

LINE OF DUTY DEATH REPORT

F2018-18 • March 15, 2021

1095 WILLOWDALE ROAD, MORGANTOWN, WV 26505 • 304.285.5916

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Executive Summary

On December 9, 2018, a 36-year-old male firefighter died in a three-story duplex apartment building after becoming disoriented on the 2nd floor at Box 5-49. At 0358 hours, Fire Alarm dispatched Engine 5, Engine 4, Engine 2, Engine 13, Ladder 4, Ladder 7, Rescue 1, Ladder 1 (Rapid Intervention Crew) and Car 4 to Box 5-49 for a report of a basement fire. The fire was reported in a three-story occupied duplex apartment building. At 0402 hours, Engine 5 arrived on scene with smoke showing from underneath the front porch. Engine 5 reported a working fire. Ladder 4 reported on scene at 0403 hours. Ladder 4 advised smoke was showing, and they were investigating. Engine 5 initially stretched a 1¾-inch hoseline to Side Alpha. It was determined that the fire was located in the basement with the only access from Side Charlie. Upon arrival, Engine 2 stretched a 1¾-inch hoseline to Side Charlie with Engine 5. Crews assigned to the basement had difficulty accessing the basement due to the bulkhead entrance blocked by debris. The fire extended to the 1st floor and 2nd floor of the fire building. A 2nd Alarm for Box 5-49 was transmitted at 0419 hours at the request of Command (Car 4). Crews still were operating in the basement, but due to fire extension, Command sent Engine 4 to the 1st floor on Side Alpha. At 0428 hours, Ladder 7 was positioned in front of the building and the tower ladder was put in service for roof ventilation. At 0432 hours, the fire in the basement was knocked down. At 0437 hours, Engine 12 reported fire on the 2nd floor and found that the fire was also in the walls. At 0442 hours, Engine 12 exited the building. Ladder 4, Ladder 5, and a firefighter from Engine 4 were operating on the 2nd floor trying to knock down the fire on this floor. At 0444 hours, a 3rd



Firefighters involved in the rescue of the Ladder 4 firefighter from a 2nd floor bedroom on Side Charlie.

(Photo courtesy of the fire department.)

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Alarm was transmitted for Box 5-49. At 0446 hours, the officer of Ladder 5 transmitted a Mayday for crews trapped on the 2nd floor. A firefighter from Engine 4 (E402) was separated from the other firefighters on the 2nd floor. E402 was able to get to a bedroom window on the Side Alpha/Delta corner and was removed via a ground ladder. Four other firefighters came out another bedroom window and onto the platform of Ladder 7. A firefighter from Ladder 5 (L502) and a firefighter from Ladder 4 (L403) were separated from the other crews and from each other. Both firefighters moved toward Side Charlie of the fire building. As L502 moved toward Side Charlie, L502 heard an end-of-service time indicator (EOSTI) sounding and found L403. L502 moved toward the other firefighter and asked for L403's name but heard no answer. L502 started looking for a window to escape because the 2nd floor was getting hot. L502 entered a bedroom and found a window on Side Charlie, broke the window, called a Mayday on the radio, and started yelling for help. L502 retrieved L403, led him to the window and put the firefighter's hands on the windowsill. L502 then exited the window and descended a ground ladder. L403 did not follow L502 down the ladder. The time was approximately 0455 hours. Rescue efforts were started to remove L403 from the bedroom. Using a rope-haul rescue system, L403 was removed from the building at 0551 hours. L403 was transported to the local trauma center and pronounced deceased. The fire was declared under control at approximately 0651 hours.

Contributing Factors

- *Lack of continuous scene size-up and risk assessment*
- *Lack of incident management and command safety*
- *Lack of forecasting*
- *Lack of tactical objectives*
- *Loss of crew integrity*
- *Lack of rapid intervention crew(s)*
- *Below-grade fire*
- *Company staffing*
- *Personnel accountability system*
- *Arson*

Key Recommendations

- *Fire departments should ensure a detailed scene size-up and risk assessment is conducted during initial fireground operations and throughout the incident. Incident commanders should continually reevaluate the strategy and adjust the incident action plan (IAP) based upon the continuous size-up and risk assessment.*

The National Institute for Occupational Safety and Health (NIOSH) initiated the Fire Fighter Fatality Investigation and Prevention Program to examine deaths of firefighters in the line of duty so that fire departments, firefighters, 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 website](http://www.cdc.gov/niosh/fire) at www.cdc.gov/niosh/fire or call toll free 1-800-CDC-INFO (1-800-232-4636).



**LINE OF DUTY
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Introduction

On December 9, 2018, a 36-year-old male career firefighter died from the inhalation of products of combustion after becoming disoriented on the 2nd floor of a three-story duplex apartment building. The United States Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident on December 10, 2018. NIOSH investigators with the Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) contacted the fire department involved in this incident to arrange an investigation. At the request of the fire department and the International Association of Firefighters (IAFF) local, the NIOSH FFFIPP investigation was initiated at the beginning of 2019. On February 10, 2019, a safety engineer, an occupational safety and health specialist, and an investigator with the NIOSH FFFIPP traveled to Massachusetts to investigate this incident. During this investigation, the NIOSH representatives met with fire department officials including the Fire Chief, Deputy Chief of Operations, Deputy Chief of Services, Chief of Safety, Chief of Training, and members of the department's Fire Investigation Unit. The NIOSH investigators also met with representatives of the IAFF local, representatives from the city's Building and Inspectional Services, the Commonwealth of Massachusetts assistant district attorney representing the county, a representative from the Massachusetts Department of Labor and Standards, and a representative from the Massachusetts Fatality Assessment and Control Evaluation (FACE) Program. The NIOSH investigators went to the city's Dispatch Center and obtained a copy of the fireground audio; visited the incident site; and conducted interviews with fire department officers and firefighters directly involved in this fatal incident. The NIOSH investigators inspected and photographed the victim's personal protective clothing (PPE) and self-contained breathing apparatus (SCBA). They also reviewed department training records and standard operating procedures (SOPs).

On April 2, 2019, the NIOSH safety engineer and investigator returned to Massachusetts to continue the investigation. Additional interviews were conducted with firefighters directly involved in the incident, including two mutual aid fire departments that responded to Box 5-49. Additional photographs and building information were obtained from the fire department.

Fire Department

The career fire department provides fire protection and life safety services to an area encompassing 39 square miles and a population of 186,000. The daytime population increases to more than 200,000. The city encompasses a diverse range of structures, from densely populated multi-family dwellings and residential occupancies to office high-rise buildings and a mixture of manufacturing and industrial complexes. The city also contains nine universities and colleges. A major east-west interstate highway passes through the city, along with multiple rail systems. The fire department provides first responder

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emergency medical care (EMS). Advanced life support (ALS) and transportation are provided by a private healthcare company.

The fire department operates 13 engine companies, 7 ladder companies, 1 heavy rescue company, 1 special operations unit, and 2 self-contained underwater breathing apparatus (SCUBA) vehicles for dive rescue operations from 10 fire stations. The heavy rescue company is staffed with one officer and six firefighters. The minimum staffing allowed on Rescue 1 is one officer and four firefighters. Fire operations are divided into North Division (Car 3) and South Division (Car 4) with a district chief overseeing emergency operations within each district. Car 3 and Car 4 also are staffed with an incident command technician. The fire department employs a total of 406 uniformed personnel within the operations, fire prevention, and support services divisions.

The members assigned to a piece of apparatus are identified as follows:

- Engine 5 or Engine 5 officer
- E501
- E502
- E503.

The firefighter's identification is based upon seniority not by riding position.

Firefighters are assigned to work one of four operations shifts. Firefighters work a 24-hour shift, followed by 2 days off, another 24-hour shift, and then 4 days off. A full shift roster includes 91 firefighters, with the minimum staffing at 69.

The fire department has a special operations division which includes a technical rescue team and dive rescue team. Both teams are available for regional response. Also, the department responds to a regional airport in a support role to the aircraft rescue firefighting (ARFF) fire department based at the airport.

The fire department responded to a total of 33,379 incidents (1,398 fire and 31,981 non-fire) during 2018. In 2007, the fire department received a Class 2 rating from the Insurance Services Office (ISO). In the ISO rating system, Class 1 represents exemplary fire protection, and Class 10 indicates that the area's fire-suppression program does not meet ISO's minimum criteria.

The fire department operates a vehicle maintenance facility, which is located at the Fire Department Headquarters.

Fire Department Operations

The personnel accountability system is based on the daily riding list of each company. The list is updated in the morning and in the evening of each shift. This process is used for tactical personnel accountability reports (PARs) and when the strategy changes from offensive to defensive. The department also uses a Pak-Tracker locator system, which is integrated into the department's SCBA. Each district chief vehicle carries two handheld Pak-Tracker locator system devices.

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Training and Experience

The Commonwealth of Massachusetts has no mandatory minimum requirements to become a firefighter. For cities and towns that have adopted the Commonwealth of Massachusetts civil service system, a candidate must pass the state civil service written examination and successfully complete the Candidate Physical Ability Test (CPAT). The Commonwealth of Massachusetts Civil Service Commission administers the firefighter written examination and physical agility exam for the municipality.

Once ranked, the examination results are provided to the city's human resources division. The municipality then conducts the following:

- Background check
- Drug screen
- Medical examination, which meets the requirements of National Fire Protection Association (NFPA) 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments* (current edition) [NFPA 2018c]
- Psychological examination
- City residency requirements check.

Preference is given to veterans, city residents, and a family member of any police officer or firefighter killed in the line of duty in the Commonwealth of Massachusetts.

Potential candidates must have a valid driver's license and a high school diploma or a general educational diploma certificate. Selected candidates attend a 16-week recruit training class at the department's training center, regardless of whether or not they have previous firefighting experience. The recruit class curriculum is equivalent to the requirements of the NFPA1001, *Standard for Fire Fighter Professional Qualifications*, Fire Fighter I and Fire Fighter II [NFPA 2019].

Recruit training is conducted at the fire training center, except for the flashover simulation training, gas-fueled fires and hazardous materials awareness and operations level training, which are conducted at the Massachusetts Fire Academy. Upon completion of the recruit school, the recruit firefighter is certified per NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, to the level of Fire Fighter I and Fire Fighter II and per NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents (WMD)*[2018a], to the Operations Level Responder.

Upon successful completion of recruit school, the recruit firefighter becomes a probationary firefighter for 36 weeks. During this time frame, the probationary firefighter process consists of the following:

- Receives a task book to complete
- Must complete a weekly journal, which documents training and emergency responses
- Rotates to an engine company, ladder company, and the heavy rescue company
- Evaluated 1 week prior to completion of probation
- Must successfully complete a physical training standard (CPAT) evaluation
- Must successfully complete Fire Fighter I and Fire Fighter II cognitive skills and live fire examinations.
- Must operate in a company with an officer during probation.

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Recruits must pass the ProBoard Certification for NFPA 1001 requirements prior to receiving a permanent assignment.

This municipal fire department operates its own training center under the supervision of a Chief of Training (district chief). The training center includes a burn building, which allows for live fire training using Class A fuels. Different configurations of the burn building allow for multiple training scenarios, which include incidents simulating residential, commercial, triple-decker, or high-rise occupancies.

The Division of Training provides the resources for each station to conduct its own company-level proficiency training. Firefighters are required to train at least 1-hour per work shift and must complete eight training drills covering eight different topics per month. Companies are required to conduct “Back to Basic Training” every Thursday. The company office submits the training record forms through their district chief to the Chief of Training. The fire department has maintained an electronic training record-keeping system since 2006. The department conducts annual mandatory training for recertification for cardiopulmonary resuscitation (CPR), first responder, and hazardous materials operations level responder. Special operations training also is handled through the fire training center.

The Division of Training is staffed with:

- 1 district chief
- 1 captain
- 1 lieutenant
- 1 firefighter.

When a recruit school is scheduled, an additional three lieutenants are assigned to the Training Division.

