



Vacant Dwelling Fire Injures Two Fire Fighters-Virginia

SUMMARY

On July 11, 1998, two male fire fighters (Victim #1 and Victim #2) were injured while trying to escape from the path of a collapsing porch roof. They were part of a two-alarm fire response that was fighting a fire in a vacant, fully-involved, two-story dwelling and providing exposure protection to two nearby dwellings. Other fire fighters were conducting an interior attack in Exposure 4 (See Figure) while the two victims were manning a 2½-inch handline and providing exposure protection to the exterior of the same structure. They were positioned about 6 to 8 feet away from the main fire building when its front porch roof collapsed outward and at an angle, trapping Victim #1. Victim #1 was rescued, treated at the scene, and transported to the local hospital. Victim #2 was examined at the scene but refused further treatment. NIOSH investigators concluded that, to minimize the chances of similar occurrences, fire departments should:

- ***ensure that fire fighters are trained in the dangers of structural collapse and establish an appropriate collapse zone***
- ***ensure that a separate Incident Safety Officer, independent from the Incident Commander is appointed***

INTRODUCTION

On July 11, 1998, one male fire fighter, age 37, from Engine 3, and one male Lieutenant, age 38, from Engine 9, were providing exposure protection to a nearby dwelling when the front porch roof of the main fire building collapsed, trapping the fire fighter. This fire fighter was rescued, treated at the scene, and transported to

the local hospital. The Lieutenant was slightly injured but refused treatment.

On July 16, 1998, NIOSH was notified of this incident by the International Association of Fire Fighters and requested NIOSH investigate the circumstances surrounding this incident. On July 23, 1998, two Safety and Occupational Health Specialists from the Division of Safety Research, Tommy Baldwin and Frank Washenitz, traveled to Virginia to conduct an investigation of this incident. Meetings were conducted with fire department officers and fire fighters who were on the scene at the time of the incident and EMT/Paramedics that treated Victim #1. Fire Department standard operating procedures were reviewed. A copy of the dispatch tape was obtained and a site visit was conducted.

The fire department involved in the incident employs 278 personnel, of whom 273 are uniformed fire fighters, and serves a population of 97,000 in a geographic area of 44 square

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. 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:

<http://www.cdc.gov/niosh/firehome.html>

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miles.

The fire department requires all new fire fighters to complete a 12-week training course at the department's fire academy and to be certified as a Fire Fighter II and EMT-B. The required training is designed to cover safety, fire behavior, hose, appliances, streams, ladders, ventilation, building construction, self-contained breathing apparatus (SCBA), salvage and overhaul, forcible entry, fire fighter rescue, hazardous materials, rope rescue, and vehicle extrication. The victims had approximately 19 and 23 years of fire fighting experience, respectively.

The site of the incident was a vacant, 70-year old, two-story, wood-frame on stone foundation, multi-family dwelling with a basement. The porch roof was covered by tin roofing and supported by four wooden columns. The front yard was about 10 feet deep and elevated about 5 feet above the sidewalk and street level.

INVESTIGATION

On July 11, 1998, the Dispatch Center was notified of a dwelling fire at 0428 hours and dispatched a residential first alarm response group consisting of Engine 3, Engine 5, Ladder 7, Medic 1 (volunteer), Medic 3, and Battalion Chief 1 (BC-1) to a fire in a two-story, vacant, multi-family dwelling. Altogether 8 pieces of equipment and 34 personnel were on the scene. Engine 3 (Lieutenant and two fire fighters, including Victim #1) and Medic 3 (two fire fighter/paramedics) were first on scene at 0431 hours and reported the interior of the structure to be fully involved, with a partial collapse of the roof, and fire impinging on exposures to the left (Exposure 2) and the right (Exposure 4). (See Figure). An additional engine company was requested and Engine 7 was dispatched. Apparatus were set up in front of the structure

because fire department SOPs prohibited apparatus operations in alleys, such as behind the dwelling. Engine 3 wrapped the hydrant with a 3½-inch supply line, proceeded to the scene, and attacked the fire initially with its deck gun. However, to conserve its water tank supply until Engine 5 could supply water to Engine 3, the fire attack was halted and the focus placed on exposure protection. A 1¾-inch handline was pulled from Engine 3 and placed near Exposure 2 and manned by the crew from Medic 3. A 2½-inch handline was also pulled from Engine 3 and placed into service on Exposure 4. It was manned by Engine 3's crew including Victim #1 and located about 6 to 8 feet from the porch of the original fire building. BC-1 arrived about 0434 hours, assumed command, and performed a scene size-up. He also acted as the Incident Safety Officer. He requested Engine 4, Engine 9, and Ladder 1 to be dispatched. Dispatch sent those units and Engine 12 to the scene. Shortly, Dispatch completed a full second alarm assignment and dispatched Battalion Chief 2 (BC-2) and the EMS Supervisor (RS-1). BC-2 requested Dispatch to notify Chief 1 (Fire Chief), Chief 2 (Deputy Chief), and Chief 3 (Deputy Chief). Engine 7 (Captain, Lieutenant, fire fighter) arrived at about 0440 hours and its crew was assigned to fight the fire inside Exposure 4. Ladder 7 (Lieutenant and two fire fighters) arrived and used its deck gun on the exterior of Exposure 2. However, the nozzle on the ladder pipe was not operating properly and had to be shut down. Medic 3 and Engine 5 crews used the 1¾-inch handline from Engine 3, and fought the fire on the exterior of Exposure 2. Engine 9 (Lieutenant [Victim #2] and two fire fighters) arrived. The crew from Medic 3 was soon reassigned inside Exposure 4. Two additional 1¾-inch handlines were pulled from Engine 3 for use inside Exposure 4. The remainder of Engine 3's crew was reassigned to the second floor of

