1000 FREDERICK LANE, MORGANTOWN, WV 26508 • 304.285.5916

Two Volunteer Firefighters Die while Conducting Fire Attack at a Single-Family Residence – Pennsylvania

Executive Summary

On December 7, 2022, two volunteer firefighters died after being exposed to a hostile fire event, losing their primary egress, and running out of air at a single-family residential structure fire. At 15:44 hours, the 911 public safety answering point (PSAP), referred to as County Radio, received a call reporting a fire in a residential structure with occupants still inside. The caller, an occupant of the residence, advised that there was a fire involving oil or kerosene, the house was rapidly filling with smoke, and he was unable to locate another family member. At 15:45 hours, five volunteer fire departments were dispatched to a reported structure fire with entrapment. A police officer and chief fire officer arrived on-scene at 15:49. They reported heavy smoke coming from the house and advised that one occupant was missing. At approximately 15:51 hours, the initial arriving fire units began primary searches in the structure for the missing occupant. They initially encountered moderate to heavy smoke conditions, but no fire conditions on the first and second floors. At 15:58 hours, interior crews reported to Command that the primary search did not result in the occupant being found. Secondary searches were initiated. The crews also reported that they had not located any fire on the first or second floor, but that smoke conditions were increasing. They requested the deployment of hoselines into the house for protection. Exterior crews identified the main body of fire in the cellar from an exterior entrance on Side Charlie. A crew then initiated a fire attack into the rear cellar from the exterior.

Photo 1. A view of the structure and conditions at the approximate time of the Mayday operation.
(Courtesy of the fire department)

At 16:05 hours, exterior teams attempted to extinguish the cellar fire with water but were unsuccessful due to the involvement of a combustible liquid (fuel oil). Firefighters recognized the odor of a combustible liquid, combined with the inability to extinguish the fire with water, and a call was made to switch to foam for the cellar fire. A hoseline was deployed through the front door to the second floor for fire attack. Fire was located on the second floor towards Side Charlie. At approximately 16:11 hours, interior crews reported fire in multiple locations on the second floor and requested additional hoselines. Two companies from fire department 17 (engine and tanker) arrived on-scene and reported to the command post for an assignment. The crew of Engine 1712 was directed to enter and assist crews on the second floor with search and fire

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attack. At 16:17 hours, an interior crew on the second-floor reported fire conditions were deteriorating in multiple locations and they were leaving their position. Interior crews reported that the secondary searches were completed at 16:19 hours.

Between 16:20 and 16:30 hours, multiple crews were operating on the second floor with two hoselines, one hoseline deployed through the front door up the stairs and one hoseline deployed via a ground ladder on Side Bravo. Crews on the exterior Side Charlie were also utilizing a hoseline to flow foam to fight the cellar fire and the fire that had extended up the Side Charlie wall. The fire had extended upward from the cellar through voids and the interior to the first floor, second floor, and top half story of the structure. At 16:31 hours, the incident commander (IC), Chief 37, advised County Radio that Chief 32 was Safety, Chief 55 was Water Supply, and Chief 3701 was Operations. Based on multiple reports of deteriorating conditions, Operations Chief 3701 called for all units to evacuate the structure and requested that County Radio activate the evacuation tones at 16:32 hours. Chief 3701 then called for a personal accountability report (PAR).

At 16:33 hours, Deputy Chief 17 advised Operations Chief 3701 that two fire department 17 firefighters were trapped on the second floor. Deputy Chief 17 was communicating with the two firefighters on the fire department 17 radio frequency, which was different than the fireground radio frequency. Chief 3701 called for a hoseline to the front door and advised everyone that he had firefighters trapped on the second floor. Multiple crews, acting as two rapid intervention teams (RIT), started an effort to reach the second floor. One crew accessed the porch roof on Side Alpha via ground ladders to initiate Vent Enter Search (VES) while one crew entered the front door and attempted to use the front stairs to reach the second floor. At 16:34 hours, a Mayday call was made by a firefighter operating on the porch roof on Side Alpha. The call was acknowledged by Command. The Mayday caller advised that he had a downed firefighter inside of a window.

At 16:36 hours, Command requested clarification on the Mayday status and accountability responded that they had two fire department 17 firefighters missing. Deputy Chief 17 confirmed that there were still two fire department 17 firefighters trapped on the second floor at 16:40. Due to rapidly developing fire conditions on both the first and second floor, the RIT was forced back out of the building. Between 16:40 and 16:52 hours, multiple crews worked from the front porch roof to access firefighter 17-1 who was found in the Alpha/Bravo corner bedroom. He was found unconscious and out of air. Additional crews entered the second floor from the front porch roof via the window on Side Alpha where firefighter 17-1 was being removed. They searched the rest of the front half of the second floor and worked towards the Alpha/Delta corner. Conditions on the second floor at this time were rapidly deteriorating with a flow path moving from the rear stairs through the center hallway and out the front window at the end of the hallway on Side Alpha.

Between 16:52 and 17:02 hours, firefighter 17-1 was moved onto the front porch roof. He was then moved to the ground via ladders and transferred to the care of emergency medical services (EMS) in the front yard. Firefighter 17-2 was found by RIT in the Alpha/Delta bedroom. Firefighter 17-2 was out of air and unconscious. Firefighter 17-2 was extricated onto the front porch roof via the window and moved to the ground via ladders and transferred to the care of EMS. Both firefighters were transported to a local hospital in separate ambulances and pronounced deceased at the hospital.

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Contributing Factors

- *Arson fire with an ignitable liquid*
- *Building construction and void spaces in combination with a previous fire*
- *Strategy & tactics specific to hoseline deployments during fire attack*
- *Incident management specific to incident assignment tracking and benchmarking*
- *Ongoing risk vs. benefit analysis*
- *Situational awareness during rapidly deteriorating conditions*
- *Mayday operations and management.*

Key Recommendations

Fire departments should develop and provide training and/or develop and execute standard operating procedures (SOPs)/standard operating guidelines (SOGs) to all department personnel focused on:

- *Fire behavior involving Class B ignitable liquid fires that includes appropriate fire attack strategies.*
- *Recognize and react to the impacts of building construction on fire behavior.*
- *Fire suppression operations in accordance with NFPA 1700.*
- *Communications and tracking of operations at the tactical and strategic levels.*
- *Risk management principles at the tactical and strategic levels.*
- *Situational awareness at the task, tactical, and strategic levels.*
- *Procedures for Mayday operations and management.*

The National Institute for Occupational Safety and Health (NIOSH) initiated the Fire Fighter Fatality Investigation and Prevention Program to examine deaths of fire fighters in the line of duty so that fire departments, fire fighters, fire service organizations, safety experts and researchers could learn from these incidents. The primary goal of these investigations is for NIOSH to make recommendations to prevent similar occurrences. These NIOSH investigations are intended to reduce or prevent future firefighter deaths and are completely separate from the rulemaking, enforcement, and inspection activities of any other federal or state agency. Under its program, NIOSH investigators interview persons with knowledge of the incident and review available records to develop a description of the conditions and circumstances leading to the deaths in order to provide a context for the agency's recommendations. The NIOSH summary of these conditions and circumstances in its reports is not intended as a legal statement of facts. This summary, as well as the conclusions and recommendations made by NIOSH, should not be used for the purpose of litigation or the adjudication of any claim.

For further information, visit the program at www.cdc.gov/niosh/firefighters/fffipp/ or call 1-800-CDC-INFO (1-800-232-4636).

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Introduction

On December 7, 2022, two volunteer firefighters died after being exposed to a hostile fire event, losing their primary egress, and running out of air at a single-family residential structure fire. On December 12, 2022, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. From January 2-7, 2023, three investigators representing the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) investigated this incident. The NIOSH investigators met with representatives from numerous agencies involved in the incident response including local law enforcement and the responding fire departments. The NIOSH investigators also met with representatives of the PSAP and Coroner's Office. The NIOSH investigators inspected the deceased firefighter's structural firefighting turnout gear and the self-contained breathing apparatus (SCBA). NIOSH investigators also reviewed the training records of specific personnel involved in the incident and reviewed the department's SOPs and professional development program.

Fire Department

The volunteer fire department in this incident (fire department 17) operates out of a single fire station and primarily serves three townships with a combined population of approximately 11,500 residents within an 81 square mile rural jurisdiction. The fire department responds via mutual aid agreements to additional areas in the county and to additional areas in the surrounding counties. The location of this incident was a mutual aid response to a surrounding county with an approximate 15-mile response route from the fire station to the incident scene. The fire department operates with 35 volunteer members and maintains an initial attack engine, engine, tanker, rescue, and utility vehicle. When an emergency incident occurs, members are contacted through an emergency response mobile application and respond by apparatus and personal vehicles. The fire department's leadership includes a fire chief as well as assistant and deputy chiefs.

Training and Experience

Firefighter 17-1 held the rank of Assistant Chief with the volunteer fire department 17. Firefighter 17-1 also previously served as a paid firefighter with a career fire department. He had approximately 17 years of experience as a volunteer and career firefighter. Firefighter 17-1 had completed the following training and certifications related to structural firefighting:

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- Pro Board® Firefighter I (NFPA 1001-2008)
- Pro Board® Firefighter II (NFPA 1001-2013)
- FEMA ICS 100, 200, 700
- Pump Operations - 16 hours
- Truck Company Operations - 16 hours
- Strategy & Tactics - 16 hours
- Structural Burn Sessions - 40 hours
- Flashover Recognition - 8 hours
- Firefighter Survival - 16 hours
- Rapid Intervention - 36 hours.

Firefighter 17-2 held the rank of firefighter with fire department 17. He had approximately 33 years of experience working in multiple roles in public safety. Firefighter 17-2 had the following training and certifications related to structural firefighting:

- Firefighting Fundamentals - 48 hours
- Advanced Firefighting - 30 Hours
- FEMA ICS 100, 200, 700.

Personal Protective Equipment

Upon arrival at the scene and throughout the incident, the two deceased firefighters were wearing their fire department issued turnout coat and pants, gloves, hood, helmet, boots, and SCBA that met the requirements of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* and NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*.

The turnout gear and SCBAs were not considered to be a contributing factor in this incident. No further evaluation or testing of the turnout gear and SCBA were conducted by NIOSH.

Apparatus and Response

The following units were dispatched to the incident:

Fire Department	Apparatus	Response
25	2530	Initial
32	3203, 3210, 3230	Initial
37	3701, 3711, 3732, 3771, 3791	Initial
55	5501, 5513, 5530, 5563	Initial
65	6512, 6513	Initial
40	4017, 4024 (Ladder)	Added
17	1712 (Engine), 1721 (Tanker)	2nd Alarm
48	4810	Added

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Cause of Death

The cause of death for both firefighters 17-1 and 17-2 was listed in the coroner's report as *asphyxia and thermal injuries*. Firefighter 17-1 had thermal burns to the torso and left arm. The burns covered approximately 5% of the body and approximately 90% were second degree. Firefighter 17-2 had thermal burns to the head, torso, left arm and hand, and right arm and hand. The burns covered approximately 25% of the body and approximately 15% were third degree.

Weather and Road Conditions

On December 7, 2022, at approximately 15:45 hours, the temperature was 52°F with winds from the west at 5 mph gusting to 7 mph. The humidity was 97% with no precipitation.

Building Construction

The single-family residential structure was situated in a rural area on a large private lot with direct access off a two-lane road **(see Image 1)**. There was no fire hydrant available in the immediate area.

