1000 FREDERICK LANE, MORGANTOWN, WV 26508 · 304.285.5916

Career Firefighter Dies After Falling into a Light/Air Shaft during a Fire in a Four-Story Mixed Occupancy Structure – Illinois

Executive Summary

On November 13, 2023, a 39-year-old career firefighter died after falling down a light/air shaft while performing roof operations. The Type III constructed building was a four-story mixed occupancy built in 1894. The first floor was occupied by a full-service restaurant. Floors two through four contained 12 occupied apartments. The roof contained a mixture of exhaust vents, several large natural openings, two sky lights, and two light/air shafts measuring 9 ½ feet by 5 feet. Additionally, the roof had several heating, ventilation, and air conditioning (HVAC) units, satellite dishes, metal beams in the center of the roof, numerous cables, wires, and various tripping hazards. At approximately 05:27 hours, a 9-1-1 call reporting a fire was received from a cleaning person employed by the restaurant. Approximately two minutes later, the dispatch was issued for a "Still" alarm Box 103607. The following companies were dispatched: Engine 55 (E55), Truck 44 (T44), Battalion Chief 12 (BC12), Engine 22 (E22), and Tower Ladder 10 (TL10). BC12 was the first arriving unit at 05:31:20 hours. BC12 was met by the caller, advising him the kitchen of the first-floor restaurant was on fire. Along with the 9-1-1 caller, BC12 proceeded to the rear/west side of the building where he observed smoke emanating from a rear door. At 05:31:48, E55 arrived, led out a cross-lay and gained access through a door on side Alpha. T44 also arrived at this same time, assisting with forcible entry on the side Alpha door that E55 utilized for entry into the structure. T44's crew was separated into two teams. The officer and firefighter assisted with forcible entry. The T44-3 firefighter (deceased firefighter) and another

A view of the structure from side Alpha. (*Photo courtesy of the Fire Marshal's Office*)

firefighter T44-2 raised the aerial ladder and proceeded to the roof to perform ventilation. A working fire was declared and dispatched at 05:33:10 hours.

Between 05:38 and 05:51 hours, the working fire units arrived. Squad 1 (SQ1) sent two personnel to the roof to assist with ventilation operations. They accessed the roof from T44's aerial ladder. Once on the roof, they assisted the two members from T44 with ventilating the vertical openings on the roof which were emanating smoke. They removed the translucent corrugated panels from the south light/air shaft. The north side light/air shaft was ventilated by puncturing several holes in the translucent corrugated panels. There was a concern about the large open south light/airshaft so a firefighter from SQ1 (SQ1-1) removed his helmet and directed the helmet light on the shaft to alert firefighters operating nearby. Around this time, T44-2 left the roof to retrieve equipment to probe the roof openings. T44-3 was observed cutting a hole in the roof adjacent to the north light/air shaft. The hole he was cutting measured approximately 2 feet by 2 feet. He appeared to have finished cutting the hole in the roof and put the saw down. A firefighter from SQ1 discussed a plan to widen the hole and picked up the saw to begin cutting, expanding the ventilation hole. During that time, the other firefighter from SQ1 (SQ1-2) noticed T44-3 was on his knees and adjusting his self-contained breathing apparatus (SCBA) facepiece. SQ1-2 then returned to assisting his partner with cutting the hole.

When T44-2 returned, he noticed that T44-3 was not there and asked the members of SQ1 if they knew where T44-3 was located. SQ1 personnel noted not seeing T44-3 after observing him adjusting his facepiece. They began searching the area along the sides of the roof. During the search, they heard a Personal Alert Safety System (PASS) device alarm coming from the opened light/air shaft and immediately declared a Mayday at 05:53:47 hours. It was determined that T44-3 fell 54 feet down the South open light/air shaft and was laying critically injured in a dry well below a platform adjacent to the first floor of the building. At 06:11:04 hours, rescue personnel begin extrication efforts.

The officer of SQ1 directed his personnel to assemble equipment to execute a vertical rescue operation into the shaft from the roof. As the equipment was being retrieved, additional units were searching for other areas to quickly access T44-3. The Rapid Intervention Team (RIT) found a window leading to the light/air shaft on the 2nd floor that was covered with plywood. They removed the covering, which enabled them to observe the injured firefighter who was conscious, critically injured, and unable to move. A firefighter (SQ1-3) was lowered from the 2nd floor window to the injured firefighter. At 06:23:06 hours, SQ1-3 made a rapid assessment of T44-3's injuries and prepared him for extrication. During the initial contact with the injured firefighter, personnel from Squad 2 (SQ2) gained access through a breach in the masonry wall on the first floor. The breach point opened to the platform approximately eight feet above the dry well containing the injured firefighter. T44-3 was removed from the dry well through this breach at 06:33:17 hours. He was treated and transported to a medical facility where he was pronounced deceased. The fire was contained to the restaurant's kitchen with slight extension to the apartment directly above and quickly extinguished.

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Contributing Factors

- *Incident command division supervision*
- *Communications*
- *Crew integrity*
- *Situational awareness*
- *Poor visibility*
- *Sleep deprivation/disturbance.*

Key Recommendations

Fire departments should ensure:

- *Incident command implements the National Incident Management System (NIMS), including establishing functional and geographical assignments at the beginning and maintaining them throughout operations*
- *Firefighters immediately notify the incident commander (IC) and all units operating on the fireground when the roof is ventilated and/or translucent corrugated roof panels are identified*
- *Personnel maintain crew integrity at all times throughout an incident*
- *The development and maintenance of effective situational awareness during emergency incidents*
- *Firefighters, company officers, and chief officers are aware of and are trained to recognize the hazards of roof operations including operating in limited/low visibility conditions*
- *Fire department management understands and communicate the effects of sleep deprivation and the potential impact on work performance and safety to firefighters before they participate in an incident response.*

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

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Introduction

On November 13, 2023, a 39-year-old career firefighter died while conducting roof operations during a fire in a four-story mixed occupancy commercial building. On November 14, 2023, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On January 7, 2024, three NIOSH investigators representing the Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) traveled to Illinois to investigate. The NIOSH investigators met with the fire chief, command staff, and Office of the Fire Marshal, and conducted interviews with fire officers and firefighters that responded to Box 103607. The NIOSH investigators inspected and photographed the deceased firefighter's personal protective equipment (PPE) and SCBA. NIOSH investigators also reviewed the training records of specific personnel involved in the incident and reviewed the department's standard operating procedures (SOPs) and professional development model.

Fire Department

The fire department involved in this incident is a career department. At the time of this incident, the department had 5,143 full-time members. The fire department is led by a fire commissioner and is assisted by a 1st deputy fire commissioner. The 1st deputy commissioner oversees the four Bureaus—Operations, Fire Prevention, Administrative Services, and Logistics. Each bureau is commanded by a deputy fire commissioner.

Administrative services oversee the Personnel Division, the Employee Assistance Program Unit, and the Training Division. The Personnel Division manages the Medical Section that monitors the health and fitness of all uniformed members of the department.

The Bureau of Operations is the department's largest staffed bureau, with a personnel strength of more than 4,500 uniformed firefighters and paramedics, many of whom are "cross-trained." The Bureau of Operations consists of four divisions: Fire Suppression and Rescue, Emergency Medical Services (EMS), Special Operations, and the Office of Fire Investigation (OFI).

The Fire Suppression and Rescue Division is responsible for the day-to-day operations of all fire suppression companies in the 98 firehouses dispersed throughout the city. When those companies are not fighting fires or responding to EMS incidents, they are responsible for conducting daily training, school inspections, and fire hydrant inspections within their first due district. The division staffs 96 engine companies, 61 truck companies, four squads (heavy rescues which are 2-piece companies), 25 battalions

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(battalion chiefs), 14 deputy district chiefs, and eight district chiefs, which are divided into five districts. The department covers a land area of 228 square miles, 37 miles of rivers and waterways, and serves a population of 2,697,000. Department members assigned to the Operations Division work a 24-on/48-off shift schedule with three platoons or shifts.

Each firehouse is assigned a captain. The captain is responsible for the fireground operations and management, firehouse budget, candidate training and evaluation, firefighter supervision, leave management, training schedules for each shift, apparatus maintenance, facility management and maintenance, public fire education, fire inspections, and serving as acting battalion chief as needed.

The fire department operates five districts, 25 battalions, 96 engine companies, 61 truck companies, and four squads. Each position on an engine, truck, and squad company has a unique identifier that is used for communication purposes (**see Table 1**). If an engine or truck company operates short (staffing of four instead of five), they operate under a variance. There are four squad companies, which are two-piece companies. Each squad company consists of a heavy rescue and a 55-foot snorkel.

