. (See Figure 8, next page). The acting officer was found lying under the fire fighter. The officer's SCBA mask had been pulled down and was found under him. The officer's helmet was approximately 10 feet from his body. The fire fighter had both his mask and helmet on. Since the fire fighter was on top, he sustained more thermal burns than the fire officer. Local investigators believed that neither fire fighter was incapacitated before the roof collapse.

Both fire fighters died of thermal burns. The officer had a COHB level of 25 percent, and the fire fighter had a COHB level of 11 percent so smoke inhalation was considered to be a contributory factor.\(^7\)

Damage

The auto parts store and two stores east of the auto parts store were destroyed by this fire. (See Photos 4 & 5, page 27). The auto parts store sustained the most extensive damage. The wood trusses for the auto parts store's roof assembly were almost totally consumed. Only small pieces of charred chord and web truss members were found. The remnants of one truss near the center of the building had pieces of gypsum wall board still attached confirming that an effort had been made to divide the combustible concealed space into, at least, two areas. Most combustible and flammable materials in the building were consumed.

\(^7\) The Occupational Safety and Health Administration (OSHA) Occupational Health Guidelines for Carbon Monoxide states that COHB levels over 60% are usually fatal; 40% is associated with collapse and fainting; above 25% there may be changes on electrocardiograph test results; between 15% and 25% there may be headache and nausea.
Photo 4: Fire damage in the auto parts store. The west wall is visible and the rear of the store is on the left side of the photograph.

Note: White cross shows victim location

Credit: NFPA

Photo 5: Fire damage in the auto parts store. The front wall of the store is on the right side of the photograph.

Credit: NFPA
IV. ANALYSIS

Cause and Origin

When the elevated boom on the power company vehicle struck the electric service conductors for the auto parts store, the neutral conductor was broken. The power company employee observed arcing at the meter base; before he could disconnect the power, electrical short circuits and ground-faults caused an over current condition that resulted in a fire in the area of the hot water heater above the rest rooms. Store employees may have extinguished this fire before the fire fighters arrived.

Local investigators believed that the over current condition also ignited numerous fires in the combustible concealed space at the same time that the fire was ignited in the area of the hot water heater. This belief was based on the post-fire examination of wiring inside the structure. The wiring had many indications of overloading. Investigators deduced that the overload could not have been a result of the fire because the utility worker disconnected the power very early in the sequence of events. At the time this report had been prepared, the Chesapeake Fire Marshall’s Office investigation of the origin and cause had not been completed. Fire department investigators had received information suggesting that the electrical system in this auto parts store had not been properly grounded. As a result, the accidental short circuit that occurred at the rear of the structure may have resulted in a number of “hot connections” throughout the building which could have ignited numerous fires.

Fire Growth and Spread

Once ignited, the fires were able to freely spread in the combustible concealed spaces on both sides of the gypsum-board-covered truss that was intended to divide the concealed space into two areas. The wood chords, webs, and plywood sheathing fueled the growing fire. Though the height of the combustible concealed space was not known, there was a large area through which the fire could spread.

The insulation installed below the trusses’ bottom chord had few voids and openings so it kept most of the smoke and heat in the combustible concealed space. The suspended ceiling also formed another layer of construction materials that helped stop smoke from spreading into the occupied areas of the building. Both of these building components initially hid the vigorously burning fire from the view of the Engine 3 fire fighters.

Approximately two minutes after entering the building, the Engine 3 fire fighters found some fire and reported that they could handle it. About a minute later, they reported some extension and decided that they needed assistance; three minutes later, they reported fire in the ceiling. This report shows that the fire fighters realized the fire was above the ceiling, but they may not have realized how much fire was above them. Meanwhile fire fighters on the outside of the building could see
smoke and, in some areas, fire coming out from under the roof. In retrospect, the conditions observed both inside and outside the structure hinted towards the large fire that was in the void space above the ceiling.

The Wood Trusses

The wood trusses and the wood sheathing materials were the primary fuels for the fire in the concealed space above the auto parts store’s ceiling. The concealed space was not used for storage or for any other documented purposes that would have placed combustible materials in that space. The ceiling assembly and insulation materials forming one side of the concealed space were noncombustible, again, eliminating a source of combustible materials. Wires with combustible insulation were in the concealed space but were negligible when compared with the amount of wood in the trusses and sheathing material. Thus, in the absence of other fuels, it becomes clear the wood trusses and the wood sheathing materials were fueling the fire in the concealed space.

