



Career Fire Fighter Dies After Single-Family-Residence House Fire - South Carolina

SUMMARY

On June 16, 2001, a 22-year-old male career fire fighter sustained injuries while fighting a residential house fire that subsequently resulted in his death. Central Dispatch received notification of a smoke detector alarm at a single-family residence. After several apparatus had arrived on the scene, the victim arrived in Tanker 34, donned his gear, and approached the house. He was met by another fire fighter who told him the fire conditions. The victim proceeded to the garage area, and shortly thereafter, a partial roof and garage door collapse occurred, trapping him. A civilian bystander notified the Incident Commander (IC) that a fire fighter was down. The IC ran to the garage area and helped pull the victim out from the debris. Emergency medical personnel moved the victim to the street and began administering first aid. The victim was flown to a regional hospital where he remained until his death on July 12, 2001. The NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should

- *ensure that adequate numbers of staff are available to immediately respond to emergency incidents*
- *ensure that at least four fire fighters are on the scene before initiating interior fire fighting operations at a structural fire - two in, two out*
- *ensure that Incident Command maintains the role of directing operations on the fire scene, and not become involved in fire fighting efforts*

- *ensure proper safety measures are implemented when accessing a structure through the garage door*

INTRODUCTION

On June 16, 2001, a 22-year-old career fire fighter sustained injuries while fighting a residential house fire that subsequently resulted in his death. When the victim arrived on the scene, he entered the garage and was trapped by a partial roof and garage door collapse. The victim was pulled out from the debris, first aid was administered, and he was air lifted to a nearby hospital. The fire fighter died of his injuries 26 days later. On July 16, 2001, the United States Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On August 21-23, 2001, a team of two Safety and Occupational Health Specialists investigated this incident. Interviews and meetings were conducted with the Chief of the Fire District, fire fighters from the department who were on the scene of this incident, members of the local fire fighter union, and representatives from the Fire Marshal's District Office. The team visited the incident site, and reviewed copies of witness

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

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statements, training records, standard operating procedures (SOPs), dispatch logs, the fire/arson investigation report, and a map of the fire scene.

This combination department consists of 465 uniformed personnel and a Chief and serves a population of about 216,000 in an area of approximately 750 square miles. The department operates on a three-shift rotation with nine paid fire fighters per shift. The department requires all fire fighters to complete a 12-week training course and to attain their NFPA compliant Fire Fighter I certification. All fire fighters are placed on a 1-year probation. The victim had been a fire fighter for four years.

At the time of the incident the victim was wearing his full array of personal protective clothing and equipment, consisting of turnout gear, helmet, Nomex® hood, gloves, boots, a Self-Contained Breathing Apparatus (SCBA), and a Manual Personal Alert Safety System (PASS) device secured to his SCBA harness.

Structure. The structure involved in the incident was a one-story, 1800-square-foot house built on a concrete slab. The wall systems consisted of 2- by 4-inch wood studs with 3 ½-inch insulation, ½-inch drywall, ½-inch plywood, and exterior masonry brick. The roof system was formed using lightweight wood trusses consisting of 2- by 4-inch and 2- by 6-inch lumber connected with metal and wood gusset plates. The roof system sheathing consisted of 5/8-inch interior plywood covered by felt paper and asphalt shingles.

Weather. The weather conditions at the time of this fire included a relative humidity of 96%, an ambient air temperature of 80 F, an approximate wind speed of 5 mph, and barometric pressure of 29.90 Mb Hg.

INVESTIGATION

On June 16, 2001, at 1815 hours, Central Dispatch received notification of a smoke detector alarm at a single-family residence. Engine 151 with one fire fighter/driver operator and Engine 101 with a Lieutenant and a fire fighter/driver operator were dispatched to the scene. Within minutes, Central Dispatch received a second call from a civilian near the involved structure who reported smoke coming from the structure. The fire fighter from Engine 151, who was the first to arrive on the scene, confirmed heavy black smoke coming from the structure. He notified Central Dispatch of the conditions and requested Central Dispatch to upgrade the response to a code 3 (use of lights and sirens). Moments after the arrival of Engine 151, Engine 101 arrived, and the Lieutenant established Incident Command (IC), and completed a size-up. The structure was fully involved when they arrived on the scene; a second house to the right was 50 percent involved in the attic area. The IC then contacted Central Dispatch requesting two additional units and personnel to be dispatched to the scene. Both fire fighters who were on the scene suited up in full turnout gear and donned their self-contained breathing apparatus (SCBA). The IC began pulling three 1 ¾-inch pre-connected hoselines off Engine 151. He then pulled a 3-inch supply line from Engine 151 and connected it to Engine 101. *NOTE: The nearest hydrant was approximately five blocks away. The only other water source in this residential area was a lake approximately 500 feet from the involved structures.*