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Exposure 4, thus leaving Victim #1 alone on the 2½-inch handline. Engine 4 arrived (Captain and two fire fighters) and was assigned to fight the fire in the attic of Exposure 4. The Engine 9 crew began attacking the fire on the outside of Exposure 2. Victim #2 was reassigned to assist the one fire fighter (Victim #1) remaining with the 2½-inch handline on Exposure 4. Ladder 1 (Captain and two Lieutenants) arrived, set up, and applied water on the original fire building. The Lieutenant from Ladder 1 stood on the porch of Exposure 4 to direct the hose streams due to the heavy smoke on the fire scene and to watch the clearance of the overhead power lines. However, the ladder pipe could not apply water to Exposure 4 due to live overhead electrical wires that were arcing and a tree in the yard of the original fire building. Therefore, the ground attack was continued on Exposure 4. BC-2 arrived at about 0445 hours, completed a scene size-up, and was assigned command of Exposure 2. BC-1 remained in command of the scene. About 30-40 minutes after the first units arrived, the fire was being extinguished on Exposure 2 and inside Exposure 4. Victims #1 and #2 were applying water to the front of the original fire building when the wall on side 4 buckled outward. The front wall and porch roof then collapsed outward and at an angle toward Exposure 4. Victim #2, about 2 to 3 feet behind Victim #1, began to stand up from a kneeling position and Victim #1 turned to run but the nozzle pressure from their 2½-inch handline moved them toward the collapsing roof. A wooden column hit Victim #1 on his back at the top of his SCBA frame and prevented him from escaping. The collapsed roof completely trapped Victim #1 (only his feet were visible) and knocked Victim #2 down. The Lieutenant from Ladder 1 came to the collapsed roof and lifted it off Victim #1. A 1½-inch handline was pulled from Engine 3 to extinguish fire under

the roof and cribbing was retrieved from Ladder 1 to support the roof. BC-1 ordered all personnel out of Exposure 4 and called for an immediate count of all personnel. Medic 3 was ordered to the Command Post and then to move their unit in front of the main fire building. Due to the number of vehicles near the scene, Medic 1, in staging, moved their unit up to the scene to assist. Medic 2 was dispatched because of the collapse. Victim #1 was complaining of lower back pain, chest discomfort, and breathing difficulty. The crew from Medic 3 removed his SCBA, cut his turnout gear off, assessed his injuries, applied a cervical collar and a horseshoe collar, placed him on a backboard, and loaded him into Medic 1. Next they initiated two IVs, placed him on high-flow oxygen and a cardiac monitor, and transported him to the hospital. Victim #2 was treated at the scene and released.

CAUSE OF INJURY

The cause of injury to Victim #1 was listed by the attending physician as two pneumothoraxes, multiple rib fractures, and compression fractures to the T10 and T11 vertebrae.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments should ensure that fire fighters are trained in the dangers of structural collapse and establish an appropriate collapse zone.^{1,2,5}

Discussion: Dangers to fire fighters are present during all phases of operations, including interior and exterior operations, and offensive and defensive operations. Structural collapse is the fourth leading cause of fire fighter death. Knowledge of building construction and the effects of fire, water application, age, termite infestation, etc. as they relate to structural collapse is necessary to ensure fire fighter safety and fire extinguishment. Structural components

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collapse in different ways, i.e. pancake, leaning, inward/outward, ninety-degree, or tent-shaped. In any structural element, the critical area subject to failure during fire is the point of connection. For example, as fire burns inside interior walls and reaches the point where the porch roof is connected to the main structure, it will weaken that point of connection. However, no two fires burn exactly the same, and structural collapse will not occur exactly the same every time even if the same type of structure and conditions are present. After a fire has burned for some time, or the structure is older, or perhaps termite damage is present, collapse is an aspect for the incident commander and the safety officer to consider. A collapse zone should be determined. One function of the incident safety officer as stated in NFPA 1521, paragraph 4-2.6, is to “ensure that established safety zones, collapse zones, hot zone, and other designated hazard areas are communicated to all members present on scene.”