Promotional Process

Internal promotions to all ranks are handled following the state’s civil service promotional testing process. Promotion examinations are given every 2 years. When promotions occur, the fire department conducts a 40-hour officer development training program. In addition, company officers can take Fire Officer I-IV training and certification at the Massachusetts Fire Academy, although it is not a fire department requirement.

- **Lieutenant:** 80-question examination (state civil service); 3 years in grade as fire fighter; with bibliography
- **Captain:** 80-question examination (state civil service); 1 year in grade as a lieutenant; with bibliography
- **District Chief:** 80 question examination (state civil service); 1 year in grade as a captain; with bibliography
- **Deputy Chief:** Written examination and assessment center; 1 year in grade as a district chief
- **Fire Chief:** Assessment Center; 1 year in grade as a deputy chief.

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The fire department conducts a biannual officer candidate school (OCS) for officer development and promotional opportunities throughout the year. OCS are two week classes for both lieutenants and captains.

The department does not have a position for fire apparatus operator or require certification for fire apparatus operator. Every firefighter must qualify as a fire apparatus operator for the type of apparatus they are assigned to. Driving training is conducted at the Fire Training Center and non-emergency training is on city streets. The fire apparatus operator position rotates weekly. It is the responsibility of the company officer to ensure probationary firefighters are provided with driver training.

The firefighter from Ladder 4 (L403) was hired by the fire department in March 2016. He started the department's Recruit Fire Academy on March 7, 2016 and was graduated on June 9, 2016. His work assignments were as follows:

- A floater with Group 3 in the South End Division
- October 16, 2016, assigned to Ladder 3, Group 3
- December 22, 2016, assigned to Ladder 4, Group 3.

He had the following certifications and training: NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, Fire Fighter I and Firefighter II (ProBoard Certification); First Responder; HAZMAT/WMD/CT/Operations Level Responder—FO/CO/FF; *Introduction to the Incident Command System* (IS-00100.b); *Basic Incident Command System for Initial Response* (IS-00200.b); *National Incident Management System* (NIMS) (IS-00700.a); *National Response Framework, An Introduction* (IS-00800.b); *Ethanol for First Responders*; *Flammable Gas Firefighter Training: Classroom and Practical*; *Flashover Simulator Training*; and *Structural Firefighting Practices*.

The captain of Ladder 4 was hired by the fire department in February 2004. The captain graduated from the department's Recruit Fire Academy on May 28, 2004. The captain's initial assignment out of the Recruit Fire Academy was Engine 12, Group 1. The captain was promoted to lieutenant on October 30, 2011, and was promoted to captain on July 7, 2013, which was the captain's assignment at the time of the incident in Engine 12, Group 1. The captain was working overtime with Group 3 at Ladder 4 on December 9, 2018.

The captain has the following certifications and training: NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, Fire Fighter I and Fire Fighter II (ProBoard Certification); First Responder; *Introduction to the Incident Command System* (IS-00100.b); *Basic Incident Command System for Initial Response* (IS-00200.b); *National Incident Management System* (NIMS) (IS-00700.a); *National Response Framework, An Introduction* (IS-00800.b); Office of the State Fire Marshal, Department of Fire Services, *Fire Prevention Officer—Basic*; *Pumper Familiarization and Operations Training*; *Emergency Response to Railroad Emergencies Course—Self Study*; Office of Emergency Medical Services, *Emergency Medical Technician—Basic*; *Flammable Gas Firefighter Training: Classroom and Practical*; National Fire Academy, *Incident Command System*; Hazardous Materials Refresher, *Detection Devices, PPE, and Emergency Response Guide*; Annual First Responder Recertification; *Annual CPR and Automated External Defibrillator(AED) Recertification*; Fire Fighter Essentials, *Live Fire Training*; Firefighter Essentials, *Large Diameter Hose*; Firefighter Essentials,

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Personal Protective Equipment; Firefighter Essentials, Positive Pressure Ventilation; Annual Hazardous Materials Recertification; Back to the Basics, Live Fire Training; Health and Safety, Nutritional Orientation and Awareness; Health and Safety, Employee Assistance Program; and EMS, Nasal Narcan.

The district chief (Car 4) was hired by the department in September 26, 1994. The district chief was graduated from the department's Recruit Fire Academy on December 8, 1994. Upon completion of the Recruit Fire Academy, the district chief was assigned to Engine 13, Group 1. The district chief was promoted to lieutenant on January 16, 2000, promoted to captain on December 14, 2003, and promoted to district chief on September 14, 2014. The district chief was assigned as the Special Operations Chief on September 14, 2014. On December 6, 2015, the district chief was transferred to Car 4, which was the district chief's current assignment at the time of the incident.

The district chief has the following certifications and training: NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, Fire Fighter I and Fire Fighter II; First Responder; *Introduction to the Incident Command System (IS-00100.b); Basic Incident Command System for Initial Response (IS-00200.b); National Incident Management System (NIMS) (IS-00700.a); National Response Framework, An Introduction (IS-00800.b); Office of the State Fire Marshal, Department of Fire Services, Fire Prevention Officer—Basic; Department of Fire Services, Emergency Vehicle Operator—Advanced Driver Training Program; United State Fire Administration, National Fire Incident Reporting System 5.0 Field Delivery; Hazardous Materials Refresher, Detection Devices, PPE, and Emergency Response Guide; Annual First Responder Recertification; Officer Training, Officer Candidate School—Company Officer; Firefighter Essentials, Live Fire Training; Annual CPR and AED Recertification; Hazardous Materials Refresher; Special Operations Training, Collapse Rescue; Special Operations Training; Trench Rescue; Special Operating Training, Rope Rescue; Special Operations Training, Dive Rescue; Firefighter Essentials, Large Diameter Hose; Firefighter Essentials, Positive Pressure Ventilation; Special Operations Training, Confined Space; Officer Training, Post Incident Analysis and Fire Prevention Methods; Texas A&M Engineering Extension Service, Weapons of Mass Destruction/Terrorism Defensive Operations; Special Operations Training, Dive Rescue Team Training; Special Operations Training, High Angle Rescue; Department of Fire Services, Small Aircraft Emergencies; and Hazardous Materials, Detection and Monitoring.*

Mutual Aid

During this incident, a fire and rescue department responded a ladder company and a fire department responded an engine company to Box 5-49 on the 4th Alarm for station coverage.

Mutual Aid Fire and Rescue Department

The Fire and Rescue Department responds into the city approximately ten times per year for station coverage. When the city fire department goes to a third alarm, the response of an engine or ladder from this fire and rescue department is to cover Engine 4 and Ladder 7.

The Fire and Rescue Department has 39 full-time career firefighters, plus 4 on-call firefighters. The department has a response area of 16 square miles and serves a population of 16,000, which increases to 32,000 during daytime hours. The department operates from two fire stations. Staffing at Fire

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Station 1 is five members and at Fire Station 2 is four members. The department operates four shifts or groups (one captain, one lieutenant, and seven firefighters). The rank structure of the Fire and Rescue Department is:

- Fire Chief
- Deputy Chief
- Captain
- Lieutenant
- Firefighter.

The Fire and Rescue Department responds to approximately 3,800 alarms annually. Approximately 1,200 of these alarms are for a response to a fire.

Under the supervision of a Deputy Chief of Operations, the Fire and Rescue Department operates four engines, a tower ladder, a forestry unit, and a heavy rescue from two fire stations. Two of the engines are specialty apparatus, serving as an engine/heavy rescue (Rescue 2) and an engine/tanker (Engine 2). Each captain and lieutenant are assigned a division of the department and are responsible for its oversight. The deputy chief is responsible for administrative duties, such as scheduling, records management, communications, training, and public relations and serves as the emergency medical services (EMS) coordinator. The deputy chief has direct control over day-to-day operations of the department.

Mutual Aid Fire Department

The fire department, consisting of 23 career members, has two fire stations. It covers 36 square miles and a population of 20,000. The fire department has four shifts or groups with 5 members each. During an impact shift, two additional members are added per shift or group. There are 23 on-call firefighters and 4 lieutenants.

The fire department responds to approximately 2,400 alarms annually. The department operates four engines, one tower ladder, three medic units, and numerous support vehicles. The fire department also houses a 500-gallon foam trailer at Fire Station 2.

The department's rank structure

- Fire Chief
- Deputy Chief
- Captain
- Lieutenant
- Firefighter/EMT or firefighter/paramedic.

The Fire and Rescue Department assigns the following responsibilities to fire department officers:

- Deputy Chief
 - Fire inspections
- Company officers
 - Target hazards
- Captain—Training Officer

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- On-call members
- Firefighters
- Officers
- EMS.

The training officer ensures that annual training occurs covering all the necessary tasks and competencies. This training includes ground ladders; hoseline operations; self-contained breathing apparatus (SCBA) care, maintenance, and use; incident management; ropes and knots; vehicle operations and maintenance; and live fire training.

Equipment and Personnel

The fire department operates on a Motorola APCO P-25 Phase 1, Digital, 800-megahertz trunked radio system managed by the city's Emergency Communications Division. The system is tied into the statewide Motorola system managed by the Massachusetts State Police. Fire Operations uses a single zone in the radio with 15 talk groups and one conventional fireground frequency. The fire department uses Motorola APX6000 XE portable radios. All portable radios are equipped with an emergency call button, which, when activated, receives priority on the particular talk group and must receive acknowledgement by the dispatcher. The radio system is a three-site system, each with a repeater system located strategically throughout the city (installed in 2016).

The city's Emergency Communications Division receives all 9-1-1 calls originating within the city. Calls are then transferred to the appropriate dispatchers. Call receipt and dispatching are processed by a computer-aided dispatch (CAD) system. These calls for service are dispatched on a designated talk group, and responding units operate on one of three talk groups assigned by Dispatch. All administrative functions, such as fire prevention, training, and maintenance operate on separate talk groups from those used for dispatch and fireground operations.

Car 3 (North Division) incidents are dispatched on Alpha channels, and Car 4 (South Division) incidents are dispatched on Bravo channels. Charlie channels are used primarily for single company incidents. Also, the contracted EMS provider can utilize Charlie channels. The radio system has one direct channel, which is not recorded and does not go through the repeater.

The Emergency Communications Division answers 90,000 calls annually. The division has 60 positions allotted and had staffing of 47 personnel at the time of this incident. Each shift works 8 hours. The shifts are 0700–1500 hours, 1500–2300 hours, and 2300–0700 hours. The daytime shifts have staffing of 10 dispatchers, and nighttime shifts have a staffing of 9 dispatchers. The Emergency Communications Division also dispatches for the city police department and a neighboring city's fire, police, and EMS.

The training for new dispatchers is based upon curriculum from Association of Public Safety Communications Officials (APCO). The training program for public safety telecommunicators is as follows:

- Assigned a field training officer during probation
- 2-day 9-1-1 telephone training

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- 3–5 months on the job training
- Probationary dispatchers do not dispatch fire incidents for the first month.

Each dispatcher must complete a minimum of 16 hours of annual telecommunicator refresher training required by the Commonwealth of Massachusetts. The Emergency Communications Division requires additional training above the minimum of 16 hours annual refresher training.

Dispatcher Mayday Procedures

Dispatchers have the following procedures in the event of a Mayday:

- If a Mayday is communicated and the incident commander hears and acknowledges the Mayday, dispatch adds the time into the incident notes. If Command requests, Dispatch will sound a unique tone on the tactical channel and repeat the Mayday.
- If a Mayday is missed by the incident commander, but the dispatcher acknowledges the Mayday, the dispatcher will relay the Mayday to the incident commander. If Command requests, Dispatch will sound a unique tone on the tactical channel and repeat the Mayday.
- The incident commander will make the decision whether to switch non-essential members to another Tactical channel or leave everyone on the fireground Tactical channel.

