



Two Fire Fighters Die and Two Are Injured in Townhouse Fire—District of Columbia

SUMMARY

On May 30, 1999, fire fighters responded to a box alarm involving a townhouse fire. The initial report came in as a house fire, and it was later reported that the fire was in the basement (all fire fighters did not receive the follow-up report of fire in the basement). Engine 26 (Lieutenant and 3 fire fighters) was the first to arrive on the scene and reported smoke showing on the front (side 1) of a row of townhouses (see Diagram 1). A fire fighter (Victim #1) from Engine 26 advanced a 1½-inch attack line through the front door (1st floor). Soon after, the layout man from Engine 26 entered to back up Victim #1. Engine 17 (Lieutenant and 3 fire fighters) arrived shortly after and stretched a 350-foot 1½-inch hose line to the rear (side 3) (see Diagram 1). Truck 15 (Captain and 3 fire fighters) arrived on the scene and began ventilation on the front. Truck 4 (Lieutenant and 3 fire fighters), responding for Truck 13 (out of service), arrived later and began ventilation in the rear. Engine 10 (Lieutenant, Victim #2, and 2 fire fighters) arrived on the scene as the third-due engine and backed up Engine 26 on side 1. Engine 12 arrived as the fourth-due engine and proceeded to side 1 of the building. Battalion Chief 1 (the Incident Commander [IC]) and

Rescue 1 (Lieutenant and 4 fire fighters) also responded as a part of the box alarm.

Engine 26 and Engine 10 advanced their lines through the front door in a search for the fire and the basement door (at the top of the basement steps). As the two crews searched, Truck 4 made forcible entry through a sliding-glass door in the rear (basement entrance door at ground level). Engine 17 (at the basement door with a charged line) reported to the IC that they were on the first floor, in the rear, with a small fire showing (Engine 17 was actually at the basement level). Engine 17 radioed the IC for permission to open their line and knock down the fire. Knowing that he had two engine crews on the first floor in the front, the IC denied Engine 17's request until he could locate the interior crews' positions. He radioed the officer from Engine 26 several times for their position, but received no response.

Engine 17 asked a second time for permission to hit the fire, as it began to grow. The IC denied the request a second time and again tried unsuccessfully



Basement entrance

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>

or call toll free **1-800-35-NIOSH**



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

to radio the officer from Engine 26. Conditions in the interior rapidly deteriorated, forcing the fire fighters on the first floor to search for an exit. A fire fighter in the interior recalled seeing fire appear from a doorway on the first floor. After seeing the fire, the fire fighter stated that everything went black and he felt an intense blast of heat. Victim #1 and Victim #2 were unable to escape, while the Lieutenant and a fire fighter from Engine 26 escaped with severe burns. All injured fire fighters were transported to a local hospital. The Lieutenant and fire fighter were admitted with burn injuries. Victim #1 was treated for severe burns and was pronounced dead the following day. Victim #2 was pronounced dead on arrival at the hospital.

NIOSH investigators concluded that, to minimize the risk of similar incidents, fire departments should:

- *ensure that the department's Standard Operating Procedures (SOPs) are followed and refresher training is provided*
- *provide the Incident Commander with a Command Aide*
- *ensure that fire fighters from the ventilation crew and the attack crew coordinate their efforts*
- *ensure that when a piece of equipment is taken out of service, appropriate back up equipment is identified and readily available*
- *ensure that personnel equipped with a radio position the radio to receive and respond to radio transmissions*
- *consider using a radio communication system that is equipped with an emergency signal button, is reliable, and does not produce interference*

- *ensure that all companies responding are aware of any follow-up reports from dispatch*
- *ensure that a Rapid Intervention Team is established and in position immediately upon arrival*
- *ensure that any hose line taken into the structure remains inside until all crews have exited*
- *consider providing all fire fighters with a Personal Alert Safety System (PASS) integrated into their Self-Contained Breathing Apparatus (SCBA)*
- *develop and implement a preventive maintenance program to ensure that all SCBAs are adequately maintained.*

INTRODUCTION

On May 30, 1999, two fire fighters died and two were injured while battling a townhouse basement fire. Two fire fighters—Victim #1, a 30-year-old nozzleman from Engine 26, and Victim #2, a 29-year-old nozzleman from Engine 10—had to be rescued when interior crews were hit by an intense blast of heat and flames. Victim #1 was rescued and transported to a nearby hospital where he was pronounced dead the following day. Victim #2 was rescued and pronounced dead on arrival at the hospital.

On June 1, 1999, the International Association of Fire Fighters notified NIOSH of the incident, and on June 21, 1999, a Safety and Occupational Health Specialist, the Senior Investigator, and the Team Leader of the NIOSH Fire Fighter Fatality Investigation and Prevention Program, initially investigated this incident. On July 21, 1999, a Safety and Occupational Health Specialist and a



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

Safety Engineer conducted additional interviews. An Engineer and a Physical Scientist from NIOSH also completed an evaluation of the department's SCBA maintenance program on July 21, 1999. On August 31, 1999, a Safety and Occupational Health Specialist returned to interview the seriously injured fire fighter. Meetings and interviews were conducted with: the Chief, the Assistant Chief, the two Battalion Chiefs on the scene (one of whom was the Incident Commander), fire fighters on the box alarm, the department safety officer, and the investigation team from the fire department involved in the incident. Representatives from the personal protective equipment manufacturer, the National Institute of Standards and Technology (NIST) who evaluated the victims' personal protective equipment and will be developing the fire growth data for the department, the metropolitan police, and the owner of the townhouse were also interviewed. Copies of photographs, training records, Standard Operating Procedures (SOPs), the reports completed by fire department investigators, the autopsy reports, and the floor plan of the townhouse were obtained. A site visit was conducted and photographs of the fire scene were taken.

