

FIRE FIGHTER FATALITY

Biloxi, MS

October 20, 1986

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Tragedy Strikes Biloxi

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FIRE INVESTIGATIONS

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Tragedy Strikes Biloxi

NFPA Fire Investigation Report

During an early morning fire in a building housing seven apartments, two Biloxi fire fighters died in a second floor bedroom. They had entered the building without a hose line and without the knowledge of others at the scene.



GREG KYTE

NFPA Life Safety Specialist

On October 20, 1986, an early morning fire of electrical origin caused severe damage to an apartment building at 506 Reynoir Street, Biloxi, Miss., and resulted in the death of two fire fighters.

The two-story, wood-frame building once had been a single family dwelling, but later had been converted into seven apartment units. The building contained numerous combustible concealed spaces, both in the walls and above the second floor ceiling. The building was not equipped with automatic sprinklers, smoke detectors or a manual fire alarm system.

The fire originated in a joist space between the first and second floors, in a location adjacent to a concealed combustible wall cavity. From the area of origin, the fire spread rapidly to the attic, eventually culminating in the total destruction of the second floor.

The severe fire burning in the concealed space created an extremely dangerous condition, which the fire fighters were attempting to remedy. Unknown to others, two fire fighters entered the building without a hose line and subsequently died in a second floor bedroom. Both were equipped with full protective clothing and self-contained breathing apparatus (SCBA).

The building

The large, two-story wood frame structure at 506 Reynoir Street originally had been a single family dwelling. It was built around the turn of the century and was converted to an apartment building several years later. There were seven living units in the building—four on the first floor and three

on the second. (See Figures 1 and 2.) Except for apartment I, all units were occupied at the time of the fire. Eight persons occupied the first floor—four in apartment A and two each in apartments B and F. Three persons occupied the second floor—one occupant each in apartments C, D and E.

An open stairway in the center of the house connected the first and second floors and provided the only escape route for second floor residents. With the exception of apartment B, all first floor units had exits opening directly to the outside. The living areas were approximately 2280 sq. ft. for the first floor and 1288 sq. ft. for the second. The building had no fire alarm system, automatic sprinklers or smoke detectors.

The structure's balloon frame construction contained vertical channels that had no fire-stopping. Numerous combustible concealed spaces were present inside the walls, the attic, and between the inside and outside walls of the second floor. The majority of interior wall and ceiling finishes were of 1-by-3-inch tongue and groove, southern pine boards. Floors were finished in a variety of materials including carpet, vinyl, and wood.

First floor ceilings were 12 feet in height except in some bathroom and kitchen areas, where 8-foot-high suspended ceiling systems had been installed. Ceilings throughout the second story were 8 feet, 10 inches high.

The building was heated by unvented, natural gas space heaters located within each of the seven living units. A central heating system with associated ductwork was present but was not being used at the time.

Fire fighters and others pay tribute to one of their fallen comrades.

PAT SULLIVAN

About 25 minutes before the bodies of the deceased fire fighters are discovered, fire fighters move in to complete extinguishment.

PAT SULLIVAN

The building was supplied through two electrical services. The first service was supplied from a normal utility service drop to the meter on the building. The second service was tapped from the load side of two separate meters on an adjacent building owned by the same individual that owned 506 Reynoir. The tap conductors were run underground to the fire building to supply window air conditioners and some lighting.

Public protection

Biloxi, Miss., is a city of 53,000 people located on the Gulf Coast. The city covers an area of approximately 26 square miles. The Biloxi Fire Department is one of three divisions in the Department of Public Safety. The Fire and Life Safety Division has a fully paid force of 78 career fire fighters operating six engine companies and two truck companies out of six fire stations.

Fire discovery

The couple in apartment F on the first floor were awake as usual during the early morning hours of October 20, 1986. Both husband and wife had risen at 2:00 a.m., to prepare to leave for work. At approximately 2:50 a.m., they saw smoke discharging from a heating duct in the living room ceiling. They also could hear a sound described as a scratching or crackling noise. The apartment was filling with smoke, and since they had no telephone, the wife ran next door where a neighbor called the fire department. The husband left the apartment, went around the outside of the building, and began pounding on the door to apartment B to awaken the occupants. Having notified them of a fire, he and a next door neighbor went up the stairway to the second floor, yelling for everyone in the building to leave immediately because of fire.

