FIRE FIGHTER FATALITY
Detroit, MI
March 12, 1987

Includes:
Triple Tragedy in Detroit
By Thomas J. Klem
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FIRE INVESTIGATIONS
NATIONAL FIRE PROTECTION ASSOCIATION

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Summary Investigative Report

3 Detroit Fire Fighter Fatalities

Detroit, Michigan

March 12, 1987

Prepared By

Thomas J. Klem

Director

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ABSTRACT

Three fire fighters lost their lives and ten others were injured battling a major group fire that involved two separate warehouse buildings in Detroit, Michigan, on March 12, 1987. The deliberately set fire originated in an abandoned three story building and eventually spread to an adjoining occupied paper and supply company. Although the building had been abandoned, an extremely heavy fuel load remained and fueled the severe fire. One fire fighter was killed in the building of fire origin, when flashover conditions forced the initial fire attack crew from the third floor. Other members of this crew were injured as they attempted to escape the intensity of the advancing flame front. After the fire spread to the adjacent structure, two more fire fighters died when a fire wall collapsed while they were attempting to limit fire extension.

This is an unusual fire fighter fatality in that the three fire fighters died at the same major fire but in two separate incidents.

Arson investigators from the Detroit Fire Marshal's Division determined that the fire was deliberately set by a vagrant who ignited large bales of cloth-type material stored in the building. Smoke was not visible to fire fighters upon their arrival. During their initial interior size-up, the fire severity became obvious and the fire fighters began to take evasive actions; however, flashover conditions were reached before they could get out of the building. The rapid advance of the fire forced several fire fighters to exterior windows where they awaited rescue. Fire conditions were so severe that one fire fighter had to abandon his position. He was killed in a fall from the third floor.

As the fire spread to the adjoining occupied structure, fire fighters attempted to limit the amount of fire extension. Approximately 3 hours after
the initial alarm, a fire wall collapsed near a position two fire fighters had taken in the extinguishment attempt. The force of the wall collapse caused the floors below to cave in, burying the fire fighters in tons of debris. Other fire fighters, working with their hands only, risked their lives attempting to rescue the fallen fire fighters.

Acknowledgments

The National Fire Protection Association conducted an investigation of the Detroit fire fighter fatalities as part of its mission-oriented fire investigations program. The investigation was conducted with the cooperation of the Detroit Fire Department. In addition to NFPA Fire Data Specialist Arthur Washburn for his on-site assistance, the NFPA would like to thank Fire Commissioner Melvin Jefferson, Deputy Fire Commissioner Philip F. Gorak and Fire Marshal Donald Robinson for their cooperation. Further, the cooperation of the fire fighters involved in this tragic incident is acknowledged and appreciated.

BACKGROUND

Over the past 25 years, Detroit, like many other major cities, has experienced a substantial population decline. The current estimated population of the 139-square-mile city is 1.2 million, nearly half its one time peak. This has resulted in numerous abandoned commercial and residential properties throughout the city. The city began an aggressive program to remove the buildings that constitute a hazard, and since 1986 an estimated 3000 buildings have been demolished.

The building of fire origin once had housed the Motor City Wiping Cloth Company, but had been abandoned by its owners for years. Reportedly, the city had reclaimed the property in an attempt to collect back taxes and was
involved in a legal process to have the building demolished. The city's legal actions were prompted in part by citizen complaints and because of the occurrence of several "minor" fires in the building.

Access to the building could be gained easily, and the remaining clothing and cloth materials made the building appealing to the vagrants who frequented it. Apparently in an attempt to keep warm, they had set several small fires that required fire department response. Recognizing the potential danger, the first due fire companies updated their pre-fire plan for the building. During one of these inspections, a fire officer inside the poorly illuminated building was startled by an equally startled vagrant warming himself by a small fire.

Weather conditions at the time of the fire were temperature, 40°F with winds out of the NNW at a velocity of 10 mph. The temperature dropped steadily throughout the afternoon; wind direction and velocity were relatively stable.

The Detroit Fire Department has 1265 fire fighters and officers. The fire fighting division is organized into nine battalions having 42 engines, 28 truck companies and 6 squads.

THE BUILDINGS

The Motor City Wiping Cloth Company

At one time, the Motor City Wiping Cloth Company had occupied several interconnected buildings covering about one-half of the roughly 425-by-675-foot city block area defined by Hancock and Lawton Avenues, Jefferies Freeway and the railroad tracks to the south (see diagram 1). Along Jefferies Freeway, a narrow perpendicular access road separated this occupancy from the adjacent occupied warehouse to the south. This 25-foot common separation distance
between buildings extended east for nearly 100 feet, at which point it opened into an unpaved area used as an employee automobile parking area. The separation between the buildings at this location was approximately 170 feet. Employees of the Continental Paper Company and the company's distribution trucks used the access road. An abandoned railroad spur formerly used to ship and receive goods ran along the south side of the Motor City Wiping Cloth Company.

It appears that the interconnected structure may once have been two separate buildings. Building 1, at the northernmost portion of the complex, was of a different construction type than Building 2 and had an independent water supply line for automatic sprinklers. In the approximately 20-foot space that once would have separated the buildings, several elevators, stairways and two access bridges joined all levels of structure and allowed for a flow of goods between the buildings. To provide for fire segregation, fire doors were installed at openings between the buildings; however, it was reported that some fire doors were not in place at the time of the fire. During pre-fire planning, the fire fighters were able to move freely, without obstruction, between the buildings. Post-fire observations of the intact Building 1 also revealed a lack of adequate horizontal and vertical fire barriers.

Building 1

Built in 1915, Building 1 was a four-story, fire-resistive structure with poured concrete floors and support columns, and a ceiling height on each floor of 12 feet. The building had numerous exterior openings on all sides and on each floor level, and window openings comprised over 80 percent of the outside
walls. There were signs of external and internal deterioration, portions of the structural concrete were crumbling, and reinforcing bars were exposed.

The contents of the 120-by-230 foot structure consisted of clothing and cloth materials in various states of arrangement and large, 4-by-8-foot wooden bins, distributed throughout the building. It appears that the operation process once consisted of receiving the cloth materials from collection points, where they would be transferred to the large wooden bins. The materials then would be baled and stored within the complex until shipped to customers. Reportedly, four men were necessary for relocating or moving the bales. Baled material ready for shipment could be relocated by using the two large service elevators; bales could be transferred on service equipment installed between Building 1 and 2. The baled storage usually was stacked within 18 inches of the ceiling. Examination of this structure after the fire revealed that substantial amounts of the baled materials remained on all floor levels. Some bales had been split open and the cloth material was spread over the floor. The heat release rate would differ substantially between stacked bales and those that had been split open. Further, because of the arrangement of the wooden materials that comprised the bins, they also would have a high heat release rate.