The fire department involved in this incident is comprised of 1,764 total employees, of whom 1,182 are uniformed fire fighters. The department serves a population of approximately 1 million in a geographic area of 69 square miles. The fire department requires all new fire fighters to complete fire fighter level I and fire fighter level II requirements, Emergency Medical Technician courses, hazmat, driver and vehicle operations, first aid, search and rescue, live fire training, and cardiopulmonary resuscitation (CPR). Fire fighters are then assigned to a department where they are placed on probation for 1 year. Each fire fighter is also certified as an Emergency Medical Technician (EMT). Refresher training courses are continued throughout the year. The victims' training records were reviewed and

appeared to be adequate. Victim #1 had 6½ years of experience as a fire fighter and EMT, while Victim #2 had 3½ years of experience as a fire fighter and EMT.

Additional companies responded to this incident; however, only those directly involved are included in this report.

INVESTIGATION

On May 30, 1999, at 0017 hours, Central Dispatch received a call of a house fire. Dispatch toned out a box alarm which consisted of the following:

- 1st due Engine 26 (Lieutenant and 3 fire fighters [including Victim #1])
- 2nd due Engine 17 (Captain and 3 fire fighters)
- 3rd due Engine 10 (Lieutenant and 3 fire fighters [including Victim #2])
- 4th due Engine 12 (Lieutenant and 3 fire fighters)
- 1st due Truck 15 (Captain and 3 fire fighters)
- 2nd due Truck 4 (Lieutenant and 3 fire fighters)
- Rescue 1 (Lieutenant and 4 fire fighters)
- Battalion Chief 1 (the Incident Commander) (BC-1)

The working fire alarm was dispatched at 0023 hours and consisted of the following:

- Engine 14 (Sergeant and 3 fire fighters)
- Chief 2
- Air 2 (1 fire fighter)



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

- Fire Investigation Unit (Car 43) (fire investigator)
- Alcohol Tobacco and Firearms (ATF) (Car 83)
- Medic 17 (2 paramedics)
- Department Safety Officer

The Hazmat Unit was also dispatched at the same time as the working fire alarm.

At 0029 hours, a task force alarm was toned with the following response:

- Engine 6 (Lieutenant and 3 fire fighters)
- Engine 4 (Lieutenant and 3 fire fighters)
- Truck 7 (Lieutenant and 3 fire fighters)
- Battalion Chief 4

As companies responded to the call of a house fire, dispatch made a second report that the fire was in the basement. During the investigation, it became clear that all companies did not receive the second report of a basement fire. Engine 26 was first to arrive on the scene at 0023 hours and reported smoke showing from the front of the building. Being the first-due engine, they positioned the engine in the small parking area in front of the row of townhouses (see Diagram 1). Engine 10 arrived behind Engine 26 as the third-due engine company and stretched a 400-foot, 1½-inch line to the front entrance (see Photo 1). Engine 17 was the second-due engine company, also arriving at 0023 hours. Upon arrival, Engine 17 stretched a 350-foot, 1½-inch line around the adjacent units (see Diagram 1) to the rear of the burning townhouse. Arriving at 0024 hours was Engine 12, as the fourth-due engine company, which by department Standard Operating Procedures (SOPs), required them to back up Engine 17 in the

rear. Instead of backing up Engine 17, the crew of Engine 12 went to the front. The IC (BC-1) was en route to the scene, and from the report he received from Engine 26, he requested a working-fire dispatch. The working-fire alarm dispatched Engine 14, Battalion Chief 2 (BC-2), Air 2, Fire Investigation Unit (Car 43), the Alcohol Tobacco and Firearms (ATF) unit (Car 83), Medic 17, and the department's Safety Officer. The Hazmat Unit was also dispatched at the same time. The IC ordered BC-2 to take command of the rear when he arrived on the scene.

The front door of the townhouse was open and emitting thick, black smoke. With a charged line, a fire fighter from Engine 26 (Victim #1) approached the front door, as his layout man and officer donned their SCBAs. Preparing to enter, Victim #1 experienced a problem with his SCBA facepiece. He returned to the engine and switched facepieces with his Wagon Driver. After switching facepieces, he told his officer at the front door that everything was working properly and he was taking in a line. With a charged line, he entered through the front door. Shortly after, the layout man entered, followed the line, and met the fire fighter (Victim #1). The officer of Engine 26 entered last and proceeded into the structure to locate his crew. With a charged line, a fire fighter (Victim #2) and the Lieutenant from Engine 10 entered behind the officer from Engine 26 to provide back up. The layout man from Engine 10 was ordered by his Lieutenant to stay at the front door and feed the line inside.

Truck 15 arrived on scene at 0024 hours as the first-due truck company, and started ventilation in the front according to department SOP requirements. The officer and a fire fighter on Truck 15 threw a ladder to the roof and the officer began to ventilate the large front window at ground level. Security bars were blocking the window, so a fire fighter from Truck 15 entered the structure, approximately 10 feet into the kitchen area, to vent the window from the interior.