Just before he was warned of the fire, the occupant of apartment D woke up coughing because of smoke in his room. He jumped up and opened the door to the hallway in an attempt to determine where the fire was. He saw people coming up the stairs shouting for everyone to get out, and he quickly dressed and left the building. The second floor occupants of apartments C and E were wakened by the warnings and quickly left the building as well.

At that time, only a light haze of grey smoke was present in the stairway, hall, and apartment D on the second floor. On their way out, at least three persons saw smoke coming from

Acknowledgements

The National Fire Protection Association investigated the apartment house fire in Biloxi, Miss., to document and analyze significant factors that resulted in the death of two fire fighters. Greg Kyte, Life Safety Specialist in the NFPA Engineering Services Division, traveled to Biloxi upon the request of local authorities, to document the facts related to this incident.

This is another of NFPA's studies of incidents having particularly important educational or technical interest. The information presented is based on the best data available immediately after the fire and that obtained during subsequent follow-up. It is not NFPA's intention that this report pass judgment on, or fix liability for, the loss of life that occurred in this incident.

Reports obtained and reviewed for the study included autopsies reports on the victims and a National Institute for Occupational Safety and Health (NIOSH) report, "Examination of SCBA from Biloxi, MS."

The cooperation and assistance of Harold Windom, Steve Moore, James Williams and Robert Burriss, of the Biloxi Department of Public Safety, and John A. Chamblee of the Mississippi State Fire Marshal's Office, are greatly appreciated.

Special thanks to Steven Delahousey of the Harrison County Medical Examiner's Office for his on-site assistance in the data collection phase and for providing additional information during the analysis and reporting phase.

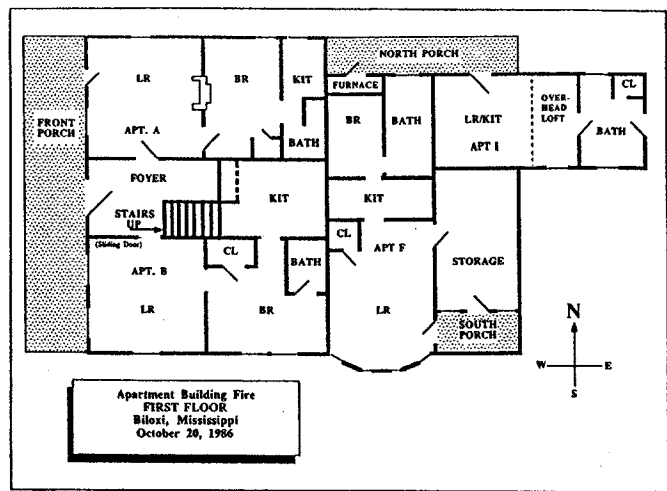


Figure 1

PAT SULLIVAN

At this point in the fire, the top floor of the apartment house is fully involved.

a heating duct adjacent to the stairway in a wall separating the kitchen of apartment B and the main entrance foyer.

At 2:54 a.m., an off-duty Biloxi fire fighter driving by in the area detected an odor of something burning. Then he observed smoke coming from the rear of the house at 506 Reynoir Street. He drove away in search of a public telephone, but he met a police officer who was responding to the reported fire. He followed the officer back to the house, and together they began a search of the apartments. They were soon joined in the search by a second police officer.

Fire fighting

First-in Engine 3 arrived on the scene at 2:55 a.m. and reported no smoke showing. Moments later, Engine 1 and a battalion chief arrived and notified the dispatcher of the presence of smoke.

The building's electrical meter was pulled, de-energizing only a portion of the circuits as indicated by the continued illumination of some lighting. Later, the public utility disconnected the service drop to the building, which also failed to cut off all of the power. Sometime later, the tap conductors running underground from an adjacent building were dis-

covered and disconnected from the meters that fed them.