The wood trusses’ ability to fuel the fire made them more hazardous than metal trusses would have been under similar conditions. Had the trusses been made of metal, the roof’s sheathing material would have been the primary combustible material in the concealed space. The change in material used for trusses would have reduced the total amount of fuel, would have reduced the area of exposed combustible surfaces, and would have changed the geometric arrangement of the fuels to one with a lower potential of fire spread. The combined effect of these changes would have been a less severe fire in the concealed space. If noncombustible sheathing materials were used instead of wood, virtually all of the fuels in the concealed space would have been eliminated. The potential for the severe fire that occurred in the Chesapeake auto parts store would have been significantly reduced.

By the nature of their design, trusses create open areas between their top and bottom chords. The height of the open area created by the trusses used in the construction of the Chesapeake auto parts store was not known because the trusses were destroyed by the fire and no plans confirmed the design of the trusses. Nonetheless, the 50-ft (15.2-m) wide trusses would have provided sufficient openings to allow the fire to quickly involve large areas of the concealed space in a short period of time. As the wood trusses burned, they lost mass and lost strength increasing the potential for collapse under the trusses’ own weight, the weight of the roofing materials, and the weight of the HVAC equipment that was installed on top of the roof. The weakened condition of the trusses also made them increasingly susceptible to a collapse due to any construction flaws that may have been present and defective materials that may have been used. The increased potential for collapse equated directly to an increased threat to fire fighters who were working below the truss.

The distance between supports for a truss (i.e., the truss’ span and the number of
partitions under a truss) affects the risk a truss can present to fire fighters. In the book *Building Construction for the Fire Service* (Brannigan), it is recognized that risk to fire fighters is less when a space contains a large number of interior partitions because the partitions will support the failing trusses allowing only pieces of the truss to fall to the floor. *(See Photo 6.)* The same truss used in a commercial building to provide a wide clear span can fail catastrophically. Such a catastrophic failure occurred in the Chesapeake auto parts store. When the roof collapsed, large sections fell landing on shelves, counter tops, and the floor, blocking the egress of the fire fighters.

**Fireground Communications**

During the 14 minutes and 22 seconds between the arrival of Engine 3 and the report that the Engine 3 officer and his fire fighter were trapped, the following observations were made and some were not communicated to the incident commander:

- **11:39 a.m.** Smoke was beginning to show at the edge of the roof on the east side and south side of the building.

- **11:45 a.m.** Heavy smoke and flames were starting to show from the roof of the building.

- **11:45 a.m.** Fire was beginning to spread at an extremely accelerated rate at the rear of the building, particularly along the roof line.

By themselves, failures in reporting fire conditions and in providing information about fire-suppression activities may seem to be minor oversights. However, when taken in context of each other and in context with other information that the incident commander may have, the information can have a significant affect on the management of fire-suppression operations and on the assessments regarding fire fighter safety.

During the Chesapeake fire, the incident commander was operating from the front of the building and could not see the rear. Therefore, the crews at the rear of the building would have had to provide information by radio in order for the incident commander to have knowledge regarding fire conditions and suppression at their position. The incident commander could have integrated this information with information that he received from other radio transmissions or that he possessed himself. For example, the Engine 3 officer radioed Battalion Chief 2 at 11:42 a.m. and reported that there was fire in the ceiling. In the same minute, Battalion Chief 2 radioed the dispatch center and reported fire showing on the outside of the building. The combination of information regarding fire conditions and fire suppression at the rear of the building, his own observations, and the reports from inside the building may have assisted the incident commander to recognize that conditions in the building were deteriorating and to recognize that the risk to his fire fighters inside the building was increasing. The incident commander may have been able...
adjust his interior fire fighting operations tactics and strategies appropriately.

At approximately 11:48, Engine 1, which was assigned to establish a water supply for the fire attack crew, ran out of supply hose before reaching a hydrant; so this engine was not able to provide the needed water supply. This information was not communicated to the incident commander, so he could not factor the lack of water and its affect on interior operations into his fire attack strategy.

The Engine 3 officer’s radio transmission at 11:49 a.m. when he reported that he and his fire fighter were trapped was the first recorded indication of a problem on the fireground. At the time this critical transmission was made, many other units were making routine communications, and the incident commander was using his portable radio and walking around the scene gathering initial information and observing conditions. In addition, he was performing several other tasks such as monitoring fire crew movements and placement, formulating a plan for the fire attack, and addressing water supply concerns for the units already on the scene. The brief, yet critical, transmission by the Engine 3 officer was heard but not understood by the incident commander and was missed by other units on the scene.