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

The fire fighter then exited the structure (see Floor Plan A-1). Next, the officer from Truck 15 climbed the ladder and stopped at a window on the second floor to knock it out. After knocking out the window, he returned to the ground as the driver and Tillerman from Truck 15 climbed the ladder to the roof. The two of them cut approximately three vent holes in the roof and stated that thick, black smoke was emitting from the holes. Truck 4 arrived at 0025 hours as the second-due truck company and began ventilation in the rear of the structure. *[NOTE: Truck 4 was responding for Truck 13, which was out of service at the time of this incident. Truck 13 was housed in the same station as Engine 10 and would have arrived on the scene at the same time as Engine 10 (approximately 2 minutes earlier) if it had been in service.]* On arrival, a fire fighter and the officer from Truck 4 began forcible entry to the rear basement sliding-glass door (which was protected by an iron security gate (see photo 2)) as the driver and the Tillerman from Truck 4 threw ladders to the windows above the door (see Floor Plan A-2). The fire fighters stated that they saw small spot fires all over the basement floor. The driver and the Tillerman tried to knock out the windows on the second floor, but felt they were unsuccessful because they could not feel the ladders breaking the glass. They also tried to break the sliding-glass door on the first floor with the ladder, but could not. *[NOTE: The windows on the second floor were left open by the homeowner, which is why the fire fighters could not feel the glass break. The sliding-glass door on the first floor was a two-panel sliding-glass door, which fire fighters could not break with the ladder they were using. The sliding-glass door on the first floor had no security gate over it.]* The driver and Tillerman from Truck 4 left the ladder at the window on the second floor and returned to the truck to get a second ladder to go to the roof.

Engine 17 was now positioned at the rear sliding-glass door as Truck 4 prepared entry (basement level). Using a gas-powered saw and a sledge

hammer, the officer and fire fighter from Truck 4 removed the iron security gate and broke open the glass door at 0026 hours (see Photo 2). Members of Truck 4 and Engine 17 stated that when the sliding-glass door was opened, air began to be sucked inside by the fire. They also saw small fires on the floor and stated that when the door was opened the fires grew larger. The Lieutenant from Engine 17 reported to the IC that they had fire on the first floor and requested permission to hit the fire. *[NOTE: Engine 17 was unaware that they were at the basement level due to the route they took to get to the rear. As they proceeded to the rear, they noticed the row houses they went between were only two stories, which caused confusion (see Diagram 1).]* The IC denied their request in fear of opposing hose lines. He then radioed the officer from Engine 26 to locate their position. He received no response from them. The IC knew that the crews from Engine 26 and Engine 10 had entered through the front door on the first floor.

Rescue 1 arrived on the scene at approximately the same time that Truck 4 made entry. They were required to complete search and rescue operations. Two fire fighters from Rescue 1 and a fire fighter from Truck 4 entered the basement to search the interior for any civilians. Shortly after they entered, the Lieutenant from Engine 17 ordered them out as conditions began to deteriorate. One of the fire fighters who exited stated that they were able to follow a small path (limited fire) to the exterior before the entire basement erupted into flames.

The driver and Tillerman from Truck 4, who returned to the truck to retrieve a second ladder, saw that the basement was fully engulfed with fire. They decided to pull a line from Engine 12 to provide back up for Engine 17. Engine 12 was supplying Engine 17 and had positioned their engine towards the rear of the structure, but Engine 12's crew proceeded to the front of the structure (see Diagram 1). The officer



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

and a fire fighter from Engine 12 entered the front of the structure advancing approximately 2 to 3 feet, where they remained throughout the attack. The Lieutenant from Engine 17 requested to hit the fire a second time and was denied. The IC denied their request because he still had not received a response from the officer of Engine 26. The IC radioed the officer of Engine 26 a second time and received no response.

At this point Engine 26 and Engine 10 were inside the structure searching for the basement door. Department SOPs required them to locate the basement door and close it or hold off at the stairs with a fog spray. The fire fighter on Engine 26, who entered the structure to back up the Nozzleman (Victim #1) stated that it was extremely hot, but tolerable, when he met up with Victim #1. He stated that the floor was solid and as they proceeded further into the structure, and visibility was improving. He recalled seeing the sliding-glass door to the rear of the first floor, a table, and a sofa on his right side. This would position Victim #1 and the fire fighter in the living room, in front of the basement-stairs door (see Floor Plan A-1). He also stated there were no signs of fire and the heat remained constant. He could not recall his officer joining the two fire fighters, but did recall hearing a radio transmission. *[NOTE: Only officers carry radios and he did not know whose radio he heard.]* It was determined that Engine 10 was inside backing them up at this time, however, the two fire fighters from Engine 26 were unaware of any other fire fighters inside.

After hearing the radio transmission, the fire fighter from Engine 26, backing up Victim #1, looked over his left shoulder and saw fire appear, filling up what looked to be a doorway. He stated the fire came out of the doorway, then disappeared, and everything went black. At that point he felt an intense blast of heat. He dropped the line and immediately started squirming around in his turnouts, in an attempt to

release the heat. He asked Victim #1 where the hose line was and related to him that something was wrong and they had to get out. Victim #1 responded by saying that he did not know where the hose line was. The fire fighter stated that Victim #1 sounded as if he was in a crouched position waiting to be rescued. He then heard a loud scream from his left side, which lasted approximately 15 seconds. The scream was clear and not muffled by an SCBA. He stated that the scream was getting closer when he heard a loud thump, as if someone dropped to the floor, and then complete silence. He then crawled forward and found the nozzle of a hose line. *[NOTE: Victim #2 was found not wearing his SCBA facepiece. It is believed the scream was from Victim #2.]*

The Lieutenant on Engine 10 recalled that as they backed up Engine 26, he turned back towards the front door and could see some light from the front doorway (entrance). He also stated that it was very hot inside the structure. As he turned back around, he felt an intense blast of heat and was knocked backward by a frantic fire fighter attempting to exit. The lieutenant then exited through the front door. When the heat hit the fire fighters, the Lieutenant thought that he was in the hallway, next to the basement door (see Floor Plan A-1). The officer of Engine 26 stated that as he made his way toward the rear of the structure to join his crew, he also encountered an intense blast of heat. Feeling that he was being burned, he quickly turned, and exited through the front door. The layout man from Engine 10 started pulling out the hose line from Engine 10, in an attempt to assist Victim #2 in his exit. As he pulled the hose line out, he noticed there was no one on the end, which meant Victim #1, Victim #2, and the fire fighter from Engine 26 remained inside.

