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NIOSH
Fire Fighter Fatality Investigation and Prevention Program

Death in the line of duty...

A Summary of a NIOSH fire fighter fatality investigation *February 8, 2001*

Arson Fire Claims the Life of One Volunteer Fire Fighter and One Civilian and Severely Injures Another Volunteer Fire Fighter–Michigan

SUMMARY

On March 3, 2000, a 27-year-old male volunteer fire fighter (the victim) died and a 32-year-old male volunteer fire fighter was severely injured after attempting to rescue an elderly woman. Volunteer fire fighters and public safety officers (trained as fire fighters) were dispatched at 0342 hours to a basement fire at an apartment building. As the crews were attacking the fire, a call came in from Central Dispatch at 0454 hours reporting smoke in a nearby apartment building. At 0457 hours, public safety patrol units reported smoke showing and a female civilian trapped in the second apartment building. At 0459 hours, command advised the patrol units that four people (one Public Safety Officer [PSO], the victim, and Fire Fighters #1 & #2) from the basement fire were being sent to the second fire. The fire fighters arrived at the second fire and saw heavy smoke coming from the front door of the apartment building and a female civilian in an upstairs apartment window (see Diagram and Photo 1). The female civilian had her head out of the window calling for help. Two of the volunteer fire fighters (victim and Fire Fighter #1), with full turnout gear and SCBAs, proceeded up the stairs to attempt a rescue of the trapped female civilian. The victim and Fire Fighter #1 located the female civilian in the kitchen area and proceeded with her back toward the entrance to the apartment. The victim opened the apartment door and was confronted with heavy fire and extreme heat. They retreated back toward the kitchen area and decided to abort the rescue. The victim and Fire Fighter #1 proceeded down the hall (without the female civilian) to the bathroom where they broke out the window and attempted to climb out (see Diagram and Photo 2). Fire Fighter #1 passed out and fell into the bathtub as the victim continued trying to get out of the window. Personnel on the fireground saw the victim attempting to climb out the window and yelled for him to jump. *Note: No apparatus or fire suppression equipment was at the second fire at this time.* At 0511 hours, Engine 1 from a mutual-aid company arrived on the scene and threw a ladder to the window the victim was attempting to exit. At approximately 0515 hours, the victim was removed from the window and was transported by ambulance to a nearby

Photo by Bill Eisner.

Incident Site

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. The program does not seek to determine fault or place blame on fire departments or individual fire fighters. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at

www.cdc.gov/niosh/firehome.html
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hospital where he was pronounced dead upon arrival. At 0525 hours, personnel on the fireground of the second fire realized they had a second fire fighter trapped in the upstairs bathroom. Two fire fighters entered through the bathroom window and rescued Fire Fighter #1 who was then transported to a nearby hospital. Fire Fighter #1 suffered from smoke inhalation and third-degree burns to 30% of his upper body. The trapped female civilian was fatally injured in this fire. NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should

- ***establish and implement an Incident Command System (ICS) with written standard operating procedures for all fire fighters***
- ***ensure that accountability for all personnel at the fire scene is maintained***
- ***ensure that fire fighters who enter hazardous areas–e.g., burning or suspected unsafe structures–are equipped with two-way communications with incident command***
- ***ensure that fire fighters preplan an escape route when entering a hazardous environment***
- ***ensure that adequate fire control forces and fire suppression equipment are on the scene and available for deployment for fire control activities***
- ***ensure that Rapid Intervention Teams are established and in position***
- ***consider providing fire fighters with a Personal Alert Safety System (PASS) integrated into their Self-Contained Breathing Apparatus (SCBA)***

INTRODUCTION

On March 3, 2000, a 27-year-old male volunteer fire fighter (the victim) died and a 32-year-old male volunteer fire fighter was severely injured after attempting to rescue a female civilian who was trapped in her apartment. *Note: The female civilian was fatally injured in this fire*. The National Institute for Occupational Safety and Health (NIOSH) was notified of this incident on March 6, 2000, by the United States Fire Administration. On April 3, 2000, a Safety and Occupational Health Specialist and a Safety Engineer from the Division of Safety Research investigated this incident. Meetings and interviews were held with the public safety department's director, public safety officers, volunteer fire fighters, and the mutual-aid company's officers and fire fighters who were on the scene at the time of the incident. Meetings were also held with the State Police Fire Investigator and the State of Michigan's Department of Consumer and Industry Services personnel who investigated this incident. A meeting was also conducted with members from the county's mutual-aid committee. The Standard Operating Procedures for the mutual-aid resolution for the county's fire departments were obtained. A site visit was conducted, and photographs of the incident scene were taken. The buildings involved in this incident were two, two-story, Co-Op apartments of ordinary construction. *Note: The site of this incident was just one of six arson fires concentrated in a 1½-mile area that the department had responded to within the 24-hour period in which this incident occurred.* A follow-up visit was conducted on July 20th by a Safety and Occupational Health Specialist to interview Fire Fighter #1 and to examine the personal