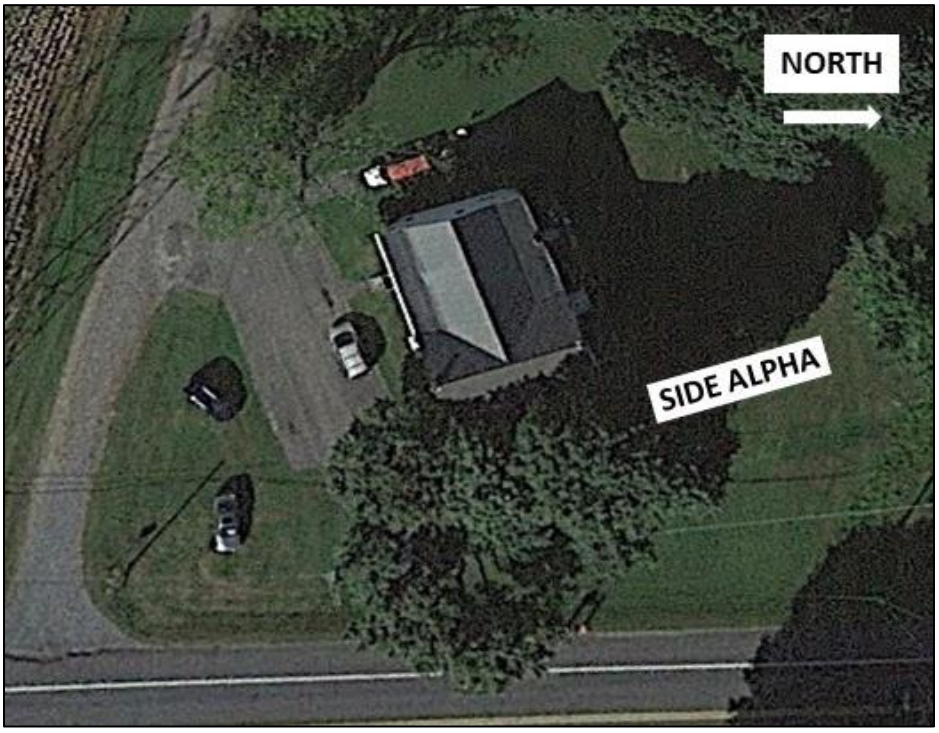

Image 1. Overhead view showing the property layout.
(Courtesy of Google Earth)

The 2½ story structure was approximately 55 feet long and 35 feet wide, with approximately 1,925 square feet on each floor **(see Photos 2-5 and Diagrams 1-3)**.

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Photo 2. Sides Alpha and Bravo. The Bilco door to the front cellar (circled in red on the photo) was visible on Side Bravo.
(Courtesy of NIOSH)

Photo 3. Side Charlie. The exterior door to the rear cellar is visible. The fire extension pathway from the cellar to the top half story is clearly visible.
(Courtesy of NIOSH)

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Photo 4. Side Delta. The Bilco door to the front cellar is visible.
(Courtesy of NIOSH)

Photo 5. Sides Alpha and Delta.
(Courtesy of NIOSH)

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The foundation consisted of a front and rear cellar **(see Diagram 1)**. The front cellar had access on Side Bravo and Side Delta via exterior Bilco doors. The rear cellar had access via an exterior door on Side Charlie and interior stairs that led to the first floor. The rear cellar had a fuel oil storage tank in the Charlie/Delta corner that served as a fuel source for the origin of the fire.

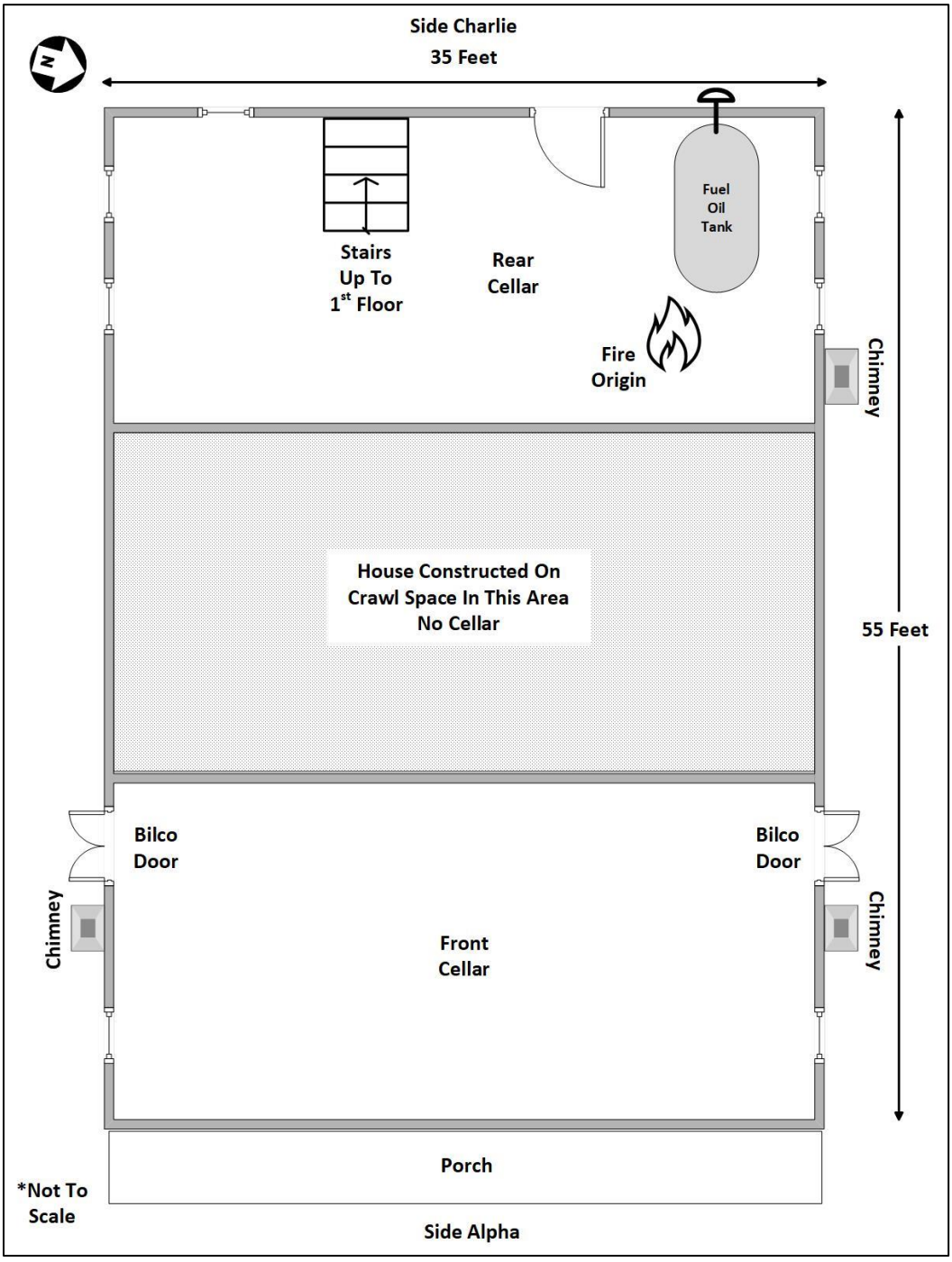

Diagram 1. Front and rear cellar layout.
(Prepared by NIOSH)

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The first floor consisted of 11 primary rooms **(see Diagram 2)**. There was an exterior entry door on all sides except for Side Charlie. There was a front staircase that led up to the second floor and a rear staircase that led both down to the cellar and up to the second floor.

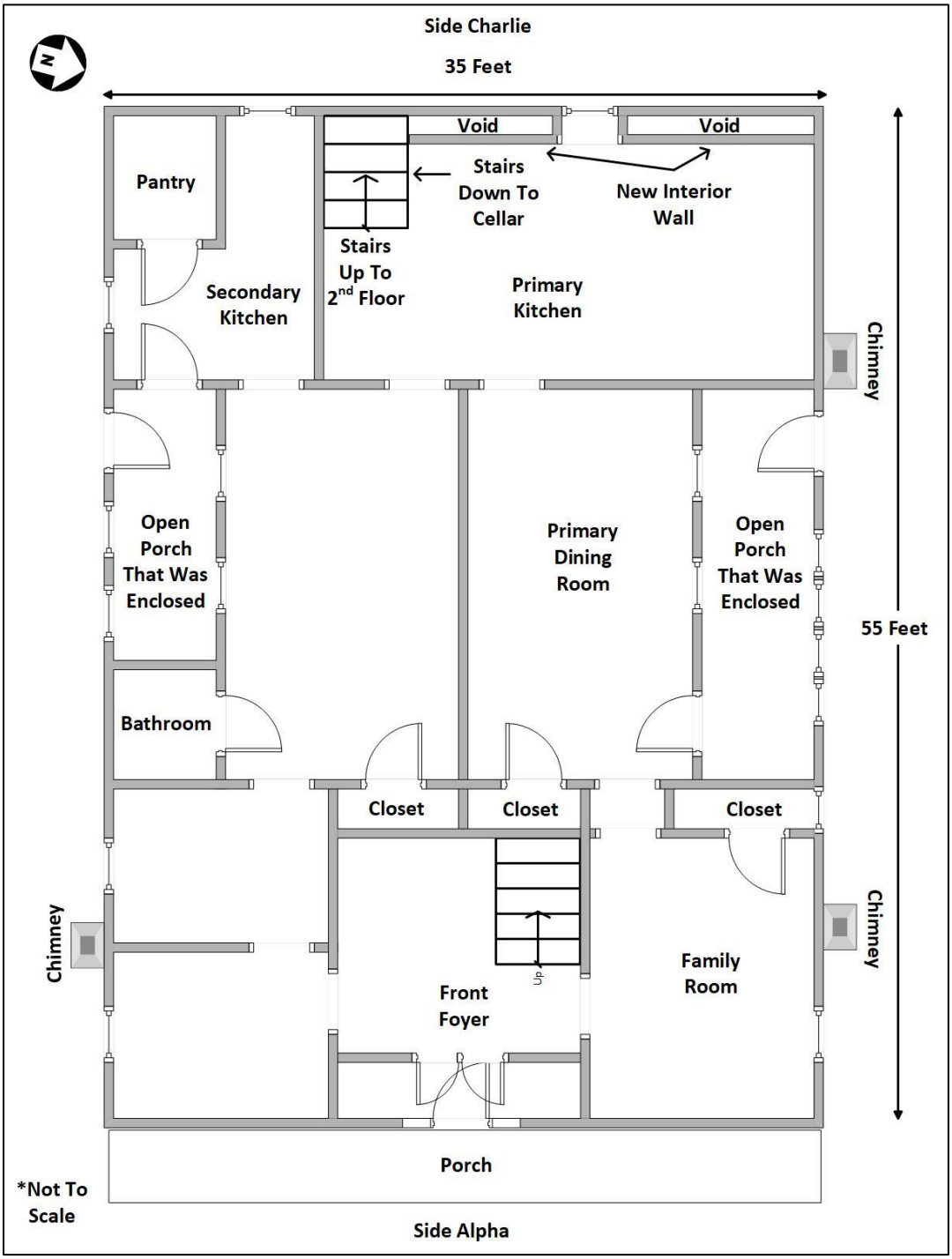

Diagram 2. First floor layout.
(Prepared by NIOSH)

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The second floor consisted of 11 primary rooms **(see Diagram 3)**. There was a front staircase that led both down to the first floor and up to the half story third floor. There was a rear staircase that led down to the first floor only.

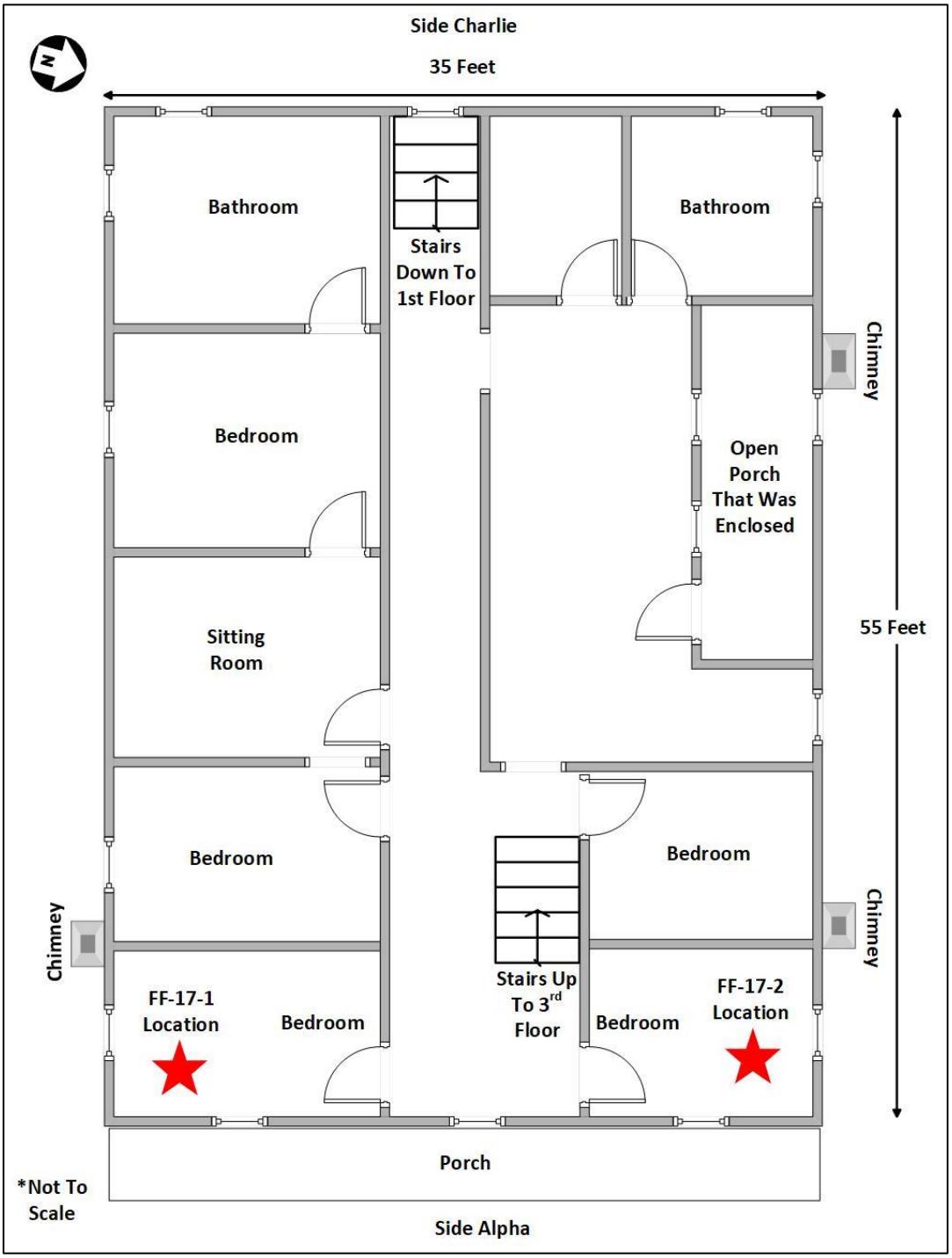

Diagram 3. Second floor layout.
(Prepared by NIOSH)