Dispatcher Fireground Operational Procedures

Dispatchers have the following procedures for fireground operations:

- All fire incidents are dispatched by Still Box
- All fire incidents are assigned a box number
- Dispatcher will broadcast the time stamp every 10 minutes for the first 60 minutes during an incident, then every 30 minutes thereafter, unless the incident commander requests Dispatch to continue broadcasting 10-minute time stamps
- Incidents involving 3rd Alarms or greater, the fire department's Chief of Special Operations will respond to the Dispatch Center
- The Chief of Special Operations also is responsible for assisting dispatchers with alarm assignments, mutual aid response, backfilling empty fire stations, response deployment, and any other necessary tasks.

Building Construction

The structure was a three-story, Type III ordinary wood frame balloon construction, multi-residential (eight units) apartment building. The structure was built in 1900 and contained approximately 10,412 square feet of living space. The 1st floor was 3,532 square feet, and the 2nd and 3rd floors were 3,440 square feet each. The open porch on Side Alpha was 612 square feet, and the unfinished basement measured 3,532 square feet (See **Diagram 1** and **Diagram 2**).

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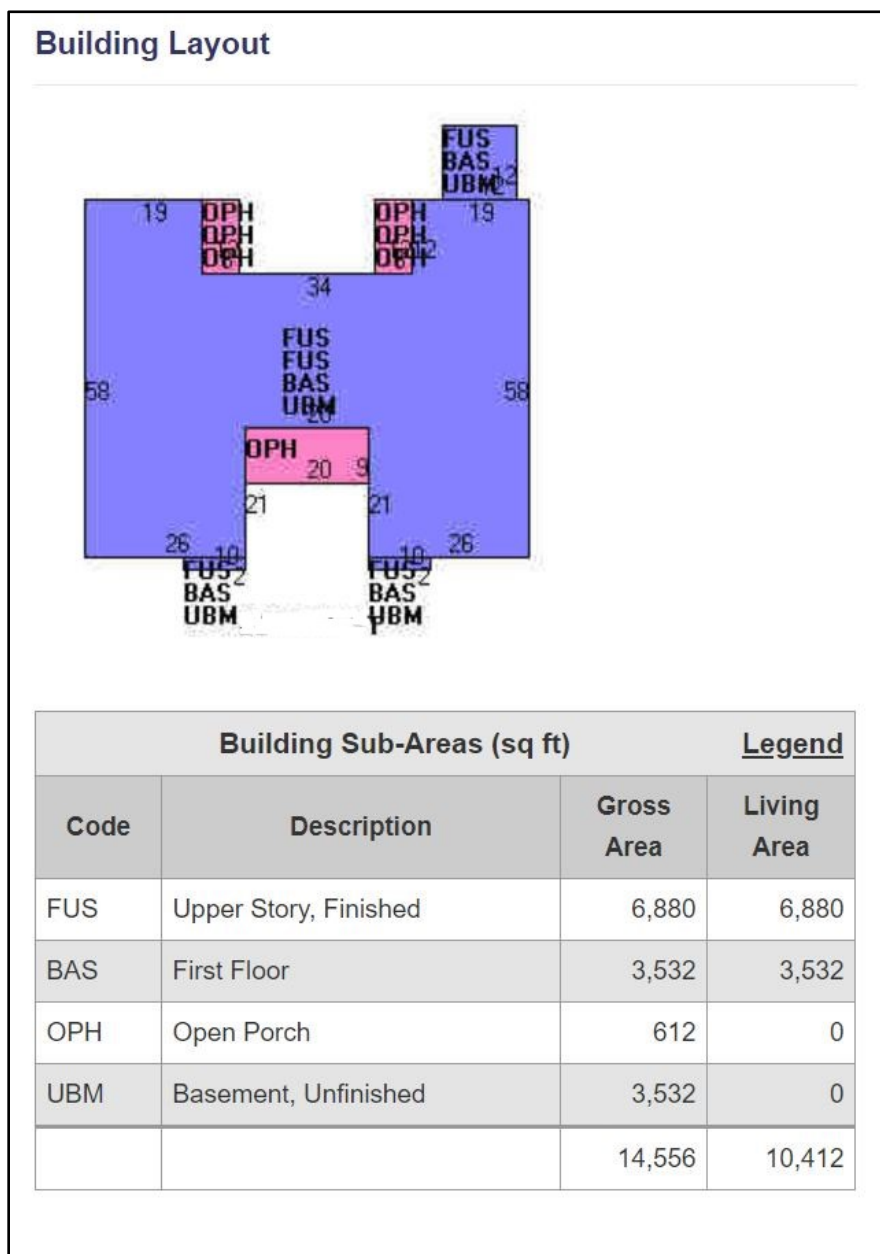


Diagram 1: The dimensional floor plan of the fire building

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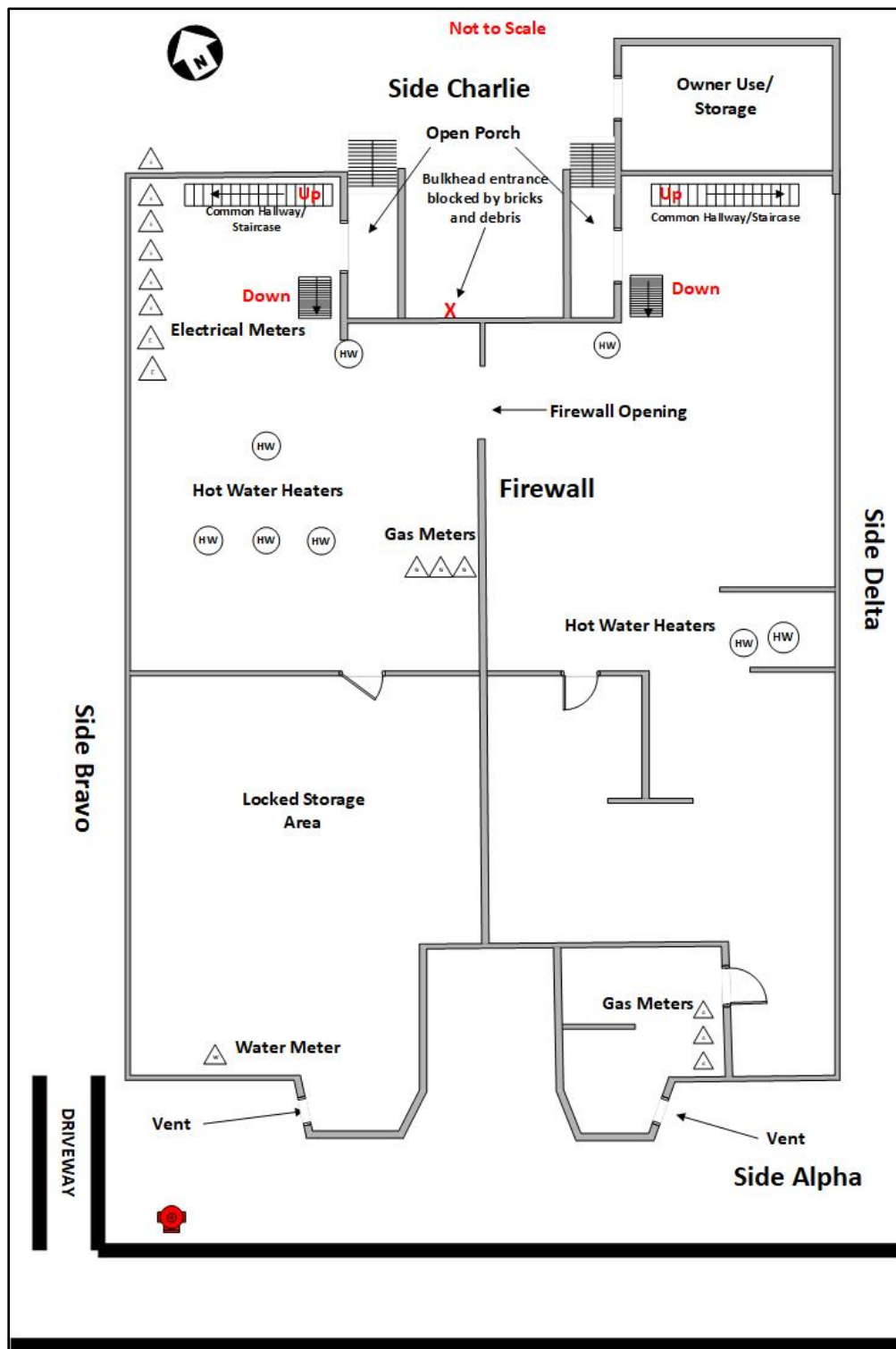


Diagram 2: Floor plan of the unfinished basement. The only access to the basement was from Side Charlie.

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The structure was not equipped with a sprinkler system. The structure was equipped with a single-station smoke alarm system, with a combination of heat and smoke detectors. The fire alarm control panel was in the entryway on the 1st floor on Side Delta.

The basement walls were constructed of a combination of stone, brick, and mortar. The basement floor was poured concrete. The basement was only accessible from the outside by a porch on each building on Side Charlie. The exterior of the structure was covered by multiple layers including vinyl siding on the outside. Beneath the vinyl siding were single layers of foam board insulation, wood shingles, and wood planks. The interior walls were clad in plaster and lath with some gypsum board noted in the areas that were renovated. The roof consisted of two gambrel peaks running north to south, with a gable roof running east to west connecting the two sides. The roof was covered with asphalt shingles over wood underlay supported by wood rafters. The front of the structure faced southwest.

For purposes of this report, this structure is identified as one building, even though each side of the apartment building had a separate address. The structure was set up in the shape of an “H,” with Side Bravo to the left (west) and Side Delta to the right (east) (**See Photo 1**). Each side of the apartment building had a separate address. Side Alpha was the street side. A driveway was on Side Bravo, which accessed a parking lot for tenants in the rear of the building (Side Charlie). A fence on Side Bravo connected to a fence on Side Charlie. A fence on Side Delta went from the sidewalk to the fence line on Side Charlie. The only access to Side Charlie was via the driveway on Side Bravo.



Photo 1: Side designations for the apartment building.
(Photo adapted from Google Earth.)

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The structure had four means of ingress/egress from the structure, which were normally kept locked, two entrances/exits in the front [one for Side Bravo and one for Side Delta] and two entrances/exits on Side Charlie [one for Side Bravo and one for Side Delta] (**See Diagram 2**). The structure had two means of egress for each of the six primary apartments, one leading to the front interior stairwell and one leading to the rear stairwell (**See Diagram 3**).

A brick fire wall in the center of the structure separated the two sides from the basement to the attic. A break in the basement portion of the fire wall allowed unrestricted access between the two buildings.

Note: The fire wall was not visible from the exterior of the building.

Side Bravo consisted of three apartments, one per floor. Side Delta consisted of five apartments and were numbered 7-1 (1st floor), 7-2 (2nd floor), 7-3 (3rd floor). These apartments were of similar size and had the same layout as the apartments on Side Bravo. Two other apartments were located at the northeast corner of the 1st floor and the 2nd floor of Side Delta and were single rooms with an adjoining half bath (7-4 and 7-5) respectively. Each of these rooms had a single and separate means of egress leading to the rear stairwell (**See Photo 2 and Photo 3**). The original structure was designed with 16 bedrooms. After the fire, investigators discovered that the building contained 22 bedrooms. A considerable amount of unpermitted work was done in the building, including adding walls, closets, and bathrooms.

The building support consisted of 3½-inch Lally columns in the basement. Because of the lack of maintenance, several Lally columns had rusted and split in two. A bulkhead area that accessed the basement was on Side Charlie, but it was inaccessible because the area was filled with bricks and debris. The two other access points to the basement were through an entrance on Side Bravo and on Side Delta through the stairwell.

Seven electrical meters were along the north exterior wall near the northwest corner of the basement, one electrical meter for each of the primary apartments and one electrical meter for the common areas. An emergency electrical shutoff for the entire structure was located next to the meters. Six natural gas meters were located in the basement, with three gas meters on Side Bravo along an interior wall next to the center of the structure and three gas meters on Side Delta along an interior wall at the south end of the structure.