Table 1: Staffing Positions for each Unit

Unit	Staffing Number	Positions				
Engine Company	5	Officer	Engineer	Firefighter Pipeman (Pipe)	Firefighter Heelman (Heel)	Firefighter Hydrant
Truck Company	5	Officer	Driver	Firefighter Roof	Firefighter Entry	Firefighter Search
Squad Company	6	Squad Officer	Squad Driver	Squad Firefighter Rear	Snorkel Firefighter Search	Snorkel Driver / Search

The EMS Division operates 80 advanced life support (ALS) ambulances, which are staffed with paramedics and emergency medical technicians. EMS field supervisors are assigned to each battalion to assist with staffing, logistical needs, and patient care.

The OFI is mandated by state law and municipal ordinance to determine the cause and origin all fires, within the city. The OFI has five 24-hour response units, as well as a Major Incident Response Unit (MIRU) that is outfitted with tools and supplies to compliment the 24-hour vehicles sent to investigate major incidents.

The fire department has written policies and procedures, which are available to all department members within their stations. These policies and procedures have been implemented and are enforced.

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Apparatus, Staffing, and Communications

A "Still" Alarm was transmitted for Box 103607 at 05:28:50 hours for a fire. **Table 2** lists the units initially dispatched for the fire, the units added for the working fire assignment, and the Mayday assignment.

Table 2: Assignment for Box 103607

Incident Response Detail	Staffing Level
Still Box Assignment	
Battalion Chief 12	1 personnel (IC)
Engine 55	5 personnel
Engine 22	5 personnel
Truck 44	5 personnel
Tower Ladder 10	5 Personnel
Working Fire Assignment	
Battalion Chief 17	1 personnel (Safety)
Battalion Chief 3	1 personnel (RIT)
Squad 1	5 personnel
Command Van 272	1 personnel
Engine 452	Filed Officer with 1 personnel
Truck 28	5 personnel (RIT)
Squad 2	6 personnel
Ambulance 6	2 personnel
Ambulance 62	2 personnel
Mayday Assignment	
Battalion Chief 7	1 personnel
Engine 472	5 personnel
Engine 78	5 personnel
Engine 56	5 personnel
Squad 2	5 personnel
Truck 6	5 personnel

Responses for Structure Fires

The city's Office of Emergency Management and Communications (OEMC) operates the 9-1-1 center and dispatch for both fire and police. OEMC operates two dispatch centers in the city, one north and one south. The fire department has two basic responses for the report of a structure fire. The alarms are a "Still" alarm or a "Still and Box" alarm. The Fire Alarm Office dispatches Box Alarms and in some cases, may transmit a Still and Box alarm.

STILL ALARM: 2 Engines, 2 Trucks, 1 Battalion Chief.

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The Fire Alarm Office will dispatch a **STILL alarm** assignment to initial reports of a structure fire. If the dispatcher receives additional reports of a fire or a fire company arrives on the scene and reports a fire, then they will dispatch a Squad, a Command Van, and a RIT Company (Truck) on the **STILL alarm** assignment.

STILL & BOX ALARM: 4 Engines, 2 Trucks, 1 Tower Ladder, 1 Squad, 3 Battalion Chiefs, 1 Deputy District Chief, 1 Command Van, 1 Ambulance, 1 OFI (Office of Fire Investigations) Car, 1 EMS Field Officer.

- Typically, a **STILL & BOX alarm** is requested by a fire officer. However, there are instances where the Fire Alarm Office can transmit a **Still & Box alarm**. These situations typically occur when one or more of the following conditions are met:
  - Caller reports someone is trapped in a fire building
  - Multiple structures are reported to be on fire
  - Large commercial type building is reported to be on fire
  - Building collapse
  - Train derailment

There are certain situations where procedure indicates that the Fire Alarm Office must automatically transmit a **STILL & BOX alarm**. These situations include:

- Report of any type of fire, including an odor of smoke, in a building such as a nursing home, theater, government building, hospital, or other place of public assembly that has a pull box at its disposal (see description of BOX alarms below)
- Stand-by alert at an airport (plane in distress).

BOX ALARM: 4 Engines, 2 Trucks, 1 Battalion Chief.

- A **BOX alarm** is transmitted by the Fire Alarm Office upon receipt of an alarm signal from a pull box located in or just outside of a nursing home, hospital, theater, government building, or other place of public assembly.
- Box alarms are usually referred to as "cold boxes" and typically do not amount to much of anything. If a cold box turns out to be a fire, the box is then "filled out" with additional companies assigned to bring the alarm level up to the **STILL & BOX alarm** level.

Communications

Extra or additional alarms are designated as 2-11, 3-11, 4-11, and 5-11 with defined response protocols for each alarm. Any equipment needed above a 5th alarm (5-11) is requested by the incident commander. For emergency medical services (EMS) incidents with a defined number of patients, the fire department dispatches an EMS Plan I, II, or III. Each Plan has a defined response protocol. For example, the *EMS Plan I* consist of:

- 6 Ambulances (one basic life support (BLS) ambulance)
- 1 engine company
- 1 truck company
- 1 battalion chief

- 1 EMS Field Officer
- 1 Assistant Deputy Chief Paramedic

For fireground operations, an incident is dispatched on a repeated channel. For incidents that require a tactical channel (e.g., Fireground Channel 4), members switch to the assigned tactical channel. The fireground tactical channel is a non-repeater channel with limited distance, is not recorded, and the Fire Alarm Office cannot monitor the fireground tactical channels. Every firefighter and fire officer are assigned a portable radio. A firefighter is identified by their assigned position (e.g., Engine 94 pipe) and the officer is identified by the apparatus they are assigned to (e.g., Engine 94 or Engine 94 officer). A battalion chief is assigned two portable radios. One portable radio is to monitor the dispatch channel (Fire Alarm Office) and the other portable radio is to communicate with companies operating on the fireground. Each portable radio has an emergency alert button (orange), but it is programmed to identify the channel the portable radio is on when pushed. The fire department operated 1700 portable radios and 400 mobile radios.

Training, Education, and Professional Development

Illinois Office of the State Fire Marshal

The Illinois Office of the State Fire Marshal (OSFM) does not mandate minimum training requirements for firefighters. However, the OSFM does maintain and oversee a Division of Personnel Standards and Education (DPSE) which promotes, encourages, and assists local governments to improve the levels of education and training standards for local firefighters. While this program is strictly voluntary, the OSFM and the DPSE highly encourage local governments to adopt and complete firefighter certification programs. This includes offering a reimbursement program for firefighter training costs. Additional information about the DPSE's programs can be found on the Division's website, and the General Assembly's Illinois Administrative Code which includes training facilities, examinations and certifications, and a current list of certifications.

Fire Department

This career fire department enacted requirements that exceeded the state's requirements. The fire department hires candidates through the city's civil service process and gives recruitment tests for both single-role paramedics and firefighter positions. Recruits that pass the exam are placed on an eligibility list and that list is sorted in lottery order. The list is referred to as vacancies become available. Recruits must pass a background check, a physical ability test, and a medical examination that complies with NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*.

The fire department operates its own recruit training academy, which is more than 6 months and exceeds the state fire training requirement. The curriculum includes:

- *Basic Operations Fire Fighter* [NFPA 1001 2019]
- *Fire Service Vehicle Operator* (FSVO) course [NFPA 1002 2017]
- National Incident Management System (NIMS): *Introduction to the Incident Command System* (IS100)
- National Incident Management System (NIMS): *An Introduction to the National Incident Management System* (IS-700.b)

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- National Fallen Firefighters Foundation, *Courage to Be Safe Course*
- *Hazardous Materials Awareness* and *Hazardous Materials Operations* (NFPA 1072)
- *Farm Machinery Extrication*

The recruit academy consists of more than 490 classroom and practical training contact hours; written and practical testing per state protocol; successful completion of a physical training test (a minimum of 3 times throughout instruction); and completion of flashover simulator training.

Also, each recruit must complete instruction in emergency medical services (EMS) and receive a *National Registry of Emergency Medical Technicians* Emergency Medical Technician (EMT). This certification is a minimum of 120 hours of classroom and practical training and education.

Firefighter candidates complete a probationary period after recruit school that entails 9 months of continuous employment from the date of initial hire. Then, candidates are further reviewed during the field evaluation period, which is 12 months of post-fire academy assignment on a company (engine or truck). The candidate is assigned to the station captain's shift.