During the initial stages of fireground operations, radio transmissions are very frequent because fire crews are being dispatched, arriving on the scene, and getting operational instructions. Fire officers are also performing multiple tasks in order to plan and organize the fire attack. Both heavy radio traffic and the high level of activity at command positions increased the potential for lost, missed, or misunderstood communications. After losing three fire fighters on February 14, 1995, the Pittsburgh Fire Department recognized the importance of being able to identify critical radio communications and established the trigger phrase of “May Day” as the
means to clear the fireground radio channels so information regarding a serious condition on the fireground may be reported.

In the Chesapeake auto parts store, the use of a trigger phrase probably would not have altered the outcome of this fire because the fire fighters were, apparently, trapped first by a partial failure of the roof assembly. Approximately one minute later, the catastrophic collapse of the roof occurred and would have prevented any rescue attempts. The Chesapeake fire shows that critical communications can be missed for various reasons and that there is a need for an emergency call sign to override all the routine radio transmissions, capture the attention of an incident commander, and provide an opportunity for rapid intervention crews to respond.

Code Analysis

In the interest of comparing conditions and other details regarding this incident with current national consensus codes and standards, NFPA 1001, Standard for Fire Fighter Professional Qualifications, 1992 edition; NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, 1992 edition; NFPA 1561, Standard on Fire Department Incident Management Systems, 1992 edition; and NFPA 13, Standard for the Installation of Sprinkler Systems, 1996 edition were used as the basis for this comparison. It was recognized, however, that these codes were not part of legal requirements adopted by the City of Chesapeake. The following discussion concerns requirements that have particular relevance to this fire. It is not intended to be a complete description of all parts of the codes or standards that could be applied to this incident.

Fire fighters regularly face environments and situations that can potentially cause them harm. General and specific knowledge of the environments in which fire officers and fire fighters must work are tools that fire fighters can use to help protect themselves. The understanding of general building construction types and how each type of building construction can affect their safety is one type of general knowledge that can help fire officers and fire fighters protect themselves. This information can be obtained through training and through experience. Specific knowledge and information about a particular building's construction can be used to anticipate specific risks and fireground tactics for buildings that fire fighters have to protect. Specific building information can be gathered during pre-fire inspections and recorded on the fire departments pre-fire plans for buildings.

NFPA recognizes that the skill and knowledge of fire fighters will contribute to effective and safe fireground operations and publishes NFPA 1001, Standard for Fire Fighter Professional Qualifications. This standard identifies the performance requirements necessary to perform the duties of a fire fighter. It specifically identifies the minimum requirements for fire fighter candidates and for two levels of performance thereafter.

Among the many requirements of NFPA 1001, Section 1001:4-23 requires Fire Fighter II candidates to be familiar with building construction. The candidates are required to identify the general fire behavior involving the five types of construc-
tion; i.e., wood frame, ordinary, heavy timber, noncombustible, and fire resistant. The candidates are also required to know how the spread of fire can affect the safety of the building, occupants, and fire fighters. Section 1001:4-23 specifically requires Fire Fighter II candidates to describe at least three hazards of truss and lightweight construction and five indicators of building collapse. The performance requirements of Section 1001:4-23 provide the opportunity for fire fighters to learn how to recognize construction types and the risks associated with each. With this information, the fire fighter might be able to select fireground tactics that would minimize the known risks.

Pre-fire inspections are an excellent opportunity for fire fighters to gather specific information about the construction of buildings they must protect. More important is for fire fighters to identify buildings constructed with components that could place fire fighters at risk during fire suppression operations. They could then make appropriate notations in the building’s pre-fire plan, at the very least. Following the loss of five fire fighters during the collapse of a bowstring truss in Hackensack, New Jersey, on July 1, 1988, the state of New Jersey adopted a law requiring all buildings that are constructed with trusses to be marked with a placard. The placard can bring the presence of a truss to the attention of responding fire fighters. A recent fire in New Jersey that was reported to the NFPA showed this system appears to be working. Fire fighters in one New Jersey community were made aware of the presence of trusses by a truss placard that had been placed on the outside of the building. Once aware of trusses, the incident commander immediately began considering for them in his fire attack strategy. The use of placards is only one method that will help fire fighters identify buildings with construction or other features that could place the fire fighters at risk during fire suppression operations.