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The house was built in 1848 as a residential occupancy. In the 1920s, a fire occurred in the primary kitchen area resulting in damage to the exterior load bearing wall on Side Charlie. Given the unique plank construction used in the house, a new load bearing wall to support Side Charlie was constructed. This construction resulted in a new wood frame wall being built along Side Charlie approximately six inches inside of the existing wall. This created a large vertical and horizontal void space between the original exterior wall and the new interior wall **(see Photo 6)**.

Photo 6. First floor Side Charlie wall construction showing original plank wall and new interior wall creating a void space.
(Courtesy of NIOSH)

In the 1960s, the single-family residence went through extensive modifications so that it could be converted into multi-unit apartments. This resulted in several original features being modified, such as the exterior open porches on the first and second floors being enclosed. In the 1980s, the structure was converted back to a single-family residence, removing the separations that were used to create the individual apartments.

The house was constructed of Type 5 wood frame construction known as “plank construction.” This is unique because the walls were constructed with plank boards placed together in several overlapping layers running vertically **(see Photo 7)**.

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Photo 7. Plank construction showing various additions to the structure.
(Courtesy of NIOSH)

Unlike typical frame construction, these later additions resulted in a solid wood wall, running both horizontally and vertically, without any voids. The solid wood wall was finished with a protective exterior weather barrier and a finished interior covering. In this construction, the original exterior barrier was wood siding. As **Photo 7** shows, throughout the life of the house, additional exterior layers were added, including asphalt shingles, foam board, and vinyl siding. The interior finish in this construction was wood lath and plaster.

Fire Origin and Cause

The origin of the fire was determined to be in the rear cellar, along Side Charlie of the structure. The valve of a fuel oil storage tank in the Charlie/Delta corner of the rear cellar **(see Diagram 1)** was intentionally damaged which allowed the fuel oil to flow out and onto the cellar floor where it was intentionally ignited **(see Photo 8)**.

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Photo 8. Rear cellar with fire origin from the side Delta window view.
(*Courtesy of NIOSH*)

The fire developed in the rear cellar and then spread upward through the following areas on Side Charlie:

- Large void in the first-floor wall
- Rear stairwell located to the interior of the first and second floor
- Exterior.

Investigation

On December 7, 2022, two volunteer firefighters, died after being exposed to a hostile fire event, losing their primary egress, and running out of air at a single-family residential structure fire.

One of the occupants of this single-family residence walked around the outside of the house and noticed smoke and flames coming from the door on Side Charlie that led into the rear cellar. The occupant called 9-1-1. At 15:44 hours, County Radio received the call reporting a fire in a residential structure with occupants still inside. The occupant advised the 9-1-1 operator that there was a fire involving oil or kerosene, the house was rapidly filling with smoke, and he was unable to locate another occupant. For approximately the next three minutes, additional phone calls were received from passing motorists reporting the fire. At 15:45 hours, five volunteer fire departments, via mutual aid response, were dispatched to a reported structure fire with entrapment: 25, 32, 37, 55, and 65.

After calling 9-1-1, the occupant went inside the house, retrieved a fire extinguisher, returned to the door leading into the rear cellar, and attempted unsuccessfully to extinguish the fire. The occupant then reentered the house to retrieve some personal items and attempted to locate the other occupant. At approximately 15:48 hours, the occupant exited the structure, at which time he was approached by the first arriving law enforcement officer, PD-195. The occupant advised PD-195 that he was unable to locate the occupant inside. At approximately 15:49 hours, PD-195 reported heavy smoke coming from

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the house and that one occupant was missing. Chief 5501 (C-5501) also arrived on-scene at this time and confirmed a working fire with a missing occupant. C-5501 conducted a rapid and limited primary search but was unable to locate the alleged missing occupant.

At 15:51 hours, Engine 3711 (E-3711) arrived on-scene and pulled down the driveway on Side Bravo of the structure to position adjacent to the Bravo/Charlie corner **(see Image 2)**.

Image 2. Aerial photo of scene.
(*Courtesy of the fire department*)

Chief 37 (C-37-IC), who arrived on E-3711, assumed command of the incident. Two personnel from E-3711 entered the structure through the front door, without a hoseline, and initiated a primary search for the missing occupant. The two personnel encountered moderate smoke conditions, but they did not initially encounter any fire conditions on the first and second floors. They conducted a primary search of the first floor, and then moved to the second floor, searching for approximately 5-6 minutes. At 15:54 hours, these two personnel contacted C-37-IC and requested a hoseline to the second floor.

Between 15:53 and 15:56 hours, multiple units arrived on-scene. Engine 5513 (E-5513) positioned at the end of the house's driveway where it met the main road. E-5513 set up and served as the water supply engine. At 15:58 hours, Tanker 5530 arrived, placed their drop tank next to E-5513, and filled the drop tank with their water. E-5513 deployed a 5-inch supply line to E-3711 to establish a positive water supply for fire attack. Chief 55 (C-55-WS) was assigned to water supply and coordinated the tanker shuttle operations. Engine 6512 (E-6512) and Engine 6513 (E-6513) positioned on an access road that ran to the left of the driveway on the Bravo Side of the house **(see Image 2)**.

The 1¾ inch front bumper line from E-3711 was deployed by personnel from fire department 37 and 65 to initiate a fire attack on the main body of the fire which was in the rear cellar **(see Photo 8)**. The

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fire attack continued for the next 4-5 minutes but proved to be ineffective due to the fire involving an ignitable liquid (fuel oil). The firefighters initiating the attack recognized the smell of an ignitable liquid, combined with the ineffective fire attack, and determined that they would need to switch to a foam-based fire attack. An additional 1¾ inch hoseline from E-6512 which was setup to flow foam, and the fire attack was reinitiated at the rear cellar **(see Photo 9)**.

Photo 9. Initial main body of fire located in the rear cellar.
(*Courtesy of the fire department*)

At 15:57 hours, the initial crew from fire department 37 reported to C-37-IC that the initial/primary search was negative. At 15:58 hours, a second report was made which advised C-37-IC that the primary search was all clear, and they needed to start secondary searches. They also reported being unable to locate the main body of fire and moderate to heavy smoke on the first and second floor. At 15:58 hours, an additional crew of three personnel from fire department 37 entered the structure through the front door, used the front stairs to reach the second floor, and started a secondary search of the second floor.

At 15:58 hours, C-37-IC advised that the main body of the fire was in the cellar at the rear of the house, and he needed additional crews to report to that area for fire attack. At approximately 16:00 hours, a team from fire department 65 deployed a 1¾ inch hoseline from E-3711 down the Bravo Side of the house, through the front door, up the front stairs, and down the center hallway on the second floor towards the rear of the house for fire attack. The fire had extended vertically from the rear cellar, via multiple routes, to multiple locations in the rear of the second floor. Crews operating on the exterior Side Charlie were still unable to fully extinguish the ignitable liquid fire in the rear cellar. They temporarily knocked the fire down, however it continuously reignited.

At approximately 16:08 hours, Truck 4024 (T-4024) arrived on-scene, positioning between the house driveway and the access road on the Bravo Side of the house **(see Image 2)**. The crew from T-4024 were ordered by C-37-IC to setup their aerial, access the roof, and conduct vertical ventilation.

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At 16:11 hours, the interior crew from fire department 65 reported that there was fire in multiple locations on the second floor towards the rear and requested additional hoselines to the second floor **(see Photo 10)**.

Photo 10. Conditions at approximately 16:11 when the second hoseline was deployed. (*Courtesy of the fire department*)

In response to the request, a crew from fire department 37 deployed a second 1¾ hoseline from E 3711 up a ladder on Side Bravo into the middle window on the second floor. For approximately the next 5-6 minutes, the fire attack crews from fire department 65 and 37 worked to open up the walls and ceilings in the rear of the second floor. They extinguished the fire as they located it in numerous areas. The fire had extended from the rear cellar, traveled vertically on the exterior and through void spaces in the Side Charlie wall, and reached the top, half story level.

At 16:11 hours, County Radio advised C-37-IC that the incident was 20 minutes in duration, and they were checking PAR. Between 16:11 through 16:15 hours, C-37-IC conducted a PAR and advised County Radio at 16:15 that all units were accounted for. At approximately 16:15 hours, two companies from fire department 17, Engine 1712 (E-1712) and Tanker (T-1721), arrived on-scene. E-1712 included a crew of five firefighters: Deputy Chief 17 (DC-17), firefighter 17-1 (deceased firefighter), firefighter 17-2 (deceased firefighter), firefighter 17-3, and a driver/operator (DO-17).

Upon arrival, DC-17 utilized two radios, one for the fire department 17 frequency (to communicate with firefighters from 17) and another for fire department 37 frequency (to communicate with incident C-37-IC). All other personnel on-scene operated on a different radio frequency for the fireground operations. Fire department 17's radios were not banked with the same frequencies as the other fire departments operating on the fireground.

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At 16:16 hours, DC-17 reported to the command post to determine their assignments. T-1721 was assigned to the water shuttle operation. The E-1712 crew was told to send their personnel to the fireground. DC-17 then returned to E-1712 to provide an update to the other two responding county stations that were enroute on their radio frequency. At 16:16 hours, Chief 3701 (C-3701) ordered the E-1712 crew to replace the crew that was using the hose deployed through the front door on the second floor. The E-1712 crew, which was made up of firefighters 17-1, 17-2, and 17-3, entered the front door and proceeded up the stairs following the hoseline to the second floor. Shortly after, firefighter 17-3 encountered a lone firefighter who was lost and disoriented. Firefighter 17-3 advised the other two 1712 firefighters that he was going to take the lost firefighter back out of the house. Firefighters 17-1 and 17-2 acknowledged him and proceeded to follow the hoseline further into the second floor. Firefighter 17-3 guided the lost firefighter down the stairs and out the front door. He then stood by at the front door until DC-17 returned.

At 16:17 hours, the interior crew from fire department 65 who were operating on the second floor encountered fire extending up the rear stairs **(see Photo 11)**. They advised C-3701 that the conditions were deteriorating rapidly, they had heavy fire on the first floor, and they were leaving their position on the second floor. Upon exiting at 16:19 hours, the interior crew from fire department 65 reported that the secondary searches were all clear.

Photo 11. Rear stairs, showing the flow path from the rear cellar, to the first floor, to the second floor (Side Charlie). (*Courtesy of the NIOSH*)

At 16:22 hours, Chief 3701 (C-3701-Ops) advised all units that he was assuming Operations. C-37-IC contacted County Radio requesting a second alarm and a Fire Marshal. C-37-IC also contacted C-55-WS to confirm the water supply status. C-55-WS advised that there were 10,000 gallons on the ground and 12,000 gallons waiting.