The fire fighter from Engine 151, using a 1 ¾-inch hoseline, proceeded to the house to the right of the fully involved structure. The fire fighter from Engine 101, with a second 1 ¾-inch hoseline from Engine 151, approached the fully involved structure. He proceeded to the front door where he noticed heavy smoke which was very intense when he opened it. He backed away from the structure to check the



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fire's progression and to see if the fire had vented through the roof. Before entering the garage area, he looked at the attic area, which did not appear to have any visible fire and very little smoke. He entered the garage through an open garage door and proceeded into the laundry room where he extinguished visible fire, and then he attempted to hold back the fire from the main living area (see Diagram). At that time, he radioed the IC requesting additional personnel; however, he was told no other personnel were on the scene. The fire fighter from Engine 151, located to the right of the main structure, radioed the IC requesting a 2 2-inch hoseline be brought to his location. At approximately the same time, Tanker 104 arrived on the scene with one fire fighter/driver, followed immediately by Tanker 34 with one fire fighter (the victim). The IC immediately instructed both fire fighters to don their gear and back up the first two fire fighters. The fire fighter from Engine 101 continued in his attempts to hold back the fire in the main area of the house. He heard an arcing breaker box to his left and he quickly retreated into the garage area where he noticed the attic was fully involved. He immediately exited the structure. The IC approached the fire fighter from Engine 101 and instructed him to take a 2 2-inch hoseline to protect nearby structures to the left of the main structure. The IC then returned to Engine 151 to operate the pump panel. At this time, an ambulance arrived on the scene with two Emergency Medical Technicians (EMTs)/paramedics.

As the fire fighter from Engine 101 was proceeding to the structure on the left, he noticed the victim approaching. The fire fighter told the victim to be careful of the garage area because of heavy fire in the room above the garage, and then he proceeded on. Approximately 5 minutes later, the IC working the pump panel behind Engine 151 was notified by a civilian bystander that a fire fighter was down. The IC ran to the other side of the engine to survey the scene and saw the victim lying halfway out of the

garage area. *NOTE: It is believed that the victim was inside the garage area for approximately 3 minutes when the roof partially collapsed. The State Fire Marshal's investigation states "it is further believed that the garage door springs failed due to high heat, causing the garage door to fall upon the victim and partially enclose around him."* The IC helped pull the victim away from the debris area and used the 1-3/4 inch hoseline to extinguish his turnouts, which were on fire. The fire fighter from Engine 151 heard people yelling and ran over to help remove the victim's burning turnouts. The IC continued to apply water to the victim and the garage area of the structure to hold back the fire while the victim was being provided medical attention until the Engine began to run out of water. EMS personnel on the scene moved the victim to the street and began administering first aid. The victim was transported by ambulance to a location where a medical helicopter was standing by. He was then flown to a regional hospital where he died 26 days later from the injuries he received.

CAUSE OF DEATH

The death certificate lists the cause of death as complications due to second and third degree burns.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Fire departments should ensure that adequate numbers of staff are available to immediately respond to emergency incidents.¹

Discussion: As stated in NFPA 1710 (5.2.1.1) "On-duty fire suppression personnel shall be comprised of the numbers necessary for fire-fighting performance relative to the expected fire-fighting conditions. These numbers shall be determined through task analyses that take the following factors into consideration:

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- (1) Life hazard to the populace protected
- (2) Provisions of safe and effective fire-fighting performance conditions for the fire fighters
- (3) Potential property loss
- (4) Nature, configuration, hazards, and internal protection of the properties involved
- (5) Types of fireground tactics and evolutions employed as standard procedure, type of apparatus used, and results expected to be obtained at the fire scene.