During this time period, firefighters are required to participate in a minimum of two hours of training per shift, which is documented by the company officer. All firefighters must complete a 30-minute SCBA drill at the beginning of each work shift, which includes monitoring air management. During the SCBA drill, firefighters must add their identification tag to the apparatus collection ring located on the apparatus they are assigned to for the shift.

The battalion chief position is the highest tested rank in the department. Ranks above a battalion chief are appointed by the Fire Commissioner. The ranks of assistant deputy chief paramedic, deputy district chief, district chief, assistant deputy fire commissioner, deputy fire commissioner, and 1st deputy fire commissioner are appointed by the fire commissioner. The fire commissioner is appointed by the mayor. The promotion process and respective requirements for the positions of lieutenant, captain, and battalion chief are show below (**see Table 3)**.

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Table 3: Promotion Process for each Department Rank

Position/Rank	Required Length of Service	Promotional Process	Training Post Promotion
Lieutenant	Requires 5 years of service as Firefighter	Written examination and oral interview	5-week training program at the fire academy
Captain	Requires 30 months of service as a Lieutenant	Written examination and oral interview	2-week training program that covers the National Fire Academy's *Incident Safety Officer* course, investigating motor vehicle accidents, the care, maintenance, and use of PPE, and incident command system (ICS) training
Battalion Chief	Requires 30 months of service as a Captain	Written exam	2-week officer candidate school program for battalion chiefs includes department communications procedures including the operational issues for portable radios, high-rise firefighting operations and practical drill, the use and management of rapid intervention crews, and Mayday procedures.

Structure

The 28,000 square foot structure was a four-story Type III mixed occupancy building, built in 1894. The building was located on a 5,820 square foot lot within a commercial district. Due to its age, it can be assumed that various improvements and alterations were made to the building to accommodate the existing occupancy. The entire first floor was occupied by a 5,600 square foot full-service restaurant containing a bar, dining tables, and a fully operational kitchen. There were two entrances on side Alpha accessing the restaurant and a separate entrance to a stairway leading to the second-floor apartments. There was an entrance leading to the restaurant's kitchen on side Charlie. The upper floors consisted of four apartments on each of the three floors, totaling 12. Each apartment had two-bedroom and one-bathroom with 900 square feet of living space. There were two unprotected wood stairways extending from the entrance door on side Alpha thru the fourth floor and a second stairway at the rear of the structure (**see Photo 1**). The interior walls were a mixture of wood lath across wall studs coated with plaster with some areas renovated with drywall (**see Photo 2**).

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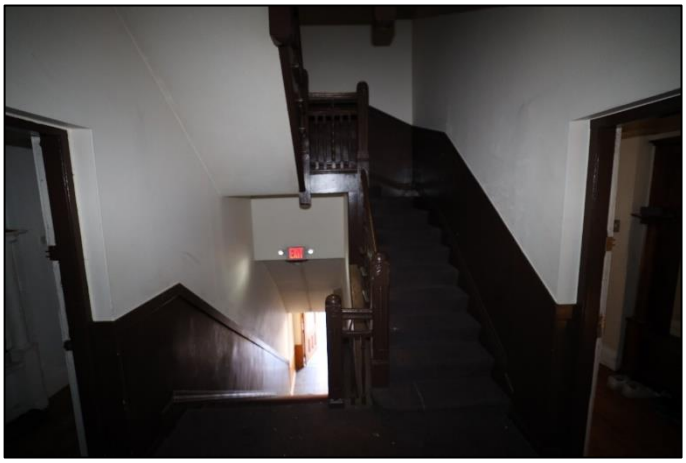

Photo 1. View of stairway leading to upper floor apartments (*Photo courtesy of Fire Marshal's Office*)

Photo 2. View of upper floor hallway providing access to apartments (*Photo courtesy of Fire Marshal's Office*)

The overall roof structure appeared to be in good stable condition at the time of the incident (**See Photo 3**). There were two square covered sky lights located in the center at the front of the roof. The roof also maintained 12 HVAC systems along with several vent pipes, an assortment of wires, cables, and satellite dishes. Additionally, two five (5') feet by nine and a half feet (9'5") light/air shafts, covered with corrugated plastic panels, were present towards the center area of the roof. The two sky lights were separated by a rectangular shaped steel I beam in a framing configuration.

Photo 3. Surface view of the South light/air shaft in which T44-3 firefighter fell (*Photo courtesy of Fire Marshal's Office*)

The light/air shaft, commonly referred to as a lightwell or airshaft, is a vertical opening within a multi-story building. The opening allows ventilation of the building's interior spaces to external air. The shaft provides air to reach unventilated areas. Additionally, the opening can provide sunlight to interior portions of the building, reducing the need for electric lighting. The shaft involved in the incident measured nine feet-five inches (9'5") X five feet (5'). The height of the shaft extended forty-six feet (46') from the roof line to the first-floor level. The shaft then continued down past the first-floor eight feet (8'), creating a dry well. The width of the dry well was approximately five feet (5') X

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five feet (5'). The total length from the bottom of the drywell to the top of the shaft measured fifty-four feet (54'). At the bottom of the well there was a small metal service hatch which opened outward to the basement room used as a woodworking area.

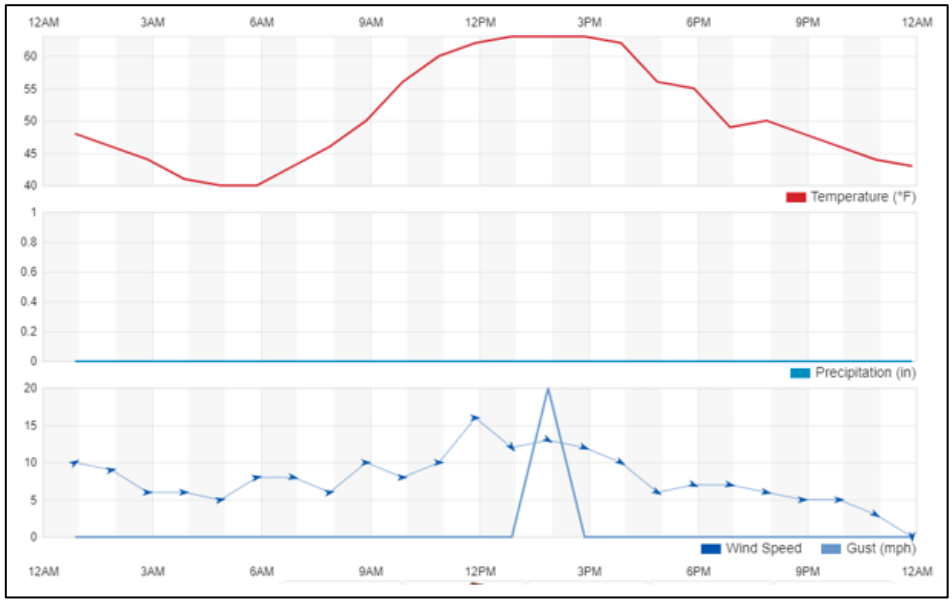
Personal Protective Equipment

NIOSH investigators inspected and photographed the structural firefighting turnout gear and SCBA worn by T44-3. At the time of the fire, the firefighter was wearing full turnout gear, which was compliant with NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* and was in good condition [NFPA 1971 2018].

The SCBA worn by T44-3 was a Mine Safety Appliance (MSA) G1, that was approved by NIOSH and certified as meeting the NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2013 edition by a third-party certification body [NFPA 1981 2018].

Weather Conditions

On November 13, 2023, at 05:53 hours, the weather was clear with winds out of the west at 8 mph with no reported wind gust. The temperature was 40°F, the dew point was 31°F, the humidity was 70%, and the barometric pressure was 29.63 inches. There had been no precipitation in the past 24 hours [Weather Underground 2023]. As detailed later, the temperature inversion shown in this graph impacted the smoke, preventing it from rising and impairing visibility. The sunrise time was at 06:31 hours.



Graph 1. Weather conditions on November 13, 2023.
(*Courtesy of Weather Underground*)

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Incident Timeline

The following timeline is a summary of events that occurred as the incident evolved on November 13, 2023. Not all incident events are included in this timeline. The time associated with the events are approximate, extracted from dispatch records, witness statements, audio recordings, and available resources. The timeline also includes benchmarks as indicated by data downloaded from the SCBA of T44-3. The timeline is not intended to serve as a formal record of events and not all incident events are included.