Section 6-5 of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, requires fire departments to provide a rapid intervention crew (RIC) for the rescue of members operating at emergency incident, if the need arises. The need did arise at the Chesapeake fire; however, there was no rapid intervention crew ready to enter. In addition, the incident commander did not initially know that the fire fighters inside were experiencing trouble, so it is unclear as to whether a rapid intervention crew, if it was available, would have immediately responded to Engine 3’s call for assistance.

In this fire, the immediate response of a rapid intervention crew could have potentially aggravated the situation. The Engine 3 officer radioed for assistance after being trapped, apparently, by the initial and partial failure of the roof assembly. However, fire fighters on the outside of the building did not observe dramatic changes in the fire until about one minute after Engine 3’s call for assistance. A rapid intervention crew responding immediately to the assistance calls may have had enough time to enter the building before the catastrophic collapse of the roof. If that was the case, even more fire fighters could have been killed or injured.

Both NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, and NFPA 1561, Standard on Fire Department Incident Management
System, have requirements for personnel accountability. Following the collapse of the roof assembly, there was a high level of confusion and anxiety on the fireground. Some fire officers suspected that fire fighters may have been trapped in the building, but an official accounting was not performed for nearly 25 minutes after the roof collapse. Since conditions in the building deteriorated rapidly after the fire fighters were trapped, it is unlikely that an earlier accounting of the fire fighters would have changed the outcome of the fire in terms of the survival of the two fire fighters. However, an accounting of fire fighters immediately following the roof collapse may have helped to reduce the amount of confusion on the fireground.

Current NFPA codes and standards would not have required automatic sprinklers in the Chesapeake auto parts store. However, had an automatic sprinkler system been installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, the combustible concealed spaces above the ceiling would have been protected by sprinklers. Paragraph 134-13.1.1 requires that all concealed spaces enclosed wholly or partially by exposed combustible construction shall be protected by sprinklers. Sprinklers in the concealed space above the ceiling in the Chesapeake auto parts store would have reduced the severity of the fire and ultimately the risk to fire fighters.

V. DISCUSSION

The greatest opportunity to change the outcome of the Chesapeake auto parts store fire occurred before the fire. Fire officers and fire fighters can be educated regarding truss construction, methods that they may employ to identify buildings constructed with trusses, the risks that trusses can pose during fire suppression operations, and fire-suppression tactics that will reduce the risk to fire fighters when they must respond to a building constructed with trusses. In addition, pre-fire planning and building inspections provide opportunities for fire fighters to identify that a building is constructed with a truss. This information can be noted on pre plans just as details regarding utility shutoff locations and the presence of hazards are noted on pre-fire plans.

On the basis of the NFPA's investigation and analysis of this fire, the following significant factors contributed to the loss of the two Chesapeake fire fighters:

- The presence of light weight wood roof trusses.
- Fire officers and fire fighters not being aware that the Chesapeake auto parts store's roof was constructed with light weight wood trusses.
- The lack of a fire attack strategy that minimized the risk to fire fighters while suppressing a fire involving light weight wood trusses.
- The lack of automatic sprinklers.

Following their investigation of the incident, the Chesapeake Fire Department pre-
pared a summary report entitled Two Fire Fighter Fatalities, Chesapeake, Virginia, March 18, 1996. Their findings were summarized in the report's Discussion and Conclusion sections. These sections of the Chesapeake report have been provided in Appendix X of this report.
VI. ADDITIONAL INFORMATION

Since 1978, NFPA has prepared 2 fire investigation reports and 2 Fire Command articles following NFPA investigations of other incidents that caused the death of fire fighters as a result of truss collapses. The following is a list of those reports and articles:

NFPA Fire Investigation Reports


Fire Command Articles


In 1988 and 1989, NFPA Journal published the following articles discussing the performance of wood trusses. These articles provided two perspectives on the subject:


ABSTRACTS

Five Fire Fighter Fatalities
Hackensack, New Jersey
July 1, 1988

Five fire fighters from the Hackensack, New Jersey Fire Department were killed while they were engaged in interior fire-suppression efforts at an automobile dealership when portions of the building's wood bowstring truss roof suddenly collapsed. The incident occurred on Friday, July 1, 1988, at approximately 3:00 p.m., when the fire department began to receive the first of a series of telephone calls reporting "flames and smoke" coming from the roof of the Hackensack Ford dealership.

Two pumper, a ladder truck, and a battalion chief responded to the first alarm assignment. The first arriving fire fighters observed a "heavy smoke condition" at the roof area of the building. Engine company crews investigated the source of the smoke inside the building while the truck company crew assessed conditions on the roof. For the next 20 minutes, the focus of the suppression effort was concentrated on these initial tactics.