Three natural gas water heaters were located in the basement on Side Bravo along an interior wall near the westside of the structure. Two natural gas water heaters were in the basement on Side Delta adjacent to the chimney.

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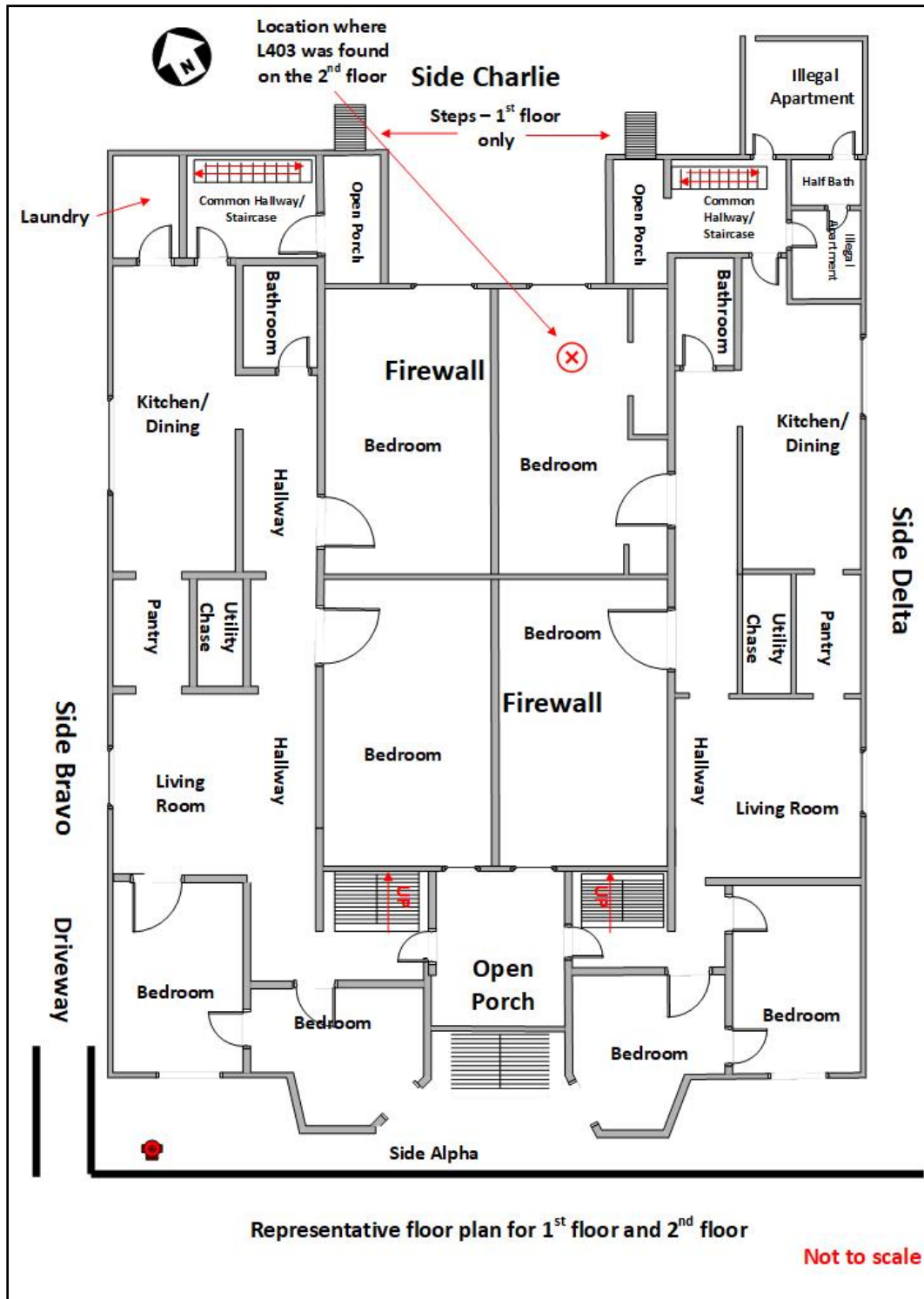


Diagram 3: Representative floor plan of the 1st first floor and 2nd floor of the apartment building.

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Photo 2: Three-story apartment building showing Side Alpha, with two separate entrances on the front porch. Note vents on the front of each building (Photo adapted from Google Earth.)



Photo 3: Side Alpha/Side Delta of the apartment building. The fence on Side Delta connected to a fence along Side Charlie. The only access to the rear of the building was from Side Bravo. (Photo adapted from Google Earth.)

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The decks on the 2nd floor and 3rd floor on Side Bravo and Side Charlie were removed prior to the fire (See Photo 4).



Photo 4: Decks on the 2nd floor and 3rd floor on the Side Bravo and Side Charlie were removed before the fire.

(Photo courtesy of the fire department.)

Timeline

The following timeline is a summary of events that occurred as the incident evolved. Not all incident events are included in this timeline. The times are approximate and were obtained by studying the dispatch records, audio recordings, witness statements, and other available information. This timeline also lists the changing fire behavior indicators and conditions reported, as well as dispatch communications, fire department response, fireground communications and fireground operations. All times are approximate and rounded to the closest minute. The timeline is not intended, nor should it be used, as a formal record of events.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
December 9, 2018		
Fire Alarm dispatched Engine 5, Engine 4, Engine 2, Engine 13, Ladder 4, Ladder 7, Rescue 1, Ladder 1 (RIC), and Car 4 for the report of basement fire for Box 5-49.	03:57:57 Hours	
Fire Alarm advised Car 4 that a building occupant stated the fire was in the basement and the fire alarm was sounding.	04:00:58 Hours	
Engine 5 arrived on scene and advised Fire Alarm that this was going to be a working fire at a three-story multi-family occupancy.	04:02:39 Hours	
	04:03:12 Hours	Ladder 4 called Car 4 and advised that smoke was showing, and this is a working fire. Ladder 4 would be investigating.
Car 4 advised Fire Alarm that Car 4 was on scene and assumed Command.	04:03:38 Hours	
	04:04:57 Hours	“Engine 5 to the 3 rd due engine, find the cellar door in the back.”
	0408 Hours	Ladder 4 had gained access to the basement on Side Charlie. Engine 2, Engine 5, Engine 13, and Ladder 7 were on Side Charlie. <i>NOTE: The bulkhead was full of bricks. Companies had to reroute to the Side Bravo entrance and the Side Delta entrance on Side Charlie.</i>

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	04:09:13 Hours	Command ordered Rescue 1 to search the Side Bravo for occupants.
	04:15:52 Hours	Command advised Engine 5 to shut down the hoseline going to Side Charlie. The hoseline needed to be extended, in order to reach into the basement.
Fire Alarm advised Command of the 10-minute elapsed time on scene.	04:16:16 Hours	
	0417 Hours	Command to Car 400 (ICT), “We have Engine 2, Engine 5, and Ladder 7 going into the basement.”
Command requested that Fire Alarm strike a 2 nd Alarm for Box 5-49.	04:18:40 Hours	
	04:19:20 Hours	Command called Car 400 and advised that Engine 4 was taking a hoseline through the front door. Engine 2, Engine 5, and Ladder 7 were in the cellar. Command advised Engine 2 that he was assigned as Basement Division.
Fire Alarm dispatched Engine 15, Engine 12, Ladder 5, and Car 3 on the 2 nd Alarm for Box 5-49.	04:19: 54 Hours	
	04:21:13 Hours	Basement Division (Engine 2) advised Command that they had water on the fire. Engine 12 moved to the front of the building. Engine 15 established a water supply for Engine 5.
	04:22:37 Hours	Command advised Ladder 5 to assist Engine 4 on the 1 st first floor, Side Alpha once Ladder 5 arrived on scene.
	04:24:43 Hours	Rescue 1 called Command and advised that the gas and power for the building was secured in the basement.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
Fire Alarm advised Command of the 20-minute elapsed time on scene.	04:25:30 Hours	
	0428 Hours	Command asked Ladder 4 to move its apparatus forward so that Ladder 7 could move to be front of the building. The crew from Ladder 4 went to the 2 nd floor to assist Engine 12.
	04:28:20 Hours	Ladder 5 advised Command that they were going to Side Alpha, 1 st floor, pulling a 1¾-inch hoseline.
	04:32:27 Hours	Engine 5 advised Command that the fire was knocked down in the basement. Command ordered Engine 5 to take its hoseline to Side Alpha of the fire building.
	04:35:02 Hours	Ladder 4 entered the fire building and went to the 2 nd floor with Engine 12.
Fire Alarm advised Command of the 30-minute elapsed time on scene.	04:35:30 Hours	
	04:36:16 Hours	Engine 2 was out of the basement.
	04:37:04 Hours	Engine 12 reported there was fire on the 2 nd floor and between the 1 st and 2 nd floors.
	04:39:03 Hours	E402 radioed he was on the 2 nd floor.
	04:39:08 Hours	Rescue 1 advised Command that the primary search was negative on all three floors of Side Bravo. A secondary search of the 1 st floor of Side Bravo was negative.

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	04:42:50 Hours	Ladder 7 had the platform up and was moving toward Side Delta. Engine 5 was supplying Ladder 7 with water.
	04:43:04 Hours	Car 3 advised Command that fire was showing on Side Delta on the 1 st first floor.
	04:43:40 Hours	Car 3 to any companies working on the 2 nd floor and the 3 rd floor, “The fire is starting to take over the 1 st floor. Beware the fire is below you.”
	04:43:49 Hours	Command to companies working on the 2 nd floor, “I want you to back out.”
Command called Fire Alarm to strike a 3 rd Alarm for Box 5-49.	04:44:10 Hours	Command to all companies, “We are going to evacuate the building.”
Fire Alarm struck a 3 rd Alarm for Box 5-49. Responding companies were Engine 6, Engine 3, and Ladder 3.	04:44:29 Hours	
Elapsed time on scene was 40 minutes.	0445 Hours	
	04:46:04 Hours	“Mayday, Mayday, Mayday. Ladder 5 to Command, we are on the 2 nd floor.” Command also was trying to locate firefighter (E402) from Engine 4.
	04:46:20 Hours	Ladder 5 radioed Command, “We are on Division 2. My access to the front stairwell is cut off. I do not have an exit, and we cannot find our way out. We need a line to the front stairwell.”
	04:47:37 Hours	Ladder 4 to Command, “We have companies stuck on the 2 nd floor, Side Delta. We have no exit.”

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	04:47:47 Hours	Car 4 to Command, “We have a firefighter on the 2nd floor, who is coming out of a Side Alpha Window.” A ground ladder was placed at the window for the firefighter (E402). E402 is out of the building. Also, Car 2 ordered Ladder 7 to lower its platform to assist the members at the 2 nd floor window on Side Alpha. Four firefighters went out the 2 nd floor window.
	04:49:09 Hours	Ladder 403 reported he was located on the 2 nd floor.
	04:49:15 Hours	Ladder 502 called a Mayday.
	04:50:17 Hours	Ladder 403 called on the radio that he could not find a way out of the building.
	04:50:38 Hours	Rescue 1 to Command. “Urgent, urgent, urgent. We need a ladder to the rear of the building. We got him on Side Charlie at the window.”
	04:51:27 Hours	Rescue 1 officer reported that someone was at the 2 nd floor window on Side Charlie. “They're hanging out of the window right now.”
	04:51:51 Hours	Rescue 1 officer reported that Ladder 502 went out the back window (Side Charlie) now.
	0452 Hours	Deputy Chief of Operations, Car 2, assumed Command and assigned Car 4 as Operations.
	04:53:35 Hours	The safety officer confirmed that the firefighter from Ladder 5 was out of the building.