NFPA 1710 recommends that a minimum acceptable fire company staffing level should be four members responding on or arriving with each engine and each ladder company responding to any type of fire. It also recommends that for companies responding in high-risk areas to be staffed with a minimum of five or six members responding or arriving with each engine and each ladder company. The initial arriving company must also be able to implement an initial rapid intervention crew (IRIC).

Recommendation #2: Fire departments should ensure that at least four fire fighters are on the scene before initiating interior fire fighting operations at a structural fire - two in, two out.^{2,3}

Discussion: The National Fire Protection Association (NFPA) recommends that four persons (two in and two out), each with protective clothing and respiratory protection, is the minimum number essential for the safety of those performing work inside a structure. The team members should be in communication with each other through visual, audible, or electronic means to coordinate all activities and to determine if emergency rescue is needed. Also, the recently promulgated standard by the Occupational Safety and Health Administration (29 CFR 1910.134) states that when at least two enter an IDLH atmosphere, e.g., structural fire fighting, two will remain on the outside and maintain visual or voice contact to assist in emergency rescue activities.

Recommendation #3: Fire departments should ensure that Incident Command maintains the role of directing operations on the fire scene, and not become involved in fire fighting efforts.^{4,5}

Discussion: According to NFPA 1561, “the Incident Commander shall be responsible for the overall coordination and direction of all activities at an incident.” In addition to conducting an initial size-up, Incident Command must maintain a command post outside of the structure in order to assign companies and delegate functions, and continually evaluate the risk versus gain of continued fire fighter efforts. To effectively coordinate and direct fire fighting activities on scene, it is essential that adequate staff are available for immediate response to ensure that the Incident Commander does not become involved in fire fighting efforts.

Recommendation #4: Fire departments should ensure that proper safety measures are implemented when accessing a structure through the garage door.⁶

Discussion: When a fire department arrives on the scene of a structure fire and the garage door is open, entry through the garage is obviously the quickest and easiest way to access the structure. Whatever the position or type of garage door (i.e., open, closed, manual, electric, sensors, or no sensors), a potential hazard exists with the door itself. If the door is open, fire fighters can simply walk into the garage. If the door is closed, typically fire fighters will perform forcible entry on the lock and lift the door open. Normally, instinct takes over and fire fighters raise the door as if conditions were normal. However, if the door is closed and then lifted open, an inrush of air will occur with the potential to cause the fire to literally explode and engulf the fire fighter. Garage doors should be forced the same way that commercial sheet-curtain or sectional doors would



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be forced, with an inverted “L” cut. If the door is controlled electronically and it is open, the motor sensor, or transmitter could short out, causing the door to fall. This poses problems such as the fire fighter being trapped inside, or struck and/or trapped by the door or the door falling on the hoselines and impeding the water flow needed for fire suppression and protection of fire fighters inside. If the door must be raised because it cannot be cut and removed or its in the open position, it should be braced or blocked open. Pike poles, rubbish hooks, or ladders can be placed on both sides of the door to prop it open. In this incident, fire fighters entered and exited through the open garage door which had not been braced or blocked open. The victim was suppressing fire in the garage area when the door fell on him, partially trapping him in the debris. It is also stated in the State Fire Marshal’s investigation that “it is further believed that the garage door springs failed due to high heat causing the garage door to fall upon the victim partially enclosing around him.”

REFERENCES

1. National Fire Protection Association [2001]. NFPA 1710, standard for the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments. Quincy, MA: National Fire Protection Association

2. NFPA [1997]. NFPA 1500, standard on fire department occupational safety and health program. Quincy, MA: National Fire Protection Association.

3. 29 Code of Federal Regulations 1910.134, OSHA Respirator Standard.

4. NFPA [1995]. NFPA 1561, standard on fire department incident management system. Quincy, MA: National Fire Protection Association.

5. Page JO [1973]. Effective company command for company officers in the professional fire service. Alhambra, CA: Borden Publishing Co.