At 2:56 a.m., a police officer reported to the battalion chief, who was functioning as fire ground commander at that time, that all occupants were out of the building. The battalion chief's size-up determined the presence of fire at the rear, northeast corner of the structure, in the area where the roof intersected the top of the exterior wall. The fire involved roof rafters that extended into the attic.

Engine 3 connected to a hydrant in front of the building with a 4-inch supply hose. Two 1¾-inch hose lines were stretched along the south side of the house and positioned to the outside rear. Initial fire suppression efforts began at position 1 (see Figure 3). Fire was spreading to the attic, and fire fighters set up a ground ladder there to reach an attic vent on the roof peak. From position 1, a fire fighter applied water to the attic area continually, in an attempt to stop the rapidly spreading fire.

Soon after, fire crews set up another ground ladder at position 2, adjacent to the north porch. They removed fascia boards to expose burning roof rafters and then put a second hose line into operation, directing water into the involved area in an effort to stop the advancing fire. With two outside lines operating, the overall effect on slowing the progress of the fire was minimal, according to incident accounts.

To this point, fire had not involved the first floor. The fire burned through the tongue-and-groove pine ceiling in apartment I, directly under the area of fire origin, causing hot embers to fall onto an upholstered chair below. After apparently smoldering for some time, flaming ignition of the chair occurred and quickly spread fire to other room furnishings and to the combustible walls and ceiling. By the time fire fighters became aware of the situation, apartment I was engulfed in flames. Quick action by fire crews stopped further involvement of the first floor. They mounted an interior attack from the north entrance to apartment I, and rapidly extinguished the first floor fire.

A request for additional forces brought Truck 1 and Engine 2 to the scene. At approximately 3:10 a.m., the captain from Engine 1, accompanied by fire fighters A and B (the fatalities), had completed a preliminary search of the building for occupants and had reported to the fire ground commander that no one was inside.

After obtaining an attic ladder, the three fire fighters reentered the building in an effort to find access to the attic. They were wearing full protective clothing and SCBA, but they did not have a hose line in their work area. The smoke was light to moderate and no noticeable heat was present. The second floor smoke layer was from approximately 7 feet above the floor to the ceiling. There was an 18-by-21-inch attic scuttle hole inside the closet between the hall and the front dormer, but the fire fighters could not locate it. All three men left the building and exchanged their SCBA air cylinders, as their two previous trips inside had used up the air supplies.

Fire continued to spread inside the concealed spaces of the attic. After involving the rear portion of the building, fire began moving toward the front and growing in intensity. Fire fighters remained at position 1 (see Figure 3), but the crew at position 2 relocated to position 3 in an effort to stop the spread of fire in the concealed spaces. However, the fire continued to spread despite these efforts.

Upon arrival, Truck 1 was positioned adjacent to Engine 3 in front of the building. A 4-inch line from Engine 3 supplied the 1000-gpm spray nozzle located on Truck 1's platform. Fire fighters hand-stretched 250 feet of 4-inch supply hose through a vacant lot to Engine 1, to provide water for two 1¾-inch exterior handlines that were deployed to the west and north sides of the building. Subsequently, Engine 4 was ordered to respond to the scene to provide extra personnel.

At approximately 3:38 a.m. fire extended from concealed spaces into habitable portions of the second floor. The interi-