Fire protection for the building at one time had consisted of two 6-inch dry pipe automatic sprinkler systems. Because the building had been abandoned, the automatic sprinkler system was not in service. As noted, openings between buildings were protected with fire doors. However, some doors were missing and there were unprotected floor to floor service elevator shaft openings.
Building 2

Determined to be the building of fire origin, the L-shaped, three-story structure with basement partially abutted Building 1 along its south side (see diagram 1) for a distance of approximately 220 feet. The front entrance was off Jefferies Freeway, and this side of the building was approximately 225 feet long and nearly 85 feet deep. A 12-inch fire wall was provided on all floor levels approximately 30 feet from the front exterior wall. Openings in the wall at one time had been provided with fire doors. In this front portion of the building, stored materials were not as heavy as those materials located beyond the fire wall.

The most common type of construction in this building was ordinary, although portions may have been qualified as mill or heavy timber construction. There was some evidence of unprotected noncombustible construction as well. The building had tongue and groove wood flooring over wood sub-flooring. Masonry fire walls, including the one previously mentioned, divided the building into four separate fire areas. Openings were once protected with fire doors. Numerous window openings were provided on all levels and sides of the building, but many windows, especially on the south side, were broken or had been boarded up. This building, too, was used to store baled clothing and cloth materials. It also was provided with a dry pipe automatic sprinkler system, supplied by an 8-inch lead-in and an in yard, 50,000 gallon gravity storage tank. The system was inoperable at the time of the fire.

Continental Paper and Supply Company

The Continental building complex was an occupied warehouse. The company supplied paper and some janitorial supplies throughout the metropolitan area.
The northernmost portion of the building was separated from the abandoned warehouse by the 25-foot wide access road. Because of the diagonal direction of the adjacent railroad line to the property, the 132,337 square foot structure was "pie" shaped. It consisted of 21 buildings of various size and shapes, which it appears, could have been built at separate times. The construction types varied, ranging from unprotected noncombustible to heavy timber or mill construction. Fire walls segregated adjoining buildings from one another. It was impossible to determine the operating condition or the presence of fire doors due to the total destruction of the property.

All of the buildings were one- or two-story structures, except the three northernmost buildings nearest to the abandoned warehouse, which were three-story. Most of the buildings had exterior masonry bearing walls. Those located along Jefferies Freeway had the entire front portion (including window openings) covered with metal siding. Numerous window openings were present along the entire 310-foot northern section of the building and one-third of the roof over this section had been raised 7 feet to allow natural illumination on the third floor.

The building was fully protected by several dry pipe automatic sprinkler systems supplied from a single 6-inch lead-in from Jefferies Freeway. A total of 8 systems, ranging in size from 4 inches to 6 inches with dry-pipe valves were distributed throughout the complex. It could not be determined if the system operated at the time of the fire.

Fire incident

At 3:05 p.m., the Detroit Fire Department Alarm Headquarters received an alarm indicating that smoke was issuing from the abandoned warehouse on Jefferies Freeway. Apparently an employee of the Continental Paper Company
observed the smoke from the employee parking lot and reported the fire. Smoke was not reported to be heavy at the time of discovery. However, due to the number of boarded up windows, a severe fire could have been developing within the building.

The alarm center sounded Box 382 and dispatched Engines 10, 34, and 5, Ladder 9, Squad 4 and Battalion Chief 5. An officer and three fire fighters manned each piece of equipment. Engine 10, Squad 4 and Ladder 9 arrived on the scene at approximately 3:10 p.m. Under standard attack procedures, an attack crew of six fire fighters in full protective gear was formed from the first arriving apparatus (two officers and four fire fighters). This crew entered the building along Jefferies Freeway and went up to the third floor, where a "wisp" of smoke was seen. A masonry fire wall separated the front third of this side of the building from the remainder of the building and, since this front portion was relatively clear of large quantities of baled materials, the crew moved freely along this area to the southwest portion where a large opening existed in the fire wall.

An officer noticed three separate fires burning beyond the fire wall. He described two small fires near the fire wall and a third at some distance that involved 7 to 8 bales of material. The officer ordered a 1 1/2-inch attack line brought to the third floor. During the few moments that the attack line was being advanced and positioned, conditions within the building quickly deteriorated. The officer immediately recognized the danger and ordered everyone out of the building. The attack crew began to move quickly toward the stairway they had used to gain access to the third floor. Before they could locate the stairway, however, fire erupted through the opening in the fire wall, and products of combustion extended over their heads, outracing
them to the stairway. In the front portion of the building, visibility and tenability were lost rapidly, requiring the crew to scramble for their lives.

Other fire fighters outside on Jefferies Freeway saw the fire travel from window to window in seconds. Two members of the trapped crew eventually were able to locate the stairway and to escape from the building without injury. The other four members of the crew were positioned at various window locations awaiting rescue. While a ground ladder was being raised to one crew members position, severe heat forced the officer from E-10, located a few window positions away, to release his grip, and he began to fall. During the fall, he apparently hit a projection from the building and landed on the ground head-first. The first crew member was rescued utilizing the ground ladder.

The two remaining crew members were in window openings at the northwest portion of the building. An alert pump operator from Engine-10 directed the wagon pipe into a window opening where one fire fighter had taken refuge. This kept flames away from this crew member until the fire fighters outside could raise a ground ladder to his position. While this rescue was in progress, the severe fire forced the remaining fire fighter to jump from the building, his fall was broken by a large telephone cable, and he survived.

The first crew member, one of the officers, who was forced to abandon his position was transported to the hospital in an arson division squad car. The officer was pronounced dead at the hospital as a result of severe head and back injuries sustained in the fall. The remaining three crew members sustained burns, fractures and other injuries but survived the rapid progression of the fire.