As the officers from Engine 26 and Engine 10 exited, the IC was walking up to the structure to get a better position. The IC was unaware of any problems until



Fatality Assessment and Control Evaluation Investigative Report #99F-21

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

he got close enough to see the fire fighters exiting. He immediately ran to the front and saw the officer from Engine 26, who related to him that Victim #1 was still inside. The IC then saw the Lieutenant from Engine 10 and ordered him to go back inside with his crew and search for Victim #1. The IC later recalled that the Lieutenant from Engine 10 appeared to be dazed and did not relate to him that anyone else was missing. The IC only became aware that Victim #1 was missing at this time.

The fire fighter from Engine 26, who was still inside, stated that as he grabbed the nozzle he rolled on his back and opened it on the ceiling in a straight stream circular pattern. He felt the room was going to flash and wanted to cool it down. As he applied water, he recalled seeing fire on the ceiling. He stated that the water reduced the heat, but it was still very hot. He opened the line a second time on the ceiling and did not see any fire. He then followed the line, exiting the structure. He did not hear any other fire fighters inside or any Personal Alert Safety Systems (PASS) alarming at that time. He stated that he was inside for approximately 1½ minutes from the time the blast of heat hit them until his exit. He exited the structure at approximately 0031 hours. He asked if Victim #1 had made it out and was told that he had not. He communicated to the IC that he thought Victim #1 was still inside, straight back through the hall, and to the right by a sofa (see Floor Plan A-1).

The IC received an additional request from Engine 17 in the rear, this time stating they were at the basement level and had heavy fire inside the basement. Engine 17 requested permission to hit the fire and the IC responded by telling them that they had a fire fighter down inside, on the first floor, and to hit the fire with a straight stream. Engine 17 opened the straight stream on the fire in the basement and quickly knocked it down. At approximately 0032 hours, the Lieutenant from Engine 10 reentered the townhouse to begin his search.

Joining the Lieutenant was the Lieutenant and a fire fighter from Rescue 1. They entered through the front door to begin their search, stating the heat was tolerable, and visibility was improving. As they got inside the structure they could hear a PASS alarm going off. They immediately followed the shrill alarm to locate a downed fire fighter. The fire fighter was lying under a table, unconscious, and with his SCBA facepiece off. His SCBA was equipped with an integrated PASS alarm, which was automatically activated when the victim turned on his SCBA. After locating the downed fire fighter, they called for assistance to remove him. The IC ordered the Hazmat crew to enter and assist removing the downed fire fighter. Engine 14's crew was already on their way inside to provide assistance. Additional fire fighters from Engine 6 and Engine 4 also entered the townhouse and helped remove the victim to the front lawn, at approximately 0045 hours. They immediately started cardiopulmonary resuscitation (CPR) and provided medical treatment to the victim's burns. The victim, who was later identified as Victim #2, was severely burned and the IC could not determine if it was the fire fighter they were searching for, or another fire fighter. A fire fighter standing nearby related to the IC that he could tell by the size of the victim that it was not Victim #1. The IC continued the search efforts, and at approximately 0049 hours, Victim #1 was found and removed. He was found slumped over the couch face down (see Floor Plan A-1). He was found equipped with a PASS device (manually operated) attached to his turnout gear. The PASS device was not activated and was found in the off position. *[NOTE: The PASS device was later inspected and was determined to be working properly.]* Fire fighters removed the victim to the front lawn of the structure where they located a pulse and immediately provided medical treatment. All three fire fighters, along with the Lieutenant from Engine 26, were transported to a nearby hospital.



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

Victim #1 was treated for his burns and was admitted to the burn unit. He was pronounced dead the following day, May 31, 1999, at 1450 hours. Victim #2 was pronounced dead on arrival to the hospital on May 30, 1999, at 0108 hours. The injured fire fighter from Engine 26 received first-, second-, and third-degree burns to over 60 percent of his body. He was admitted to the burn unit where he was treated for his burns. He has been released from the burn unit and is currently undergoing rehabilitation. The Lieutenant from Engine 26 received treatment for burns to his hands and head area and was released the following day. He is currently back to his normal duties.

CAUSE OF DEATH

According to the Medical Examiner, Victim #1 died due to thermal injuries involving 60% of total body surface area and airways. Victim #2 died due to thermal injuries involving 90% of total body surface area and airways.

RECOMMENDATIONS AND DISCUSSION

Recommendation #1: Fire departments should ensure that the department's Standard Operating Procedures (SOPs) are followed and refresher training is provided.¹

Discussion: *"It is imperative that companies perform their duties as described in the Standard Operating Procedures (SOPs) unless directed by, or with notification to, and approval of, the Incident Commander."*¹ According to department SOPs, the following procedures should take place:

- ❑ ***Engines responding should take their due positions.***

Department SOPs state that the first-due engine company will layout and take a position in the front of the building. The second-due engine company should layout and take a rear position. The third-due

engine company should back up the first-due engine company in the front and the fourth-due engine company should back up the second-due engine company in the rear. Engine 12 was the fourth-due engine company, and according to department SOPs was required to back up Engine 17 in the rear. On arrival, Engine 12 proceeded to the front of the structure and took position, leaving Engine 17 in the rear with no back up. Throughout operations, Truck 4 backed up Engine 17 in the rear.

- ❑ ***Officers should keep in contact, physically or verbally, with their crews at all times during interior fire fighting.***

Department SOPs state that the officer in charge (OIC) should always be in contact with his crew by voice, touch, or sight.