During this time, however, little headway appeared to have been made by the initial suppression efforts, and the magnitude of the fire continued to grow. The overall fireground tactics were shifted to a more "defensive" posture (exterior operation), and the battalion chief gave the order to "back your lines out." However, before suppression crews could exit from the interior, a sudden, partial collapse of the truss roof occurred, trapping six fire fighters. An intense fire immediately engulfed the area of the collapse. One trapped fire fighter was able to escape through an opening in the debris. The other five died as a result of the collapse.

This incident and an earlier similar incident at a supermarket fire in Brooklyn, New York provide important lessons to the fire service regarding the fireground hazards of wood truss roof assemblies.
Six Fire Fighter Fatalities
Brooklyn, New York
August 2, 1978

On Wednesday, August 2, 1978, six New York City fire fighters died while fighting a fire at Waldbaum’s Supermarket at 2892 Ocean Avenue, Brooklyn, New York. The fire fighters died of burns received when the roof of the supermarket they were working on collapsed without warning. The roof system structurally consisted of seven 100 foot long, medium-weight wood segmental trusses. At the time of the roof collapse, there were approximately 24 operating personnel of the New York City Fire Department on the roof. The combination of a major fire in the combustible truss area, building construction features, the apparent lack of recognition by fire department operating personnel of the wood truss construction involved in this incident and the hazards associated with it, and the exposure of large numbers of fire fighters to those hazards were the primary factors that lead to the fatalities.
VIII. CODE SECTIONS


**NFPA 13, Standard for the Installation of Sprinkler Systems**

**13:4-13 Special Situations.**

**13:4-13.1 Concealed Spaces.**

13:4-13.1.1* All concealed spaces enclosed wholly or partly by exposed combustible construction shall be protected by sprinklers.

*Exception No. 1: Concealed spaces formed by studs or joists with less than 6 in. (152 mm) between the inside or near edges of the studs or joists. (See Figure 4-6.4.1.4.)*

*Exception No. 2: Concealed spaces formed by bar joists with less than 6 in. (152 mm) between the roof or floor deck and ceiling.*

*Exception No. 3: Concealed spaces formed by ceilings attached directly to or within 6 in. (152 mm) of wood joist construction.*

*Exception No. 4: Concealed spaces formed by ceilings attached directly to the underside of composite wood joist construction, provided the joist channels are firestopped into volumes each not exceeding 160 ft³ (4.53 m³) using materials equivalent to the web construction.*

*Exception No. 5: Concealed spaces entirely filled with noncombustible insulation.*

*Exception No. 6: Concealed spaces within wood joist construction and composite wood joist construction having noncombustible insulation filling the space from the ceiling up to the bottom edge of the joist of the roof or floor deck, provided that in composite wood joist construction the joist channels are firestopped into volumes each not exceeding 160 ft³ (4.53 m³). The joists shall be firestopped to the full depth of the joist with material equivalent to the web construction.*

*Exception No. 7: Concealed spaces over isolated small rooms not exceeding 55 ft² (4.6 m²) in area.*

*Exception No. 8: Where rigid materials are used and the exposed surfaces have a flame spread rating of 25 or less and the materials have been demonstrated not to propagate fire in the form in which they are installed in the space.*
Exception No. 9: Concealed spaces in which the exposed materials are constructed entirely of fire-retardant treated wood as defined by NFPA 703, Standard for Fire Retardant Impregnated Wood and Fire Retardant Coatings for Building Materials.

Exception No. 10: Noncombustible concealed spaces having exposed combustible insulation where the heat content of the facing and substrate of the insulation material does not exceed 1000 Btu per ft² (11 356 kJ/m²).

13:4-13.1.2 Sprinklers in concealed spaces having no access for storage or other use shall be installed in accordance with the requirements for Light Hazard Occupancy.

13:4-13.1.3 Where heat-producing devices such as furnaces or process equipment are located in the joist channels above a ceiling attached directly to the underside of composite wood joist construction that would not otherwise require sprinkler protection of the spaces, the joist channel containing the heat-producing devices shall be sprinklered by installing sprinklers in each joist channel, on each side, adjacent to the heat-producing device.

NFPA 1001, Standard for Fire Fighter Professional Qualifications

1001:4-23 Building Construction.