Within 30 minutes of the initial attack, the fire progressed to five alarms, ultimately bringing 125 fire fighters and 24 pieces of equipment to the scene. The fire in the Motor City Wiping Cloth Company became so severe
that first responding apparatus had to be relocated because of the radiant heat. At this time, all fire fighting efforts at the building of origin reverted to heavy stream appliances. Because of the severe conditions within minutes of flashover, the fire spread from the building of origin to that portion of the Continental Paper Company that was within 25 feet. Ignition of this building was first detected along its roof line. Fire fighters positioned heavy appliances in an attempt to prevent the fire from extending into the paper and supply warehouse. A ladder pipe assembly was positioned in front of the Continental building near the access road. Massive quantities of water effectively reduced the fire spread in this portion of the building; however, flying brands, strong winds, and severe radiation ignited other portions of the building, especially the northernmost portion where access was limited for large volume water application. As fire began to spread into the paper company, fire fighters positioned handlines around the entire perimeter of the warehouse. During the early stage of fire spread to this structure fire fighters took positions along the roof in an attempt to prevent extension. As the fire progressed, other fire fighters were committed to similar actions. These attempts continued for nearly three hours after the initial fire alarm.

At approximately 6:00 p.m. an officer and two fire fighters were working a handline in the three-story, northernmost portion of the warehouse. They had taken the handline into the building and were positioning themselves close to a fire wall that subdivided this portion of the building. Apparently they were attempting to apply water beyond the fire wall onto the burning structure on the other side. One fire fighter left the position to advance additional hose. At that moment, the fire wall collapsed on the officer and the remaining fire fighters and resulted in the collapse of the floors below. In
the collapse, the two fire fighters fell to the first floor and were buried under tons of rubble. The third fire fighter was not injured.

In an attempt to prevent fire from engulfing the two buried men and the fire personnel who had been summoned to the area, hose lines were applied to the area of the rubble. Fire fighters dug through the rubble by hand for approximately 1 1/2 hours before they could extricate the two fire fighters (officer and fire fighter). They were transported to the hospital, where they were pronounced dead from injuries sustained in the collapse.

Eventually the fire consumed the entire block, with the exception of Building 1, which sustained only minor fire damage at locations immediately exposed to the severe radiation from Building 2.

Tragically, three were killed and ten others were injured battling this large group fire.
The decision of the initial attack fire fighters to enter the abandoned building was sound. Their initial size-up from the exterior of the building could not, and did not, reveal the magnitude of fire burning within the structure. Smoke did not penetrate the fire wall near the front of the building until the interior size-up was begun. During the interior size-up the fire fighters realized the severity of the fire and began to take evasive action. Within minutes, the fire overran them.

Fire fighters are trained not to subject themselves to undue danger to extinguish fires in abandoned buildings. However, this building was known to have vagrants living in it and their presence may have been a consideration by the fire fighters in their initial determination. Further, their initial determinations were influenced by the conditions they observed upon arrival. The lack of any exterior fire signs warranted an interior size-up and rescue tactic. Many exterior windows had been boarded up, especially on the south side of the building, which prevented fire fighters from seeing the actual magnitude of the fire beyond the fire wall. As noted previously, smoke did not at first penetrate the fire wall. The fire fighter who lost his life and those who subsequently were injured in Building 1 were victims of unfortunate set of circumstances that could have been prevented only by actions beyond their immediate control.

The two fire fighters that were killed by the collapse in Building 2 had taken positions that made them vulnerable to injury, considering the length of time the fire had been burning within the Continental Paper Company. Perhaps because of the manner in which the fire was extending or because of the apparent independence of each of the separate buildings, the fire fighters felt they could safely fight the fire from one structure to another. They may
have felt that the fire wall would protect them. The severity of the fire, however, apparently had weakened the structure in their immediate area, resulting in the collapse.

NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures, provides guidance for the protection of property from external building fires. In using the standard, a series of variables are assessed and the results are used to determine separation distance between buildings. Among the variables considered are height and width of the exposing fire, percentage of openings in the exposing wall area, and severity of the exposing fire. The application of several types of fire protection equipment, such as total automatic sprinkler protection or blank walls of noncombustible materials, allows a reduction in the recommended separation distance requirements determined from the first computation. Where an exposing building (i.e., Motor City Wiping Cloth Company) is protected throughout by an approved properly maintained automatic sprinkler system, no exposure hazard is considered to exist. Therefore, when both businesses were in full operation and their sprinkler systems maintained, the buildings met the recommendations of the standard in spite of the close proximity of the buildings.

However, when the Motor City Wiping Cloth Company was abandoned, so was its automatic sprinkler protection. As a result, the credit given for the automatic sprinklers in the elimination of an exposure hazard is no longer applicable. Building separation/protection requirements would therefore be based on the initial variables. Therefore, the Motor City Wiping Cloth Company building presented a severe exposure hazard to the Continental building. It is not surprising that the fire was able to spread easily to the exposed building. A major group fire was a predictable occurrence.
Analysis of the performance of the Continental Building's automatic sprinkler system was beyond the scope of the NFPA investigation. Property destruction was extensive, and it could not be determined if the system operated during the fire. Even if it did, it might not have been able to contain the severe fire exposure for several reasons including the following:

**Magnitude of the exposure fire.** The intense severe fire in the abandoned warehouse almost immediately exposed the Continental warehouse. Further, the fire extended into the warehouse roof structure. Fire fighters could not immediately take positions around its entire perimeter to prevent extension in all of the exposed areas. As a result, it is likely that numerous sprinkler heads on several of the systems and at various levels were activated.

**Lack of sufficient water supply and pressure.** Numerous fire department heavy stream appliances were supplied from the same 8-inch domestic water supply that fed the 6-inch main to the automatic sprinklers. Fire fighters used large amounts of water to stop fire extension. The fire department did not supplement the sprinkler system during the fire, and the system likely was deficient in water supply and pressure. Finally, free-burning portions of the warehouse probably contributed to severed piping that could not have been easily isolated from the remainder of the system.

**Condition and maintenance of systems.** The condition of the system at the time of the fire was unknown. The dry pipe automatic sprinkler system within the Continental Building had a pipe schedule design. The type and age of the system would have warranted yearly maintenance. The maintenance and testing records were not examined, nor was the position of valves or the condition of piping.

Based on NFPA's investigation of this fire the following are considered significant factors resulting in fire fighter fatalities in this incident:
1. Failure to secure an abandoned building from entry by vagrants, arsonists or both.

2. The nature of the ignition scenario.

3. The significant fuel load provided by the baled cloth materials.

4. Lack of external indications of a working fire in the abandoned warehouse thus warranting an interior investigation.

5. The extreme exposure hazard presented by the Motor City Wiping Cloth Company.

6. The danger presented to fire fighters committed to an interior fire attack in a building complex subjected to severe fire exposure and damage for a considerable length of time.
three fire fighters lost their lives and ten others were injured battling a major group fire that involved two separate warehouse buildings in Detroit, Mich., on March 12, 1987. The deliberately set fire originated in an abandoned three-story building and eventually spread to an adjoining occupied paper and supply company. Although the first building had been abandoned, an extremely heavy fuel load remained and fueled the severe fire. One fire fighter was killed in the building of fire origin, when flashover conditions forced the initial fire attack crew from the third floor. Other members of this crew were injured as they attempted to escape the intensity of the advancing flame front. After the fire spread to the adjacent structure, two more fire fighters died when a fire wall collapsed while they were attempting to limit fire extension.