protective equipment (PPE) worn by Fire Fighter #1 and the victim (some of the PPE was not available for inspection).

The department involved in this incident is a public safety department that consists of one fire station with a total of 64 employees, of which 53 are public safety officers cross-trained as Fire Fighter Level I & II. Additionally, 30 volunteer fire fighters are on call for this department. The department serves a population of approximately 15,000 in a geographic area of 4.2 square miles. The victim was certified at Fire Fighter Level I & II. The victim had received training as a medical first responder, basic emergency medical technician, confined-space rescue, and hazardous-material awareness. The victim and the injured fire fighter each had 5 years of fire fighting experience.

INVESTIGATION

On March 3, 2000, public safety officers (PSOs [trained as fire fighters]) were notified by Central Dispatch at 0342 hours of a basement fire in an apartment building. The crews responded with Quint 1 (Officer and two fire fighters) and Engine 4 (Officer and two fire fighters). Volunteer fire fighters (including the victim and Fire Fighter #1[injured]) were also toned out, and six volunteer fire fighters responded to the scene in their privately owned vehicles (POVs) and Engine 2. The PSOs and volunteer fire fighters quickly knocked down one of two fires in the basement. As the crews were attacking the second of the two basement fires, Central Dispatch reported smoke in a nearby apartment building, ½ mile away, at 0454 hours. *Note: The fire department personnel and apparatus were committed to the first incident when the call came in from Central Dispatch reporting a fire at the second incident. The fires at both incidents were determined to be incendiary fires with multiple points of origin.* At 0455 hours, public safety patrol units (the Director of the Public Safety Department and two PSOs [one in plain clothes and one in police uniform] and two additional PSOs) responded to check for smoke at the second apartment building. At 0457 hours, the patrol units reported smoke showing and that a female civilian was trapped. They requested "additional help" and "personnel in fire gear." Command at the first incident notified Central Dispatch and requested a second alarm. At 0459 hours, command advised the patrol units that they were sending four people with turnout gear from the first incident to the second incident. Four fire fighters from the basement fire responded in the Fire Lieutenant's van (one PSO, the victim, and Fire Fighters #1 and #2). The Director and a PSO used a fire extinguisher to knock down a small fire in a closet on the first floor beneath the stairs. A second fire with heavy smoke at the top of the stairs prohibited the Director and PSOs from going upstairs to evacuate the female civilian (see Diagram). A call (from an unknown person on the fireground) was made to Central Dispatch requesting an ambulance. The PSO, the victim, Fire Fighter #1, and Fire Fighter #2 arrived on the scene of the second incident and saw heavy smoke coming from the front door of the apartment building. The fire fighters saw and heard a female civilian in an upstairs apartment window calling for help (see Photo 1 and Diagram). Two of the volunteer fire fighters (the victim and Fire Fighter #1), in their full turnout gear and SCBAs, proceeded to the front door of the building. Hearing the female civilian calling for help, they proceeded up the stairs to attempt a rescue. At 0503 hours, the Director radioed the IC at the first incident and requested that "they need a fire vehicle." The PSO, in the Lieutenant's van, was donning his gear while Fire Fighter #2 proceeded to the front door. During interviews, Fire Fighter #2 reported that he saw heavy smoke