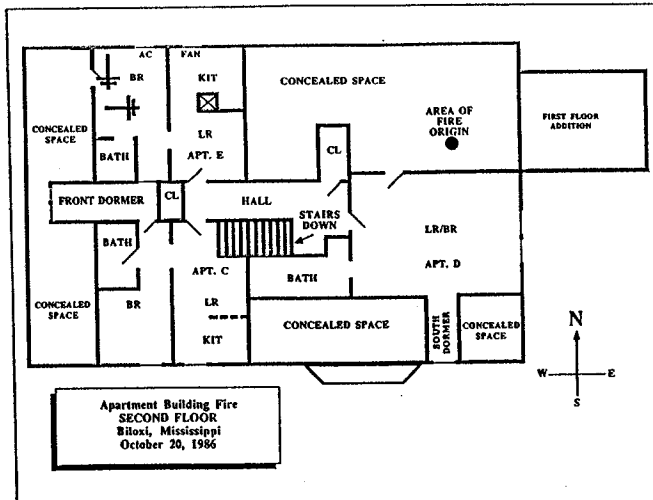


Figure 2

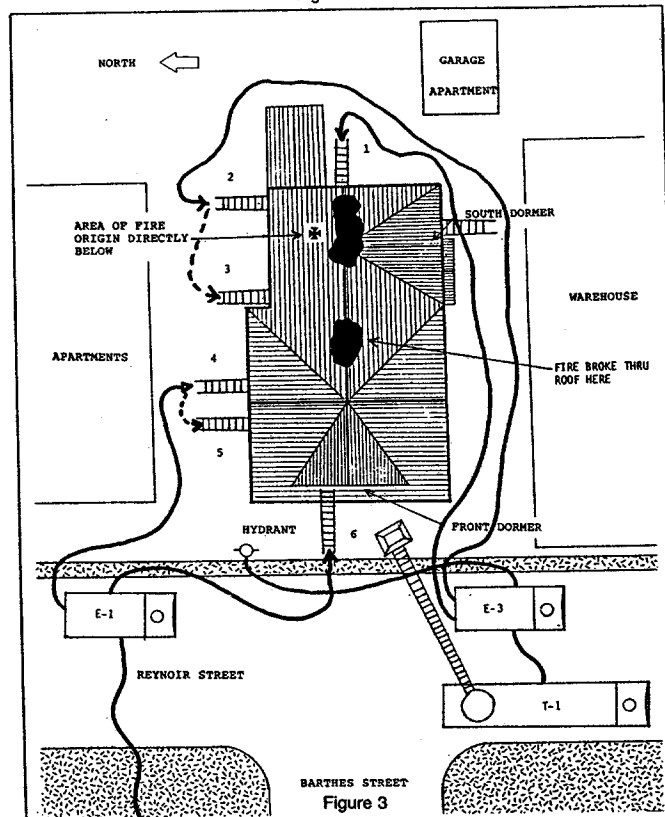


Figure 3

or wall and ceiling finishes, comprised mainly of tongue-and-groove pine boards, became a significant factor in the rapid involvement of the second floor. Room furnishings added to the fire load.

In the rear of the second floor, room furnishings started to burn, followed closely by the combustible interior finish. Tremendous quantities of smoke and toxic gases were being generated, and the high temperatures pre-heated other combustibles to the point of ignition and eventually the area reached flashover. The second floor became untenable and fire and heat rendered the stairway impassable. The fire ground commander decided not to attempt entry to the second floor via the stairway after that point.

Between 3:43 a.m. and 3:53 a.m., fire broke through the roof in the rear of the building. Shortly thereafter, it burned through other portions of the roof.

Proceeding on the assumption that no one was inside, the fire ground commander ordered the operation of Truck 1's master stream. The captain from Engine 1 and a fire fighter began directing water from the aerial platform onto fire vent-

ing through the roof. For safety considerations, fire fighting at position 1 was discontinued while the master stream was in operation. As with the handlines, the master stream was ineffective in extinguishing the fire because water was not being applied to the seat of the fire.

Because of another fire alarm at a high-rise apartment building a short distance away, Engine 2, staffed by two fire fighters, was dispatched directly from the fire scene, at 3:43 a.m. An engine and a truck from their respective stations also were dispatched to the high-rise alarm.

Shortly before 4:00 a.m., apartment E, at the northwest corner of the house, began burning. As Truck 1 continued to apply water from above at a rate of 1000 gpm, fire fighters put a 1¼-inch handline into operation from the ground at position 4. This directed water through the kitchen window of apartment E. Shortly thereafter, crews positioned a ground ladder at that window to allow fire fighters better access for stream penetration.