This is an unusual fire fighter fatality in that the three fire fighters died at the same major fire but in two separate incidents.

Arson investigators from the Detroit Fire Marshal’s Division determined that the fire was deliberately set by a vagrant who ignited large bales of cloth-type material stored in the building. Smoke was not visible to fire fighters upon their arrival. During their initial interior size-up, the fire severity became obvious and the fire fighters began to take evasive actions; however, flashover conditions were reached before they could get out of the building. The rapid advance of the fire forced several fire fighters to exterior windows where they awaited rescue. Fire conditions were so severe that one fire fighter had to abandon his position. He was killed in a fall from the third floor.

As the fire spread to the adjoining occupied structure, fire fighters attempted to limit the amount of fire extension. Ap-
TRIPLE TRAGEDY IN DETROIT

Three members of the Detroit Fire Department—two officers and a fire fighter—died last March in a fire that was deliberately set in an abandoned warehouse. Ten more fire fighters were injured while battling the fire, which extended to an adjacent warehouse and became a major group fire.

THOMAS J. KLEM
Director
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Approximately three hours after the initial alarm, a fire wall collapsed near a position that two fire fighters had taken in the extinguishment attempt. The force of the wall collapse caused the floors below to cave in, burying the fire fighters in tons of debris. Other fire fighters, working only with their hands, risked their lives attempting to rescue the fallen fire fighters.

Fire incident

At 3:05 p.m., the Detroit Fire Department's Alarm Headquarters received a report that smoke was issuing from an abandoned warehouse on Jeffries Freeway. Apparently an employee of the Continental Paper Company spotted the smoke from the employee parking lot and reported the fire. Smoke was not reported to be heavy at the time of discovery. However, due to the number of boarded-up windows, a severe fire could have been developing within the building.

The alarm center sounded Box 382 and dispatched Engines 10, 34 and 5, Ladder 9, Squad 4 and Battalion Chief 5. An officer and three fire fighters manned each piece of equipment. Engine 10, Squad 4 and Ladder 9 arrived on the scene at approximately 3:10 p.m. Under standard attack procedures, an attack crew of six fire fighters (two officers and four fire fighters) in full protective gear was formed from the first arriving apparatus. This crew entered the building along Jeffries Freeway and went up to the third floor, where a "wisp" of smoke was seen. A masonry fire wall separated the front third of this side of the building from the remainder of the building. This front portion was relatively clear of large quantities of baled materials, so the crew moved freely along this area to the southwest portion, where a large opening existed in the fire wall.
An officer noticed three separate fires burning beyond the fire wall. He described two small fires near the fire wall and a third at some distance that involved seven to eight bales of material. The officer ordered a 1½-inch attack line brought to the third floor. During the few moments that the attack line was being advanced and positioned, conditions within the building quickly deteriorated. The officer immediately recognized the danger and ordered everyone out of the building. The attack crew began to move quickly toward the stairway they had used to gain access to the third floor. Before they could locate the stairway, however, fire erupted through the opening in the fire wall, and products of combustion extended over their heads, outracing them to the stairway. In the front portion of the building, visibility and tenability were lost rapidly, requiring the crew members to scramble for their lives.

Other fire fighters outside on Jeffries Freeway saw the fire travel from window to window in seconds. Two of the trapped crew eventually were able to locate the stairway and to escape from the building without injury. The other four members were positioned at various window locations awaiting rescue. While a ground ladder was being raised to one crew member’s position, severe heat forced another fire fighter to release his grip, and he began to fall. During the fall, he apparently hit a projection from the building and landed on the ground head-first. The first fire fighter came down the ground ladder to safety.

The two remaining crew members were in window openings at the northwest portion of the building. An alert pump operator from Engine 10 directed the wagon pipe into a window opening where one fire fighter had taken refuge. This kept flames away from this crew member until the fire fighters outside could raise a ground ladder to his position. While this rescue was in progress, the severe fire forced the remaining fire fighter to jump from the building. His fall was broken by a large telephone cable, and he survived.

The first crew member who was forced to abandon his position at the window was an officer. He was transported to the hospital in an arson division squad car. At the hospital, the officer was pronounced dead as a result of severe head and back injuries sustained in the fall. The remaining three crew members sustained burns, fractures and other injuries but survived the rapid progression of the fire.

Within 30 minutes of the initial attack, the fire progressed to five alarms, ultimately bringing 125 fire fighters and 24 pieces of equipment to the scene. The fire in the Motor City Wiping Cloth Company became so severe that first responding apparatus had to be relocated away from the radiant heat.

### Background

Over the past 25 years, Detroit, like many other major cities, has experienced a substantial population decline. The current estimated population of the 139-square-mile city is 1.2 million, nearly half its one time peak. This has resulted in numerous abandoned commercial and residential properties throughout the city. The city began an aggressive program to remove the buildings that constitute a hazard, and since 1986 an estimated 3000 buildings have been demolished.

The building of fire origin once housed the Motor City Wiping Cloth Company, but had been abandoned by its owners for years. Reportedly, the city had reclaimed the property in an attempt to collect back taxes and was involved in a legal process to have the building demolished. Citizens had lodged complaints about the building, and several "minor" fires had occurred in the building.

Access to the building could be gained easily, and the remaining clothing and cloth materials made the building appealing to the vagrants who frequented it. Apparently in an attempt to keep warm, they had set several small fires that required fire department response. Recognizing the potential danger, the first due fire companies updated their prefire plan for the building. During one of these inspections, a fire officer inside the poorly illuminated building was startled by an equally startled vagrant warming himself by a small fire.

At the time of the fire the temperature was 40°F, with winds out of the north/northwest at a velocity of 10 mph. The temperature dropped steadily throughout the afternoon; wind direction and velocity were relatively stable.