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
Elapsed time on scene was 50-minutes.	04:55:51 Hours	Car 5 reported to Command, “We’re on Side Charlie of the building. We have a firefighter trapped. We are trying to get the firefighter out now. We have contact with him.”
Fire Alarm to Command, “Just wanted to let you know, we are 55 minutes into the incident.	05:00:06 Hours	
	05:01:42 Hours	Car 3, the safety officer, Engine 2, and Ladder 4 were assigned to breach the fire wall from Side Bravo, 2 nd floor, to gain entry to the room where Ladder 403 was located.
	05:02:15 Hours	Operations to Command, “Operations is in the rear of the building (Side Charlie). We need that 2½-inch hoseline charged right now. It is the green hoseline that’s going to the back (Side Charlie).”
Car 1 advised Fire Alarm that he was on scene	05:02:32 Hours	
	05:02:41 Hours	Operations to Command, “We are still in contact with L403. We are working on cutting a hole to get the firefighter out the window.”
	05:03:17 Hours	Engine 5 charged the 2½-inch hoseline going to Side Charlie.
Command called Fire Alarm to have a 4 th Alarm struck for Box 5-49.	05:03:47 Hours	

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
<p>Fire Alarm to Command, Box 7-25 has struck for a structure fire. Be advised, there are no companies available to respond to the 4th Alarm.</p> <p><i>Note: Box 7-25 was struck prior to Command requesting a 4th Alarm. All available resources in the city were dispatched to Box 7-25 including mutual aid companies.</i></p>	05:04:14 Hours	
<p>Car 1 advised Fire Alarm, that he would be assuming Command for Box 5-49. Car 2 would assume Operations.</p>	05:05:55 Hours	
	05:09:54 Hours	Car 5 to Command, we need an EMS unit to Side Charlie.
	05:14:31 Hours	Command called Operations regarding the status of the rescue on Side Charlie. Operations advised they had L403 right at the window but could not get L403 out of the building at this point.
<p>Fire Alarm advised Command that a mutual aid tower ladder and mutual aid engine were enroute to Box 5-49. These were the only available resources to respond.</p>	05:16:50 Hours	
	05:19:24 Hours	Engine 15 reported heavy fire on the 2 nd floor of Side Delta.
	05:21:41 Hours	Engine 2 advised Command that they were having difficulty making a hole in the fire wall on the 2 nd floor.
<p>Fire Alarm advised Command that two engines (Engine 11 and Engine 8) were responding from Box 7-25. Also, another mutual aid ladder was responding.</p>	05:24:36 Hours	

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
Fire Alarm to Command, “You are 1 hour and 20 minutes into the incident.”	05:25:47 Hours	
Fire Alarm sent a text to all members of Group 1 to report to duty at their fire stations.	05:28:46 Hours	
Fire Alarm to Command, “You are 1 hour and 30 minutes into the incident.”	05:36:07 Hours	
	05:39:10 Hours	Car 4 to companies operating on Side Charlie, “Companies in the rear on the 2 nd floor, you have heavy fire on the 1 st floor.”
	05:41:32 Hours	Car 10 to Command, “You have Ladder 2, Ladder 6, and E11 heading your way.” <i>Note: Car 10 was assigned to Fire Alarm with the dispatcher for this incident.</i>
	05:50:34 Hours	Engine 12 to Car 5, “We have all visual fire knocked down on the 2 nd floor. We are going to start opening up walls and ceilings.” Engine 12 was operating with Engine 3 on the 2 nd floor of the fire building, Side Alpha.
	05:51:35 Hours	Operations advised Command, that the firefighter from Ladder 4 (L403) was out of the building.
	05:51:47 Hours	Operations advised Command that the firefighter from Ladder 4 was transferred to EMS.
Command advised Fire Alarm that the fire was under control.	0651 Hours	
Command advised Fire Alarm that the fire was out.	1000 Hours	

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
December 10, 2019		
Command was dissolved, and all units were cleared from Box 5-49.	0737 Hours	

Personal Protective Equipment

The NIOSH investigators inspected the PPE worn by the deceased firefighter from Ladder 4 at the Fire Department Headquarters on February 11, 2019.

Some signs of thermal degradation were seen on the right shoulder and front on the outer shell of the turnout coat. The drag-rescue-device (DRD) in the turnout coat was not deployed. The turnout pants had no damage from thermal insult. The pants were cut off the firefighter during patient care. The left glove and the outer shell of the helmet were cut during the extrication process. No damage was seen to the firefighting protective hood. The boots were in good condition. Because the turnout gear was not considered a contributing factor to the fatality in this incident, NIOSH investigators conducted no further evaluation or testing of the turnout gear.

NIOSH investigators inspected and photographed the SCBA worn by the firefighter from Ladder 4 and the SCBA (L1-4) that was put on L403 during the rescue operations (**See Appendix One**). This process was conducted at the fire department Headquarters on February 11, 2019. Further evaluation and testing of the SCBAs was conducted by the NIOSH National Personal Protective Technology Laboratory (NPPTL). No evidence was found to suggest that the SCBA units contributed to the fatality.

Note: The summary report of the NPPTL evaluation and testing of the SCBA is provided in **Appendix One**.

Weather Conditions

At 0354 hours on December 9, 2018, the following weather conditions were reported. The temperature was 16 degrees Fahrenheit (16° F), the dew point was 13 degrees Fahrenheit (13° F), the relative humidity was 88%, and the winds were out of the WSW at 8 miles per hour. The conditions were fair. No precipitation had occurred in the past 24 hours [Weather Underground 2018].

Investigation

On December 9, 2018, a 36-year-old male firefighter died in a three-story apartment building after becoming disoriented on the 2nd floor at a structure fire.

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At 0358 hours, Fire Alarm dispatched Engine 5 (PAR 3), Engine 4 (PAR 3), Engine 13 (PAR 3), Engine 2 (PAR 3), Ladder 4 (PAR 3), Ladder 7 (PAR 3), Rescue 1 (PAR 5), Ladder 1 (PAR 3) (Rapid Intervention Crew) and Car 4 (PAR 2) to Box 5-49 for a report of a basement fire. The fire was reported in a 3-story duplex apartment building with a firewall separating the apartments. *Note: For the purposes of this investigation report, this structure will be identified as one building even though each side of the apartment building had a separate address. The apartment building on the left will be identified as Side Bravo. The apartment building on the right (fire building) will be identified as Side Delta to be consistent with the incident command system as this is one building. The majority of fire was located inside Side Delta, all floors.*

Engine 5 initially stretched a 1¾-inch hoseline to Side Alpha. There was smoke pushing out from underneath the front porch. The fire was determined to be in the basement with the only access on Side Charlie. Engine 5 then moved their hoseline to Side Charlie. Engine 2 also stretched a hoseline to Side Charlie.

Car 4 arrived on scene and assumed Command. Command assigned Engine 5, Engine 13, Engine 2, Ladder 4, and Ladder 7 to locate and extinguish the fire in the basement. Engine 4 was assigned to flow water into the basement window from Side Alpha. The time was approximately 0408 hours. Due to the bulkhead entrance being blocked by bricks and debris, crews had difficulty accessing the basement. Ladder 4 had gained access to the basement through the entrance on Side Bravo. The hoselines stretched to Side Charlie came up short (200-foot 1¾-inch pre-connects). Both hoselines needed to be extended by using high-rise hose packs in order to make the stretch into the basement. At 0409 hours, Engine 2 was in the process of adding hose to their hoseline to make entrance into the basement. Rescue 1 arrived on scene at 0409 hours. Command assigned Rescue 1 to search the Side Bravo. During the search, Rescue 1 divided into two teams to search all three floors. Ladder 1 was assigned as the rapid intervention crew (RIC). They operated on Side Alpha during the initial phases of the incident. At 0415 hours, Command advised pump operator of Engine 5 to shut down the hoseline going to Side Charlie. The hoseline needed to be extended to reach the basement. At 0417 hours, Engine 2, Engine 5, and Ladder 7 were making entry into the basement. Also, operating in the rear were Engine 13 and Ladder 4 (**See Diagram 4**).

At 0418 hours, while crews were operating on Side Charlie, Ladder 1 (RIC) notified Command that the fire was extending to Side Alpha from the basement to the 1st floor front entrance. Command ordered Engine 4 to take a hoseline to the front entrance. Due to the fact that the fire was growing and extending to the 1st and 2nd floors, Command ordered a 2nd Alarm be transmitted for Box 5-49 at 04:18:40 hours. At 04:19:54 hours, Fire Alarm dispatched Engine 15 (PAR 3), Engine 12 (PAR 3), Ladder 5 (PAR 3), and Car 3 (PAR 2).

At 04:21:13 hours, the Basement Division (Engine 2) advised Command they had water on the fire. Crews operating in the basement were Engine 5, Engine 2, Engine 13, Ladder 4, and Ladder 7. Engine 12 had moved to the front of the building (Side Alpha) and was hooking a 1¾-inch hoseline into Engine 5. Engine 15 was establishing an additional water supply for Engine 5. At 04:22:37 hours, Command advised Ladder 5 to assist Engine 4 on the 1st floor, Side Delta. At 04:24:43 hours, Rescue 1 advised Command that the natural gas and electrical service to the building had been secured.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

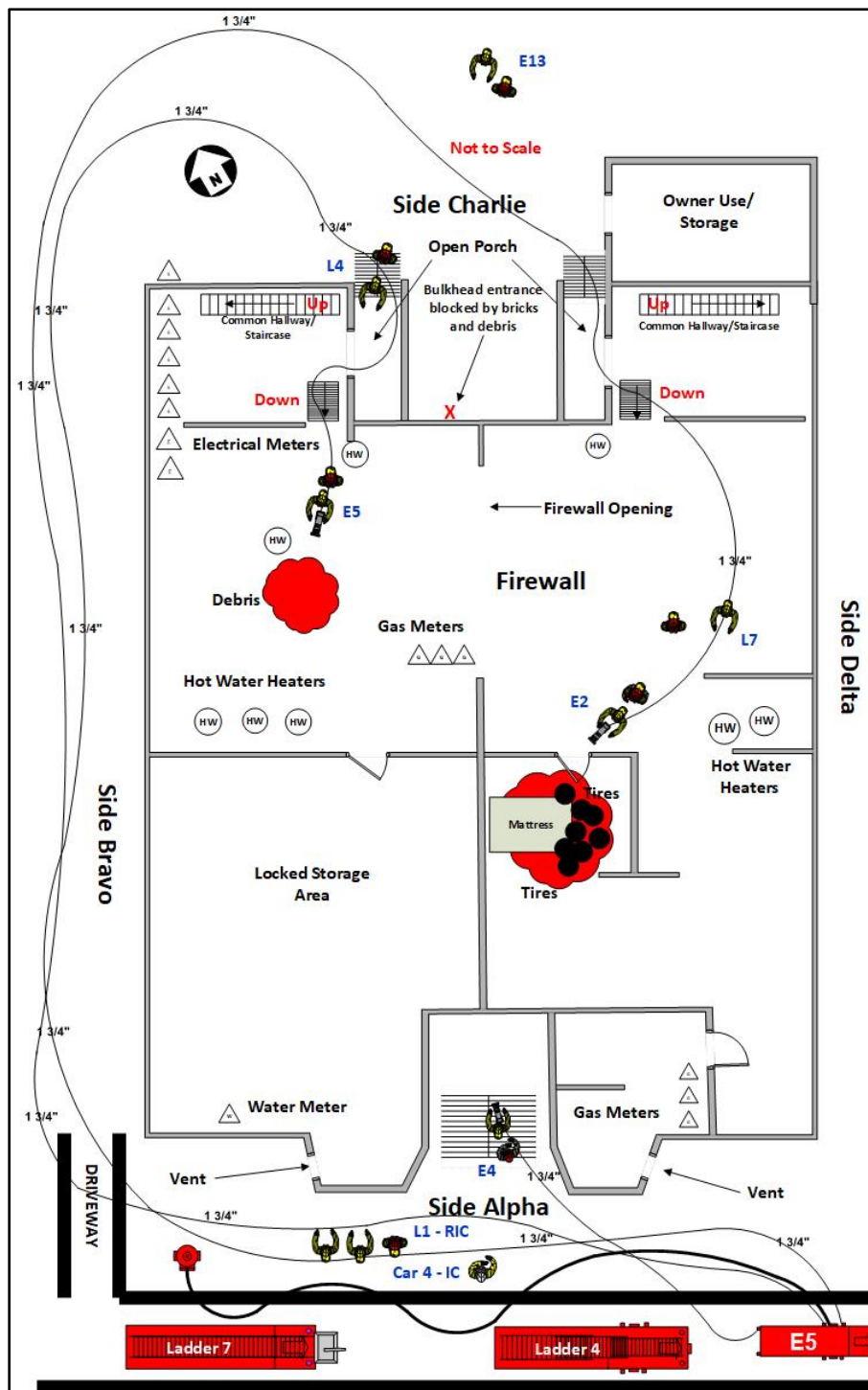


Diagram 4: It was necessary to extend the two hoselines stretched to Side Charlie. Engine 4 flowed water into the basement from Side Alpha. The companies on Side Charlie included Engine 2, Engine 5, Engine 13, Ladder 7, and Ladder 4. The time was approximately 0417 hours.