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From approximately 16:20 to 16:30, fire attack on the interior and exterior continued:

- Interior: two crews, one from fire department 37 and another from 17, operated on the second floor with two hoselines. The team from fire department 37 used a hoseline deployed up a ground ladder on Side Bravo and focused on the fire in the rear Bravo/Charlie corner. The crew from E-1712 (fire department 17) used the hoseline deployed through the front door up the front interior stairs and focused on the fire in the rear Charlie/Delta corner.
- Exterior: Crews on the exterior at Side Charlie continued to flow foam on the cellar fire and the fire that had extended up the Side Charlie wall. The fire had extended vertically from the rear cellar through the void space in the Side Charlie wall, and through the rear stairs to the first floor.

At approximately 16:24 hours, T-4024 placed the aerial ladder to the roof to conduct vertical ventilation. However, the deteriorating fire and smoke conditions forced them to abandon the operation **(see Photo 12)**.

Photo 12. Conditions at the time that T-4024 attempted to ventilate the roof.
(*Courtesy of the fire department*)

At approximately 16:25 hours, DC-17 returned to the front door for a status report. Firefighter 17-3 advised that firefighters 17-1 and 17-2 entered through the front door following the hoseline and were conducting fire attack on the second floor. DC-17 then called another incoming county unit on fire department 17 radio frequency and advised them that him (DC-17) and 17-3 would be making entry into the building. He requested the unit to monitor the department 17 radio frequency. DC-17 and firefighter 17-3 then entered the structure and took the front stairs to the second floor. On the second floor, DC-17 noted that there was heavy dense black smoke with zero visibility and high heat levels. He determined that conditions were very hazardous, and they were deteriorating rapidly. DC-17 unsuccessfully tried to reach the C-37-IC on the fireground radio frequency to advise that an evacuation was warranted. DC-17 advised firefighter 17-3 to leave the house, find C-3701-Ops or C-37-IC, and advise them that an evacuation was warranted. Firefighter 17-3 left the second floor to carry out those orders. DC-17 made several attempts on the fire department 17 radio frequency to reach firefighters 17-1 and 17-2 to advise them to evacuate. DC-17 was able to reach firefighter 17-1 but was

unable to understand his response. DC-17 then left the house to reach C-37-IC for a face-to-face so that he could ensure that an evacuation was ordered, and a Mayday was called if warranted.

At 16:30 hours, a hoseline was stretched from E-5513 to Side Delta to attack the fire that was breaking out on the first floor and extending on sides Charlie and Delta. The crew attempted to make entry through the door on Side Delta that led into the enclosed porch **(see Diagram 2)**, but progress was limited, and they were forced out due to fire conditions that they could not control. This crew remained in place and tried to extinguish fire where they could.

At 16:31 hours, C-37-IC advised County Radio that Chief 32 was Safety, Chief 55 was Water Supply on radio channel A2, and Chief 3701 was Operations. County Radio asked C-37-IC about the status of the trapped civilian and C-37-IC responded, "Unknown at this time still looking." At 16:32 hours, C-3701-Ops called for all units to evacuate the structure and requested that County Radio activate the evacuation tones. This decision was based on several reports of deteriorating conditions from the fire department 65 crew, who had just previously exited the structure, and a report from firefighter 17-3. In response to this request, the evacuation tones were sounded over the radio and the apparatus sounded their airhorns. C-3701-Ops called for PAR.

At 16:33 hours, DC-17, who had exited the house, advised C-3701-Ops face-to-face that two fire department 17 firefighters (17-1 and 17-2) were trapped on the second floor. DC-17 indicated he was speaking to these two firefighters on the fire department 17 radio frequency. Firefighter 17-1 said they were trapped on the second floor next to the "white hoseline" (this was the hoseline deployed via the front door and front stairs). C-3701-Ops called for a hoseline to the front door and stated that he had firefighters trapped on the second floor. Other firefighters told DC-17 that firefighters were evacuating the house via ground ladders; however, DC-17 and firefighter 17-3 determined those were not the trapped firefighters.

Multiple firefighters from fire department 48, who were standing by as RIT, began an effort to reach the second floor. RIT-A entered via the front door and attempted to use the front stairs to reach the second floor. RIT-B accessed the porch roof on Side Alpha via ground ladders to initiate VES. At 16:34 hours, a Mayday call was made by one of the RIT firefighters who accessed the porch roof on Side Alpha. He advised that he was on the first-floor roof and had a downed firefighter inside of a window. The call was acknowledged by C-37-IC but was unclear on the exact location of the downed firefighter.

At 16:36 hours, C-37-IC called C-3701-Ops and requested the status of the Mayday. Accountability responded that they still had the accountability tags of two fire department 17 firefighters. Chief 40 contacted County Radio and requested the response of another RIT to the scene. At 16:38 hours, DC-17 advised C-37-IC and C-3701-Ops that there were still two fire department 17 firefighters trapped on the second floor and they were by the white hoseline. County Radio contacted C-37-IC and advised that the incident was 40 minutes in duration, and they requested a PAR. C-37-IC advised County Radio to dispatch a third Alarm and requested a PAR from all units.

At 16:40 hours, DC-17 advised C-3701-Ops that he had confirmed via radio that the two missing fire department 17 firefighters were trapped on the second floor on the white hoseline. C-3701-Ops asked what they needed, and DC-17 responded that he needed RIT to follow the white hoseline going through the front door. C-3701-Ops advised that RIT had been deployed.

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From approximately 16:34 to 16:44 hours, the initial RIT operations to locate and rescue the trapped fire department 17 firefighters took place:

- RIT-A: Four firefighters made entry through the front door with the RIT hoseline. They were immediately met with fire conditions on the first floor that extended into the front foyer. The decision was made to leave two firefighters on the first floor with the hoseline to prevent the fire from cutting off the front stairs. Two firefighters proceeded up the front stairs and made it to the center hallway at the top of the stairs. The conditions at the top of the stairs were extremely hazardous with smoke, heat, and fire conditions throughout the second floor. They searched at the top of the stairs and looked down the center hallway and noted a firefighter at the end of the hallway towards Side Alpha. They questioned if they could make it to the firefighter due to the extreme conditions when they heard that other firefighters were on the front porch roof and were making entry. At that point, the conditions on the first floor had significantly deteriorated, and the two firefighters who had attempted to protect the stairs called for them to evacuate. The two firefighters made the decision to withdraw given the firefighters on the porch would be in a better position to make the rescue, and their position was not tenable. They came back down the stairs, and all four RIT members exited the house.
- RIT-B: Two firefighters used a ground ladder to reach the front porch roof. One of the firefighters heard a low air alarm inside the bedroom window on the second floor in the Alpha/Bravo Corner. At that time, he called the Mayday. He unsuccessfully attempted to locate the low air alarm/firefighter through the window. At that time the two firefighters were ordered off the porch roof due to concerns that it might collapse.

From 16:44 to 16:52 the second phase of the RIT operations took place:

Based on the inability to reach the fire department 17 firefighters from the interior due to the rapidly deteriorating conditions, firefighters were placed back onto the porch roof to access the second floor. A decision was also made to initiate VES via a ground ladder on Side Bravo. Multiple firefighters from various fire departments accessed the front porch roof via ground ladders. A hoseline was also passed up onto the porch roof to suppress the fire that was venting out of the window at the end of the center hallway on Side Alpha.

- Rescue of firefighter 17-1: The firefighters on the front porch roof entered the bedroom window located in the Alpha/Bravo corner. They were joined by a firefighter conducting VES via a ground ladder on Side Bravo. They located firefighter 17-1 with his PASS alarm sounding. He was unconscious and appeared to be out of air. Multiple firefighters worked to move him back out of the window on Side Alpha and then lower him down to the ground via ladders.

From 16:52 to 17:02 the final phase of the RIT operations occurred:

- Rescue of firefighter 17-2: Additional firefighters also entered the second floor from the front porch roof via the window on Side Alpha where firefighter 17-1 was removed. They searched and confirmed that firefighter 17-2 was not in the same bedroom that firefighter 17-1 was found in. They attempted to move out of that bedroom into the center hallway. However, there was fire and extreme heat moving down the hallway towards the front window. The firefighters on the front porch with the hoseline flowed water into the center hallway window knocking the

conditions back enough to allow the firefighters to cross the hallway into the front bedroom in the Alpha/Delta corner. Once in that bedroom, firefighter 17-2 was located. He was unconscious and appeared to be out of air. He was moved out of the window and onto the front porch roof. He was then moved to the ground via ladders and transferred to the care of EMS.

Both firefighters were transported from the scene, with one in a Basic Life Support (BLS) unit and one in an Advanced Life Support (ALS) unit, with CPR in progress. Both firefighters were pronounced deceased at the hospital. At 17:11 hours, C-37-IC reported to County Radio that the Mayday had been cleared.

Contributing Factors and Recommendations

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the fatalities:

Contributing Factor #1 - Arson fire with an ignitable liquid

Discussion: At this incident there were several hazards related to a Class B ignitable liquid fire:

- The point of origin and fire growth in the rear cellar involved an ignitable liquid in the form of fuel oil. The fuel oil was intentionally released from its storage tank and ignited making the fire incendiary **(see Diagram 1 and Photo 8)**.
- The initial tactic used for fire attack in the rear cellar used water from a hoseline, an ineffective tactic at extinguishing a Class B ignitable liquid fire. Consequently, the cellar fire grew and spread to other areas of the structure.
- When foam was used to extinguish the Class B fire, the foam blanket failed multiple times which resulted in repeated reignitions of the ignitable liquid fire. These reignitions contributed to the continued spread of smoke and fire throughout the structure.
- County Radio did not relay all information about the fire from 9-1-1 caller to responding units. The occupant called 9-1-1 reported to County Radio that there was a fire involving oil or kerosene.

Recommendation #1 - Provide training on fire behavior involving Class B ignitable liquid fires that includes the appropriate fire attack strategies.

Discussion: In 2023, the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Bomb Arson Tracking System (BATS) recorded a total of 21,750 fire-related incidents. Of those incidents, 5,402 incidents (25%) were determined to be incendiary in nature. There were 93 civilian victims, two firefighter fatalities, and 39 firefighters injured at those incendiary fires [ATF 2023].

Class B ignitable liquid fires should be extinguished using the appropriate strategy, tactics, and resources. Bane [2019] highlights three steps related to performing this task.

Step 1: Have the knowledge and ability to recognize the presence of an ignitable liquid fire. Means of identifying an ignitable liquid fire include recognizing (if applicable) [Bane 2019]:

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- Markings (placards or labels) on the ignitable liquid container.
- Shape of the container used to store and/or transport an ignitable liquid.
- Distinct odor given off by some ignitable liquids. Note: although the sense of smell should not be used a primary means of recognizing the presence of an ignitable liquid, if the smell is inadvertently recognized prior to PPE being utilized, it should be acknowledged.
- Multicolored rainbow sheen associated with hydrocarbons when a liquid is observed.
- Readings from air monitoring devices, including a combustible gas meter.
- Fire behavior associated with an ignitable liquid, including the inability to extinguish the fire with water.

Some ignitable liquids can be difficult to positively detect via the methods mentioned above. If there are doubts about the presence of an ignitable liquid, then firefighters can take the appropriate proactive and precautionary steps to fight the fire as if it does involve an ignitable liquid.

Step 2: Utilize the appropriate strategy and tactics [Bane 2019]:

- Recognize the appropriate overall strategy. Without the proper resources, a defensive operation might be warranted until proper resources are available and operating.
- Stop or limit the flow of the ignitable liquid. This may be an initial, immediate, or a delayed step after gaining an appropriate level of fire control.
- Use the proper extinguishing agent (i.e., chemical agents or Class B foam). The proper extinguishing agent is dictated by the type of fuel, quantity of fuel, environmental conditions, and the fire behavior.
- If Class B foam is used, proper foam application steps include proper:
    - **Delivery:** the equipment used must match the required flow rates.
    - **Type of foam concentrate:** the foam concentrate must be effective on the type of ignitable liquid involved.
    - **Amount of foam concentrate:** the percentage of foam concentrate needs to be matched to the type of ignitable liquid.
    - **Aeration of the foam solution:** an appropriate nozzle/aerator that introduces air into the foam solution to form bubbles as a part of the vapor suppressing blanket.
    - **Application of finished foam:** the application technique (e.g., sweep, bank, or rain down) should be specific to the situation.
    - **Re-application of foam:** this situation specific; however, foam may have to be reapplied to maintain an effective vapor suppressing blanket.

Step 3: Appropriate actions are taken to prevent the fire from reigniting [Bane 2019]:

- Ensure the extinguishing agent is working as intended and reapply as necessary.
- Conduct air monitoring to ensure flammable vapors are eliminated or remain below the lower explosive limit (LEL).