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and fire on the ceiling above the stairway landing and at the door to the storage area when he arrived at the front door (see Diagram). The victim and Fire Fighter #1 conducted a right-hand search upon entering the apartment. A PSO (Sergeant) arrived on the scene of the second incident, at 0505 hours, and assumed Incident Command (IC). He was informed that civilians were trapped inside, and that fire fighters had gone in to attempt a rescue. *Note: The IC and the other fire fighters at the second incident did not know how many civilians or fire fighters were inside the building.* The victim and Fire Fighter #1 located the female civilian in the kitchen area (she had her head out the window and was conscious) and proceeded with her back toward the entrance of the apartment. Fire fighters who were on side A of the building saw the woman disappear from the apartment window. The fire fighters then saw the large window above the front entrance shatter. Flames were rolling out of the top half of the shattered window (see Diagram and Photo 1). The victim opened the apartment door and was confronted with heavy fire and extreme heat. Fire Fighter #1 was carrying the female civilian and was standing directly behind the victim. The victim and Fire Fighter #1 retreated back toward the kitchen area. Fire Fighter #1 put the female civilian down and asked her if there was any other way out of the apartment. Due to smoke inhalation, she was unable to answer. As the heat continued to build, the victim and Fire Fighter #1 decided to abort the rescue and to find another way to of the apartment. *Note: Fire Fighter #1 was sustaining burns to his upper body. The clothes under his bunker gear were saturated with water from fire fighting efforts at the first incident.* The victim and Fire Fighter #1 proceeded down the hall to the bathroom where they broke out the window located above the bathtub and they attempted to climb out of the second-story window (see Diagram and Photo 2). *Note: The window measures 24 inches high by 48 inches wide with a center divider. Each of the two sides of the divider measures 24 inches high by 24 inches wide. Attempts were made by the rescue crew to remove the center divider; however, the frame and center divider were mortared into the wall.* The victim and Fire Fighter #1 were unable to get out of the window because their air bottles were getting caught on the window frame. Fire Fighter #1's low-air alarm began to sound, and he quickly ran out of air. Fire Fighter #1 then disconnected the breathing tube on his SCBA and stuffed the end of the tube into his jacket before passing out and collapsing into the bathtub. The victim continued in his attempt to climb out of the window. At 0507 hours, the Director called for additional help on side C of the building to rescue a fire fighter (the victim). The Director of the Public Safety Department and a PSO yelled for the victim to jump from the second-story window. Flames and heavy smoke were rolling out of the window above the victim's head. The victim was yelling for help and that he was being burned. *Note: No apparatus or equipment was on the scene at this time. Engine 2, Engine 4, and Quint 1 were at the first incident. Engine 2 was in the process of traveling to the second incident.* At 0511 hours, Engine 1 from a mutual-aid company (Lieutenant and four fire fighters) arrived on the scene and connected a 5-inch supply line to the hydrant on side A of the building. The IC then informed the Lieutenant that a fire fighter was trapped on side C of the building. The Lieutenant and a fire fighter from Engine 1 took a ladder to side C where they set a ladder to the window the victim was attempting to exit. The victim became unresponsive during the extrication attempt (the victim's air mask had been removed at this time by the Lieutenant in an attempt to allow the victim to get some air). A fire fighter from Engine 1 pulled a 3-inch hoseline to side C

and began applying water to the window area around the victim in an attempt to protect the him. An attack team, made up of two fire fighters from Engine 1, proceeded with a 1¾-inch preconnect to the entrance on side A and attempted to knock down the fire at the top of the stairway. A second ladder was thrown to the window to allow additional rescuers to aid in the victim's removal from the window. The rescuers cut the victim's air pack straps so that they could remove his air pack and pull him out of the window. At approximately 0515 hours, Ambulance #2 arrived on the scene just as the victim was being brought down from the window. The victim was unresponsive and not breathing. The paramedics began administering cardiopulmonary resuscitation (CPR). The victim was transported by ambulance to a nearby hospital where he was pronounced dead upon arrival. Vertical ventilation of the building was initiated after the victim was removed. Additional fire fighters from the first incident and additional mutual-aid companies began arriving on the scene. At 0525 hours, personnel on side C heard moaning coming from the bathroom from which the victim had been removed. Personnel climbed the ladders and shined their flashlights down into the bathroom where they saw Fire Fighter #1. Two fire fighters from the first incident entered through the bathroom window and found Fire Fighter #1 lying in the bathtub with his air hose stuffed into his jacket. The rescuers attempted to lift Fire Fighter #1 up to the bathroom window, and personnel were waiting on the two ladders (see Photo 3). After numerous attempts, the two rescuers were able to get Fire Fighter #1 up to the window where personnel pulled him out. Fire Fighter #1 was transported by ambulance to a nearby hospital. Fire Fighter #1 suffered from smoke inhalation and third-degree steam burns to 30% of his body (most of the burns were to his upper body). The trapped female civilian was fatally injured in this fire.