- ❑ ***Ensure that when a fire fighter is not accounted for, it is reported to the IC immediately and a roll-call is ordered.***

Department SOPs state that a mechanism to quickly account for personnel must be available to the IC at any point during the incident. The officer from Engine 10 exited the structure without Victim #2. At that point, the victim's position was not accounted for, and it was not reported to the IC. When the IC becomes aware a fire fighter is not accounted for, a roll-call should then be ordered. When the roll-call is taken, any fire fighters not accounted for should be immediately reported to the IC. In this incident, the IC only became aware that Victim #1 was missing at the time search and rescue efforts took place.

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

- ❑ *Provide adequate personnel to operate according to department SOPs.*

Department SOPs state that Sector Leaders can be assigned to sectors for accountability, to monitor progress, redirect activities within the sector, coordinate activities, monitor safety, request additional resources as needed, communicate with command or other Sector Leaders, and reallocate resources within the sector. The Sector Leader would be a company officer or a Battalion Chief and would be designated as Sector Leader by the IC. In the early stages of this incident, an adequate number of personnel was not on the scene to perform effectively and in accordance with the department SOPs. The officer on Truck 4 was performing tasks with one of his fire fighters while the officer on Engine 17 was on the initial attack line in the rear. All ventilation efforts in the rear were not completed when conditions rapidly changed (the sliding-glass door on the first floor was not vented until conditions deteriorated). Truck 4 eventually backed up Engine 17, because Engine 12 had proceeded to the front of the structure, which also delayed ventilation. With all officers in the rear performing operational tasks, no monitoring took place. This hindered the opportunity to complete proper ventilation, to provide timely reports to the IC, and allowed a breakdown in communication. To be compliant with department SOPs, additional personnel would have been needed to free up a company officer to serve as a Sector Leader.

- ❑ *Ensure that first arriving companies give the required size-up report to communications on the fireground channel.*

According to department SOPs, the first arriving units in the front and rear of the building, or the incident site, should give a size-up report to communications on the fire channel 1 and then switch to the fireground channel for subsequent fireground communications. The fireground channel is an informal radio channel to report what you see, what you don't see, and what you think. It is to be used for fireground communications between units, between units and Sector leaders, and between Sector Leaders and the Incident Commander. All responding units will monitor the fireground channel to hear reports between units on scene and the responding Battalion Chief, and will be aware of the fireground situation before arrival. Also, responding units should monitor the fireground channel since they may be contacted by the Battalion Chief or Sector Leader for assignment prior to arrival on the fireground. In this incident, Engine 26 gave a size-up report to communications when they arrived. A size-up of the rear conditions was never reported by the first arriving unit in the rear.

Fire departments should also ensure that, whenever possible, a size-up is made from the inside. At the initial stage of a fire the inside size-up is more accurate and useful than the size-up made from outside the building. The officers inside the structure are closer to the fire and obviously can see more than someone outside the building at the command post.²

Recommendation #2: Fire departments should consider providing the Incident Commander with a Command Aide. ³⁻⁵



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

Discussion: Aides are personnel assigned to assist the Incident Commander. During large operations, Sector Leaders also may have aides to assist them. They do this by managing information and communications. They can keep track of assignments, locations, and the progress of companies, assist with tactical worksheets, or access reference materials and pre-fire plans. Another important function they may perform is to provide reconnaissance and operational details for the IC (his eyes and ears). Some jurisdictions assign full-time aides to command officers to perform routine administration functions and to act as drivers in addition to their fireground role. Departments should consider the aide to be an individual that has the experience and authority to conduct the required tasks.

Battalion Fire Chiefs are required to respond quickly to emergency incidents. In their response, they have to be fully aware of heavy traffic conditions, construction detours, traffic signals, and other conditions. Also, they must monitor and comprehend which companies are responding, fireground activity, fire conditions, and additional information from dispatch. If possible, they will also monitor all incoming information from dispatch and the fireground and make important decisions. Aides could assist the Battalion Fire Chief in processing information without distraction and complete the necessary tasks en route to the scene. In this incident, an aide could have been directed to go to the rear of the structure and determine what floor level the fire fighters in the rear were on. The aide could have also driven the IC to the incident scene, freeing up the IC to better comprehend all information and make important decisions prior to arrival.

Recommendation #3: Fire departments should ensure that fire fighters from the ventilation crew and the attack crew coordinate their efforts. ^{2,3}

Discussion: The importance of ventilation when attacking basement fires cannot be overemphasized. Fire can quickly spread upward into the structure causing potential problems such as a flashover, backdraft, or weakening of the structure. Ventilation timing is extremely important and must be carefully coordinated with both fire attack and ventilation crews. Ideally, it should occur just ahead of interior crews advancing their hose lines. Properly ventilating the heat and smoke from buildings can reduce the possibilities of potentially hazardous situations fire fighters can be faced with. The fire fighters performing ventilation tasks should be in communication with the fire fighters attacking the fire or entering the structure to coordinate their efforts. In this incident, fire fighters from Engine 26 entered the structure as fire fighters from Truck 15 began ventilation efforts in the front of the structure. Truck 4 was delayed in its ventilation efforts because it arrived late as a replacement for Truck 13 (which was out of service). The crew from Engine 10 also entered behind Engine 26 as back up. At that point, ventilation had not been completed. Fire fighters on the attack lines experienced considerable heat and heavy smoke conditions. They were forced to crawl inside the structure and stated that the heat remained consistent as they proceeded into the structure. When the rear sliding-glass door (basement) was opened by Truck 4, the small fires in the basement began to grow rapidly.