1001:4-23.1 Describe the basic structural characteristics of the following types of building construction:
(a) Wood frame
(b) Ordinary
(c) Heavy timber
(d) Noncombustible
(e) Fire resistant.

1001:4-23.2 Identify the general fire behavior expected with each type of building construction, including the spread of fire and the safety of the building, occupants, and fire fighters.

1001:4-23.3 Describe at least 3 hazards associated with truss and lightweight construction.

1001:4-23.4 Identify dangerous building conditions created by fire and fire suppression activities.

1001:4-23.5 Identify 5 indicators of building collapse.

1001:4-23.6 Describe the effects of fire and fire suppression activities on the fol-
lowing building materials:
(a) Wood
(b) Masonry (brick, block, stone)
(c) Cast iron
(d) Steel
(e) Reinforced concrete
(f) Gypsum wall board
(g) Glass
(h) Plaster on lath.

1001:4-23.7 Define the following terms as they relate to building construction:
(a) Veneer wall (exterior)
(b) Party wall
(c) Fire wall
(d) Partition wall
(e) Cantilever or unsupported wall
(f) Load bearing.


1500:6-3 Accountability.

1500:6-3.1 The fire department shall establish written standard operating procedures for a personnel accountability system in accordance with Section 4-3 of NFPA 1561, Standard on Fire Department Incident Management System, and that provides for the tracking and inventory of all members operating at an emergency incident.

1500:6-3.1.1 The system shall consider local conditions and characteristics in establishing the requirements of the personnel accountability system.

1500:6-3.2 It shall be the responsibility of all members operating at an emergency incident to actively participate in the personnel accountability system.

1500:6-3.3 The incident commander shall be responsible for overall personnel accountability for the incident. The incident commander shall initiate an accountability and inventory worksheet at the very beginning of operations and shall maintain that system throughout operations.

1500:6-3.3.1 The incident commander shall maintain an awareness of the location and function of all companies and sectors.

1500:6-3.3.2 Sector officers shall directly supervise and account for the companies operating in that sector.
1500:6-3.3.3 Company officers shall maintain an ongoing awareness of the location and condition of all company members.

1500:6-3.3.4 Where assigned as a company, members shall be responsible to remain under the supervision of their assigned company officer.

1500:6-3.3.5 Members shall be responsible to follow personnel accountability system procedures.

1500:6-3.4 The personnel accountability system shall be used at all incidents.

1500:6-3.5 The fire department shall develop the system components required to make the personnel accountability system effective.

1500:6-3.6 The standard operating procedures shall provide the use of additional accountability officers based on the size, complexity, or needs of the incident. These accountability officers shall work with the incident commander and sector officers to assist in the ongoing tracking and accountability of members.

1500:6-4 Members Operating at Emergency Incidents.

1500:6-4.1 The fire department shall provide an adequate number of personnel to safely conduct emergency scene operations. Operations shall be limited to those that can be safely performed by the personnel available at the scene. No member or members shall commence or perform any fire fighting function or evolution that is not within the established safety criteria of the organizational statement as specified in 2-1.2 of this standard.

1500:6-4.2 When inexperienced members are working at an incident, direct supervision shall be provided by more experienced officers or members. This requirement shall not reduce the training requirements contained in Chapter 3 of this standard.

1500:6-4.3 Members operating in hazardous areas at emergency incidents shall operate in teams of two or more. Team members operating in hazardous areas shall be in communication with each other through visual, audible, physical, safety guide rope, or electronic means, or by other means in order to coordinate their activities. Team members shall be in close proximity to each other to provide assistance in case of emergency.

1500:6-4.4 In the initial stages of an incident where only one team is operating in the hazardous area, at least one additional member shall be assigned to stand by outside of the hazardous area where the team is operating. This standby member shall be responsible for maintaining a constant awareness of the number and identity of members operating in the hazardous area, their location and function, and time of entry. The standby member shall remain in radio, visual, voice, or signal line
communications with the team.

1500:6-4.4.1 The “initial stages” of an incident shall encompass the tasks undertaken by the first arriving company with only one team assigned or operating in the hazardous area.

1500:6-4.4.2 The standby member shall be permitted to perform other duties outside of the hazardous area, such as apparatus operator, incident commander, or technician or aide, provided constant communication is maintained between the standby member and the members of the team.

1500:6-4.4.3 The standby member shall be provided with at least the appropriate full protective clothing, protective equipment, and SCBA as required in Chapter 5 of this standard. The standby member shall be permitted to rescue or provide for the rescue of the members of the one team that is operating if the need arises. If such a rescue need arises, the standby member shall communicate the situation to the communications center and additional response shall be dispatched if not already underway.