Time (Hours)	Fireground Operations, Response, and Details
05:27:00	• 9-1-1 call received for Box 103607.
05:29:00	• 9-1-1 communications center dispatched assignment: E55, T44, BC12, E22, and TL10
05:31:20	• BC12 arrived on-scene as first arriving unit.
05:31:48	• E55 arrived on-scene. • T44 arrived on-scene.
5:32:42	• BC12 reported four-story ordinary construction 50 x 75 feet with fire in the rear.
5:32:58	• E22 directed to the rear alley.
5:33:10	• Communications announced working fire.
5:33:22	• 9-1-1 communications center dispatched SQ1, E272, E452, T28, A6, A62, BC3, and BC17 for a working fire.
5:36:14	• T28 designated RIT.
5:36:26	• BC3 assumed RIT along with T28.
5:36:33	• BC17 designated safety.
05:38:00	• Working fire units begin to arrive on-scene.
5:40:15	• BC12 reported hose stretched and ladder to the roof.

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Time (Hours)	Fireground Operations, Response, and Details
05:46:00	• T44-3 SCBA activated on-air and breathing as indicated by SCBA data.
05:52:00	• T44-3 fell into the light shaft and his SCBA cylinder emptied.
05:53:51	• Mayday declared.
05:54:07	• "Still and Box" and EMS Plan 1 dispatched.
06:11:04	• Units continued to extinguish the fire. • Rescue personnel have eyes on the T44-3 and were working on getting him out.
06:23:06	• Rescue crew made contact with T44-3 and packed him up for extrication out of the shaft.
06:27:05	• T44-3 extrication underway via a rope removal.
06:33:17	• The T44-3 removed and transported to the hospital.

Investigation

On November 13, 2023, a 39-year-old male career firefighter fell down a light/air shaft while conducting roof operations. The communications center received a 9-1-1 call at 05:27 hours from an employee who arrived to work at a restaurant, located in a four-story mixed occupancy building. She opened the front door and observed white smoke throughout the rear of the restaurant where the kitchen was located. At approximately 05:29 hours, the dispatch was issued for a "Still" alarm Box 103607. E55, T44, BC12, E22, and TL10 were dispatched for a structure fire. The first arriving unit was BC12, at 05:31:20 hours. He met with the caller who reported that the kitchen of the restaurant was on fire. Along with the caller, BC12 proceeded to the rear of the building where he observed smoke emanating from a north facing door in the alley on the west side of the structure. At 05:31:48 hours, E55 arrived on-scene simultaneously with T44 and was positioned northbound approximately two buildings past the fire location. T44 approached the building from the West, positioning the apparatus at the front of the building. T44's aerial ladder was raised and placed on the Southeast corner of the roof (**see Photo 4**).

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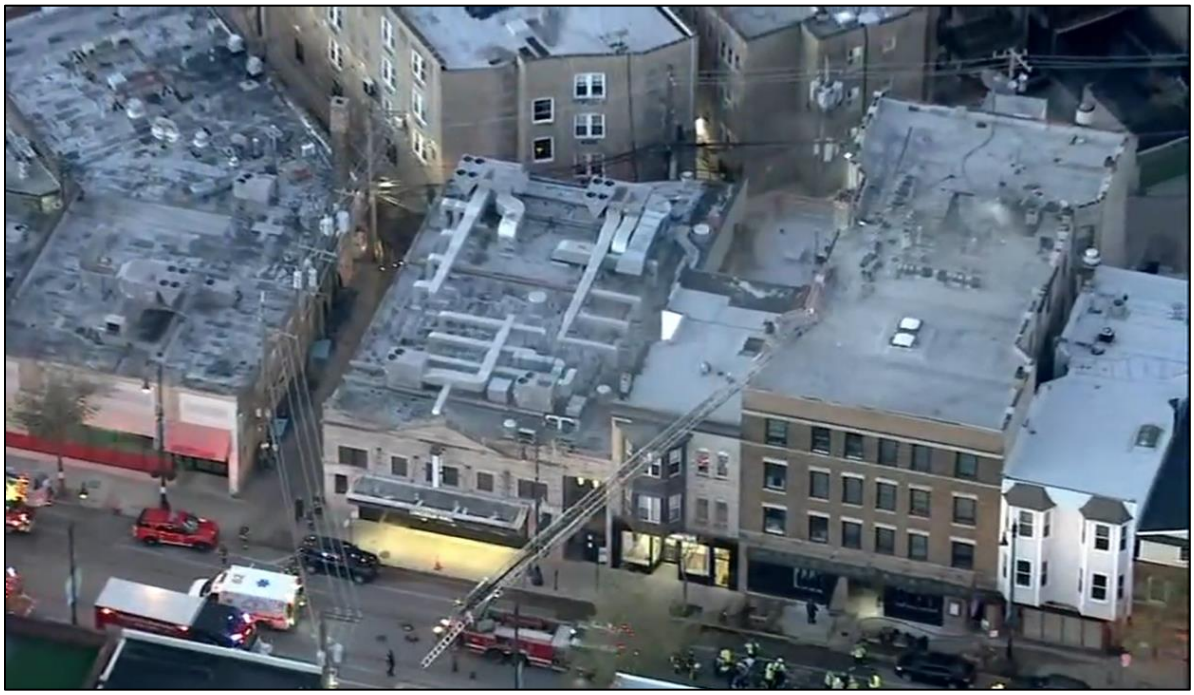

Photo 4. View of Truck 44's position
(*Photo courtesy of fire department*)

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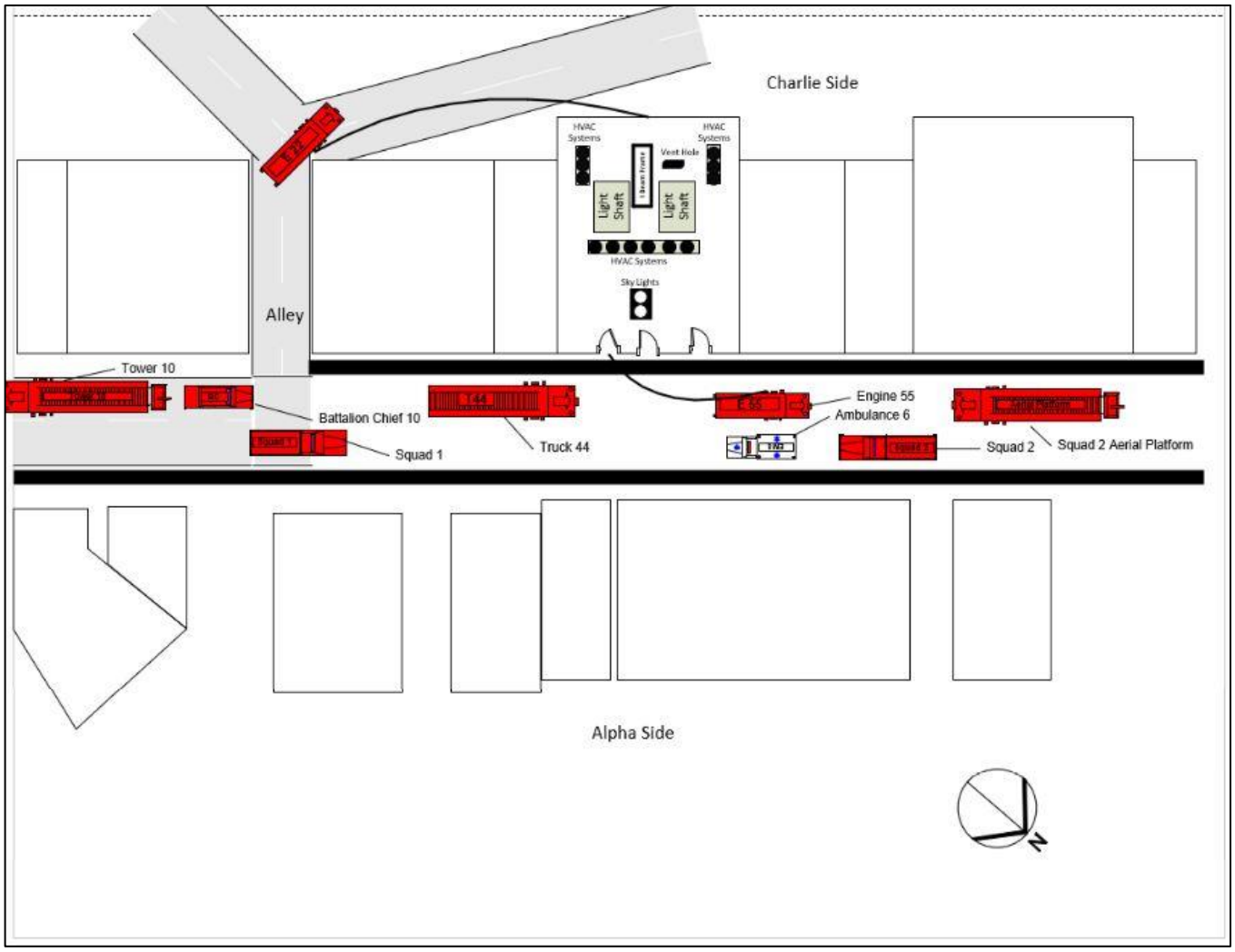

Figure 1. Scene diagram showing apparatus and hose line placement (*Courtesy of NIOSH*)

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Initial size-up indicated a light haze was present along with the odor of smoke in the area. Units received notification over the radio from BC12 that the fire was located at the rear of the structure at 05:32:42 hours with E22 being directed to the rear alley. E55 stretched 550' of 2½" hose that supplied 150' of 1¾" attack hose through a wye, preparing to make an interior attack. The crew of E55 entered the building through a side Alpha glass door, followed by a wooden door that was forced open by T44 (**see Photo 5**).