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### The buildings

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An abandoned railroad spur formerly used to ship and receive goods ran along the south side of the Motor City Wiping Cloth Company. It appears that the interconnected structure may once have been two separate buildings. Building 1, at the northermost portion of the complex, was of a different construction type than Building 2 and had an independent water supply line for automatic sprinklers. In the approximately 20-foot space that once would have separated the buildings, several elevators, stairways and two access bridges joined all levels of the structures and allowed for a flow of goods between the buildings. To provide for fire segregation, fire doors were installed at openings between the buildings; however, it was reported that some were not in place at the time of the fire. During
Building 1
Built in 1915, Building 1 was a four-story, fire-resistive structure with poured concrete floors and support columns, and a ceiling height on each floor of 12 feet. The building had numerous exterior openings on all sides and on each floor level, and window openings comprised more than 80 percent of the outside walls. There were signs of external and internal deterioration, portions of the structural concrete were crumbling, and reinforcing bars were exposed.

The contents of the 120-by-230-foot structure consisted of clothing and cloth materials in various states of arrangement and large, 4-by-9-foot wooden bins distributed throughout the building. It appears that the operation process once consisted of receiving the cloth materials from collection points, where they would be transferred to the large wooden bins. The materials then would be baled and stored within the complex until shipped to customers. Reportedly, four men were necessary for relocating or moving the bales. Baled material ready for shipment could be relocated by using the two large service elevators. Bales could be transferred on service equipment installed between Buildings 1 and 2. The baled storage usually was stacked up to within 18 inches of the ceiling. Examination of the structure after the fire revealed that substantial amounts of the baled materials remained on all floor levels. Some bales had been split open, and the cloth material was spread over the floor. The heat release rate would differ substantially between stacked bales and those that had been split open. Further, because of the arrangement of the wooden materials that comprised the bins, they would have a high heat release rate.

Fire protection for the building at one time had consisted of two 6-inch dry pipe automatic sprinkler systems. Because the building had been abandoned, the automatic sprinkler system was not in service. As noted, openings between buildings were protected with fire doors. However, some doors were missing, and there were unprotected floor to floor service elevator shaft openings.

Building 2
Determined to be the building of fire origin, Building 2 was an L-shaped, three-story structure with a basement that partially abutted Building 1 along its south side for a distance of approximately 220 feet (see diagram). The front entrance was off Jeffries Freeway, and this side of the building was approximately 225 feet long and nearly 85 feet wide. A 12-inch fire wall was provided on all floor levels approximately 30 feet from the front exterior wall. Openings in the wall at one time had been provided with fire doors. In this front portion of the building, stored materials were not as plentiful as beyond the fire wall.

The most common type of construction in this building was ordinary, although portions may have been qualified as mill or heavy timber construction. There was some evidence of unprotected noncombustible construction as well. The building had tongue-and-groove wood flooring over wood subflooring. Masonry fire walls, including the one previously mentioned, divided the building into four separate fire areas. Numerous window openings were provided on all levels and sides of the building, but many windows, especially on the south side, were broken or had been boarded up. This building, too, was used to store baled clothing and cloth materials. It also was provided with a dry pipe automatic sprinkler system, supplied by an 8-inch lead-in and an in-yard, 50,000-gallon, gravity storage tank. The system was inoperable at the time of the fire.

Continental Paper and Supply Company
The Continental Building complex was an occupied warehouse. The company supplied paper and some janitorial supplies throughout the metropolitan area. The northernmost portion of the building was separated from the abandoned warehouse by the 25-foot-wide access road. Because of the diagonal direction of the adjacent railroad line to the property, the 132,337-square-foot structure was pie-shaped. It consisted of 21 buildings of various sizes and shapes, which, it appears, could have been built at separate times. The construction types varied, ranging from unprotected noncombustible to heavy timber or mill construction. Fire walls segregated adjoining buildings from one another. It was impossible to determine the operating condition or the presence of fire doors due to the total destruction of the property.

All except three of the buildings were one- or two-story structures. The three northernmost buildings nearest to the abandoned warehouse were three-story. Most of the buildings had masonry exterior bearing walls. Those located along Jeffries Freeway had the entire front portion including window openings covered with metal siding. Numerous window openings were present along the entire 310-foot-long northern section of the building, and one-third of the roof over this section had been raised 7 feet to allow natural illumination on the third floor.

The building was fully protected by several dry pipe automatic sprinkler systems supplied from a single 6-inch lead-in from a main at Jeffries Freeway. A total of eight systems, ranging in size from 4 inches to 6 inches, with dry-pipe valves were distributed throughout the complex. It could not be determined if the system operated during the fire.
Fire fighters are trained not to subject themselves to undue danger to extinguish fires in abandoned buildings. However, it was known that vagrants lived in this building... where they were pronounced dead from injuries sustained in the collapse.

Eventually, the fire consumed the entire block, with the exception of Building 1, which sustained only minor fire damage at locations immediately exposed to the severe radiation from Building 2.

Tragically, three fire fighters were killed and ten others were injured battling this large group fire.

Analysis
The decision of the six fire fighters to enter the abandoned building was sound. Their initial size-up from the exterior of the building could not, and did not, reveal the magnitude of fire burning within the structure. Smoke did not penetrate the fire wall near the front of the building until the interior size-up was begun. During the interior size-up, the fire fighters realized the severity of the fire and began to take evasive action. Within minutes, the fire overran them.

Fire fighters are trained not to subject themselves to undue danger to extinguish fires in abandoned buildings. However, this building was known to have vagrants living in it, and their possible presence may have been a consideration in the fire fighters’ determination. Further, the fire fighters’ initial actions were influenced by the conditions they observed upon arrival. The lack of any exterior fire signs warranted an interior size-up and rescue tactic. Many exterior windows had been boarded up, especially on the south side of the building, which prevented fire fighters from seeing the actual magnitude of the fire beyond the fire wall. As noted previously, smoke did not at first penetrate the fire wall. The fire fighter who lost his life and those who subsequently were injured in the abandoned building were victims of an unfortunate set of circumstances that could have been prevented only by actions beyond their immediate control.

The two fire fighters who were killed during the collapse in the Continental Building had taken positions that made them vulnerable to injury, considering the length of time the fire had been burning within the Continental Paper Company. Perhaps because of the manner in which the fire was extending, or maybe because of the apparent independence of each of the separate buildings, the fire fighters felt they could safely fight the fire from one structure to another. They may have felt that the fire wall would protect them. The severity of the fire, however, apparently had weakened the structure in their immediate area, resulting in the collapse.

NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures, provides guidance for the protection of property from external building fires. In using the standard, a series of variables are assessed and are used to determine separation distances between buildings. Among the variables considered are height and width of the exposing fire, percentage of openings in the exposing wall area, and severity of the exposing fire. The application of several types of fire protection equipment, such as total automatic sprinkler protection or blank walls of noncombustible materials, allows a reduction in the recommended separation distance requirements determined from the first computation. Where an exposing building (i.e., Motor City Wiping Cloth Company) is protected throughout by an approved, properly maintained automatic sprinkler system, no exposure hazard is considered to exist. Therefore, when both businesses were in full operation and their sprinkler systems were maintained, the buildings met the recommendations of the standard in spite of their proximity.
Late in the operation, fire fighters work in a scrap fire area at the corner of Building 2. The fire eventually consumed the entire block, with the exception of Building 1, a portion of which shows in the left side of this photo.

However, when the Motor City Wiping Cloth Company was abandoned, so was its automatic sprinkler protection. As a result, the credit given for automatic sprinklers in the elimination of an exposure hazard is no longer applicable. Therefore, the Motor City Wiping Cloth Company building presented a severe exposure hazard to the Continental Building. It is not surprising that the fire was able to spread easily to the exposed building. A major group fire was a predictable occurrence.

An analysis of the performance of the Continental Building’s automatic sprinkler system was beyond the scope of the NFPA investigation. Property destruction was extensive, and it could not be determined if the system had operated during the fire. Even if it did, it might not have been able to contain the severe exposure fire for several reasons, including the following:

Magnitude of the exposure fire. The intense, severe fire in the abandoned warehouse almost immediately exposed the Continental warehouse. Further, the fire extended into the warehouse roof structure. Fire fighters could not immediately take positions around its entire perimeter to prevent extension in all of the exposed areas. As a result, it is likely that numerous sprinkler heads on several of the systems and at various levels were activated.

Lack of sufficient water supply and pressure. Numerous fire department heavy stream appliances were supplied from the same 8-inch domestic water supply that fed the 6-inch main to the automatic sprinklers. Fire fighters used large amounts of water to stop fire extension. The fire department did not supplement the sprinkler system during the fire, and the system likely was deficient in water supply and water pressure. Finally, free-burning portions of the warehouse probably contributed to severed piping that could not have been easily isolated from the remainder of the system.

Condition and maintenance of systems. The condition of the system at the time of the fire was unknown. The dry pipe automatic sprinkler system within the Continental Building had a pipe schedule design. The type and age of the system would have warranted yearly maintenance. The maintenance and testing records were not examined, nor was the position of valves or the condition of piping.

Based on the NFPA’s investigation of this fire, the following are considered significant factors resulting in fire fighter fatalities in this incident:

1. Failure to secure an abandoned building from entry by vagrants, arsonists or both.
2. The nature of the ignition scenario, which included multiple fires.
3. The significant fuel load provided by the baled cloth material.
4. The lack of external indications of a working fire in the abandoned warehouse, thus warranting an interior investigation.
5. The extreme exposure hazard presented by the Motor City Wiping Cloth Company.
6. The danger presented to fire fighters committed to an interior fire attack in a building complex subjected to severe fire exposure and damage for a lengthy period of time.

Acknowledgments

The National Fire Protection Association conducted an investigation of the Detroit fire fighter fatalities as part of its mission-oriented fire investigations program. The investigation was conducted with the cooperation of the Detroit Fire Department. In addition to thanking NFPA Fire Data Specialist Arthur Washburn for his on-site assistance, the NFPA would like to thank Detroit Fire Commissioner Melvin Jefferson, Deputy Fire Commissioner Philip F. Gorak and Detroit Fire Marshal Donald Robinson for their cooperation. Further, the cooperation of the fire fighters involved in this tragic incident is acknowledged and appreciated.
Three fire fighters lost their lives and ten others were injured battling a major group fire that involved two separate warehouse buildings in Detroit, Mich., on March 12, 1987. The deliberately set fire originated in an abandoned three-story building and eventually spread to an adjoining occupied paper and supply company. Although the first building had been abandoned, an extremely heavy fuel load remained and fueled the severe fire. One fire fighter was killed in the building of fire origin, when flashover conditions forced the initial fire attack crew from the third floor. Other members of this crew were injured as they attempted to escape the intensity of the advancing flame front. After the fire spread to the adjacent structure, two more fire fighters died when a fire wall collapsed while they were attempting to limit fire extension.

This is an unusual fire fighter fatality in that the three fire fighters died at the same major fire but in two separate incidents.

Arson investigators from the Detroit Fire Marshal’s Division determined that the fire was deliberately set by a vagrant who ignited large bales of cloth-type material stored in the building. Smoke was not visible to fire fighters upon their arrival. During their initial interior size-up, the fire severity became obvious and the fire fighters began to take evasive actions; however, flashover conditions were reached before they could get out of the building. The rapid advance of the fire forced several fire fighters to exterior windows where they awaited rescue. Fire conditions were so severe that one fire fighter had to abandon his position. He was killed in a fall from the third floor.

As the fire spread to the adjoining occupied structure, fire fighters attempted to limit the amount of fire extension. Ap-
Three members of the Detroit Fire Department—two officers and a fire fighter—died last March in a fire that was deliberately set in an abandoned warehouse. Ten more fire fighters were injured while battling the fire, which extended to an adjacent warehouse and became a major group fire.

THOMAS J. KLEM
Director
Fire Investigations and Applied Research Division

Approximately three hours after the initial alarm, a fire wall collapsed near a position that two fire fighters had taken in the extinguishment attempt. The force of the wall collapse caused the floors below to cave in, burying the fire fighters in tons of debris. Other fire fighters, working only with their hands, risked their lives attempting to rescue the fallen fire fighters.

Fire incident
At 3:05 p.m., the Detroit Fire Department’s Alarm Headquarters received a report that smoke was issuing from an abandoned warehouse on Jeffries Freeway. Apparently an employee of the Continental Paper Company spotted the smoke from the employee parking lot and reported the fire. Smoke was not reported to be heavy at the time of discovery. However, due to the number of boarded-up windows, a severe fire could have been developing within the building.