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At 0425 hours, Fire Alarm advised Command of the 20-minute notification. Engine 4 was working in the area of the Side Alpha front porch and had knocked down some of the fire that was extending to 1st floor. Engine 4 then moved to the 1st floor on Side Delta and knocked down the fire behind the stairwell. At 04:26:11 hours, Rescue 1 advised Command that they had completed a primary search on the 1st floor, Side Delta, but not Side Delta in the basement. At 0428 hours, Command ordered Ladder 4 and Ladder 7 to reposition their apparatus to allow Ladder 7 to be located in front of the structure. Ladder 5 was assigned to assist Engine 4 on the 1st floor with stretching a 1¾-inch hoseline. Ladder 5 entered through the front door on Side Alpha entrance and made their way to the 2nd floor where they pulled walls and ceilings. Engine 12 went to the 2nd floor. Engine 12 worked a hoseline in the center hallway. Ladder 7 deployed their tower ladder to Side Alpha to begin venting the roof. At 04:29:32 hours, Command received notification that an occupant in an apartment on Side Bravo was still in the building. Rescue 1 was ordered to search for the occupant after changing their cylinders.

The status of all companies at approximately 0430 hours (See Diagram 5):

- Car 4 was in Command operating on Side Alpha
- Car 3 was in the yard on Side Alpha
- Engine 2 was operating a hoseline in the basement
- Engine 4 was operating a hoseline in the front stairwell on Side Delta and behind the stairwell. Engine 4 then moved further into the 1st floor
- Engine 5 was out of the building, changing out their air cylinders at Engine 5
- Engine 12 was advancing a hand line to the 2nd floor via the Side Alpha stairs. Their line was connected to Engine 5's pump
- Engine 13 was operating a hoseline in the basement
- Engine 15 was establishing a secondary water supply for Engine 5
- Ladder 5 was operating in an apartment on the 2nd floor
- Ladder 4 was in the process of repositioning their apparatus
- Ladder 7 was in the process of repositioning their apparatus
- Ladder 1 was staged on the Alpha Side as the RIC
- Rescue 1 was out of the building changing air cylinders at Rescue 1.

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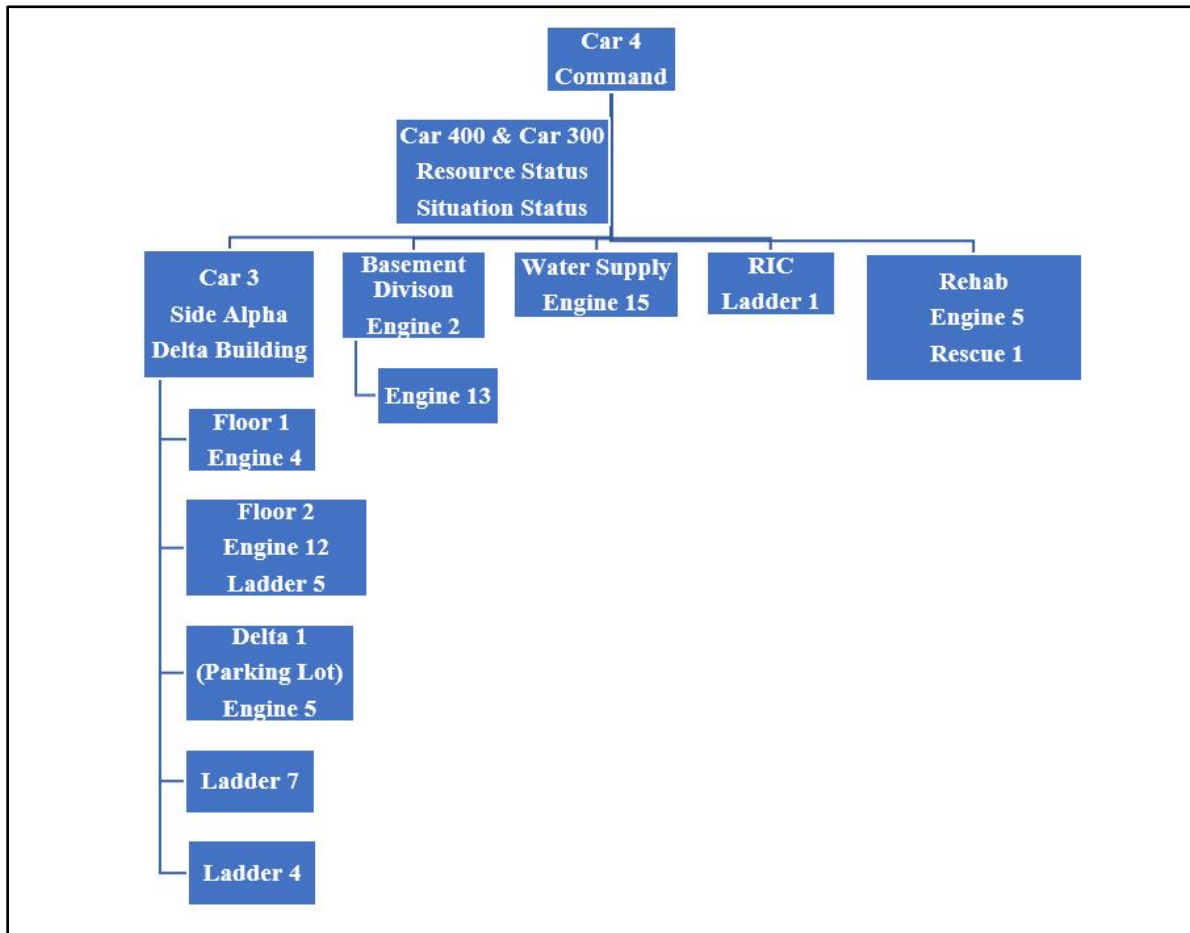


Diagram 5: The assignment of all companies operating at Box 5-49 at 0430 hours.

At 0435 hours, Fire Alarm advised command of the 30-minute notification. Ladder 4, after repositioning their aerial was assigned to join Engine 12 on the 2nd floor. They entered via the Side Alpha front door and went to the 2nd floor. Engine 12 reported fire in the front stairwell between the 2nd floor and 3rd floor. Engine 2 and Engine 13 had left the basement. Engine 4 (officer and firefighter) reported themselves out of the building and headed to their apparatus to change cylinders. E402 remained on the exterior porch on Side Alpha operating a 1¾-inch hoseline.

The status of all companies at approximately **0436 hours** (See **Diagram 6**):

- Car 4 was in Command Side Alpha
- Car 3 was on Side Alpha
- Engine 13 was out of the building, changing out their air cylinders at E13
- Engine 2 radioed Command they were out of the building
- Engine 5 is working to supply Ladder 7 with a 3-inch supply line
- Engine 4:
 - two members out of the building changing bottles,

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- one member (E402) was advancing a 1¾-inch hoseline up the front stairs to 2nd floor – Side Delta
- Engine 12 is operating a 1¾-inch hoseline in the front stairwell between the 2nd floor and the 3rd floor
- Engine 15 is establishing a secondary water supply with a different hydrant due to the first hydrant being frozen
- Ladder 4 was advancing Engine 4’s 1¾-inch hoseline up the front stairs to the 2nd floor of Side Delta
- Ladder 5 was on the 2nd floor pulling walls and ceilings
- Ladder 7 was in the process of setting up for roof ventilation
- Ladder 1 was stationed on Side Alpha as the RIC
- Rescue 1 was engaged in secondary searches of apartments on Side Bravo and Side Delta.

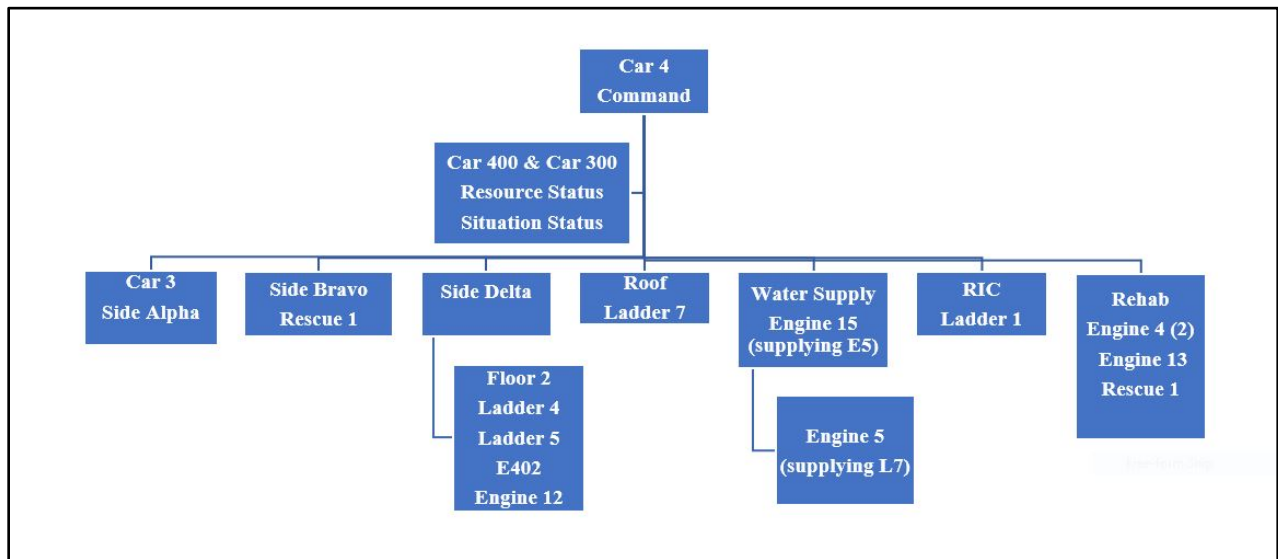


Diagram 6: The assignment of all companies operating at Box 5-49 at 0436 hours.

At 0437 hours Engine 12 advised Command that the fire was knocked down in the front stairwell and they were beginning overhaul. E402 joined Ladder 4’s crew and both made their way to the 2nd floor. Rescue 1 was engaged in secondary searches of apartments on Side Bravo.

At 0442 hours, Engine 12 radioed Command they have left the building to change out their air cylinders. Engine 402, Ladder 4, and Ladder 5 were continuing to operate on the 2nd floor conducting firefighting operations. Command was operating on the Side Alpha and Car 3 had moved to the Side Delta. Eventually, E402 moved to the interior and moved the hoseline to the 2nd floor. This change in position was not reported to Command and resulted in no hoselines being operated on the 1st floor. This allowed the fire to spread to the front apartment on the 1st floor and extend up the stairwell, utility chases and walls. E402, Ladder 4 and Ladder 5 were now all operating on the 2nd floor. Engine 2, Engine 5, and Engine 13 were out of the building.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Car 3 reported to Command that heavy fire was coming out the windows on the 1st floor. Command notified all companies operating on the 2nd and 3rd floors to back out of the building as fire was below them. Engine 4 reported to Command that they were missing E402. Command began trying to locate E402 by calling him on the radio (**See Diagram 7**). At 0444 hours Command ordered the evacuation of the building and struck a 3rd Alarm.