Photo 5. View of the attack crew's entry point to the restaurant on side Alpha. (*Photo courtesy of Fire Marshal's Office*)

As E55 stretched a hose to the rear of the structure, they encountered heavy grey smoke coming from the restaurant's kitchen. As they reached the rear of the restaurant, they pushed open the kitchen door and began to extinguish the fire. They reported the overhead HVAC system was falling as the pressure from the water hit the air duct assembly. At 05:33 hours, BC12 upgraded the incident to a working fire. The working fire units dispatched were SQ1, E272, E452, T28, A6, A62, BC3, and BC17. It was determined the main body of fire was in the kitchen area of the restaurant. BC12 returned to the front of the building to direct arriving units on fire operations.

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At 05:36 hours, multiple units were given assignments while en route to the scene. These units began to arrive on-scene between 05:38 and 05:51 hours. The second team from T44 ascended the aerial ladder and accessed the front of the roof. BC12 reported to dispatch that hose was stretched and a ladder was to the roof at 05:40:15 hours. As the T44 crew climbed onto the roof, smoke emanated from all vertical openings and smoke conditions increased as the T44 team started roof operations. As the smoke accumulated, it drifted and hovered over the roof, causing visibility to decrease. The smoke was failing to rise and dissipate, which was likely caused by temperature inversion (**see Photo 6**). The smoke conditions and darkness presented the T44 team with increased difficulty in identifying trip hazards and openings located on the roof.

Photo 6. View of smoke over roof.
(*Photo courtesy of citizen app*)

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They observed two large light/air shafts covered with translucent corrugated panels (**see Photo 7**). They called out the hazard and proceeded with making several ventilation holes in the north light/air shaft covering.

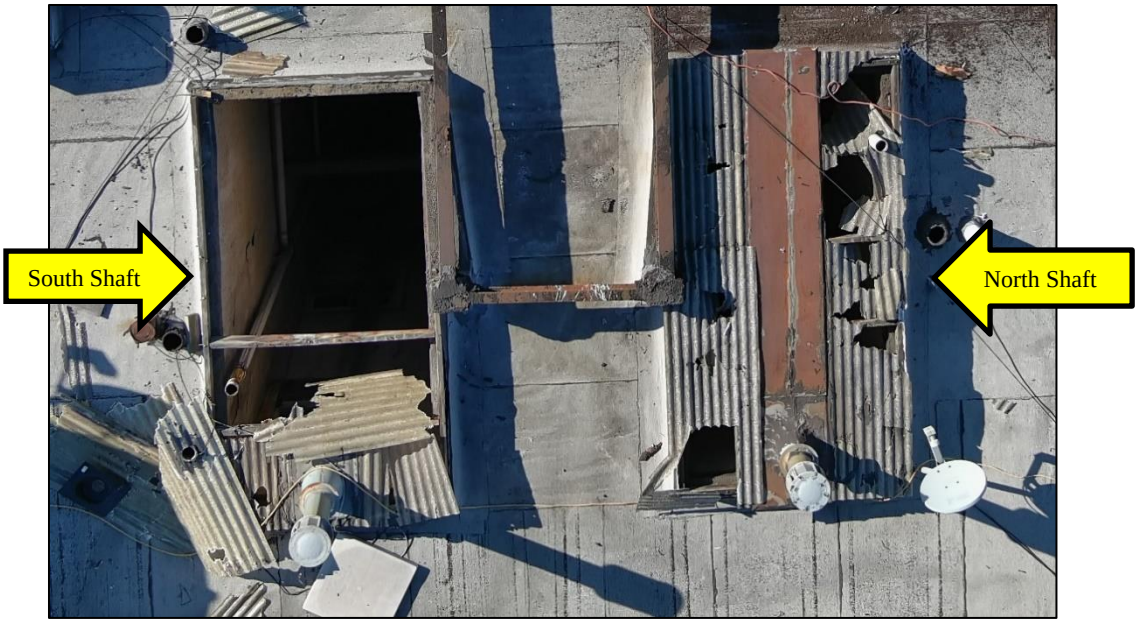

Photo 7. View of the two light/air shafts with removal of panel (south shaft) and ventilation holes (north shaft).
(*Photo courtesy of Fire Marshal's Office*)

They decided to cut a vertical ventilation hole, west of the second light/air shaft, located north of the first light/air shaft. As they started cutting the ventilation hole, heavy smoke pushed out of the cockloft. The remaining crew member, T44-3, began to cut a ventilation hole in the roof using a K12 saw. At 05:46:00 hours, T44-3 activated his SCBA and began breathing air.

Two members of SQ1 proceeded to the roof to support T44. They began to assist in ventilating the vertical openings, removing the translucent corrugated panels from the South light/air shaft (**see Photo 8**). One of the members announced they were ventilating the shaft. SQ1-1 left his helmet near the shaft in an attempt to warn of the large opening hazard. At this time, T44-2 decided to return to the apparatus and retrieve a tool to probe the hole. T44-3 took a break from cutting the ventilation hole in the roof and put the saw down. A firefighter from SQ1 discussed a plan to widen the hole (**see Photo 9**). They then picked up the saw to expand the ventilation hole. During this time, T44-3 was observed on his knees, positioned west of the ventilation hole, adjusting his SCBA facepiece.

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Photo 8 and Photo 9. View of ventilation hole
(*Photo courtesy of Fire Marshal's Office*)

As the crew of SQ1 was focused on expanding the ventilation hole, T44-3 fell into the light shaft and his SCBA's data noted that his cylinder emptied at 05:52:00 hours. T44-3's partner returned and noticed that T44-3 was not in the area. He asked the SQ1 firefighters about T44-3's location, but they did not know. T44-2 and the crew from SQ1 immediately started to search for T44-3, concerned he may have fallen off the edge of the roof.

They then heard a PASS alarm sounding from the south light/air shaft (**see Photo 10 and Photo 11**). It was determined the alarm was from T44-3 and a Mayday was immediately issued at 05:53:51 hours. They were unable to get a visual on T44-3 due to the depth of the shaft as well as the lack of light. At 05:54:07 hours, "Still and Box" and EMS Plan 1 were dispatched.

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Photo 10. Roof view inside the light/air shaft.
(*Photo courtesy of Fire Marshal's Office*)

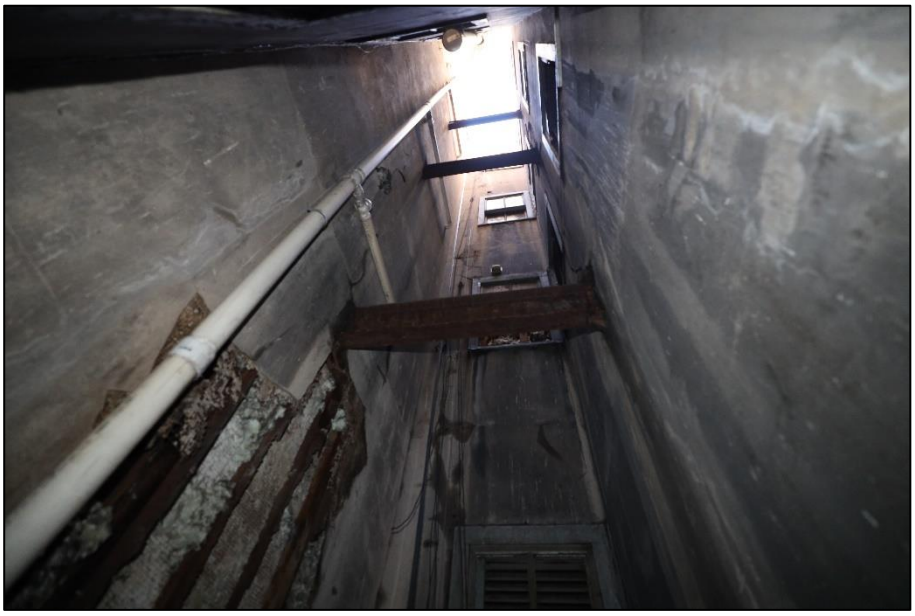

Photo 11. Bottom view inside the light/air shaft.
(*Photo courtesy of Fire Marshal's Office*)

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Once it was relayed that T44-3 fell down the shaft, rescue operations immediately commenced with units rapidly searching for access to the shaft at 06:11:04 hours. The officer of SQ1 directed personnel to gather equipment and proceed to the roof to assemble an artificial highpoint to lower personnel down the shaft. The plan was to make contact with T44-3 and to use a retrieval system if an access point was unavailable. As the rescue operation on the roof continued, other units searched for alternative access to the shaft. The RIT was operating on the 2nd floor and gained access through a window that was closed off and secured with a plywood and drywall covering (**see Photo 12**).