If there are doubts about the ability to keep the fire from reigniting then appropriate precautions, such as evacuating the area, should be taken to protect firefighters and the public. Failure to recognize a Class B ignitable liquid fire can result in the use of standard firefighting operations for Class A ordinary combustibles, leading to rapid fire development, spread, and exposing firefighters to a fire that they are not capable of extinguishing. As such, fire departments should ensure that their

firefighters are provided with the necessary professional development opportunities to recognize these fires and are equipped with the proper resources to effectively extinguish these fires. This includes educating firefighters on reading smoke which helps identify the location and intensity of a fire as well as the likelihood of a hostile fire event. Reading smoke helps firefighters and ICs make better strategic and tactic decisions regarding what they see on the fireground [Dodson n.d.].

Contributing Factor #2 - Building construction and void spaces in combination with a previous fire

Discussion: At this incident there were several hazards related to building construction:

- A large open void space on Side Charlie ran horizontally and vertically between the original exterior wall and a new interior wall on the first floor. This large void created a space where the fire could grow and spread. This void was also difficult to access for fire attack. This was an abnormal building construction feature that the fire department was not expecting nor were aware of during the initial fire attack efforts.
- The rear staircase ran from the rear cellar to the second floor. This vertical pathway allowed the rapid spread of smoke and fire throughout the interior of the structure. The rear stairway, combined with the center hallway running unobstructed from the rear to front of the second floor, created a flow path when the window at the end of that hallway failed. Also, having both a rear and front set of stairs allowed for the rapid spread of smoke, heat, and fire up to the second floor.

These combined features allowed the fire to develop and spread in ways that were not fully understood or anticipated. This led to rapidly deteriorating conditions on the second floor resulting in the downed firefighters being caught in a hostile fire event (flashover and/or flow path) with their primary means of egress cutoff.

Recommendation #2 - Recognize and react to the impacts of building construction on fire behavior.

Discussion: Firefighters are faced with the challenges of identifying the type(s) of construction in private residences and how it will impact fire behavior and firefighting operations. In most cases, firefighters lack the legal authority to access private residences for inspections and preplans. A private residence can go through construction changes over time which can negatively alter the original fire and life safety code features. Given the lack of knowledge that firefighters may have about the structure on arrival, it is critical to conduct ongoing size ups to determine the type(s) of building construction and features present. The findings of these size ups should be comprehended, and predictions made as to how it may positively or negatively impact the fire behavior and firefighting operations.

Due to the lack of pre-incident information available for residential structures and the variation that can exist with fire routes and fuel loads, all personnel operating on the fireground need to collect and share critical information on the building construction and other unique design features. This can be accomplished by:

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- Asking occupants questions about the building construction such as:
  - How many floors are in the structure?
  - Does the structure have a cellar/basement?
  - If the structure has a basement, does it have finished walls and ceilings, and is it accessed from the interior, exterior, or both?
  - How many sets of stairs are in the structure? Where are they located? What floors do they access?
  - Does the structure have any unique features such as hidden rooms or passageways?
  - Are there security features that could inhibit ingress and egress?
- Physically opening the interior and exterior of the structure to expose key structural elements, so the type of construction and features present can be identified.

On arrival, crews had a moderate to heavy smoke condition but no fire on the first or second floors. Size-up revealed the fire in the basement. This information indicated that the structure had vertical void spaces and flow paths. Based on the cues provided by the fire behavior in the structure, the movement of the fire from the basement up though voids in the structure should have been recognized and addressed, regardless of the knowledge or lack of knowledge of the construction details of the structure.

Building Construction

Each type of occupancy can have a unique type of building construction and features that can have a positive or negative impact on fire behavior and firefighting operations. When classifying the construction type and any unique design features, four areas that can be evaluated. Specifically, NFPA 220 [2024] notes five types of building construction:

- 4.3.1 Type I and Type II Construction – **Type I (Fire Resistive)** and **Type II (Noncombustible)** construction include those types in which the fire walls, structural elements, walls, arches, floors, and roofs are of approved noncombustible or limited-combustible materials.
- 4.4.1 Type III Construction – **Type III (Ordinary)** construction is the type in which exterior walls and structural elements that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and in which fire walls, interior structural elements, walls, arches, floors, and roofs are entirely or partially of wood of smaller dimensions than required for Type IV construction or are of approved noncombustible, limited-combustible, or other approved combustible materials.
- 4.5.1 Type IV Construction – **Type IV (Heavy Timber)** construction encompasses fire walls, exterior walls, and interior bearing walls and structural elements that are portions of such walls that are of approved noncombustible or limited-combustible materials, except as allowed for exterior walls in 4.5.6.7. Other interior structural elements, arches, floors, and roofs are comprised of solid or laminated wood or cross-laminated timber without concealed spaces or with concealed spaces conforming to 4.5.4 and comply with the allowable dimensions of 4.5.5.
- 4.6 Type V Construction – **Type V (Wood Frame)** construction entails structural elements, walls, arches, floors, and roofs that are comprised entirely or partially of wood or other approved material.

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Type I (Fire Resistive) - has the highest protection levels while Type V (Wood Frame) - has the lowest level of fire protection features. Specific to the building where the incident occurred, it was constructed using an uncommon form of Type V Wood Frame known as plank framing. While this construction is uncommon in most of the country, it was a fairly common type of construction in the geographical area where this incident occurred. In order for firefighters to determine the types of building construction and features associated with them, they need to receive professional development that covers the general types of building construction commonly found as well as the types of building construction that are unique to where they will be operating.

As another example, this structure had multiple, open staircases to connect the floors; this construction can serve as a vertical pathway for the rapid spread of smoke and fire [Dodson 2021].

Building Size

At this incident, the structure was of medium size (i.e., Four) due to the four stories and about 4,000 square feet overall. For medium size structures, usually 400 feet of hoseline will reach all areas and four hoselines are required for extinguishment. Although this was a medium structure, it is important to note that it was larger than what would typically be encountered in many areas for a single-family residence. This larger structure had a negative impact on the fire behavior with the fire having a much larger fuel load and areas where it could spread. It also negatively impacted the firefighting operations. Firefighters had to cover more area in their searches and encountered more areas where they had to access and attack the fire [Mittendorf 2015].

Building Occupancy/Use

Building occupancy/use is based on the primary use of the building when it was constructed. The most common types of occupancies include:

- Private Family Dwellings – single and multiple
- Commercial – retail, hotels/motels
- Industrial – manufacturing, warehouse
- Public Assembly – theaters, churches, sports venues.

The occupancy/use of a building can change over its lifespan. In some cases, a change can introduce a high hazard in a building that was originally constructed for a low hazard occupancy. The fire structure in this incident had been through several changes during its lifespan from being a single-family occupancy, to a multifamily occupancy, and back again to a single-family occupancy. These occupancy changes resulted in modifications to access points, enclosing porches, room layouts, and room usage. Evaluating some of these changes made can help determine if the building construction and features could have a positive or negative impact on fire behavior and firefighting operations.

Building Locations and Fuel Loads

Evaluating primary locations and fuel loads for fire development can also have a significant impact on fire behavior and firefighting operations:

- **Interior Spaces and Contents**: this involves a fire in the finished and occupiable spaces where the primary fuel load is the contents and surface finishes in those spaces. The compartmentalization of these spaces can have a significant impact on fire development and spread. When ventilated, there is the potential for rapid fire development leading to a flashover.

When not ventilated, there is the potential for a backdraft as these spaces are opened up for access. Another hazard posed by these fires is that they can cut off primary egress routes as they rapidly develop and spread.

- **Void Spaces and Structural Elements**: this involves a fire in the void spaces found in the floors, walls, and ceilings. This can also include void spaces such as attics and crawl spaces. The primary fuel load is the exposed building construction materials. Contents can also serve as a fuel load if these spaces are used for storage. Further, limited ventilation of spaces can significantly impact fire development. For example, there is a potential for a backdraft as spaces are opened for access, for failure and collapse as the structural elements in these spaces are consumed and weakened by the fire, posing a significant challenge in locating and gaining access for fire attack.
- **Exterior Spaces and Exterior Finishes**: the primary fuel load is the exterior building construction materials. These spaces are well ventilated, so development is primarily impacted by the available fuel load. With some types of building construction, such as Type 4 and Type 5, the exterior finishes include large quantities of combustible fuels. There are several hazards associated with these fires. There is a potential for failure and collapse as the structural elements involved are consumed and weakened by the fire. These fires can also pose challenges in accessing them to include the need to use dedicated hoselines on the exterior and using ground and aerial ladders for access.

All three locations and fuel loads were involved in this structure fire and had a negative impact on the fire behavior and firefighting operations. Fire present in all three locations required a large number of personnel and equipment resources, beyond what was available to effectively locate, confine, and extinguish all the fire. Having fire in the void spaces was also challenging for the available firefighters as the void spaces had to be opened prior to water being applied.

A primary focus of assessing building construction is the probability of structural collapse. There should also be ongoing assessment to determine if the firefighting operations are having the intended outcomes, and if not, it should be considered if there is something related to building construction that is having an unforeseen negative impact. It is also important to have an effective and ongoing feedback loop between the crews operating and the incident management team as the building construction and key features are being identified.

Contributing Factor #3 - Strategy & tactics specific to hoseline deployments during fire attack

Discussion: There were several hazards related to strategy & tactics specific to hoseline deployments during the fire attack:

- The initial hoseline deployed for fire attack in the cellar was water based and not effective at controlling or extinguishing the ignitable liquid fire.
- While orders were given by the incident commander (IC) to initiate a fire attack on the first floor, no hoseline was ultimately deployed to the first floor. There was a miscommunication resulting in the hoselines intended for use on the first floor being redirected for fire attack on the exterior.

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- With the initial efforts to extinguish the cellar fire being ineffective and the lack of a hoseline(s) operating on the first floor to contain the fire spread, the fire was able to rapidly develop and spread throughout the structure ultimately resulting in a hostile fire event (flashover and/or exhaust portion of the flow path) on the second floor and both sets of stairs being cutoff eliminating the primary means of egress as they served as the exhaust portion of the flow paths initiating in the basement.

Recommendation #3 - Conduct fire suppression operations in accordance with NFPA 1700.

Discussion: Per NFPA 1700, *Guide for Structural Firefighting*, in Chapter 10 *Tactical Considerations for Fire Control and Extinguishment*, in section 10.4.14 [2021]:

> *When high-priority tasks can be accomplished simultaneously, it is important to support and protect the rescue or search operations using hose line(s) and flow path management. Ignoring the fire during search and/or rescue operations is a recipe for disaster. If the fire is extinguished early enough, there will be less smoke, heat, flame, and potential for rapid fire development and its associated dangers. Regardless of the assigned priorities of on-scene crews, a fire control crew should not overlook the needs of a trapped occupant, and a rescue or search crew should not disregard the risks presented by active fire.*

Developing an effective incident action plan (IAP) for a fire extinguishment process should include determining:

- Where the fire is located, considering occupiable interior spaces, the structural void spaces, and the exterior of the structure.
- The best strategy and tactics to extinguish the fire. This includes determining if the fire attack is being carried out to support life safety, property conservation, or incident stabilization.

The size up process should include visible observations on all sides and areas of the structure, conversations with any occupants or witnesses, and utilizing technology such as a thermal imaging camera. This size up process must be ongoing throughout the fire attack process and adjustments must be made as the positive or negative changes in conditions are noted.

When conditions allow, fire suppression should start at the lowest level in the structure, with the fire attack being initiated on the same level as the fire. Initiating a fire attack from a floor above the fire is higher-risk due to the potential for structural collapse and the ability of the fire to spread vertically. A comprehensive risk/benefit analysis should be carried out before a fire attack is initiated from the floor above.

Fire attack should be initiated with a hoseline that meets the requirements identified in the fire attack size up to include the proper length of hose to reach all necessary areas, proper hose diameter that will provide the required flow, and the correct type of nozzle to apply the water effectively as needed. Per NFPA 1410, *Standard on Training for Emergency Scene Operations*, a minimum of two hoselines should be deployed for an offensive interior fire attack. They are defined as [NFPA 1410 2020]:

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Initial Attack Line

- *3.3.33.3 Initial Attack Line - The first hose stream placed in service by a company at the scene of a fire to protect lives or to prevent further extension of fire while additional lines are laid and placed in position.*
- *8.2.2 - The initial attack shall provide a minimum flow of 100 gpm (379 L/min) from the nozzle.*

Backup Line

- *3.3.33.2 Backup Line - An additional hose line used to reinforce and protect personnel in the event the initial attack line proves inadequate.*
- *8.2.3 - The required flow from the backup line shall be a minimum of 200 gpm (757 L/min).*

A minimum of two hoselines should be deployed. However, the layout of the structure and the fire conditions ultimately dictate the number of hoselines that should be deployed to effectively protect egress and extinguish the fire. This would generally include at least an initial attack line and a backup line for each level of the structure where fire is present or has the potential to reach. Once the number of hoselines has been determined as part of the IAP, the IC must consider if the necessary resources are available to support the deployment of those hoselines.