The status of all companies at approximately **0442 hours**:

- Car 4 was in Command on the Side Alpha
- Car 3 was on Side Delta of the structure
- Engine 4:
 - two members (E401 and E403) were out of the building
 - one member (402) operating on the 2nd floor with Ladder 4
- Engine 12 was out of the building; Ladder 5 manned their hoseline
- Engine 2 was out of the building
- Engine 13 was out of the building changing SCBA cylinders
- Engine 15 is working on a secondary water supply
- Engine 5 had just finished supplying Ladder 7
- Ladder 4 was operating on the 2nd floor
- Ladder 5 was operating on the 2nd floor
- Ladder 7 was operating their platform on Side Alpha and going to the roof for ventilation
- Ladder 1 is stationed on the Side as the RIC
- Rescue 1 was out of the building.

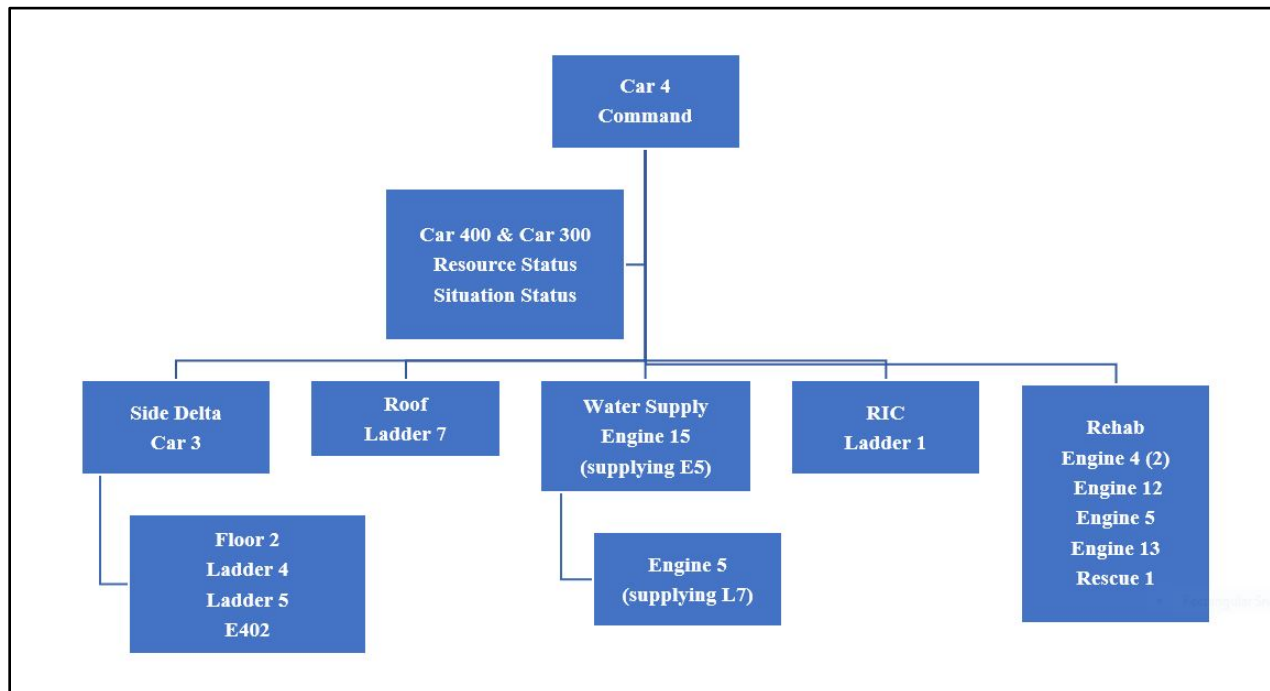


Diagram 7: The assignment of all companies operating at Box 5-49 at 0442 hours.

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At this time, there were 7 members operating on the 2nd floor:

- a captain and two firefighters from Ladder 4
- a lieutenant and two firefighters from Ladder 5
- one firefighter from Engine 4 (E402).

At 04:44:29 hours, Fire Alarm struck a 3rd Alarm for Box 5-49 and dispatched Engine 6 (PAR3), Engine 3 (PAR3), and Ladder 3(PAR3). At 0445 hours, Fire Alarm advised Command of the 40-minute notification. At 04:46:04 hours, the officer of Ladder 5 called a *Mayday* from the 2nd floor apartment on Side Delta. **Note:** *The two Maydays transmitted from Side Delta, 2nd floor were transmitted by voice and not using the emergency alert button (EAB) on the portable radios.*

At 04:46:20 hours, the officer of Ladder 5 called Command and advised, “We are on Division 2. My access to the front stairwell is cut off. I do not have an exit and we can’t find our way out. We need a line up the front stairwell.” Conditions on the 2nd floor were quickly deteriorating. Fire was coming up the front stairwell, visibility dropped to near zero, and the temperature was rising to the point of becoming untenable. The 7 members began searching for alternate means of egress with some members searching for a rear exit and others searching for a window. The firefighter from Engine 4 (E402) made his way into a bedroom on the Side Alpha/Delta corner and broke a window attracting the attention of the RIC. Ladder 1 (RIC) raised a ground ladder to the window and E402 came out of the building at 0447 hours.

At 0447 hours, the lieutenant and one firefighter from Ladder 5 made their way to the Alpha/Bravo bedroom and signaled from a window. Car 2 (Deputy Chief of Operations) ordered Ladder 7 to move the platform from the front porch to a bedroom window on Side Alpha/Side Delta corner to prepare to get firefighters out of the 2nd floor. The lieutenant from Ladder 5, a firefighter from Ladder 5, the captain from Ladder 4, and a firefighter from Ladder 4 went out the bedroom window at 0447 hours (**See Diagram 8**).

A member of Ladder 5 (L502) and a member of Ladder 4 (L403) did not get out of the Side Alpha 2nd floor bedroom windows with the other five members operating on the 2nd floor. The fire on the 1st floor increased in intensity and travelled up the front stairwell. The fire had also vented out the 1st floor on Side Delta and begun travelling up the exterior of the Delta side directly below an open 2nd floor window. The firefighter from Ladder 5 (L502) was searching for a rear exit. He had trouble finding his way to the rear exit on Side Charlie due to the layout of the 2nd floor and clutter in the rooms. He heard an EOSTI sounding and a PASS alarm activated. L502 came across the Ladder 4 (L403) firefighter, who was in a bedroom across from the living room. The firefighter from Ladder 5 (L502) asked for the L403’s name but heard no response. L502 led L403 into rear bedroom. **Note:** *The bedroom door could not be closed to protect the firefighters (L502) and (L403) due to furniture and debris in the bedroom. The bedroom had been used for a party with chairs and debris preventing the door from closing.*

At 04:49:15 hours, the firefighter from Ladder 5 pushed the emergency alert button (EAB) on his portable radio and called a *Mayday*. The firefighter from Ladder 5 (L502) found a window the bedroom, knocked the glass out with his elbow, and started shouting for help. The firefighter from Ladder 4 (L403) was also near the window. The window faced Side Charlie.

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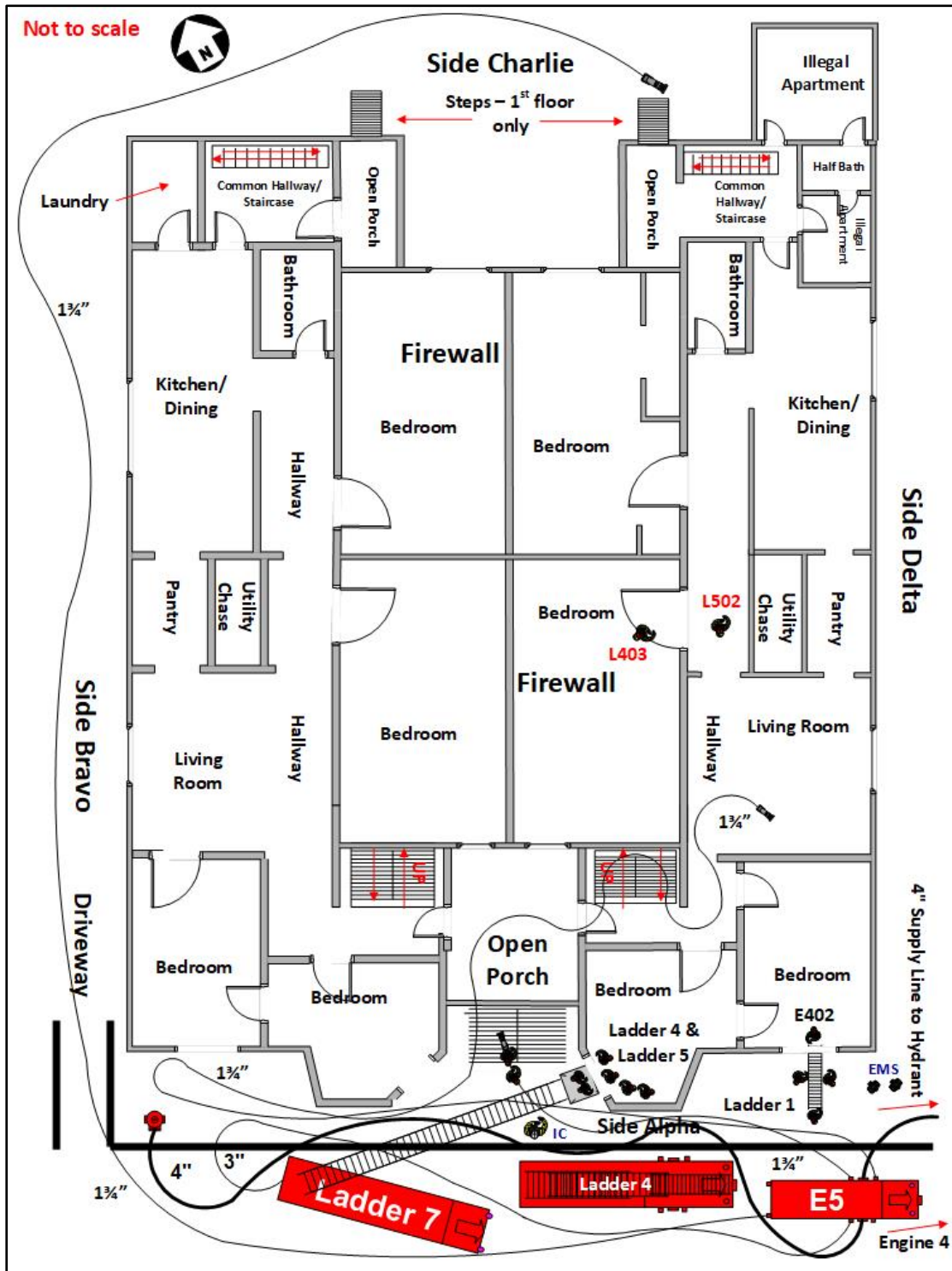


Diagram 8: Crews from Ladder 4 and Ladder 5 escaping the 2nd floor by entering the platform of Ladder 7. L403 and L502 were trying to find an exit on Side Charlie. The time is approximately 0447 hours.

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At 04:50:38 hours, Rescue 1 called Command stating, “Urgent, urgent, urgent. We need a ladder to the rear of the building. We got him on Side Charlie at the window.” One minute later, the officer of Rescue 1 reported that someone was at the 2nd floor window on Side Charlie. “They’re hanging out of the window right now.” The firefighter from Ladder 5 (L502) went out the window and was hanging onto the sill, while crews on Side Charlie got a ground ladder to the window. L502 had to try three times to get out the window because his foot kept getting caught on debris. The firefighter from Ladder 4 (L403) was at the window when L502 went down the ground ladder. He informed the firefighters outside that L403 was still in the room, right at the window.