Photo 12. View from window along wall of light/air shaft.
(*Photo courtesy of Fire Marshal's Office*)

Members from SQ1 arrived to assist the RIC gain access to the shaft through the window. Once the window was opened, a member of SQ1 was secured in a Class 3 harness and lowered to T44-3 with a rapid intervention kit.

T44-3 was conscious, severely injured, and unable to feel his legs. He was lying in a fetal position covered with debris, with his SCBA facepiece off. At 06:23:06 hours, the SQ1 firefighter removed T44-3's SCBA to prepare him for extrication. A hasty harness was secured to him for extrication out of the shaft. Both firefighters were in a space with limited mobility which complicated extrication efforts (**see Photo 13**).

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Photo 13. View of area light/air shaft where T44-3 was trapped
(*Photo courtesy of Fire Marshal's Office*)

As the SQ1 firefighter was preparing T44-3 for removal, members of SQ2 gained access on the 1st floor through the breach of a masonry wall. At 06:27:05 hours, T44-3 became unresponsive, and was rapidly removed from the shaft using a rope system through the first-floor breach (**See Photo 14**). After being removed from the dry well at 06:33:17 hours, T44-3 was treated and transported to a medical facility where he was pronounced deceased.

Photo 14. View of extrication area.
(*Photo courtesy of Fire Marshal's Office*)

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Fire Origin and Cause

The fire was investigated by the fire department's Office of Fire Investigation, ATF, Office of the Fire Marshal, and the Local Police Arson Unit. The fire originated in the kitchen area of the first-floor restaurant (**see Photo 15**). There was a slight vertical extension of fire that traveled above the kitchen into a second-floor apartment. All logical ignition sources were investigated, and it was determined that the cause of the fire was accidental. The investigation was conducted using the principles of NFPA 921 *Guide for Fire and Explosion Investigations* (NFPA 921, 2024).

Photo 15. Area of origin.
(*Photo courtesy of Fire Marshal's Office*)

Cause of Death

According to the *Report of Postmortem Examination* by the Office of the Medical Examiner, T44-3 died due to blunt force trauma.

Contributing Factors

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 injuries or fatalities. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the fatality:

- *Incident command division supervision*
- *Communications*
- *Crew integrity*
- *Situational awareness*
- *Poor visibility*
- *Ongoing sleep disturbance.*

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Recommendations

Fire departments should:

Recommendation #1: Ensure incident command implements the NIMS, including establishing functional and geographical assignments at the beginning and maintaining them throughout operations.

Discussion: During this incident, two crews were operating on a flat roof that had multiple trip and fall hazards (i.e., unprotected skylights and roof holes). As part of NIMS, the designation of a division or group includes a Division Group Supervisor to oversee the activity of personnel operating on the roof. Division Group Supervisors maintain safety, crew integrity, and accountability of personnel assigned under their supervision. Safety maintenance can include the identification and marking of elevated risks such as life-threatening hazards. When a crew is separated, a division supervisor could monitor the roof operations to keep visual contact of the personnel and closely maintain a safe zone around the roof hazards.

It is the responsibility of the IC to implement the incident management system to provide structured coordination to emergency incident operations as well as ensure the safety and health of organization responders. It is important for the IC to focus on the progress of the fire, identify additional resources needed, and forecast the future of the incident. For more information, refer to NFPA 1561, Standard on Emergency Services Incident Management Systems and Command Safety [NFPA 1561 2020]:

- *Chapter 4, Section 6* provides direction on the structure and coordination of the incident management system
- *Chapter 5* identifies the functions and structure of command, allowing the IC to determine which elements of the incident management system to implement and assign supervisors
- *Chapter 8* addresses the initiation of an accountability system including functional divisions by groups and geographical assignments as divisions. The implementation of divisions and groups allows for each area to have supervision and accountability. It also provides the effective management of a growing incident, relieving the IC of the responsibility of directing each area of the incident.

Recommendation #2: Ensure firefighters immediately notify the IC and all units operating on the fireground when the roof is ventilated and/or translucent corrugated roof panels are identified.

Discussion: In this incident, the roof of the building was large, consisting of several high-risk hazards. Two crews were operating on the roof, performing different tasks. Communicating the actions and progress of roof operations would allow the IC, along with all personnel operating on the incident to know what tasks were completed and the number of hazards encountered on the roof. This would give the IC the vital information to factor into their decision-making process.

Situation reports (Sit Reps) from tactical divisions to Command need to include milestones such as progress (or lack of) along with critical benchmarks. Specific hazards on the fireground such as roof openings, or spongy or questionable structural integrity need to be communicated immediately to

command when encountered. Specific to this incident, whenever translucent corrugated roof panels are identified, this information should be transmitted to Command. NIOSH published a Safety Alert in 2015 to bring attention to the hazards associated with translucent corrugated roof panels that are widely used across the United States.

Translucent corrugated roof panels can be difficult to identify and seldom have frames or other features that identify their location. Fire departments can identify structures within their jurisdiction that have translucent corrugated roof panels and include this information in pre-incident plans. ICs can consider conducting a risk benefit analysis of permitting rooftop operations on identified buildings as firefighters may not be aware of and may not fully appreciate the hazards and risks associated with these panels. It is the responsibility of firefighters to inform the IC and other firefighters when translucent corrugated roof panels are identified and not to walk or stand on them. Firefighters should constantly sound the roof to gauge structural integrity and changes in roof construction. Relevant information should be shared with mutual aid departments and added into the caution notes of Computer-Aided Dispatch systems where possible.

Recommendation #3: Ensure personnel maintain crew integrity at all times throughout an incident.

Discussion: During this incident, two members from T44 proceeded to the roof to perform roof operations. As they began to ventilate, one of the assigned crew members left to retrieve a tool. The separation of assigned partners placed T44-3, who remained in the hazardous environment, in danger. During this time, a second crew from SQ1 arrived on the roof to assist. They directed their focus on expanding a ventilation hole that was started by a member of T44. Although there were three personnel operating on the roof, the crew of SQ1 was focused on a task that did not allow them to keep visual contact with T44-3. The last visual contact between the SQ1 crew and T44-3 was observing T44-3 on his knees, adjusting his SCBA facepiece. When T44-3's partner returned, he noticed that T44-3 was not in the area and engaged with the SQ1 crew to locate him. T44-3's PASS sounded, and it was determined he had fallen in the light/air shaft, resulting in a Mayday being declared.

Crew integrity starts at the arrival of the unit and continues throughout the incident. When the cohesion of a crew breaks down, the possibility of a mishap occurring increases [Tippett 2012]. Crew integrity is most effective by maintaining visual and voice contact when operating in an immediately dangerous environment. NFPA 1550 *Standard on Fire Department Occupational Safety and Health Program* states in Paragraph 10.6.4 "Members operating in hazardous areas at emergency incidents shall operate in crews of two or more". Additionally, Paragraph 10.6.5, states "Crew members operating in a hazardous area shall be in communication with each other through visual, audible, or physical means or safety guide rope, in order to coordinate their activities". Furthermore, NFPA 1550 Paragraph 10.6.6 states, "Crew members shall be in proximity to each other to provide assistance in case of an emergency" [NFPA 1550 2021].

During an incident, if one of the crew members needs to leave, both should leave together to maintain crew integrity. The company officer is responsible for ensuring no members of a team get lost or separated. Constant contact with their assigned partner by visual observation, voice, or touch while operating in a hazard zone allows members to recognize dangers and assist with life threatening

emergencies. It is the responsibility of every member to always stay in communication with crew members. If crew members get separated, crew integrity is lost and can elevate firefighter risk.