Recommendation #4: Fire departments should ensure that when a piece of equipment is taken out of service, appropriate backup equipment is identified and readily available. ⁵

Discussion: Equipment on the fireground is very important to any fireground operation. It should be kept clean, in safe operating condition, and repaired when necessary. When any piece of equipment is taken out of service for repair, a new or backup piece of equipment should be immediately placed in service. In this incident, the truck company (Truck 13) that would have responded with Engine 10 was



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

out of service. A backup truck was not placed in service to replace Truck 13 causing Truck 4 to be dispatched from a different location. Truck 4 arrived on the scene approximately 2 minutes after Engine 10 (Truck 13 would have arrived on scene approximately the same time as Engine 10), which delayed ventilation procedures.

Recommendation #5: Fire departments should ensure that personnel equipped with a radio position the radio to receive and respond to radio transmissions.³

Discussion: The fireground communications process combines electronic communication equipment, a set of Standard Operating Procedures, and the fire personnel who will use the equipment. To be effective, the communications network must integrate the equipment and procedures with the dynamic situation at the incident site, especially in terms of the human factors affecting its use. The ease of use and operation may well determine how consistently fire fighters monitor and report over the radio while fighting fires. In this incident, radio calls were made several times by the IC to an engine company, and the IC never received a response. Dispatch tapes recorded the transmission made by the IC to the engine company, but it remains unclear why the engine company never responded. NIOSH investigators have also reviewed a photograph taken approximately the same time the interior crews had exited the structure. An officer in the photograph had his radio positioned in his front bottom pocket (approximately waist level) of his turnout coat. The officer was not identified. Fire departments should review both operating procedures and human factors issues to determine the ease of use of radio equipment on the fireground to ensure that fire fighters consistently monitor radio transmissions from the IC and respond to radio calls.

Recommendation #6: Fire departments should consider using a radio communication system that is equipped with an emergency signal

button, is reliable, and does not produce interference.⁶

Discussion: Radio communication is one of the most important functions on the fireground. When situations on the fireground arise, radio transmissions need to be made in a timely and understandable fashion.

❑ ***Departments should operate on a radio frequency that does not “bleedover” or cause interference.***

Radios need to be reliable, in good working condition, and fully charged and ready to use. They should not produce interference or “bleedover.” Fire departments should also take into consideration the frequency on which the radio communications system will operate. The National Fire Protection Association (NFPA) recommends that frequencies should be 15 kHz apart in the VHF high band. The separation in frequencies is to avoid possible interference. The frequencies used by the department involved in the incident are 15 kHz apart. However, in the past, this department has experienced problems with interference or “bleedover” between Channels 1 and 4. Interference or “bleedover” between Channel 1 and Channel 4 has been noted because the frequencies are close to one another. The frequency for Channel 1 (Fire Channel) is 154.190 KHz and the frequency for Channel 4 (Fireground Channel) is 154.205 KHz. Although the frequencies meet the NFPA recommended standard of separation, there still remains a problem with “bleedover” or interference. For this reason, departments should consider changing the fireground channels or adjust the frequencies to reduce further “bleedover” or interference. The radio of the officer from Engine 26 was

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

tested after the fire and appeared to be working properly. The officer could not recall receiving any radio transmissions from the IC; however, the dispatch tapes recorded a radio transmission from the IC to the officer of Engine 26. There is a possibility that the officer did not receive the call because of “bleedover” or interference.

- ***Departments should consider using portable radios equipped with an emergency signal button.***

Fire fighters are always encountering potentially hazardous situations and should be prepared with the proper equipment to assist them in an emergency. Departments should consider using portable radios equipped with an emergency signal button. When fire fighters become trapped or encounter an emergency situation where assistance is needed, they could push the emergency signal button on their portable radio. When the emergency signal button is pushed, it would transmit an emergency alert signal to dispatch, the IC, or possibly all radios. This signal would signify that a fire fighter needs assistance and would alert all fireground personnel that an emergency call is going to be transmitted.

Recommendation #7 Fire departments should ensure that all companies responding are aware of any follow-up reports from dispatch. ³

Discussion: From the very beginning of fireground operations, the IC must use communications to initiate and evaluate fireground actions. Upon arriving, he needs to advise all operating companies of the basic details of the attack plan and provide an initial status

report. This transmission should explain the conditions he can see from the command post, and should be directed to everyone on scene, arriving at the scene, or en route to the scene. The initial report should provide a standard description of the following items: building size, building height, occupancy, fire/smoke conditions, confirmation of any additional reports, designation of command, and action being taken. If a Sector Leader is assigned, the IC can communicate directly to the Sector Leader to receive direct transmissions. Additional reports initiated by dispatch should be noted and all companies, on the scene or responding, should be aware of the report. In this incident, the initial dispatch report stated that it was a house fire. As companies responded, dispatch made a second report stating the fire was in the basement. Some of the companies acknowledged the report, others did not. Fire departments should develop and implement a SOP to ensure all radio transmissions are received by all responding units.

Recommendation #8: Fire departments should ensure that a Rapid Intervention Team is established and in position immediately upon arrival. ⁵

Discussion: A Rapid Intervention Team (RIT) should respond to every major fire. The team should report to the officer in command and remain at the command post until an intervention is required to rescue a fire fighter(s). The RIT should have all tools necessary to complete the job, e.g., a search rope, first aid kit, and a resuscitator to use if a fire fighter becomes injured. The RIT will be ordered by the IC to complete any emergency searches or rescues. It will provide the companies with the opportunity to regroup and take a roll call, instead of performing rescue operations. When the RIT enters to search and rescue, each team member will have a SCBA with a full cylinder and will be physically prepared. In this incident, the officer on Engine 10 and fire fighters from additional companies, who had already been involved in fireground operations, entered the



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

structure to search for Victim #1. If a roll call had been ordered during search operations, the officer of Engine 10 would have been inside the structure and would not have been able to report to the IC that one of his crew members was unaccounted for. If a RIT had been in place, accountability calls could have been conducted because fireground officers would not have been directed to rescue operations.