CAUSE OF DEATH

The death certificate lists the cause of death as asphyxiation.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments should establish and implement an Incident Command System (ICS) with written standard operating procedures for all fire fighters.[1,2]

Discussion: An ICS should be defined and documented in writing, describing standardized guidelines for each situation, including routine and non-routine incidents. The system should establish roles and responsibilities for all personnel involved. It should ensure personnel accountability and safety and should provide a well-coordinated approach to all emergency activities. All fire department personnel should be thoroughly trained on this system and receive periodic refresher training, and all training should be documented. An ICS becomes more difficult when several fire departments respond to the same incident; therefore, a type of unified command system should be established. The unified command system can be used to coordinate command of the incident when several departments arrive on the scene.

Recommendation #2: Fire departments should ensure that accountability for all personnel at the fire scene is maintained.[2,3]

Discussion: Accountability on the fireground is paramount and may be accomplished by several methods. It is the responsibility of all officers to account for every fire fighter assigned to their company and relay this information to Incident Command (IC). A fire fighter should communicate with the supervising officer by portable radio to ensure accountability and indicate completion of assignments and duties.

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One of the most important aids for accountability at a fire is the Incident Command System (ICS). As a fire escalates and additional fire companies respond, communication assists the IC with accounting for all fire-fighter companies at the fire, at the staging area, and at rehabilitation. With an accountability system in place, the IC may readily identify the location of all fire fighters on the fireground. Additionally, the IC would be able to initiate rescue within minutes of realizing a fire fighter is trapped or missing.

Recommendation #3: Fire departments should ensure those fire fighters who enter hazardous areas–e.g., burning or suspected unsafe structures–are equipped with two-way communications with incident command.[1,4,5]

Discussion: Although face-to-face is the best form of communication, radio communication should be used when face-to-face communication is not possible. NFPA 1221, 6-3.6, *Two-way portable equipment,* provides the standards for NFPA compliant portable radios.

Recommendation #4: Fire departments should ensure that fire fighters preplan an escape route when entering a hazardous environment.[6]

Discussion: All fire fighters operating in a hazardous environment should continually look for multiple escape routes. If a room is going to be utilized as the method of escape, then the fire fighter should enter an uninvolved room and shut the door. The fire fighter can then use a window for escape. If the window is above the first floor, the fire fighter may have to clear the window and wait for a ladder. These actions should be communicated if it is not obvious to crews outside. If the room has no window, then a wall breach may be an option, allowing fire fighters to get to rooms with alternative escape routes.

The victim and Fire Fighter #1 attempted to escape out of a second-story bathroom window after their primary means of egress was cut off by intense heat and flames. Through interviews, it was disclosed from the fire fighters assisting in the rescues of the victim and Fire Fighter #1 that the bathroom door was not closed. A site visit by the NIOSH investigators confirmed evidence that the fire had spread down the hallway leading to the bathroom. Closing the bathroom door would have minimized the horizontal ventilation effect created by the breaking of the bathroom window by the victim and Fire Fighter #1. The door would have provided a protective barrier from the fire and heat, possibly providing the victim and Fire Fighter #1 crucial time until assistance could be provided at the window.

Recommendation #5: Fire departments should ensure that adequate fire control forces and fire suppression equipment are on the scene and available for deployment for fire control activities.[4,7]

Discussion: Fire control forces are the fireground personnel who are involved in gaining entry and access, providing support activities, and controlling the fire. Four critical factors are to be considered when developing a basic rescue size-up: the fire stage; the fire victims (number, location, and condition); effect of the fire on victims; and the capability of control forces to enter the building, remove or protect the victims, and control the fire.

The fire suppression equipment needed at a multifamily occupancy fire is outlined in the National Fire Protection Association (NFPA) Fire Protection Handbook. The NFPA suggests that, for this type of occupancy, the staffing should be at least three pumpers, one ladder truck (or

combination apparatus with equivalent capabilities), one chief officer, and other specialized apparatus as may be needed or available.