Recommendation #4: Support the development and maintenance of effective situational awareness during emergency incidents.

Discussion: During this incident, after T44 arrived, they gained access to the roof from the aerial ladder and the visual conditions were obstructed by darkness and smoke. They were likely unaware of the obstacles and hazards on the large unfamiliar roof. The fire operations involved a large commercial roof, including two large light/air shaft openings, that were covered with translucent corrugated plastic panels.

- Level 1 – Perception: Ineffective observation of critical information during the initial scene size-up and during the creation of the Incident Action Plan (IAP) in relation to the active fire in a multi-story mixed occupancy building
- Level 2 – Comprehension: Inadequate recognition of elevated risks upon arrival and how those were directly impacting the safety of personnel operating on the roof
- Level 3 – Prediction: Inaccurate forecasting of the roof hazards; large natural openings on the roof which resulted in a firefighter falling down the light/air shaft was not anticipated.

Discussion: During this incident, compromised situational awareness at one or more levels resulted in negative outcomes. Situational awareness is an ongoing process; all personnel need to maintain SA to make effective decisions throughout the emergency incident. SA has been defined as, “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.” [Gasaway R 2019]. As hazards rapidly increase and change during an incident, new stressors may emerge, requiring the need to reestablish situational awareness.

Situational awareness is an ongoing process at all three levels:

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 then 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 training program that provides a range of education and hands-on experience to aid comprehension during stressful situations.

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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.

Several barriers can negatively impact situational awareness [Gasaway R 2013; 2017; 2023] including: 1) sense of urgency to respond; 2) physical and mental stressors; 3) ineffective or lack of communication; 4) distorted sense of time and fixation; 5) task overload; 6) sense of complacency; and 7) use of improper procedures. Effective situational awareness may be supported by several activities [Gasaway R 2013; 2017; 2019; 2023]. To support incident response, fire service management can:

- Provide ongoing professional development that includes academic and technical education and hands-on experience.
    - *Example:* Use the three situational awareness levels as a tool to work through emergency case examples. This may include training personnel on identifying critical hazards, 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 expectations training in 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 ISO 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.

Recommendation #5: Ensure that all firefighters, company officers, and chief officers are aware of and are trained to recognize the hazards of roof operations, including limited/low visibility operations.

Discussion: In this incident, the T44 roof team ascended the aerial ladder and accessed the front of the roof. As they climbed onto the roof, smoke emanated from all existing openings. Smoke conditions increased as the T44 team started roof operations. As the smoke accumulated, it drifted and hovered over the roof, decreasing visibility. The smoke was failing to rise and dissipate, which was likely caused by temperature inversion. The smoke conditions and darkness presented the T44 team with increased difficulty in identifying trip hazards and openings on the roof.

Generally, fire department training is already focused on the challenges firefighters face when confronted with poor visibility and disorientation. A firefighter's senses, such as hearing and sight, can help comprehend what is going on around them. However, PPE, including SCBAs, can decrease or obstruct hearing and visibility (**see Photo 16**). Further, while walking allows for rapid movement, walking erect can also cause firefighters in PPE to lose the visibility immediately in front of them when conditions are poor. This increases the risk of tripping and/or falling. One mitigation method is to train firefighters to crawl and walk while probing their immediate area with a tool to alert them of any hazards (**see Photo 17**). Additionally, when working in any high-risk area, operating at a reduced tempo can improve awareness.

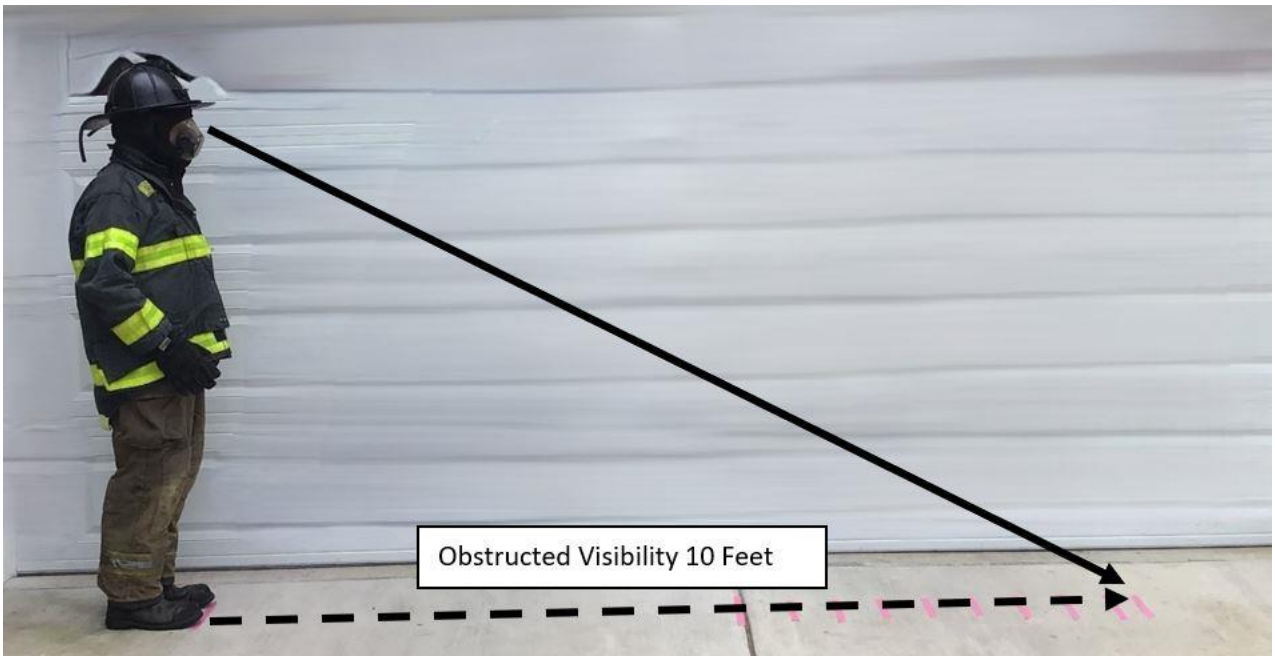

Photo 16. Obstructed view of firefighter standing.
(*Photo courtesy of NIOSH*)

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Photo 17. Obstructed view of firefighter kneeling.
(*Photo courtesy of NIOSH*)

These conditions can also delay rescue efforts of firefighters and delay survival. If a life-threatening hazard present and there is no avenue to reduce or eliminate the hazard, the firefighter may opt to remove themselves from the area until the conditions improve, or the hazard is eliminated.

Roof operations in many incidents can be viewed as routine. Existing roof openings are often used first since they can usually be opened more easily while cutting a hole to create ventilation takes more energy and time. Regardless of whether an existing or new opening is being, the expectation is for smoke to exit the opening and quickly rise. However, firefighters should recognize factors that may impact routine expectations and take appropriate actions. For example, wind has a significant impact on roof operations; however, trained firefighters can identify wind direction and position themselves to where the smoke drifts away from them. By reviewing photographs, video, and interview statements, NIOSH investigators determined that the smoke emanating from existing openings in the roof and ventilation access points was not rising and dissipating in a normal manner. Temperature inversion is a phenomenon that reverses the typical characteristics of the atmosphere. This phenomenon can affect the movement and dissipation of smoke. During the time of the incident, the temperature was at its lowest point throughout the previous day and into the early morning. Temperatures usually drop as altitudes increases above the earth's surface. This occurrence is caused by different factors.

Surface inversion is a form of temperature inversion that usually takes place on a cloudless night with little or no wind present, creating the perfect conditions for heat to escape rapidly from the surface. As a result, the air at the surface cools down much more quickly than the air above it in the atmosphere, creating a low-lying temperature inversion. The temperature inversion causes the warm air to cap cooler air which can trap smoke in the cooler air under the warmer temperatures. This event combined with the darkness added to the reduced visibility for the personnel operating on the roof during this incident.