1500:6-4.4.4 Once a second team is assigned or operating in the hazardous area, the incident shall no longer be considered in the “initial stage,” and at least one rapid intervention crew shall be required.

1500:6-4.5 When members are performing special operations, the highest level of emergency medical care shall be standing by at the scene with medical equipment and transportation capabilities. Basic life support shall be the minimum level of emergency medical care.

1500:6-4.5.1 All emergency medical personnel who provide emergency medical care and medical monitoring at hazardous material incidents shall meet the minimum requirements of NFPA 473, Standard for Competencies for EMS Personnel Responding to Hazardous Materials Incidents.

1500:6-4.5.2 At all other emergency operations, the incident commander shall evaluate the risk to the members operating at the scene and, if necessary, request that at least basic life support personnel and patient transportation be available.

1500:6-4.6 When members are operating from aerial devices, they shall be secured to the aerial device by an approved safety harness that complies with the requirements of 5-8.1.1 of this standard.

1500:6-4.7 When members are operating at an emergency incident and their assignment places them in potential conflict with motor vehicle traffic, they shall wear a garment with fluorescent retroreflective material.

1500:6-4.7.1 Apparatus shall be utilized as a shield from oncoming traffic wherever possible.
1500:6-4.7.2 When acting as a shield, apparatus warning lights shall remain on, and fluorescent and retroreflective warning devices such as traffic cones, illuminated warning devices such as highway flares, or other appropriate warning devices shall be used to warn oncoming traffic of the emergency operations and the hazards to members operating at the incident.

1500:6-5 Rapid Intervention for Rescue of Members.

1500:6-5.1 The fire department shall provide personnel for the rescue of members operating at emergency incidents if the need arises.

1500:6-5.2 A rapid intervention crew shall consist of at least two members and shall be available for rescue of a member or a team if the need arises. Rapid intervention crews shall be fully equipped with the appropriate protective clothing, protective equipment, SCBA, and any specialized rescue equipment that might be needed given the specifics of the operation underway.

1500:6-5.3 The composition and structure of rapid intervention crews shall be permitted to be flexible based on the type of incident and the size and complexity of operations. The incident commander shall evaluate the situation and the risks to operating teams, and shall provide one or more rapid intervention crews commensurate with the needs of the situation.

1500:6-5.4 In the early stages of an incident, the rapid intervention crew(s) shall be either:
(a) On-scene members designated and dedicated as rapid intervention crew(s).
(b) On-scene members performing other functions but ready to redeploy to perform rapid intervention crew functions.

1500:6-5.5 As the incident expands in size or complexity, the rapid intervention crews shall be either:
(a) On-scene members designated and dedicated as rapid intervention crews.
(b) On-scene company or companies either in a staging area, or designated and dedicated as rapid intervention crews.

1500:6-5.6 Whenever members are operating in positions or performing functions that include special operations or would subject them to immediate danger of injury in the event of equipment failure or other sudden event, at least one rapid intervention crew shall be standing by with equipment to provide assistance or rescue.

1561:2-6 Personnel Accountability.

1561:2-6.1 The incident management system shall provide for personnel accountability at the incident scene.

1561:2-6.2 The fire department shall adopt and routinely use a system to maintain accountability for all personnel assigned to the incident. This system shall provide a rapid accounting of all personnel at the incident scene.

1561:2-6.3 All supervisors shall maintain a constant awareness of the position and function of all personnel assigned to operate under their supervision. This awareness shall serve as the basic means of accountability that shall be required for operational safety.

1561:2-6.3.1 The incident management system shall maintain accountability for the location and function of each company or unit at the scene of the incident. Personnel who respond to the incident on fire apparatus shall be identified by a system that provides an accurate accounting of those personnel actually responding to the scene with each company or on apparatus.

1561:2-6.3.2 Personnel who arrive at the scene of the incident by means other than fire apparatus shall be identified by a system that accounts for their presence and their assignment at the incident scene.

1561:2-6.4 The system shall include a specific means to identify and keep track of personnel entering and leaving hazardous areas, such as confined spaces or areas where special protective equipment is required.

1561:2-6.5 The incident management system shall include a standard operating guideline to evacuate personnel from an area where an imminent hazard condition is found to exist and to account for their safety. This guidance shall include a method to notify immediately all personnel in the affected area by means of audible warning devices, and by radio signals in accordance with the requirements specified in 2-2.4.