The alarm center sounded Box 382 and dispatched Engines 10, 34 and 5, Ladder 9, Squad 4 and Battalion Chief 5. An officer and three fire fighters manned each piece of equipment. Engine 10, Squad 4 and Ladder 9 arrived on the scene at approximately 3:10 p.m. Under standard attack procedures, an attack crew of six fire fighters (two officers and four fire fighters) in full protective gear was formed from the first arriving apparatus. This crew entered the building along Jeffries Freeway and went up to the third floor, where a “wisp” of smoke was seen. A masonry fire wall separated the front third of this side of the building from the remainder of the building. This front portion was relatively clear of large quantities of baled materials, so the crew moved freely along this area to the southwest portion, where a large opening existed in the fire wall.
An officer noticed three separate fires burning beyond the fire wall. He described two small fires near the fire wall and a third at some distance that involved seven to eight bales of material. The officer ordered a 1 ½-inch attack line brought to the third floor. During the few moments that the attack line was being advanced and positioned, conditions within the building quickly deteriorated. The officer immediately recognized the danger and ordered everyone out of the building. The attack crew began to move quickly toward the stairway they had used to gain access to the third floor. Before they could locate the stairway, however, fire erupted through the opening in the fire wall, and products of combustion extended over their heads, ostracizing them to the stairway. In the front portion of the building, visibility and tenability were lost rapidly, requiring the crew members to scramble for their lives.

Other fire fighters outside on Jeffries Freeway saw the fire travel from window to window in seconds. Two of the trapped crew eventually were able to locate the stairway and to escape from the building without injury. The other four members were positioned at various window locations awaiting rescue. While a ground ladder was being raised to one crew member’s position, severe heat forced another fire fighter to release his grip, and he began to fall. During the fall, he apparently hit a projection from the building and landed on the ground head-first. The first fire fighter came down the ground ladder to safety.

The two remaining crew members were in window openings at the northwest portion of the building. An alert pump operator from Engine 10 directed the wagon pipe into a window opening where one fire fighter had taken refuge. This kept flames away from this crew member until the fire fighters outside could raise a ground ladder to his position. While this rescue was in progress, the severe fire forced the remaining fire fighter to jump from the building. His fall was broken by a large telephone cable, and he survived.

The first crew member who was forced to abandon his position at the window was an officer. He was transported to the hospital in an arson division squad car. At the hospital, the officer was pronounced dead as a result of severe head and back injuries sustained in the fall. The remaining three crew members sustained burns, fractures and other injuries but survived the rapid progression of the fire.

Within 30 minutes of the initial attack, the fire progressed to five alarms, ultimately bringing 125 fire fighters and 24 pieces of equipment to the scene. The fire in the Motor City Wiping Cloth Company became so severe that first responding apparatus had to be relocated away from the radiant heat.

**Background**

Over the past 25 years, Detroit, like many other major cities, has experienced a substantial population decline. The current estimated population of the 139-square-mile city is 1.2 million, nearly half its one time peak. This has resulted in numerous abandoned commercial and residential properties throughout the city. The city began an aggressive program to remove the buildings that constitute a hazard, and since 1980 an estimated 3000 buildings have been demolished.

The building fire origin once had housed the Motor City Wiping Cloth Company, but had been abandoned by its owners for years. Reportedly, the city had reclaimed the property in an attempt to collect back taxes and was involved in a legal process to have the building demolished. Citizens had lodged complaints about the building, and several "minor" fires had occurred in the building.

Access to the building could be gained easily, and the remaining clothing and cloth materials made the building appealing to the vagrants who frequented it. Apparently in an attempt to keep warm, they had set several small fires that required fire department response. Recognizing the potential danger, the first due fire companies updated their prefire plan for the building. During one of these inspections, a fire officer inside the poorly illuminated building was startled by an equally startled vagrant warming himself by a small fire.

At the time of the fire the temperature was 40°F, with winds out of the north/northwest at a velocity of 10 mph. The temperature dropped steadily throughout the afternoon; wind direction and velocity were relatively stable.

The Detroit Fire Department has 1265 fire fighters and officers. The fire fighting division is organized into nine battalions having 42 engines, 28 truck companies and six squads.

**The buildings**

The Motor City Wiping Cloth Company

At one time, the Motor City Wiping Cloth Company had occupied several interconnected buildings covering about one-half of the roughly 425-by-675-foot city block area defined by Hancock and Lawton Avenues, Jeffries Freeway and the railroad tracks to the south (see diagram). Along Jeffries Freeway, a narrow perpendicular access road separated this occupancy from the adjacent occupied warehouse to the south. A 25-foot common separation distance between buildings extended east for nearly 100 feet, at which point it opened into an unpaved area used as an employee automobile parking area. The separation between the buildings at this location was approximately 170 feet. Employees of the Continental Paper Company and the company's distribution trucks used the access road.

An abandoned railroad spur formerly used to ship and receive goods ran along the south side of the Motor City Wiping Cloth Company.

It appears that the interconnected structure may once have been two separate buildings. Building 1, at the northernmost portion of the complex, was of a different construction type than Building 2 and had an independent water supply line for automatic sprinklers. In the approximately 20-foot space that once would have separated the buildings, several elevators, stairways and two access bridges joined all levels of the structures and allowed for a flow of goods between the buildings. To provide for fire segregation, fire doors were installed at openings between the buildings; however, it was reported that some were not in place at the time of the fire. During
Fire fighters are trained not to subject themselves to undue danger to extinguish fires in abandoned buildings. However, it was known that vagrants lived in this building. . . .

At this time, all fire fighting efforts at the building of origin reverted to heavy stream appliances. Because of the severe conditions within minutes of flashover, the fire spread from the building of origin to that portion of the Continental Paper Company that was within 25 feet.

Ignition of the Continental Building was first detected along its roof line. Fire fighters used heavy appliances in an attempt to prevent the fire from extending into the paper and supply warehouse. A ladder pipe assembly was positioned in front of the Continental Building near the access road. Massive quantities of water effectively reduced fire spread in this portion of the building. However, flying brands, strong winds, and severe radiation ignited other portions of the building, especially the northernmost portion where access for large volume water application was limited. As fire began to spread into the paper company, fire fighters positioned handlines around the entire perimeter of the warehouse. During the early stage of fire spread to this structure, fire fighters took positions along the roof in an attempt to prevent extension. As the fire progressed, other fire fighters were committed to similar positions. These attempts continued for nearly three hours after the initial fire alarm.

At approximately 6:00 p.m., an officer and two fire fighters were working a handline on the third floor of the three-story, northernmost portion of the warehouse. They had taken the handline into the building and were positioning themselves close to a fire wall that subdivided this portion of the building. Apparently they were attempting to apply water beyond the fire wall onto the burning structure on the other side. One fire fighter left the position to advance additional hose. At that moment, the fire wall collapsed on the two remaining men and resulted in the cave-in of the floors below. In the collapse, the two fire fighters fell to the first floor and were buried under tons of rubble. The third fire fighter was not injured.