Hazardous conditions that need to be identified and addressed as the fire attack is being carried out include:

- Recognize and prevent the fire from reaching areas that can cut off egress.
- Not create openings or change the airflow in a way that will introduce fresh air, which can lead to a hostile fire event such as a backdraft or flashover.
- Not create openings or change the airflow in a way that could lead to a flow path that threatens civilian and firefighter lives due to the rapidly changing smoke, heat, and fire conditions.

Throughout the fire attack operations, it is important to ensure [Avillo 2015]:

- At the task and tactical levels, progress/benchmarks are confirmed and communicated (e.g., fire location is confirmed, fire is confined/extinguished, and there no extension).
- At the tactical and strategic levels, any tactics and components of the IAP should be working effectively, to support the incident priorities to include life safety, incident stabilization, and property conservation.
- Availability of resources to support the current and ongoing operations is also important.

Fire control and extinguishment benchmarks should be documented by the IC, or a member of the incident management team, on some form of a tactical worksheet. Fire control and extinguishment is a critical part of the overall IAP, and any failure to effectively execute that part of plan should be recognized immediately. If a failure is recognized, and it cannot be immediately addressed with an appropriate corrective action, then the IC should consider if interior offensive operations should be terminated, and personnel withdrawn from the structure.

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Contributing Factor #4 - Incident management specific to incident assignment tracking and benchmarking

Discussion: During this incident there were several hazards related to incident management specific to assignment tracking and incident benchmarking.

As warranted by reports of a missing occupant, the fire department made it a priority to conduct primary and secondary searches of the structure. The initial/primary searches were reported from the interior crews via radio as being completed at 15:58 hours, which was 9 minutes after fire department arrival. The secondary searches were reported from the interior crews via radio as being completed at 16:19 hours, which was 30 minutes after fire department arrival. However, with both of those reports, when County Radio asked about the status of the trapped occupants at 16:31 hours, which was 42 minutes after fire department arrival, the response from command was "unknown at this time still looking."

There were also inconsistencies with the hoseline deployments. There were hoselines deployed to the rear cellar, the second floor, and the exterior. However, there were no hoselines deployed to the interior of the first floor. This was attributed to:

- Communications not being clear as to where hoselines should be operating.
- Orders not being completed as assigned.
- A lack of communicating the location and status of the hoselines in operations between the crews operating and the incident management team.
- Communication between three radio frequencies: fire department 17, fire department 37, and a fireground channel.
- Not having a proper 360-degree size up.
- Improper recognition of smoke from basement of Charlie side.
- Accountability issues where crews were not aware of each other in structure.

Recommendation #4 - Utilize communications and tracking of operations at the tactical and strategic levels.

Discussion: There are three primary elements that must be identified and addressed in an IAP to effectively address a structure fire incident. Once a determination has been made on how these components will be addressed in the IAP, the assignments must be effectively communicated to the appropriate personnel at the corresponding levels.

1. **Strategic Level**
    - Consider the immediate incident priority:
        - Life safety
        - Property conservation
        - Incident Stabilization
        - Environmental Protection.
    - Consider the primary operating mode:
        - Offensive operations

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        - Defensive operations
        - Transitional operations that switch from offensive to defensive or defensive to offensive.

2. **Tactical Level**
    - Identify the appropriate plans to address the primary tactical priorities, covered by the acronym RECEO-VS, which includes:
        - Rescue
        - Fire Control & Extinguishment
        - Overhaul
        - Ventilation
        - Salvage.
    - The specific actions required to complete each of the tactical level assignments.

Once assignments are underway the IC working at the strategic level must communicate frequently with the company and chief officers who are operating at the tactical level to ensure that the assignments are [Brush 2024]:

- Being carried out by the personnel who were assigned to complete them. If the original personnel assigned were not able to complete the assignment and other personnel have taken it over, the IC should be updated so that accountability and resource availability can be updated.
- Taking place at the location where they were assigned. If the personnel assigned never made it to the location assigned or were forced to move to another area, that change should be communicated to the incident management team so that accountability can be updated, and the impact on the IAP can be evaluated.
- Making acceptable progress in the anticipated time frame. If acceptable progress is not being made, the reason for the lack of progress and the plan to address it should be communicated to the incident management team so that the impact on the IAP can be evaluated.

The use of a conditions, actions, needs (CAN) report can help communicate this information (s**ee Image 3**) [Fire Engineering 2009]:

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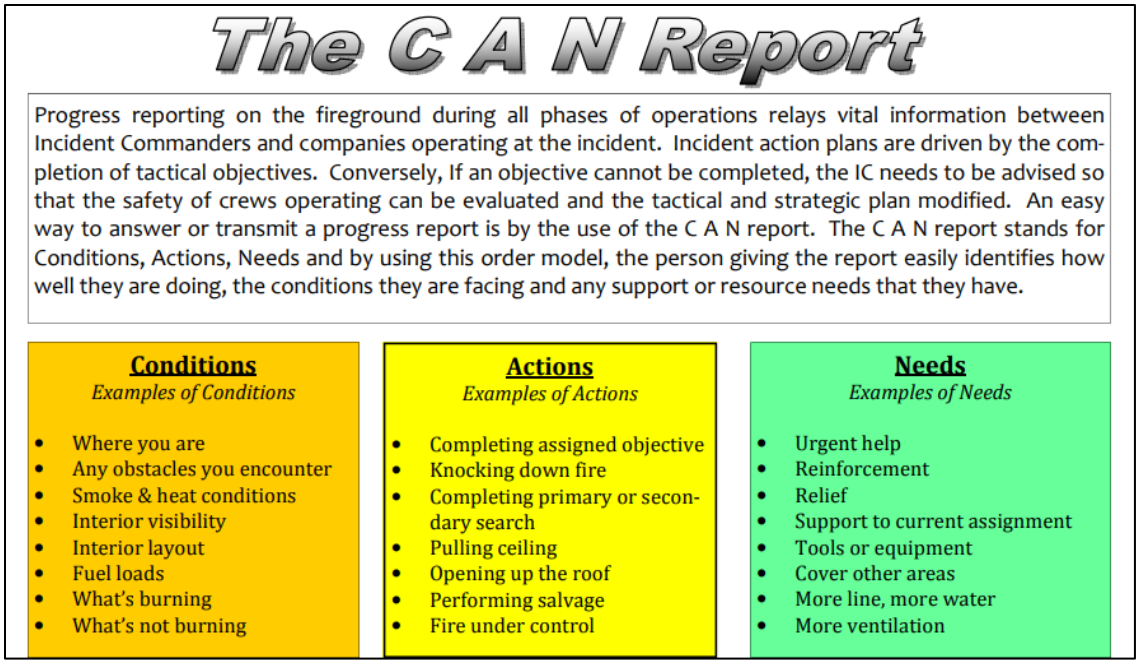

Image 3. CAN Report Components
(Courtesy of Fire Engineering – Company Training Drill)

Also, the use of a tactical worksheet can assist the IC with tracking various task assignments on the fireground while facilitating consistent, organized information. It is important that the IC start using the tactical worksheet as early in the incident as possible, along with pre-plan information and other relevant data, to integrate information management, fire evaluation, and decision-making. A tactical worksheet [NIOSH 2018]:

- Identifies critical incident information in a fill-in format to help manage an incident.
- Documents the command structure at the strategic, tactical, and task levels.
- Allows for the tracking of initial alarm assignments, additional alarms, division/group assignments, and tactical/functional considerations.
- Should record location to note individual assignments, unit status, benchmark time, and include a diagram of the fireground, occupancy information, activities checklist(s), and other relevant information.
- Provides other tactical benchmarks, such as "fire located," "primary search complete," "fire under control," and "loss stopped."
- Can help the IC in continually conducting a situation evaluation and maintaining personnel accountability and resource status.
- Provides reminders, prompts for the IC such as time, air management, and PARS, and a convenient workspace for tracking companies and apparatus.
- Allows the IC to slow down during an incident and record vital information that may help make future operational decisions.
- Expedites passing of Command or support for the IC.

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A staff aide, incident command technician, or field incident technician is responsible for maintaining the resource status and situation status of an incident with a tactical worksheet [NIOSH 2018]. See **Appendix A** for an example of a tactical worksheet. The IC should develop and utilize a system that captures pertinent incident information which allows continuous situational awareness and effective decision making. The IC's decisions can be no better than the quality of the information that they are receiving. The IC should use a system that effectively captures and accounts for changing fireground conditions to stay ahead of the fire. If this is not done, the IAP will be out of sequence with the phase of the fire, and the IC will be continually surprised by changing conditions [Smith 2016]. Fire departments can conduct a communications audit to review radio traffic from previous incidents as part of a post-incident analysis to ensure communications are effective or need improvement (**see Appendix B**).

Specific to this incident, fire departments operating at an incident should remain on the same, repeated dispatch channel until 1) fire is under control and the high-risk threat is mitigated or 2) fire is in defense attack mode.

Contributing Factor #5 – Ongoing risk vs. benefit analysis

Discussion: At this incident there were several hazards related to risk vs. benefit analysis:

Initial search operations were warranted given the reliable reports of a missing occupant and the initial manageable risks. As the incident evolved however, several changes occurred that impacted the risk vs. benefit analysis:

- Benefit: both the primary and secondary searches were conducted and reported as all clear.
- Risk: the initial risks presented were manageable, and the level of risk exposure was acceptable given the potentially high life safety benefit. As the incident progressed, the conditions continued to deteriorate, and both the probability and severity of the risks continued to escalate.

Recommendation #5 – Execute risk management principles at the tactical and strategic levels.

Discussion: The International Association of Fire Chiefs (IAFC) developed the *Rules of Engagement for Structural Firefighting* to improve risk assessment and management for firefighters (**see Image 4**). The rules of engagement serve as a best-practice model procedure for fire departments to adopt in their policies, procedures, and guidelines. These rules integrate several nationally recognized risk management programs and principles. They include risk management principles from NFPA 1550. The rules of engagement align with the concepts in the International Association of Fire Fighter's (IAFF) Fire Ground Survival Program. They also are supported by the contributing factors and recommendations from numerous NIOSH FFFIPP reports. The rules recognize that firefighters operating in the hazard zone are at significant risk from many hazards. Those hazards must be integrated into a risk/benefit analysis and risk management plan, which is part of the IAP. They are a nationally accepted best practice for the fire service [IAFC 2010].

The initial IAP needs to include an effective risk/benefit analysis and risk management strategy for any actions taken. The IAP should address the priorities of civilian life safety, incident stabilization, and

property conservation, and balance those potential benefits against the risks posed to firefighter life safety from the hazards present.

The incident management team should track the positive and negative changes impacting the risks and benefits as the incident develops and firefighting operations are carried out. When and where appropriate, the initial IAP should be modified at all levels to ensure that that level of risk being taken corresponds to the level of potential benefit that is still achievable.

Contributing Factor #6 - Situational awareness during rapidly deteriorating conditions

Discussion: There were several hazards related to situational awareness during rapidly deteriorating conditions:

- At Level 1, Perception – Effective ongoing 360 size ups were not conducted throughout the incident. This affected the ability to perceive the changes occurring with the fire behavior as well as the impacts of firefighting operations on the conditions.
- At Level 2, Comprehension – The significance of the changing fire conditions throughout the incident were not clearly understood and firefighters struggled to identify that some firefighting operations were ineffective.
- At Level 3, Prediction – The impacts of the changing fire conditions were not accurately predicted. This resulted in the downed firefighters operating on the second floor being caught in a hostile fire event (flashover and/or exhaust portion of a flow path) and cutoff from their primary means of egress.

Inconsistences in situational awareness existed at the task, tactical, and strategic level throughout the incident.

Recommendation #6 - Maintain situational awareness at the task, tactical, and strategic levels.