Recommendation #2: Fire departments should ensure that a separate Incident Safety Officer, independent from the Incident Commander is appointed.^{3,4,5}

Discussion: According to NFPA 1561, paragraph 4-1.1, “The Incident Commander shall be responsible for the overall coordination and direction of all activities at an incident. This shall include overall responsibility for the safety and health of all personnel and for other persons operating within the incident management system.” While the Incident Commander (IC) is in overall command at the scene, certain functions must be delegated to ensure adequate scene management is accomplished. According to NFPA 1500, paragraph 6-1.3, “As incidents escalate in size and complexity, the incident commander shall

divide the incident into tactical-level management units and assign an incident safety officer to assess the incident scene for hazards or potential hazards.” The incident safety officer (ISO), by definition is “An individual appointed to respond to or assigned at an incident scene by the incident commander to perform the duties and responsibilities specified in this standard. This individual can be the health and safety officer or it can be a separate function.” According to NFPA 1521, paragraph 2-1.4.1, “An incident safety officer shall be appointed when activities, size, or need occurs.” Each of these guidelines compliments each other and indicates that the incident commander is in overall command at the scene, but oversight of all operations is difficult. On-scene fire fighter health and safety is best preserved by delegating the function of safety and health oversight to the ISO.

REFERENCES

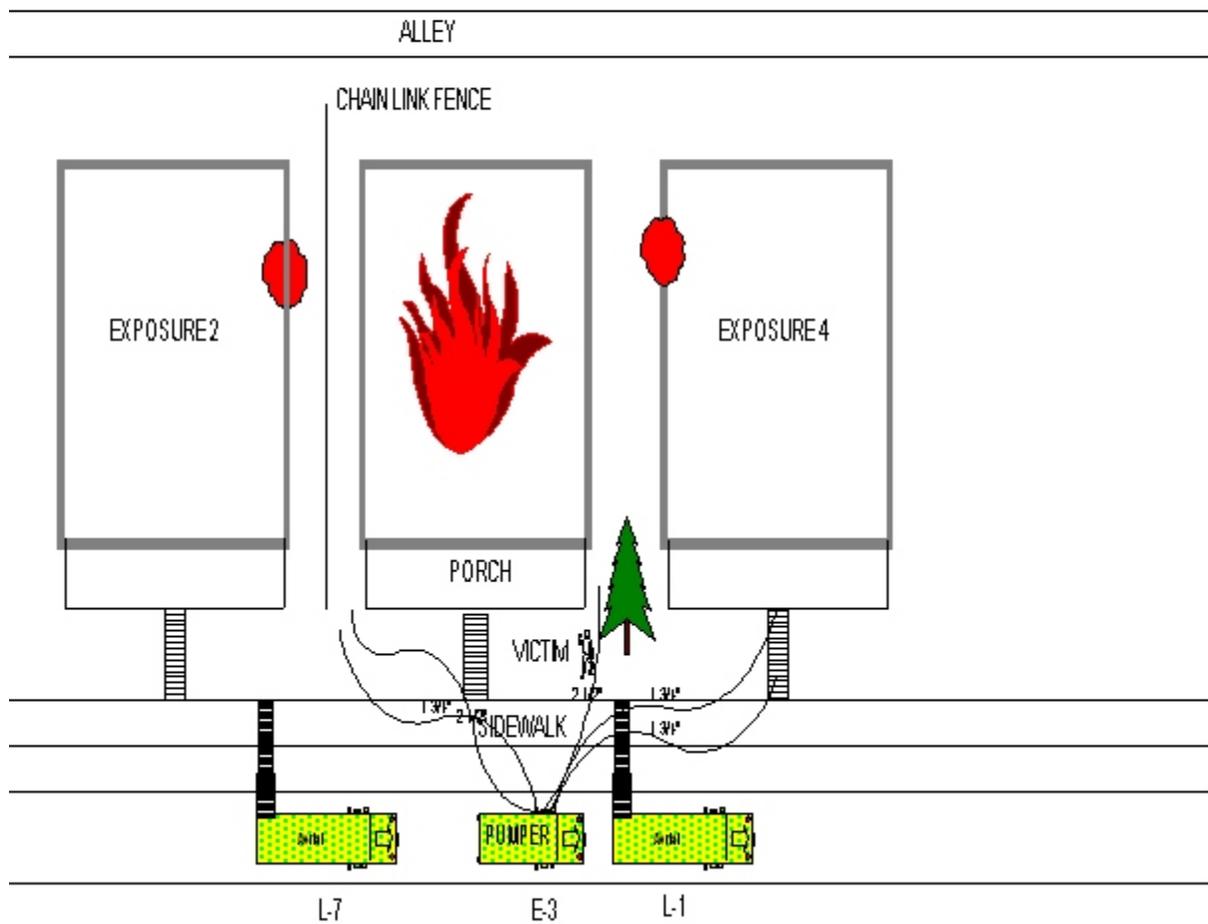
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Figure. Fire Incident Scene

FACE 98F-18
Top View





Fatality Assessment and Control Evaluation
Investigative Report #98F-18

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