As suppression efforts continued, fire suddenly erupted from the bedroom window of apartment E (see position 5, Figure 3). Fire crews stopped their attack at position 4 and directed streams through the window from the ground. At about this time, Truck 1 began directing its master stream into the front dormer, which also was beginning to burn.

Engine 2 returned to the scene at 3:53 a.m., from what had been a false alarm at the high-rise apartment complex. At approximately 4:45 a.m., three fire fighters went up the ladder at position 5 and pushed the air conditioner from apartment E's bedroom window into the room.

The fire now had extended into apartment C, and the entire second floor was burning. Large portions of the roof were collapsing, with the worst damage occurring over the stairway and apartment D.

Fire fighters entered apartment E through the bedroom window and succeeded in extinguishing the fire there. Then they directed their efforts toward the fire in the hallway and inside apartment C.

By this time, another crew had placed a ground ladder at position 6, at the front of the building. From that ladder, fire fighters could direct water onto the fire in the front dormer. Eventually, they entered the second floor, fighting fire as they went. Working in a coordinated effort, the two crews eventually pushed the fire toward the rear of the house, where they accomplished final extinguishment.

At approximately 5:05 a.m., when small spot fires were being extinguished and smoke conditions had lightened, crews discovered the bodies of two fire fighters in the bedroom of apartment E. Although a crew had passed through that room during interior fire suppression activities, the bodies had gone unnoticed for almost 20 minutes. This is attributed to smoke and fire conditions, the depth of water on the floor, and debris in the room.

Fire damage

Fire damage was extensive. The second floor was gutted, and most furnishings were consumed or severely damaged. Most of the roof collapsed, except in the front of the building and on the one-story addition in the rear. The floor/ceiling assembly between the first and second floors received severe structural damage adjacent to the stairway and in the area of fire origin. Apartment I sustained moderate damage, caused when burning debris fell from the ceiling and ignited the room furnishings and interior finishes. Although no struc-

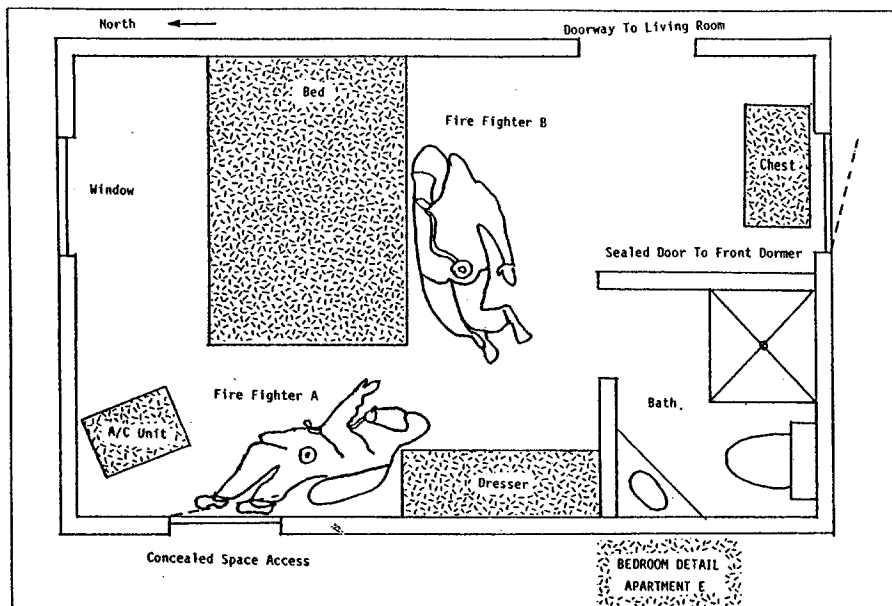


Figure 4



GREG KYTE

The room in which the deceased fire fighters were found.

tural damage occurred on the first floor, there was considerable smoke and water damage. The estimated property loss to the building and contents was \$90,000.