Discussion: Situational awareness is an ongoing process; all personnel need to maintain situational awareness to make effective decisions throughout the emergency incident. situational awareness has been defined as [Gasaway 2019]: *"The ability to perceive and understand what is happening in the environment around you, in relation to how time is passing, and then using your understanding of the situation to accurately predict future events in time to prevent bad outcomes."* As hazards rapidly increase and change as an incident progress, new stressors may emerge and require the need to reestablish situational awareness.

Compromised Situational Awareness → Ineffective Decision Making → Increased Firefighter Injuries and LODDs

According to the International Fire Service Training Association [2019], situational awareness is an ongoing process at all three levels:

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Level 1 – Perception: The ability to sense and subsequently perceive the situation. Perception must always be deliberate, and continual for success. In the fire service, perception is often correlated with size up. Size up usually focuses on visual observations; however, if safe to do so, personnel may use hearing, taste, touch, and smell in addition to sight.

- *Perception quick tip:* When possible, personnel may use technology to enhance perceptual cues (e.g., a thermal imaging camera may enhance sight in certain scenarios such as heavy smoke or darkness).

Level 2 – Comprehension: The ability to fully understand the meaning of the situation. Personnel must have the proper knowledge and ability to effectively apply that knowledge, which comes from education and past experiences.

- *Comprehension quick tip:* Given the broad and dynamic range of incidents that firefighters respond to, departments should establish an ongoing professional development program that provides a range of education and hands-on experience to aid comprehension during stressful situations.

Level 3 – Prediction: Also referred to as forecasting or projecting, prediction is the ability to form an understanding of a situation and determine what actions are appropriate to mitigate future negative outcomes. The fireground is constantly changing and evolving. Inaccurate predictions occur when the ability to consistently reestablish situational awareness and keep pace with the speed at which the incident is developing becomes too difficult.

- *Prediction quick tip:* Seeking input from someone else who has more extensive education and experience in similar incidents may be useful to support accurate forecasting.

Intentional & Ongoing Perception + Full Comprehension + Timely Prediction = Effective Situational Awareness

- Effective situational awareness during incident response may be supported by several approaches provided by fire service management, some of which are adapted from Gasaway [2013]: Provide ongoing professional development that includes education and hands-on experience.
    - *Example:* Use the three situational awareness levels as a tool to work through case examples of emergencies. This may include professional development on critical hazards to identify how those hazards inform an understanding of the event and possible outcomes based on what is known. Over time, a list of optimal response strategies for a variety of scenarios can be developed.
    - *Example:* During realistic professional development using simulated or mock fire scenarios, fire instructors can work through the three levels of situational awareness with personnel to understand decision making during immediate or high-risk actions and discuss how decision making could be impacted.
- While there is a significant reliance at most incidents on the IC and the Incident Safety Officer to maintain situational awareness, it is critical that everyone maintain situational awareness at

their respective levels and within their areas of operation. Considerations for personnel while responding to an incident:

- Take periodic, brief intentional opportunities to reassess and evaluate incident cues and mentally document what is changing in real time. Any unexpected changes in the incident's progression might alter future decision making.
- Employ relevant stress management techniques (e.g., controlled breathing) and operational techniques (e.g., workload management utilizing Field Incident Technicians to assist the IC during fire ground operations) to support ongoing awareness.
- Use technology and other vetted procedures to ensure that all messages are received and understood.
- Ensure personnel within the incident management system at the task, tactical, and strategic level are not deviating from assignments or failing to execute assignments.

In summary, all personnel should strive to maintain situational awareness throughout an incident response, effectively communicate their findings with key personnel throughout the response and seek to establish and reestablish shared situational awareness as the incident evolves to support effective decision making.

Contributing Factor #7 - Mayday operations and management

Discussion: There were several contributing factors related to Mayday operations and management:

- The details of the initial Mayday radio transmission made by the fire department 17 firefighters who were in distress was delayed in reaching the IC due to communications issues.
- The Mayday radio transmission made by the responding RIT member who located firefighter 17-1 did not effectively communicate the details of the situation including who was involved, the exact location, and what was needed.
- Due to the lack of a hoseline(s) in place on the first floor for fire attack, the rapidly developing fire conditions prevented the responding RIT from being able to operate on the interior and access the primary means of ingress/egress. This forced all RIT operations to be carried out via ground ladders to the second floor via the front porch roof.
- There were concerns over the front porch supporting the weight of the responding RIT members, which initially led to confusion and conflicting orders with personnel accessing and operating on the porch roof.

Recommendation #7 - Ensure that all firefighters and fire officers are trained in fireground survival procedures and Mayday operations.

Discussion: There are several components and key steps that should be included in written guidance for calling, responding to, and managing a Mayday.

Firefighters need to be trained to recognize when they are in trouble, know how to call for help, and understand how the IC and others need to react to a responder in trouble [Jakubowski and Morton 2001]. A Mayday declaration is such an infrequent event in any firefighter's career that they need to

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frequently train to recognize when to declare the Mayday and what steps to take to improve their survival chances.

Calling a Mayday is a complicated behavior that includes the affective, cognitive, and psychomotor domains of learning and performance [Grossman and Christensen 2008; Clark 2005]. Any delay in calling a Mayday reduces the chance of survival and increases the risk to other firefighters trying to rescue the downed firefighter.

Firefighters should be 100% confident in their competency to declare a Mayday for themselves. Fire departments should ensure that any members who may enter an IDLH environment meet the Mayday competency standards of the authority having jurisdiction (AHJ) throughout their active-duty service. Presently, there are no national Mayday standards for firefighters and most states do not have Mayday standards. A RIC will typically not be activated until a Mayday is declared. Any delay in calling the Mayday reduces the window of survivability and increases the risk to the RIT [IAFF 2010; IAFF 2022; Clark 2005; Clark 2008; USFA 2009].

There are no mandates on when a firefighter should call a Mayday [NFPA 1010 2024]. It is up to each AHJ to develop parameters and performance standards f. The International Association of Fire Fighters (IAFF) Fireground Survival program is another resource fire departments can use. It was developed to ensure that training for Mayday prevention and Mayday operations are consistent among all firefighters, company officers, and chief officers [IAFF 2010].

Once in distress, firefighters must immediately declare a Mayday as accurately as possible. Any Mayday communication must provide the location of the firefighter in as much detail as possible and, at a minimum, should include the division (floor) and quadrant. It is imperative that firefighters always know their location when in IDLH environments to effectively give their location in the event of a Mayday. The following example uses *LUNAR* (Location, Unit, Name, Assignment/Air, Resources needed) as a prompt: "Mayday, Mayday, Mayday, Division 1 Quadrant C, Engine 71, Smith, search/out of air/vomited, can't find exit." Once the IC and RIC know the firefighter's location, the firefighter can then try to fix the problem, such as clearing the nose cup, while the RIC is enroute for rescue [USFA 2009].

Psychological and Physiological Effects:

A firefighter who is breathing carbon monoxide quickly loses their cognitive ability to communicate correctly and can unknowingly move away from an exit and other firefighters before becoming unconscious. Without the accurate location of a downed firefighter, the speed at which the RIT can find them is diminished, and the window of survivability closes quickly because of lack of oxygen and high carbon monoxide concentrations in an IDLH environment [Clark 2005; Clark 2008].

Firefighters also need to understand the psychological and physiological effects of the extreme level of stress encountered when they become lost, disoriented, injured, trapped, or run low on air during rapid fire progression. Most fire training curriculum does not include discussion of the psychological and physiological effects of extreme stress, such as encountered in an imminently life-threatening situation, nor do they address key survival skills necessary for effective response. Understanding the psychology and physiology involved is an essential step in developing appropriate responses to life-threatening situations. Reaction to the extreme stress of a life-threatening situation, such as being trapped, can

result in sensory distortions, and decreased cognitive processing capability [Grossman and Christensen 2008].

In the book, *Stress and Performance in Diving*, the authors note: "We know that under conditions of stress, particularly when rapid problem-solving is crucial, overlearning responses is essential. The properly trained individual should have learned coping behavior so well that responses become virtually automatic requiring less stop and think performance" [Bachrach and Egstrom, 1987]. One of the most difficult situations a firefighter can face is when they realize they need to declare a Mayday [FIRESCOPE, 2015]. Recognizing that they are or about to be in a life-threatening situation is the first step in improving a firefighter's chance to survive a Mayday event. Some fire departments do not have a simple procedure for what to say when a firefighter gets into trouble—a critical situation where communications must be clear [NIOSH 2010].

Mayday Procedures:

Firefighters must understand that when they are faced with a life-threatening emergency, there is a very narrow window of survivability. Training is frequently limited to breathing apparatus emergencies, egress through small openings, and emergency window egress. It is necessary to place additional emphasis on appropriate procedures for tactical withdrawal under worsening fire conditions and structural collapse situations. Firefighter training programs should include training on such topics as air management and emergency communications; familiarity with their SCBA, radio, and PPE; crew integrity; reading smoke, fire dynamics and fire behavior; entanglement hazards; building construction; and signs of pending structural collapse. The IAFF has developed the IAFF Fire Ground Survival Program to ensure that training for Mayday prevention and Mayday operations is consistent between all firefighters, company officers, and chief officers [IAFF 2010].

Firefighters must act promptly when they become lost, disoriented, injured, low on air, or trapped [FIRESCOPE 2015; IAFF 2010, LAFD 2016; Toledo Fire & Rescue Department 2012]. After quickly assessing the sustainability of their location, a firefighter should transmit a Mayday following these procedures:

- Activate the EAB on the portable radio pushing the button for 1 to 3 seconds to activate. Note: All fireground radios should be equipped and programmed with EABs [NIOSH 2023]
- Declare the Mayday announced on the radio as "MAYDAY, MAYDAY, MAYDAY" followed by the unit designation, then a brief and concise statement of essential information
- Ensure the message is acknowledged by command and/or the dispatcher
- Ensure their PASS device is activated.

Firefighters must transmit a Mayday while still having the capability and sufficient air, noting their location if possible. Firefighters may need to move away from untenable fire conditions before calling the Mayday. The next step is to manually activate their PASS device. To conserve air while waiting for rescue, firefighters should try to stay calm and focused on their situation and avoid unnecessary physical activity.

After initiating a Mayday, firefighters should survey their surroundings to get their bearings and determine potential escape routes, such as windows, doors, hallways, changes in flooring surfaces, etc.,

and stay in radio contact with the IC and other rescuers. In addition, firefighters can attract attention by maximizing the sound of their PASS device (e.g., by pointing it in an open direction), pointing their flashlight toward the ceiling or moving it around, and using a tool to make tapping noises on the floor or wall. A crew member who initiates a Mayday call for another person should quickly try to communicate with the missing member via radio and, if unsuccessful, initiate another Mayday providing relevant information on the missing firefighter's last known location. Emphasis on appropriate procedures for retreat/emergency evacuation under worsening fire conditions and/or pending building collapse is necessary. An operational retreat is designed to quickly remove firefighters from operations in an unsafe or potentially unsafe environment. The IC needs to initiate an operational retreat whenever the operational area is deemed unsafe for emergency personnel. All members operating in the unsafe area need to evacuate as the operational retreat procedures are initiated. Operational retreat needs to begin with radio traffic announcing "emergency traffic" with directions for all emergency personnel to evacuate the operational area. An emergency egress signal should sound [IAFF 2010; IAFF 2022; LAFD 2016]. For example, repeat short air horn blasts of approximately 10 seconds, followed by 10 seconds of silence. This sequence should be repeated three times.

Upon hearing an operational retreat signal, all firefighters should immediately withdraw from any operations they are performing and leave the operational area. All company officers should immediately perform a PAR, of all members they are responsible for and report the results to the IC. If firefighters find themselves in a questionable position (dangerous or not), they must be able to recognize this and know the procedures for when and how a Mayday should be called. A firefighter's knowledge, skill, and ability to declare a Mayday must be at the mastery level of performance. This performance level should be maintained throughout their career through training offered more frequently then annually [IAFF 2010; IAFF 2022; Sendelbach 2003].

Fireground Survival and Mayday Training:

As part of emergency procedures training, firefighters need to understand that their PPE and SCBA do not provide unlimited protection. PPE that is not properly donned, worn, or activated may provide reduced protection or no protection at all.

Training should include situations dealing with uncontrolled SCBA emergencies, egress through small openings, emergency window egress, building collapse, and other situations that are possibly encountered during a Mayday situation. Firefighters need to be trained to recognize when they are in trouble, know how to call for help, and understand how ICs and others need to react to a responder in trouble [Jakubowski and Morton 2001]. A Mayday declaration is such an infrequent event in any firefighter's career that they need to frequently train to recognize when to declare the Mayday and what steps to take to improve their survival chances.