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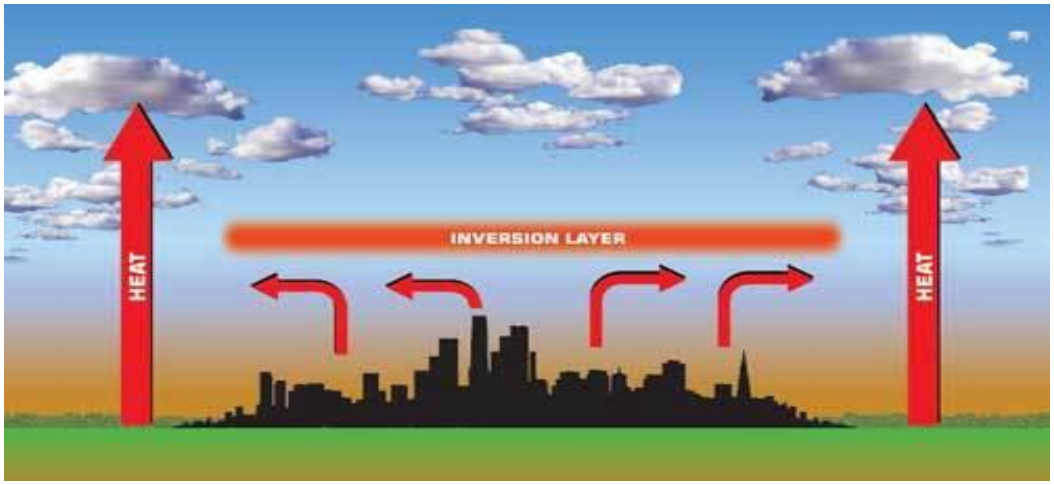

Figure 2. Example of heat inversion affecting smoke movement.
(*Photo courtesy of ownyourweather.com*)

Recommendation #6: Ensure fire department management understands and communicates the effects of sleep deprivation and the potential impact on work performance and safety to firefighters before they participate in an incident response.

Discussion: The fire department involved in this incident has a night watch policy. Each member of the crew has a designated time to staff the watch desk. If the station is alerted for a response, the night watch is responsible for alerting the crew of the response and providing information that will allow personnel to properly prepare for the type of response. T44-3 had performed night watch duties starting at 22:00 hours prior to the incident. During this time, he was required to stay awake for the duration of his night watch. Additionally, T-44-3's company had responded to two incidents prior to the incident fire, one at 03:04 and the second response at 04:38. On November 9, T44-3 worked a 24-hour shift during which his company responded to 15 responses throughout the 24-hour period. Between the 24-hour shift on November 9 and the 24-hour shift on November 12, T44-3 had 48 hours of break time between shifts. T44-3 may not have received an adequate amount of sleep during the 24-hour shift leading up to the fatal incident.

Firefighters and EMS workers encounter many shift variations depending on department policies, schedules, and staff resources. In some cases, a lack of staffing and increased demand for service can cause workers to engage in extended shifts without sleep. The 24-hour shift model used in the current department is prevalent throughout the fire service. However, the fire service has evolved into much more then extinguishing fires and transporting the sick and injured. The fire and EMS service is not routine and the fluctuation in the amount and type of work can include physically demanding tasks for long periods of time. Workers are also expected or required to engage in inspections, community events, strenuous training, and technical emergency response. Many departments require suppression personnel to staff the EMS units during a portion of a shift. Potentially, a member may arrive for a 24-hour shift, participate in daily station activities including cleaning and maintaining the station, attend a variety of inspections including building, smoke detector, hydrant, and then engage in training or they may be

assigned to an EMS unit involving continued medical treatment and transport. Some of these tasks may require the emergency worker to make rapid lifesaving decisions.

These variations in shift schedules can be problematic as research indicates that the demand in public safety services causes impaired sleep and eventually chronic fatigue. From an occupational standpoint, the Canadian Federation of Nurses Union described fatigue as "an individualized experience of lack of energy or tiredness with physical, cognitive and/or psychological manifestations". The report also said that fatigue is "A hazard at work due to its association with several sequelae, including diminished cognitive and physical acuity and increased risk of work-related injury or accident" [Scott-Marshall 2023]. Lack of sleep and its contributions to chronic fatigue is a growing concern in the fire service. For example, one study indicated that 59% of firefighters reported sleep deprivation and 23% reported insomnia. Minimal interruptions from nighttime calls affected processing speed, visual-motor coordination, and reaction time. The shiftwork caused a decrease in neurocognitive function (visual attention, cognitive flexibility, verbal memory, and visual, psychomotor, and motor speed [Allison et al. 2022].

The International Association of Fire Chief's 2007 report on The Effects of Sleep Deprivation on Fire Fighters and EMS Responders indicates that a suitable amount of sleep is required to perform sufficiently. Lack of sleep can be associated with mistakes involving performance that require quick decision-making while being alert and vigilant. According to the 2007 report, lack of sleep can reduce alertness, as fatigued individuals experience brief periods of micro-sleep. These brief monetary lapses can cause a person to not be observant of their environment. As stated in the IAFC report: "Being awake for prolonged periods, such as when working more than a typical eight-hour shift, also impairs performance. In fact, studies show that being awake for 18 hours produces impairment equal to blood alcohol concentration (BAC) of 0.05, and deficits reach a BAC equivalent of 0.10 after 24 hours of wakefulness. Thus, a drowsy driver may be as dangerous as a drunk driver" [IAFC 2017].

Despite this concern, there is still a desire from departments and personnel to default to a longer shift model. Longer shifts are appealing because they allow personnel to work fewer days throughout the year, resulting in a reduced commute to and from work and multiple days off to engage in secondary employment or spend more time with family. Especially if fire departments use a longer shift model, they may incorporate training on fatigue and interrupted sleep. Departments may also opt to include sleep disturbance screening into their existing health and wellness program. For example, NFPA 1580, Chapter 10, section 10.1.1 states, "The fire department shall evaluate the following 15 essential job tasks against the types and levels of emergency services provided to the local community by the fire department, the types of structures and occupancies in the community, and the configuration of the fire department to determine which tasks apply to individuals." Included in the essential job task are "unpredictable, prolonged periods of extreme physical exertion as required by emergency operations without benefit of a warm-up period, scheduled rest periods, meals, access to medication(s), or hydration," "critical, time-sensitive, complex problem solving during physical exertion in stressful, hazardous environments, including hot, dark, tightly enclosed spaces, that is further aggravated by fatigue, flashing light, sirens, and other distractions," and "working shifts, including during nighttime, that can extend beyond 12 hours" [NFPA 1580 2025].

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Additionally, Chapter 11, section 11.7.22.1 says "screening for sleep disorders using a validated questionnaire, such as the Berlin Questionnaire or Epworth Sleepiness Scale, shall be provided annually" to proactively identify possible sleep disorder risks among personnel. Section 11.7.22.2 further indicates that, for firefighters with a high index of suspicion for sleep disorder based on the questionnaires or biometric data, the physician shall discuss the risks and benefits of testing and treatment [NFPA 1580 2025]. Section 14.3.3.4 of NFPA 1550 [2024], states that the fire department should develop and implement SOPs to provide strategies to manage the effects of acute and chronic sleep and circadian rhythm disruption that lead to sleep deprivation, fatigue, and other adverse health effects. In addition, A.14.3.3.4 includes some suggested strategies for combating sleep and circadian rhythm disorders.

Such discussions can be encouraged and supported by department management. Dr. Matthew Walker, a neuroscience and psychology professor at the University of California, Berkley, and founder and director of the school's Center for Human Sleep Science, is one subject matter experts who has discussed sleep health for first responders. He explained that person who only gets six hours of sleep has a 30% more chance of getting into a car crash [Walker 2023]. The fire service relies on personnel to store memories of past experiences to assist in rapid decision making. Regardless of the type of department or length of service, fire department personnel will certainly experience times of sleep deprivation. Dr. Walker recommends educating new recruits about the risks they may face when experiencing fatigue from lack of sleep. This can be done by posting information in stations regarding sleep deprivation and ways to improve sleep, including, sleeping in dark cool areas, not using phones prior to sleep, taking naps, and attempting to get adequate sleep prior to the start of the work shift [Walker 2023].

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Investigator Information

This incident was investigated by Louis (Rick) Lago (former), Investigator, Patrick R. Montague (former), Investigator, and Jeff R. Funke, Team Lead, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. This report was authored by Louis (Rick) Lago (former) and Dr. Wesley R. Attwood, Investigator and Program Advisor. Dan Madrzykowski from the Fire Safety Research Institute (FSRI) provided an expert review of the investigation report. A subject matter expert review was provided by Michael V. Krzeminski, Staff Fire Instructor, Allegheny County Emergency Services – Fire Academy. The NFPA Public Fire Protection Division also provided a technical review.

Career Firefighter Dies After Falling into a Light/Air Shaft during a Fire in a Four-Story Mixed Occupancy Structure – Illinois

Additional Information

Fire Safety Research Institute (FSRI)

The Firefighter Safety Research Institute (FSRI), part of 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.

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. *NIOSH Approved is a certification mark of the U.S. Department of Health and Human Services (HHS) registered in the United States and several international jurisdictions.*