6. Hines C [2001]. Beware the garage door! American Fire Journal, August 2001.

INVESTIGATOR INFORMATION

This incident was investigated by Kimberly Cortez and Thomas Mezzanotte, Safety and Occupational Health Specialists, and finalized by Richard Braddee, Team Leader, Fire Fighter Fatality Investigation and Prevention Program, Division of Safety Research, NIOSH



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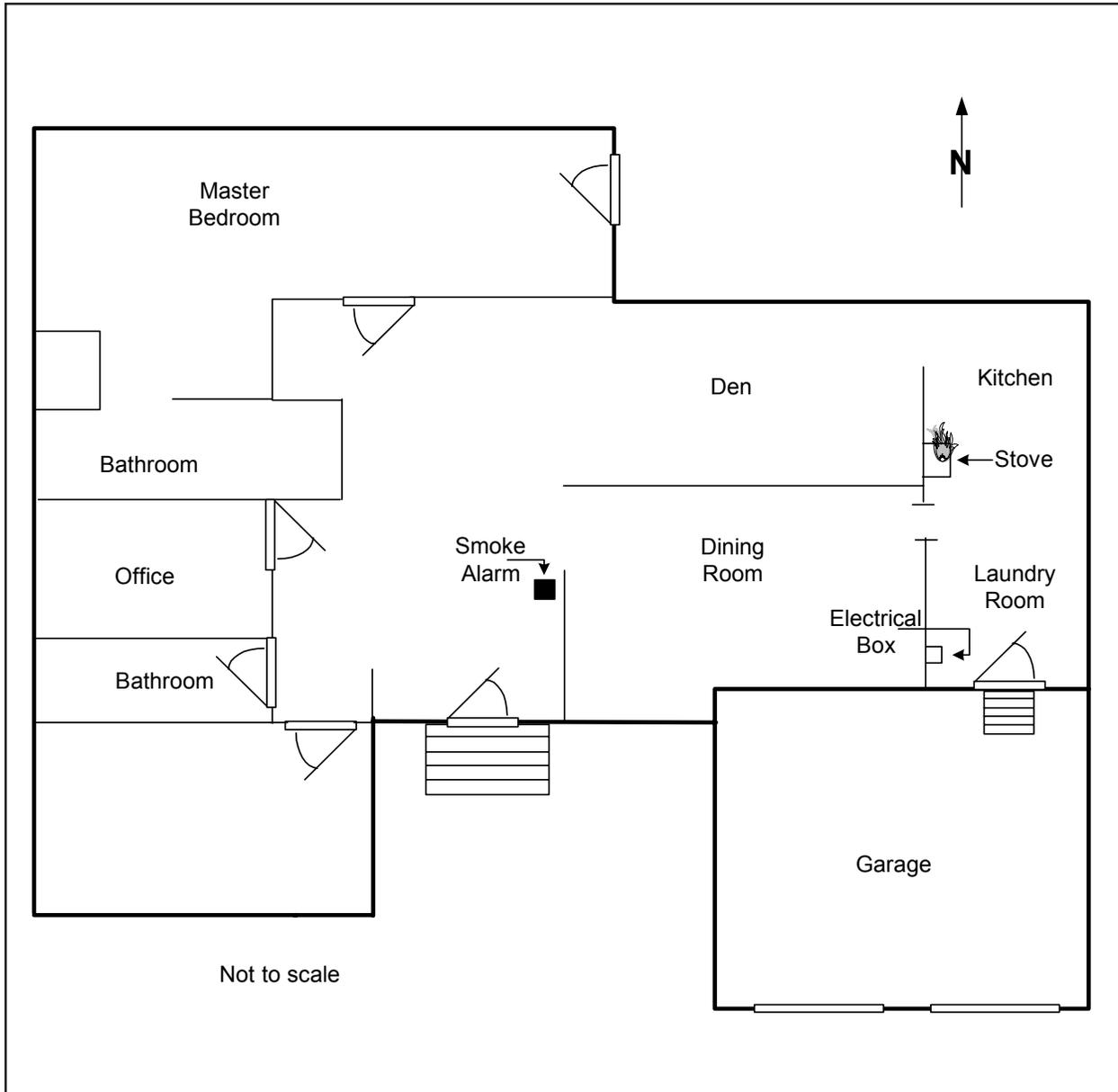


Diagram. Residence Floor Plan

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