Casualties

The scene was preserved for investigators who were summoned immediately. They examined the premises and made the following observations about the fatalities.

Both deceased fire fighters were equipped with protective coats, protective trousers, and protective hoods. Other equipment included boots, gloves, fiberglass helmets with faceshields, and 30 minute positive pressure SCBA. Neither fire fighter was wearing a helmet or protective hood when discovered.

Fire fighter A was found lying on his side on the floor between the dresser and bed (see Figure 4). The SCBA was being worn and the facepiece was tightly sealed on the face. The breathing tube was not connected to the regulator, but was found near the victim's hand. Burned debris was present on top of the body but not beneath it. His helmet was located approximately four feet away, near the bedroom window.

Fire fighter B was found lying on his back on the floor

against the south end of the bed. The SCBA was being worn and the facepiece was fitted loosely to the face. The breathing tube was connected to the regulator. Burned debris was present beneath the body as well as on top of it. His helmet was found close by, next to the bed.

After the fatalities were transferred to the Medical Examiner's Office, the SCBA of each fire fighter was transferred carefully to a case of the type provided by the SCBA manufacturer. Each case was sealed and subsequently was shipped to the National Institute for Occupational Safety and Health (NIOSH) for examination and testing.

Testing conducted on November 20, 1986, included the remaining service life indicators (low pressure warning) of the fire fighters' SCBA for conformance to Title 30, Code of Federal Regulations, Part 11. The NIOSH report indicated that the low pressure warning of the SCBA worn by fire fighter A did not function during the test and also cited other significant findings on each apparatus examined. Further, the report states NIOSH has no evidence or opinion as to whether any or all of these problems were the result of fire scene exposure. The report did recommend, as a precautionary measure, that all of Biloxi's SCBA be given a thorough examination for proper assembly and performance. (The complete NIOSH report, dated November 21, 1986, is entitled, "Examination of SCBA from Biloxi, MS.")

Medical information

The Harrison County medical examiner conducted post-mortem examinations on both fire fighters. The Gulf Coast Community Hospital, in Biloxi, performed toxicological analyses.

The cause of death for fire fighter A was determined to be carbon monoxide poisoning due to the inhalation of smoke. The autopsy revealed sooty material in the upper and lower respiratory tract.

The cause of death for fire fighter B was determined to be upper respiratory tract burns due to the inhalation of hot air and smoke. Medical authorities believe that the inhalation of super-heated air induced a bronchospasm, immediately resulting in the cessation of breathing.

Cause and origin

Investigators from the Biloxi Department of Public Safety have determined the cause of the fire to be electrical in origin.

The original wiring in the structure, when it was occupied as a single-family dwelling, was "knob and tube" type of wiring. Several years later, when the building was converted into seven apartment units, additional wiring was necessary as bathroom and kitchen facilities were added. It most likely was during this period when nonmetallic-sheathed cable was spliced to the original wiring to expand the electrical system. The splices were made by twisting the nonmetallic sheathed cable wire around the bare knob and tube wiring.

Splices of this type are not uncommon; however, they are required to be soldered, and these splices were not. Poor electrical contact of copper conductors can cause the connection to overheat. While a load is connected, the overheating may cause the twisted conductor to expand. When the load is disconnected, the conductors cool off and contract. The contact at the connection will deteriorate because of this thermal cycling.

Section 110-14(b) of NFPA 70, *The National Electrical Code*®, has specific requirements for splices, such as the following:

Conductors shall be spliced or joined with splicing devices suitable for the use or by brazing, welding or soldering with a fusible metal or alloy. Soldered splices shall first be so spliced or joined as to be mechanically and electrically secure without solder and then soldered. All splices shall be covered with an insulation equivalent to that of the conductor or with an insulating device suitable for the purpose.