Recommendation #6: Fire departments should ensure that Rapid Intervention Teams are established and in position.[8,9]

Discussion: A Rapid Intervention Team (RIT) should respond to every major fire. They should report to the officer in command and remain at the staging area until an intervention is required to rescue a fire fighter. The Rapid Intervention Team should have all the tools necessary to complete the job–e.g., a search rope, rescue rope, first-aid kit, and a resuscitator to use in case a fire fighter needs assistance. These teams can intervene quickly to rescue fire fighters who become disoriented, lost in smoke-filled environments, trapped by fire, involved in structural collapse, or run out of breathing air. Many fire fighters who die from smoke inhalation or flashover, or who are caught or trapped by fire, actually become disoriented first. In this incident, fire fighters were near the entrance (Fire Fighter #2 and PSO/Fire Fighter), but they were not designated as the RIT.

Recommendation #7: Fire departments should consider providing fire fighters with a Personal Alert Safety System (PASS) integrated into their Self-Contained Breathing Apparatus (SCBA).

Discussion: A PASS that is integrated into fire fighters' SCBA would automatically activate when they turn on their air supply. The victim and Fire Fighter #1 each had a manually activated PASS device. (Only one PASS device was available at the time of the investigation, and it was unable to be determined if it belonged to the victim or to Fire Fighter #1.) The PASS device was manually operated by NIOSH investigators and found to be in good operational condition, emitting a loud and clear, audible signal. The fire fighters who found Fire Fighter #1 did not hear a PASS alarm. The fire department is in the process of purchasing additional integrated PASS devices. In fire departments where manually operated PASS devices are used, such as this department, the fire fighters should be trained and routinely reminded to activate their PASS devices when operating on the fireground. Activation of manually operated PASS devices should be required of all fire fighters on the fireground.

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INVESTIGATOR INFORMATION

The lead author of this report is Mark McFall, Safety and Occupational Health Specialist, Division of Safety Research, NIOSH. Eric Schmidt, Safety Engineer, participated in the first site visit.