Recommendation #9: Fire departments should ensure that any hose line taken into the structure remains inside until all crews have exited. ⁷

Discussion: Fire fighters who enter smoke-filled enclosures should be equipped with a safety line or hose line in the event that a fire fighter becomes disoriented or trapped. Many fire fighters who die from smoke inhalation, a flashover, or are caught or trapped by fire, actually become disoriented first. They are lost in smoke, their SCBA run out of air, or they cannot find their way to exit through the smoke. Although fire or smoke kills them, the primary contributing factor is disorientation. By using a life line or hose line, the fire fighter is able to determine the direction of exit by the couplings that connect two hose lines together. The male coupling signifies the exit direction. When trying to exit, fire fighters are trained to find the line and follow it out, which is what the injured fire fighter from Engine 26 did. The line should remain inside as a guide for fire fighters to follow.

Recommendation #10: Fire departments should consider providing all fire fighters with a Personal Alert Safety System (PASS) integrated into their Self-Contained Breathing Apparatus.

Discussion: PASS devices, which are electronic devices worn by the fire fighter, emit a loud and distinctive alarm if the fire fighter becomes motionless for more than 30 seconds. Fire fighters entering

hazardous areas should be equipped with a PASS devices. There are several types of PASS devices available. One device that could be used is the PASS that is integrated into the SCBA. PASS devices integrated into the SCBA will be activated when the SCBA air cylinder is turned on. Manual PASS devices are also used throughout the fire service. These devices require the fire fighter to manually turn on the device each time they use it. In this incident, Victim #2 was equipped with a PASS device integrated into his SCBA. Victim #1 was equipped with a manual device. When search efforts took place, the fire fighters searching the structure were only aware that Victim #1 was missing. When they entered the structure, they recalled hearing a PASS device sounding. The fire fighters followed the alarm and located a fire fighter, later to be identified as Victim #2. Victim #1 was located inside the structure approximately 4 minutes later. Victim #1 was found to be equipped with a manual PASS device attached to his turnouts. However, his PASS device was never turned on.

Recommendation #11: Fire departments should develop and implement a preventive maintenance program to ensure that all SCBA's are adequately maintained. ⁸

Discussion. Fire departments should establish service and maintenance procedures and rigidly enforce them to provide respirators that are dependable and are constantly evaluated, tested, and maintained. Equally important is record keeping, a critical element of any respirator maintenance program. During this incident, Victim #1 stated that as he prepared to enter the structure, he experienced a problem with his SCBA facepiece. He returned to the engine and replaced his facepiece with the Wagon driver's facepiece. NIOSH completed an evaluation of the fire department's SCBA program on July 21, 1999 and issued a report to the department (see Attachment 1).



Fatality Assessment and Control Evaluation
Investigative Report #99F-21

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

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INVESTIGATOR INFORMATION

This incident was investigated by: Frank Washenitz, Safety and Occupational Health Specialist; Rich Braddee, Project Officer/Team Leader; Ted Pettit, Senior Investigator; and Eric Schmidt, Safety Engineer all from the Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH.

The SCBA maintenance program was evaluated by: Tim Merinar, Engineer, and Tom McDowell, Physical Scientist, Respirator Branch, Division of Respiratory Disease Studies, NIOSH.

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia



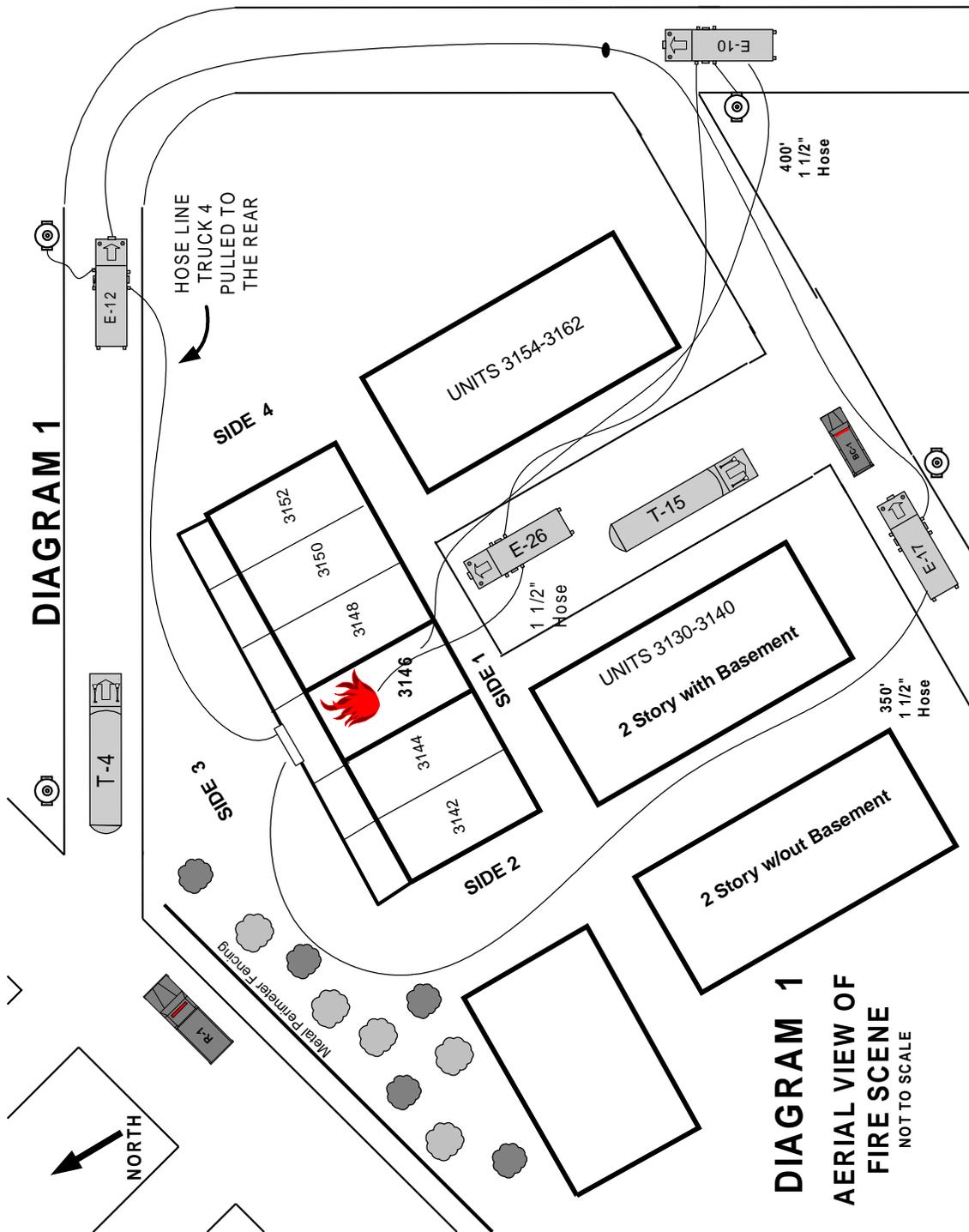
Photo 1: This photo depicts the front (side 1) entrance of the townhouse involved in the incident.