In an attempt to prevent fire from engulfing the two buried men, as well as the fire personnel who had been summoned to the area, hose lines were applied to the area of the rubble. Fire fighters dug through the rubble by hand for approximately 1½ hours before they could extricate the downed officer and fire fighter. They were transported to the hospital.

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Eventually, the fire consumed the entire block, with the exception of Building 1, which sustained only minor fire damage at locations immediately exposed to the severe radiation from Building 2.

Tragically, three fire fighters were killed and ten others were injured battling this large group fire.

Analysis

The decision of the six fire fighters to enter the abandoned building was sound. Their initial size-up from the exterior of the building could not, and did not, reveal the magnitude of fire burning within the structure. Smoke did not penetrate the fire wall near the front of the building until the interior size-up was begun. During the interior size-up, the fire fighters realized the severity of the fire and began to take evasive action. Within minutes, the fire overran them.

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The two fire fighters who were killed during the collapse in the Continental Building had taken positions that made them vulnerable to injury, considering the length of time the fire had been burning within the Continental Paper Company. Perhaps because of the manner in which the fire was extending, or maybe because of the apparent independence of each of the separate buildings, the fire fighters felt they could safely fight the fire from one structure to another. They may have felt that the fire wall would protect them. The severity of the fire, however, apparently had weakened the structure in their immediate area, resulting in the collapse.

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**Magnitude of the exposure fire.** The intense, severe fire in the abandoned warehouse almost immediately exposed the Continental warehouse. Further, the fire extended into the warehouse roof structure. Fire fighters could not immediately take positions around its entire perimeter to prevent extension in all of the exposed areas. As a result, it is likely that numerous sprinkler heads on several of the systems and at various levels were activated.

**Lack of sufficient water supply and pressure.** Numerous fire department heavy stream appliances were supplied from the same 8-inch domestic water supply that fed the 6-inch main to the automatic sprinklers. Fire fighters used large amounts of water to stop fire extension. The fire department did not supplement the sprinkler system during the fire, and the system likely was deficient in water supply and water pressure. Finally, free-burning portions of the warehouse probably contributed to severed piping that could not have been easily isolated from the remainder of the system.

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Based on the NFPA's investigation of this fire, the following are considered significant factors resulting in fire fighter fatalities in this incident:
1. Failure to secure an abandoned building from entry by vagrants, arsonists or both.
2. The nature of the ignition scenario, which included multiple fires.
3. The significant fuel load provided by the baled cloth material.
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prefire planning, the fire fighters were able to move freely, without obstruction, between the buildings. Postfire observations of the intact Building 1 also revealed a lack of adequate horizontal and vertical fire barriers.

Building 1
Built in 1915, Building 1 was a four-story, fire-resistive structure with poured concrete floors and support columns, and a ceiling height on each floor of 12 feet. The building had numerous exterior openings on all sides and on each floor level, and window openings comprised more than 80 percent of the outside walls. There were signs of external and internal deterioration. Portions of the structural concrete were crumbling, and reinforcing bars were exposed.

The contents of the 120-by-230-foot structure consisted of clothing and cloth materials in various states of arrangement and large, 4-by-6-foot wooden bins distributed throughout the building. It appears that the operation process once consisted of receiving the cloth materials from collection points, where they would be transferred to the large wooden bins. The materials then would be baled and stored within the complex until shipped to customers. Reportedly, four men were necessary for relocating or moving the bales. Baled material ready for shipment could be relocated by using the two large service elevators. Bales could be transferred on service equipment installed between Buildings 1 and 2. The baled storage usually was stacked up to within 18 inches of the ceiling. Examination of the structure after the fire revealed that substantial amounts of the baled materials remained on all floor levels. Some bales had been split open and the cloth material was spread over the floor. The heat release rate would differ substantially between stacked bales and those that had been split open. Further, because of the arrangement of the wooden materials that comprised the bins, they would have a high heat release rate.

Fire protection for the building at one time had consisted of two 6-inch dry pipe automatic sprinkler systems. Because the building had been abandoned, the automatic sprinkler system was not in service. As noted, openings between buildings were protected with fire doors. However, some doors were missing, and there were unprotected floor to floor service elevator shaft openings.

Building 2
Determined to be the building of fire origin, Building 2 was an L-shaped, three-story structure with a basement that partially abutted Building 1 along its south side for a distance of approximately 220 feet (see diagram). The front entrance was off Jeffries Freeway, and this side of the building was approximately 225 feet long and nearly 85 feet wide. A 12-inch fire wall was provided on all floor levels approximately 30 feet from the front exterior wall. Openings in the wall at one time had been provided with fire doors. In this front portion of the building, stored materials were not as plentiful as beyond the fire wall.

The most common type of construction in this building was ordinary, although portions may have been qualified as mill or heavy timber construction. There was some evidence of unprotected noncombustible construction as well. The building had tongue-and-groove wood flooring over wood subflooring. Masonry fire walls, including the one previously mentioned, divided the building into four separate fire areas. Numerous window openings were provided on all levels and sides of the building, but many windows, especially on the south side, were broken or had been boarded up. This building, too, was used to store baled clothing and cloth materials. It also was provided with a dry pipe automatic sprinkler system, supplied by an 8-inch lead-in and an in-yard, 50,000-gallon, gravity storage tank. The system was inoperable at the time of the fire.

Continental Paper and Supply Company
The Continental Building complex was an occupied warehouse. The company supplied paper and some janitorial supplies throughout the metropolitan area. The northernmost portion of the building was separated from the abandoned warehouse by the 25-foot-wide access road. Because of the diagonal direction of the adjacent railroad line to the property, the 132,337-square-foot structure was pie-shaped. It consisted of 21 buildings of various sizes and shapes, which, it appears, could have been built at separate times. The construction types varied, ranging from unprotected noncombustible to heavy timber or mill construction. Fire walls segmented adjoining buildings from one another. It was impossible to determine the operating condition or the presence of fire doors due to the total destruction of the property.

All except three of the buildings were one- or two-story structures. The three northernmost buildings nearest to the abandoned warehouse were three-story. Most of the buildings had masonry exterior bearing walls. Those located along Jeffries Freeway had the entire front portion including window openings covered with metal siding. Numerous window openings were present along the entire 310-foot-long northern section of the building, and one-third of the roof over this section had been raised 7 feet to allow natural illumination on the third floor.

The building was fully protected by several dry pipe automatic sprinkler systems supplied from a single 6-inch lead-in from a main at Jeffries Freeway. A total of eight systems, ranging in size from 4 inches to 6 inches, with dry-pipe valves were distributed throughout the complex. It could not be determined if the system operated during the fire.