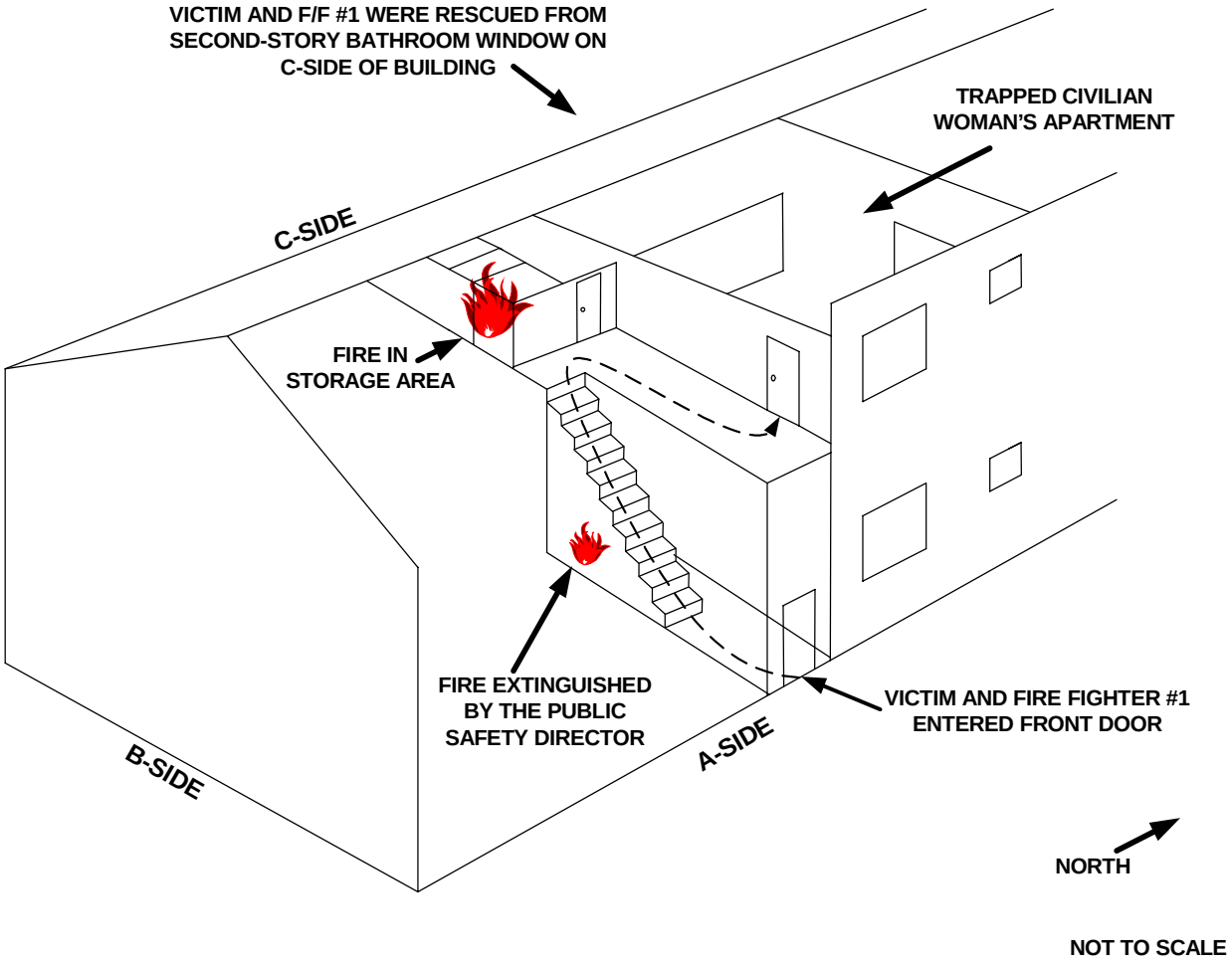

Diagram. *Profile of Building*

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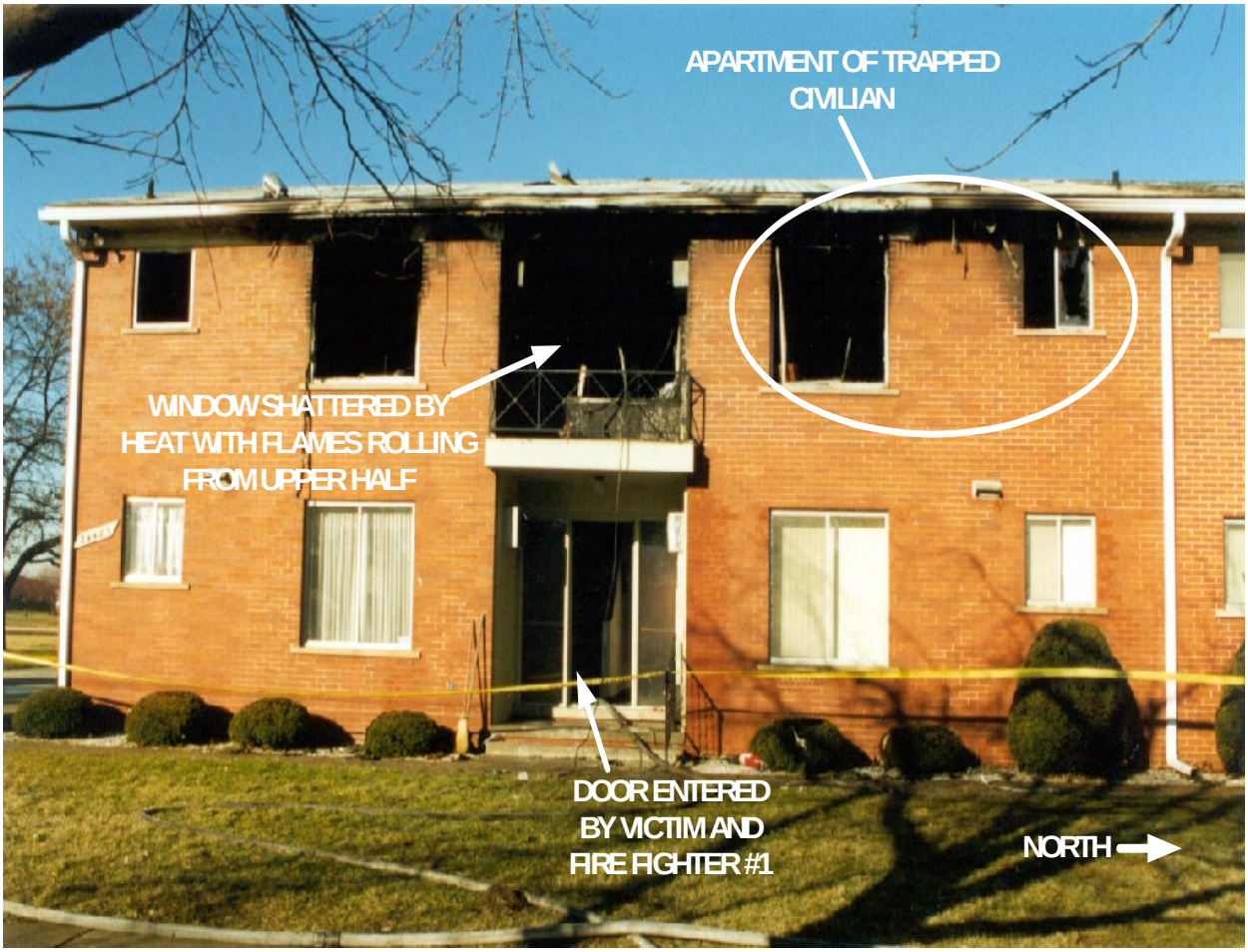