Summary Time Line

Time	Time lapsed from discovery of fire	Activity
2:50 a.m.*	:00	Discovery of fire.
2:52 a.m.	:02	Alarm received by fire department.
2:54 a.m.	:04	Police officers and off-duty fire fighter arrive on scene and begin to search building for occupants.
2:55 a.m.	:05	First fire apparatus arrives on scene.
2:56 a.m.	:06	Police officer reports all occupants out of the building.
3:10 a.m.*	:20	Fire department completes preliminary search for occupants.
3:11 a.m.*	:21	Fire crew begins search for access to attic.
3:13 a.m.	:23	Truck 1 and Engine 2 arrive on scene.
3:27 a.m.*	:37	Fire fighters A and B leave the building and have their air cylinders changed.
3:29 a.m.*	:39	Fire ground commander notified that attic access could not be located.
3:38 a.m.*	:48	Stairs to second floor blocked by fire.
3:43 a.m.*	:53	Engine 2 leaves scene to respond to another reported fire.
3:43 a.m. to 3:53 a.m.*	:53 to 1:03	Operation of truck 1 master stream begins.
3:53 a.m.	1:03	Engine 2 returns to fire scene.
4:00 a.m.*	1:10	Fire is observed issuing from apartment E bedroom window.
4:06 a.m.	1:16	Engine 5 arrives on scene.
4:45 a.m.	1:55	Fire fighters enter bedroom window of apartment E with hose line and begin fighting fire.
5:05 a.m.*	2:15	Bodies of fire fighters A and B discovered.

* Indicates approximate time based on available data and the best judgment of the investigator.

Table 1

	Fire fighter A	Fire fighter B
Age	33	30
Company	Engine 3	Engine 1
Experience (yrs.)	5	8½
Type of breathing apparatus	Pressure-demand	Pressure-demand
Conditions of SCBA when found		
Facepiece on	Yes	Yes
Facepiece hose attached to regulator	No	Yes
Air supply remaining	0	0
Blood CO (carbon monoxide) (normal = less than 1.5%)	73.6%	15.0%
Blood ethanol	0	0
Blood CN (cyanide) (normal: < 0.1) (lethal: > 0.5)	0.17mg/L	0.05mg/L

According to investigators, an unsoldered splice was located in a joist space between the first and second floors in an area directly below a concealed combustible wall cavity. While connected to a load, the poor electrical connection apparently heated and ignited combustible materials in the concealed space.

Discussion

Fire began to involve the void space created by 1/2-inch tongue-and-groove boards attached above and below the 2-by-6-inch floor joists, spaced 24 inches on center.

Fire eventually burned through the ceiling of apartment I, directly under the area of fire origin, causing hot embers to fall onto an upholstered chair below. The smoldering chair generated a large quantity of smoke in the room over a period of time. Forced air heating ductwork connected apartment I,

the foyer, and apartment F to the furnace room adjacent to the north porch. Although the furnace was not in use, smoke traveled through the ductwork and into apartment F, where the occupants were awake and could respond quickly to the emergency.

The fire also burned through the wood decking over the floor joists and spread to the concealed combustible wall cavity above. The concealed space, formed by the sloping roof rafters and a kneewall from apartment D, ran for a distance of approximately 35 feet along the north side of the building. Because there was no fire-stopping at the top of the kneewall, fire traveled to the attic and, once inside, involved the entire space.

The fire department was on the scene within three minutes of notification. At arrival, all occupants were safely outside the building.

Problems associated with cutting the electricity off to the building were encountered due to power being supplied from an adjacent building. This condition hampered fire ground operations and was in violation of Section 230-2 of NFPA 70, *The National Electrical Code*[®].

Approximately 15 minutes after fire department arrival, the captain of Engine 1 with fire fighters A and B had completed a preliminary search for occupants and had reported to the fire ground commander that there were no occupants inside.

Of the five crew members initially available to the fire ground commander, two were deployed to the rear of the structure to make an exterior attack, and three were sent inside to search for occupants and to find an attic access. Approximately 40 minutes after fire department arrival, the entire attic space was burning. Fire crews positioned on the north side of the building were ineffective in stopping fire spread. They had to reposition continually to follow the fire as it progressed toward the front of the building.