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

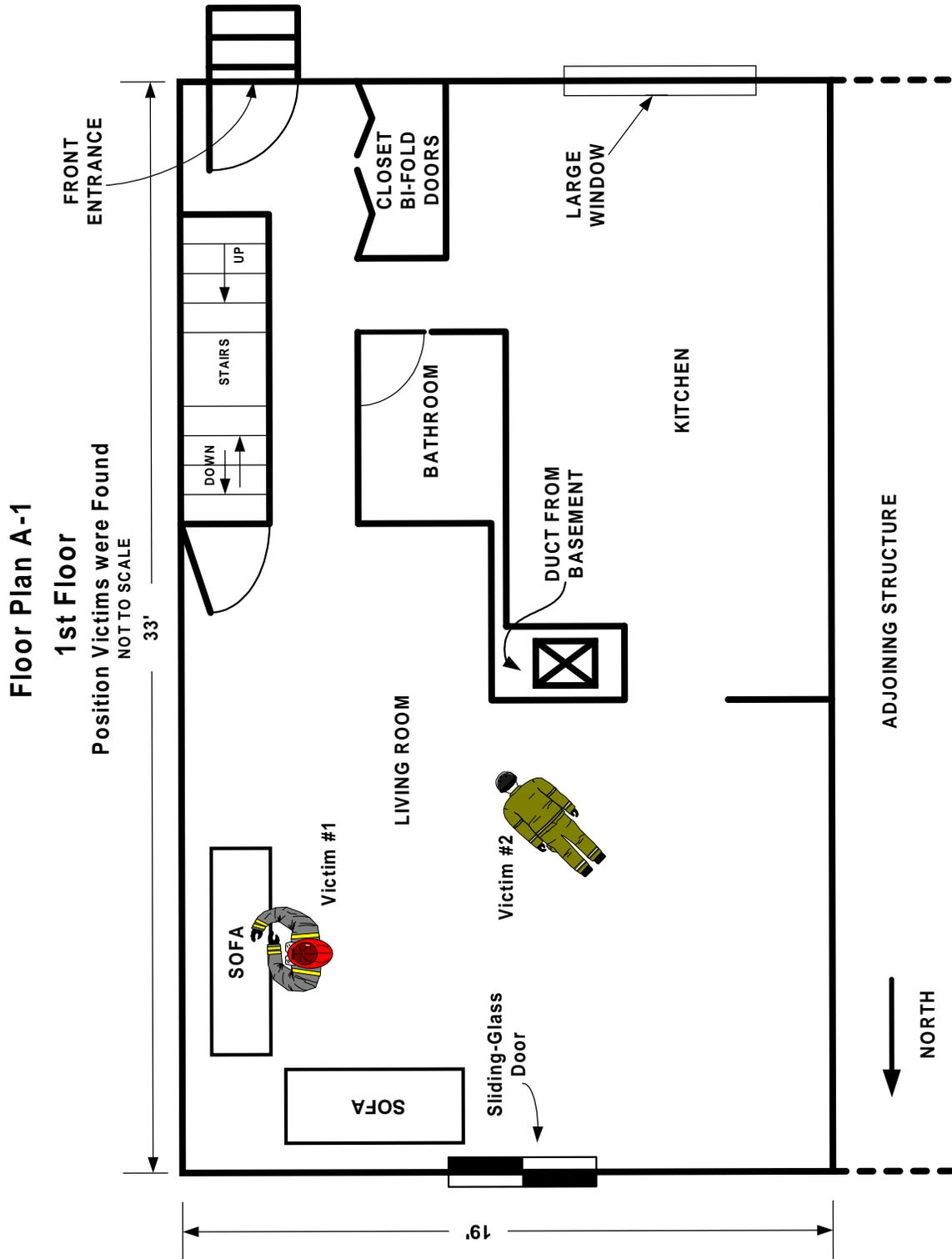


Photo 2: This photo depicts the rear (side 3) sliding-glass door leading to the basement

Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia



Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia





NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

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Two Fire Fighters Die and Two Are Injured in Town House Fire—District of Columbia

Floor Plan A-2
Basement
NOT TO SCALE