For an example of a Mayday management guide, see the IAFF Firefighter Mayday Checklist in **Appendix C**.

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Investigator Information

This incident was investigated by Jeff Funke, Team Lead, Mike Richardson (former), Investigator, and Tammy L. Schaeffer, Investigator, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. The report was written by Michael Richardson (former), Dr. Wesley R. Attwood, Investigator and Program Advisor, and Jeff Funke.

An expert technical review was provided by Robert Fetty, Assistant Fire Chief, Chartiers Township Volunteer Fire Department, Pennsylvania. Dan Madrzykowski and Keith Stakes from the Fire Safety Research Institute, part of the UL Research Institutes, provided an expert review of the investigation report. The NFPA Emergency Response & Responder Safety Division provided a technical review.

Additional Information

Underwriters Laboratories (UL)

The Fire Safety Research Institute (FSRI), part of the UL Research Institutes, continues to work with fire departments and fire service organizations to conduct research on fire dynamics, fire safety issues, and fire ground operations. Access to reports from completed studies and information from on-going studies can be found at https://fsri.org. Access to free online training on evidence-based firefighting (more than 30 course modules in all) can be found at https://training.fsri.org.

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Disclaimer

The information in this report is based upon dispatch records, audio recordings, witness statements, and other information that was made available to the National Institute for Occupational Safety and Health (NIOSH). Information gathered from witnesses may be affected by recall bias. The facts, contributing factors, and recommendations contained in this report are based on the totality of the information gathered during the investigation process. This report was prepared after the event occurred, includes information from appropriate subject matter experts, and is not intended to place blame on those involved in the incident. Mention of any company or product does not constitute endorsement by NIOSH, Centers for Disease Control and Prevention (CDC). In addition, citations to websites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these websites. All web addresses referenced in this document were accessible as of the publication date.

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Appendix A

Tactical Worksheet (Page 1)

(Courtesy of the Los Angeles Fire Department)

LOS ANGELES FIRE DEPARTMENT
COMMAND TACTICAL WORKSHEET – *STRUCTURE FIRE Draft*

ASSUMPTION OF COMMAND		INC. CLOCK
ADDRESS:	STAGING:	60 10 20 30 40 50
DESCRIPTION/ CONDITION:	IC DESIGNATION:	
SAFETY:	CP LOCATION:	
ADDITIONAL RESOURCES:	ACTION / MODE:	

INCIDENT OBJECTIVES	PRIORITIES
• PROVIDE FOR SAFETY FOR ALL VICTIMS AND RESPONDERS • DEVELOP AND IMPLEMENT AN ICS STRUCURE CAPABLE OF MITIGATING THE INCIDENT • PROVIDE ACCURATE INFORMATION TO THE PUBLIC, MEDIA AND CITY OFFICIALS • PROTECT INFRASTRUCTURE AND NATURAL RESOURCE AREAS • MINIMIZE THE FINANCIAL AND RESOURCE IMPACT TO THE CITY OF LOS ANGELES	• DETERMINE THE SCOPE OF THE PROBLEM • DEVELOP SITUATIONAL AWARENESS • PROVIDE FOR SAFETY • RESCUE VICTIMS • HAZARD CONTROL • LIMIT LOSSES • STABILIZE VICTIMS AND THE INCIDENT • ENSURE RESPONDER POST INCIDENT DECONTAMINATION

COMMUNICATIONS	CHANNEL
DISPATCH (ADMIN)	
INCIDENT TAC	
COMMAND	
ADD TAC	
ADD TAC	

TACTICS		THREATS
☐ TRANSITIONAL ATTACK		☐ HOMELESS IN BUILDING
☐ EARLY USE OF 2 ½		☐ VACANT BUILDING
☐ STRIP VENTILATION		☐ FLASHOVER
☐ MASTER STREAMS		☐ BACKDRAFT
RISK PROFILE:	MODE:	☐ COLLAPSE HAZARDS
• RESCUE	• OFFENSIVE	☐ OPERATIONAL DELAYS
• PROPERTY	• DEFENSIVE	☐ WIRES DOWN
• EXPOSURE		☐ PREVIOUS FIRES
• NO RISK	• INVESTIGATE	☐ FACADES/MANSARDS

SITUATION AWARENESS

BUILDING ASSESSMENT

○ 360 SURVEY	○ NUMBER OF FLOORS	○ ASCENDING HILLSIDE HOME
○ READ SMOKE	○ REPORTS OF VICITMS	○ DECENDING HILLSIDE HOME
○ DETERMINE FLOW PATH	○ SPRINKLERS	○ CANTILEVER HILLSIDE HOME
○ BEST ACCESS	○ OTHER BUILDING SYSTEMS	○ BUILDING PLACARDS

BUILDING PLACARDS

VACANT BUILDING PLACARDS
- R/O – ROOF OPEN
- S/M – STAIRS, STEPS, LANDING MISSING
- F/E – AVOID FIRE ESCAPES
- H/F – HOLES IN FLOORS


HAZARDOUS BUILDING


DANGEROUS BUILDING


704 DIAMOND

DEPLOYMENT
○ FIRE ATTACK
○ BACK UP FIRE ATTACK
○ ASSIST WITH FIRE ATTACK
○ ROOF OPERATIONS/VENTILATION
○ TYPE OF ROOF:
○ LADDER RESCUE
○ FORCIBLE ENTRY
○ INSIDE TRUCK WORK
○ PRIMARY SEARCH
○ SECONDARY SEARCH
○ MEDICAL GROUP
○ RAPID INTERVENTION CO / GROUP
○ UTILITIES
○ SALVAGE
○ FORM DIVISIONS AND GROUPS

POST FIRE INVESTIGATION

DATE	INC NUMBER	KNOCKDOWN TIME	INJURIES
FATALITIES	**PROPERTY LOSS**	**CONTENTS LOSS**	**EXPOSURE LOSS**

OWNER NAME:

ADDRESS:

CITY: STATE: ZIP CODE:

PHONE: CELL PHONE:

ARSON NOTIFICATIONS

○ MAJOR EMERGENCY	○ CRITICAL BURNS
○ INTENTIONAL FIRE	○ HIGH PROFILE / VIP
○ EXPLOSIONS	○ ARSON SUSPECT / WITNESS
○ FATALITIES	○ CHURCHES / TERRORISM

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Appendix A

Tactical Worksheet (Page 2)

(*Courtesy of the Los Angeles Fire Department*)

LOS ANGELES FIRE DEPARTMENT

COMMAND TACTICAL WORKSHEET – *STRUCTURE FIRE Draft*

MAYDAY		
TONES / CLEAR THE CHANNEL MEMBER WITH MAYDAY GO WHO / WHAT / WHERE INITIATE GRAB LIVES: INITIATE RESCUE / DEPLOY RIC TONES / UPDATE ALL CO & MFC COMMUNICATE WITH MEMBER COORDINATE RESCUE FIGHT FIRE ONCE RESCUED PAR-CAR ALL CLEAR	MEMBER DECLARING MAYDAY (WHO): LOST / TRAPPED / MISSING (WHAT): MEMBER LOCATION (WHERE): COMPANIES ASSIGNED TO RESCUE: TIME OF MAYDAY: TIME COMPLETE:	**G.R.A.B. L.I.V.E.S.** GAUGE: E ¼ ½ ¾ FULL RADIO CHANNEL ACTVATE PASS – Y / N CONTROL BREATHING – Y / N STAY LOW – Y / N TURN ON LIGHTS – Y / N MAKE NOISE – Y / N FIND EXIT – Y / N SHIELD AIRWAY

RESOURCE ASSIGNMENTS

RESOURCES TO REQUEST		COMMAND PLACEMENT				
1-3 TASK FORCES 1-3 ENGINES NEEDED RA'S 1-3 BC'S NEEDED EMS ○ ARSON ○ PIO ○ LAPD ○ DOT ○ DWP	○ GAS CO ○ LADBS RED CROSS ○ MAYORS CRT ○ CORONER ○ LA IMPACT (DRUG LABS) ○ ANIMAL SERVICES ○ DEPT OF SANITATION ○ US COAST GUARD ○ FISH & GAME	IC	OPS	SAFETY	ROOF	MED GROUP
		DIV	DIV	DIV	DIV	RIC

UNIT	ONS	ASSIGNMENT

Two Volunteer Firefighters Die while Conducting Fire Attack at a Single-Family Residence – Pennsylvania

Appendix B

Communications Audit

(Courtesy of the Plano Fire Department)

PLANO FIRE-RESCUE
INCIDENT COMMUNICATIONS AUDIT

INCIDENT DATE/ TIME: _____ INCIDENT TYPE: _____
INCIDENT/ RMS # _____ LOCATION: _____
UNITS ASSIGNED: _____

A. CALLTAKER			COMMENTS
CRITICAL INFO. OBTAINED FROM CALLER(S)?	Y	N	

B. ALARM & NOTIFICATION			COMMENTS
CORRECT UNITS DISPATCHED ON INITIAL ALARM?	Y	N	
ANY ISSUES WITH INITIAL DISPATCH?	Y	N	
CRITICAL PRE-ARRIVAL INFO. RELAYED TO CREWS?	Y	N	
WIND SPEED AND DIRECTION GIVEN ENROUTE?	Y	N	

C. STRUCTURE	COMMENTS
RESIDENTIAL? (SINGLE FAMILY or MULTI-FAMILY)	
COMMERCIAL?	
# OF STORIES _____ FIRE LOCATION	

D. ARRIVAL (1ST MAJOR UNIT ON SCENE _____)			COMMENTS
SIZE UP GIVEN	Y	N	
QUOTE SIZE UP IN THIS BOX			
360 COMPLETE & ANNOUNCED ON RADIO	Y	N	"WORKING FIRE" ANNOUNCED (UNIT_____)
SITUATION REPORT (TO 1ST DUE BC OR COMMAND)	Y	N	
QUOTE SITUATION REPORT IN THIS BOX			

E. COMMAND (ENG_____/ BATT_____)			COMMENTS
COMMAND CHANNEL USED	Y	N	
IF YES, DID ALL COMMS W/ DISPATCH REMAIN ON COMMAND CHANNEL?	Y	N	
COMMAND FROM THE CAB, OR MOBILE?			

F. FIREGROUND COMMUNICATIONS			COMMENTS
PHONETIC ALPHABET USED	Y	N	
LIST ANY COMMUNICATIONS ISSUES (FEEDBACK, ANY UNITS CONSISTENTLY UNREADABLE?)			

G. COMMUNICATIONS MODEL USED? (3-C'S) Connect, Convey, Confirm
i.e. COMMAND: *"Truck 1 from Command"* TRUCK 1: *"Truck 1"*
ANY UNITS THAT CONSISTENTLY USED CORRECT MODEL?

H. OTHER COMMENTS/ SUGGESTIONS FOR IMPROVEMENT

I. SUPPLEMENT ATTACHED	Y	N	
REVIEWED BY:			

Two Volunteer Firefighters Die while Conducting Fire Attack at a Single-Family Residence – Pennsylvania

Appendix C

IAFF Firefighter Mayday Checklist
(*Courtesy of the IAFF*)

APPENDIX A
FIRE FIGHTER MAYDAY CHECKLIST

❑ Look at screen & document Radio Identifier _____

❑ Transmit: "All units assigned to the _____ incident, clear this channel for a MAYDAY. Unit calling MAYDAY, identify."

❑ Receive & Document:

WHO: Name _____

Unit _____

WHAT: Lost Trapped Injured Out of Air SCBA Malfunction

Other _____

WHERE: Floor _____ , Side _____

Area _____ , Division _____

❑ Transmit: "Fire Fighter _____, I copy your MAYDAY (Repeat WHO, WHAT, WHERE information). RIC is being deployed. Initiate your G-R-A-B-L-I-V-E-S procedures."

❑ Deploy RIC/RIG

❑ Transmit: (On Command and Tactical Channels): "All units on the _____ Incident, we have a fire fighter MAYDAY. Maintain your current assignments and keep this channel clear."

❑ Transmit: "Fire Fighter_____, remain calm, control your breathing, turn on your PASS alarm and shine your flashlight. RIC is coming to get you."

❑ Transmit requests to Dispatch:

- ○ "Requesting _____ additional alarm(s), including _____ ambulances."
- ○ "Requesting _____ Communication plan" OR "Requesting additional tactical channel(s)."

❑ Assign additional companies to RIC and RIC Group Supervisor (RICGS)

❑ Conduct a Roll-Call (PAR) prior to clearing the MAYDAY

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