By approximately 3:38 a.m., 43 minutes after the fire department arrived, fire had extended onto the second floor, blocking the stairs. Apparently, fire fighters A and B were trapped in the front portion of the second floor at that time, with no hose line and with windows as the only avenue of escape. Between 3:43 a.m. and 3:53 a.m., fire broke through the roof and Truck 1 began operating the master stream.

At some point during the fire, fire fighter A apparently disconnected his facepiece hose from the regulator. He died of carbon monoxide poisoning due to smoke inhalation. Because burned debris was found on top of his body but not underneath, it is believed this victim was on the floor prior to room involvement.

Fire fighter B was found on his back in a prone position, close to the other fire fighter. It is possible that fire fighter B was standing up and attempting to help fire fighter A when fire and super-heated gases entered the bedroom. He died of upper respiratory tract burns due to the inhalation of hot air and smoke. The presence of burned debris beneath as well as on top of his body indicates that fire fighter B collapsed to the floor after fire fighter A.

Fire fighters A and B were last seen at approximately 3:27 a.m., when others helped them change their SCBA air cylinders. Nearly an hour and forty minutes later, their bodies were discovered during final fire extinguishment. They were not missed during that time.

One of the two fire fighters who manned Engine 2 when it responded from the scene to the false alarm at the high-rise building was not normally assigned to the engine. Given this situation, keeping track of individual fire fighters admittedly was difficult. Engine 2 and its crew returned to the fire scene at 3:53 a.m., about one hour and twelve minutes prior to discovery of the fatalities.

Summary

Fires that begin inside concealed combustible spaces create special problems for fire fighters. These fires can grow

Total damage to the house was estimated at \$90,000.

and spread rapidly throughout a structure and can be difficult to attack. It is not easy to apply water directly on the fire unless openings are made. The quickest method of getting at a concealed attic fire is to open up the top floor ceilings while a charged hose line is standing by¹.

In his textbook, *Fire Command*, Chief Alan Brunacini of the Phoenix Fire Department has the following to say on the subject:

Command and interior sectors cannot be timid during the size-up of a concealed space fire. Initial hesitation to open up will usually force everyone to chase the fire. Access, as a form of support, requires good size-up to be at the right spot, quick decisions to be on time, hard work to get inside, and good coordination to balance access with attack. The fire ground commander must:

Forecast fire travel; get fire fighters ahead of the fire; open the structure; cut off the fire; and complete extinguishment.

The key lesson in this fire fighter fatality incident is the need for continuous command and control of fire fighters and for attention to safety on the fire ground.

The essence of fire ground control by the fire ground commander involves the on-going ability to know where fire fighters are located and to direct what they are doing. In a very practical sense, if the fire ground commander initially can place his fire fighters, move them, and change what they are doing, he has the most important level of control².

To accomplish that level of control, sector officers often are assigned to manage specific areas or functions. In this incident, fire fighters did not remain with their officers, but were assembled from different companies, making accountability most difficult. The false alarm further worsened the situation.

A major responsibility of any fire department is to provide for fire fighter safety. Nowhere is compliance with safety practices more important than at the fire ground. This is where many fire fighter fatalities occur. Establishing clearly defined standard operating procedures (SOPs) ensures uniformity, streamlines operations, reduces confusion and promotes accountability and safety³.

When crews or individuals are operating outside of the structured "game plan," they have a negative impact on control efforts and also on their personal safety and welfare. Accountability is necessary to promote teamwork and to ensure safe, efficient operations. It requires the cooperation of everyone on the fire ground, including fire fighters and fire officers.⁴

Footnotes

1. Anthony R. Granito, *Company Leadership and Operations* (Boston: National Fire Protection Association, 1975), p. 230.
2. Alan V. Brunacini, *Fire Command* (Boston: National Fire Protection Association, 1985), p. 67.
3. Theodore L. Jarboe, "S.O.A.P. For a Clean Operation," *Fire Command*, July 1984, p. 22.
4. Theodore L. Jarboe, "Accountability—Engine 54 Where Are You?" *Fire Command*, December 1985, p. 43.