Photo 1. *A-Side of Incident Site*

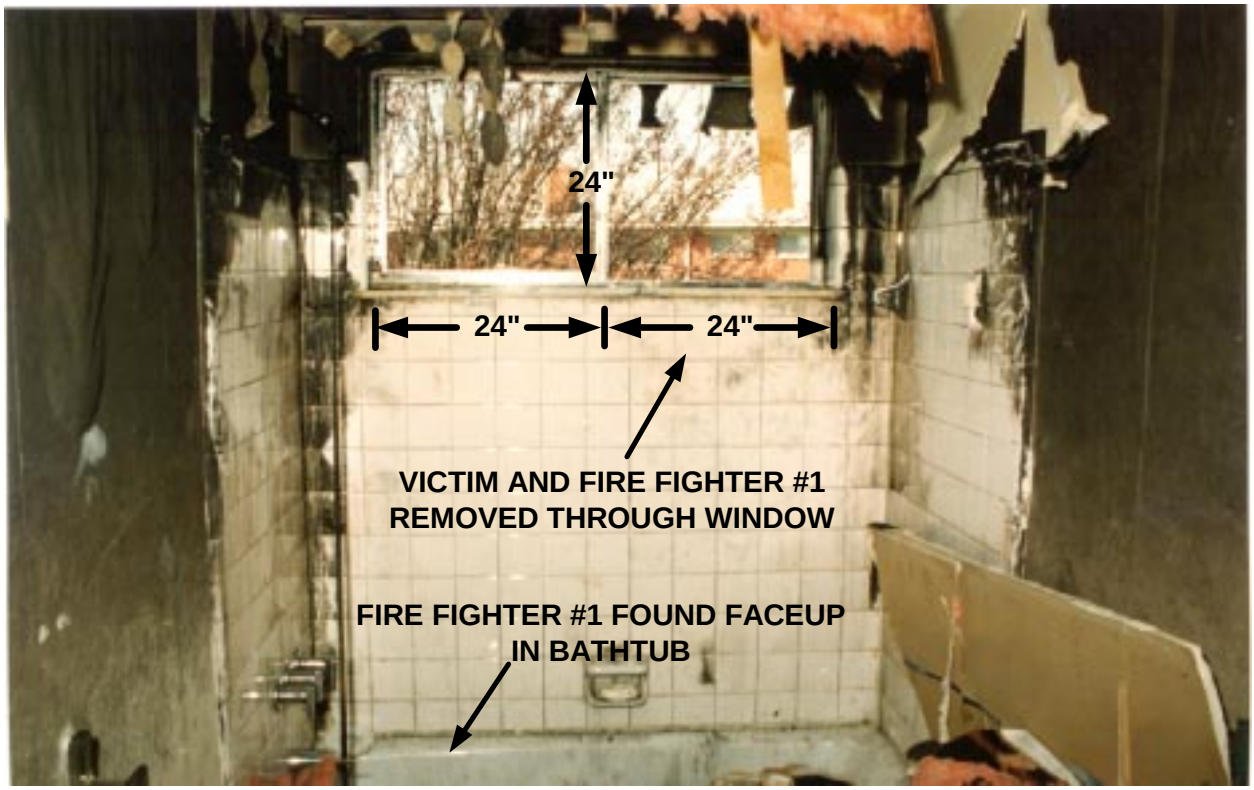

Photo 2. *Bathroom Window Victim and Fire Fighter #1 Attempted to Exit*

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Photo by Bill Eisner.

Photo 3. *Fire Fighter #1 Being Removed From Bathroom Window*