1561:2-2.4* The communications system shall provide a standard method to give priority to the transmission of emergency messages and notification of imminent hazards to all levels of the incident command structure over that of routine communications.

1561:A-2-2.4 The emergency notification system should provide a means to rapidly warn all persons who might be in danger if an imminent hazard is identified or if a change in strategy is made. An emergency message format with distinctive alert tones and definitive instructions should be used to make such notifications.
IX. CHESAPEAKE FIRE DEPARTMENT’S DISCUSSION AND CONCLUSION

The Chesapeake Fire Department’s summary report entitled *Two Fire Fighter Fatalities, Chesapeake, Virginia, March 18, 1996*, provided the following Discussion and Conclusion regarding the fire:

**Discussion**

In the initial stages of interior fire suppression operations, when fire crews are not certain of such factors as construction, interior configuration, exact location and free burn time of the fire, fire fighter safety is at risk.

Unfortunately, these factors, and a number of unusual circumstances, resulted in the tragic deaths of two Chesapeake fire fighters. The dangers involved in fighting fires in structures built with lightweight wood truss construction have, again, vividly come to light. It is felt that in this tragic fire, the construction technique was the primary factor in the loss of the lives of two fire fighters.

This fire, just as with other fires involving lightweight wood truss construction, and resulting fire fighter fatalities has provided important “lessons learned”. We hope that our analysis will produce recommendations that will prevent the repeat of this type tragedy in the future.

The following is a list of major contributing factors that may have accounted for the outcome of this fire:

1. The first due company did not realize that the structure was of lightweight wood truss construction, with extenuating circumstances, such as unsupported 50 ft. spans, an additional roof top loading, and possible sub-standard construction. Pre-Fire planning is essential to identify this type of construction.

2. The first due company, based on a cursory investigation and incomplete knowledge of the extent of fire or multiple points of origin in the concealed space, returned the second due equipment too quickly, resulting in a delay in arrival of the second due company when they were called back into the alarm.

3. On arrival of the first command officer, no direct exchange of command and transfer of information took place. It appears that this was complicated by the distance of the interior fire suppression crew from the exterior point of arrival of the first command officer.

4. The incident commander should have assured the interior fire suppression crew was called out of the building once the following became evident:
   A. The increased volume and rapid extension of the fire on the roof was observed by the incident commander.
B. That master stream operations were being placed into service at the front of
the building.

5. Fireground communications, particularly early in the operation became stressed
and, at times, were ineffective, due to the interior fire crew and exterior fire com-
mand operating on portable radios. This was complicated by the ambient noise
on the fireground. Also radio traffic from dispatching multiple alarms and di-
recting (fill in) companies on Channel One became a problem.

6. While it is felt that it had no direct bearing on the collapse or the fatalities, the
inability of the second due engine to establish a sustained water supply, due to
the fact that it exhausted its hose load before it reached the hydrant. This com-
licated search and recovery efforts, after the collapse of the structure and be-
came a distraction during this critical period.

7. Accountability and incident command procedure must be initiated at the begin-
ning of fireground operations. While the rapid collapse of the structure precluded
the fireground commander’s ability to establish a Personnel Accountability Sys-
tem (PAS), the system only became effective after it was known two fire fight-
ers had been lost. The system then could only confirm that knowledge.

CONCLUSION
The Chesapeake Fire Department’s investigation and analysis of this incident es-
ablishes a need to address the following items:

1. All Fire Department personnel must have a clear understanding before entering
into any hazardous area, whether it be for preliminary assessment of the situa-
tion, investigation, or suppression activities. Personnel must have knowledge
of the type of structure they are entering, and any inherent weaknesses in that
structure. Personnel must consistently operate in pairs, and must be confident
that there are sufficient resources, such as a sustained water supply, back-up per-
sonnel, if interior suppression activities are to take place.

2. Any person assuming command on the fire ground, whether it be on the initial
response or a change of command, must insure that they have complete knowl-
edge of the location of all personnel, and the activities in which they are involved.

3. The Incident Commander on the fireground must consistently insure that clear
radio communications be maintained between command, interior operation, and
the Emergency Operations Center. All non-emergency radio traffic must be halt-
ed, particularly during the initial stages on any operation.

4. Accountability procedures must continue to be stressed, particularly in the ini-
tial stages of an operation, when it is most difficult to perform, when oper-
tions are isolated and sufficient personnel have not yet arrived on the scene.