A firefighter from Rescue 1 ascended the ground ladder and entered the bedroom. L403 was found almost immediately on the floor, a short distance from the window. Another member of Rescue 1 and members of Ladder 1 went up the ground ladder and into the bedroom.

At 0452 hours, Car 2 assumed Command of the incident. At 0455 hours, Car 5 reported to Command, “We’re on Side Charlie of the building. We have a firefighter trapped. We are trying to get the firefighter out now. We have contact with him.” (See **Photo 5**). At 0500 hours, Fire Alarm advised Command, they were 55 minutes into the incident. At 05:01:42 hours, Command assigned Car 3, the safety officer, Engine 2, and Ladder 4 to breach the firewall from Side Bravo, 2nd floor, to gain entry to the room where Ladder 403 was located on Side Delta. At 05:03:47 hours, Command called Fire Alarm and requested a 4th Alarm for Box 5-49. At 05:04:14 hours, Fire Alarm advised Command that Box 7-25 had been struck for a structure fire. Fire Alarm advised there were no companies available to respond to Box 5-49 on the 4th Alarm. *Note: Box 7-25 was struck prior to Command requesting a 4th Alarm. All available resources in the city were dispatched to Box 7-25 including the mutual aid companies.* Engine 16 has been placed out of service at approximately 0430 hours for a mechanical issue. The crew from Engine 16 (PAR3) put a reserve engine (Engine 25) in service and responded to Box 5-49 at approximately 0455 hours.

Firefighters from Rescue 1 moved the firefighter from Ladder 4 (L403) to the window. They were unable to get L403 to the window due to the weight and size of the firefighter from Ladder 4 (L403), the bedroom was cluttered with chairs and obstacles, and the fatigue of the firefighters. A member of Ladder 1 put a SCBA and facepiece with full cylinder of air on the firefighter from Ladder 4 (L403). Crews from Rescue 1 and Ladder 1 were trying to cut out the sill of the window with chain saws. The cut was made on both sides of the sill to the floor. The sill would not come out because of the 6-inch baseboard extended one-inch under the floor (See **Diagram 9**).

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Photo 5: Companies trying to gain access to the bedroom where L403 was located. Due to the bedroom door being unable to be closed, the fire was moving into the bedroom from the hallway. In the window on Side Bravo of the building, crews were trying to breach the firewall to gain access to L403. The time is approximately 0500 hours. (Photo courtesy of Paul Shea.)

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Side Charlie Bedroom - Wall Elevation

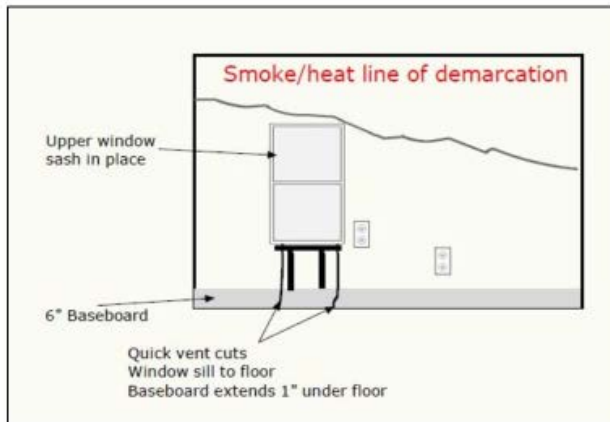


Diagram 9: Diagram and pictures of the fire room where the firefighter from Ladder 4 (L403) was removed. Also see Photo 6. (Photos courtesy of the fire department.)

The status of all companies at approximately **0510 hours** (See **Diagram 10**):

- Engine 5 operating a 2½-inch hoseline on Side Delta from the parking lot
- Engine 2 breached fire wall from Side Bravo with Ladder 3, safety chief, and Car 3
- Engine 13 operated on Side Alpha and then Side Charlie
- Engine 4 operated a hoseline with E13 from the ground on Side Charlie during rescue, flowing water on the 1st floor and 2nd floor
- Ladder 4 was operating hoseline from the 2nd floor deck on Side Delta during rescue
- Ladder 7 firefighters operating L7 on Side Alpha
- Ladder 1 worked as part of RIC on Side Charlie
- Rescue 1 worked as RIC on Side Charlie
- Engine 15 was operating a 2½-inch hoseline on Side Delta
- Engine 12 operated on 2nd floor Side Alpha during the rescue
- Ladder 5 operated on Side Charlie during rescue
- Engine 6 provided logistical support on Side Charlie during the rescue
- Ladder 3 established a supply for Engine 4; assisted with the breaching of the fire wall in the bedroom
- Engine 3 operated on 1st floor and 2nd floor on Side Alpha during rescue
- Engine 16 (E25) operated on Side Charlie during rescue

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- Car 2 operating on Side Charlie during the rescue and was the Rescue Group Supervisor
- Car 5 was Fire Attack Group Supervisor
- Car 1 in Command during the rescue operations
- Car 4 assigned as Operations Section Chief during rescue operations
- Car 3 on 2nd floor of Side Bravo in the bedroom during the breaching of fire wall
- Safety 1 (Safety Chief) on 2nd floor of Side Bravo in the bedroom during the breaching of fire wall.

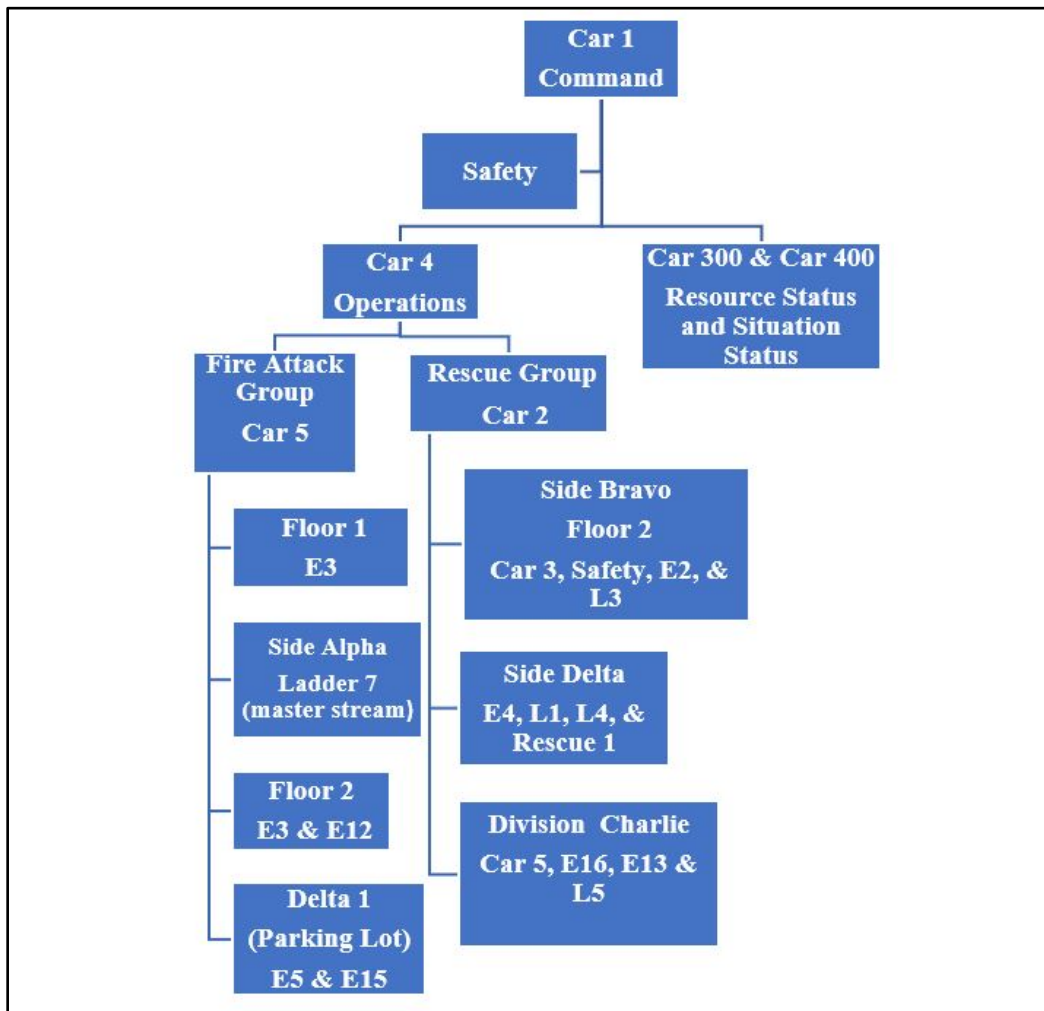


Diagram 10: The assignment of all companies operating at Box 5-49 at 0510 hours.

Tower Ladder 1 (PAR4) from the Fire and Rescue department arrived on scene at Box 5-49 after being diverted from Box 7-25. They checked in with Car 400, were assigned to Side Charlie, and were ordered to the 2nd floor to knock down the fire. They stayed on the 2nd floor until they were ordered out of the building because of the amount of fire on the 1st floor. The time was approximately 0525 hours.

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Companies assigned to the incident at Box 7-25 were released and responded to the 4th Alarm for Box 5-49. Engine 11 (PAR3), Engine 8 (PAR3), Ladder 6 (PAR3), Ladder 2 (PAR3) from the originating fire department and Tower 1 (PAR3) (from the mutual aid fire department) responded at 0524 hours. A mutual aid engine company (PAR5) was assigned to Fire Headquarters. Also, Command had Fire Alarm send a text to all members of Group 1 to report to duty at their respective fire stations at 05:28:46 hours.

While crews were operating on Side Charlie, heavy fire was on the 3rd floor and through the roof. Car 5 was operating on Side Alpha as Fire Attack. Car 5 assigned Ladder 7 to flow the master stream on the 3rd floor and roof. Tower 1 from the mutual aid fire department, Ladder 6, Engine 12, and Engine 11 were conducting firefighting operations on the 1st floor and 2nd floor on Side Delta. No access was available to the 3rd floor because of heavy fire. Ladder 3 was moved into the parking lot of the Delta Exposure. Ladder 3 was supplied with multiple 2½-inch hoselines and prepared for defensive operations once L403 was removed from the building. The time was approximately 0530 hours.

The captain and firefighters from Tower Ladder 1 from the Fire and Rescue Department went back to Side Charlie. The captain advised the deputy chief of a method for getting the firefighter from Ladder 4 out of the building. Using a 2:1 haul system and a 35-foot ground ladder as the anchor point, crews were able to lift the Ladder 4 firefighter out of the building using the firefighter's SCBA harness (**See Photo 6**). The process started at approximately 0530 hours, and the Ladder 4 firefighter was out of the building at 0551 hours.

The firefighter from Ladder 4 was transferred to EMS after removal from the structure. The firefighter was transported to a local trauma center and was pronounced deceased at 0625 hours.

The Command declared the fire under control at 0651 hours. The fire for Box 5-49 was declared out at 1000 hours.

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Photo 6: Firefighters have the haul system hooked onto the Ladder 4 (L403) firefighter's SCBA harness. They would lift L403 out of the window, onto the 16-foot ground ladder, and then lower the firefighter to the ground. The time was approximately 0545 hours. (Photo courtesy of Paul Shea.)

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Emergency Extraction System

The emergency extraction system is a simple 2:1 mechanical advantage system for removing a “downed” or unresponsive firefighter from a structure. It often is used to raise a firefighter up to and over a windowsill or railing. This emergency extraction device, also referred to as the 2:1, is designed as an attachment to a ground ladder, set into a building with four rungs above the extraction point. The ground ladder is used as a high-point anchor with the system attached to the ladder, and the system is operated from the ground (See **Photos 7 and 8**).

With the system in place, the working end is lowered to the firefighter and attached to the SCBA harness. Although the 2:1 is operated from the ground, another firefighter needs to operate in the room to guide the “downed” firefighter out or over obstacles from inside the room. The benefit and design of this system gives the RIC a lift, with a mechanical advantage and lowering abilities.

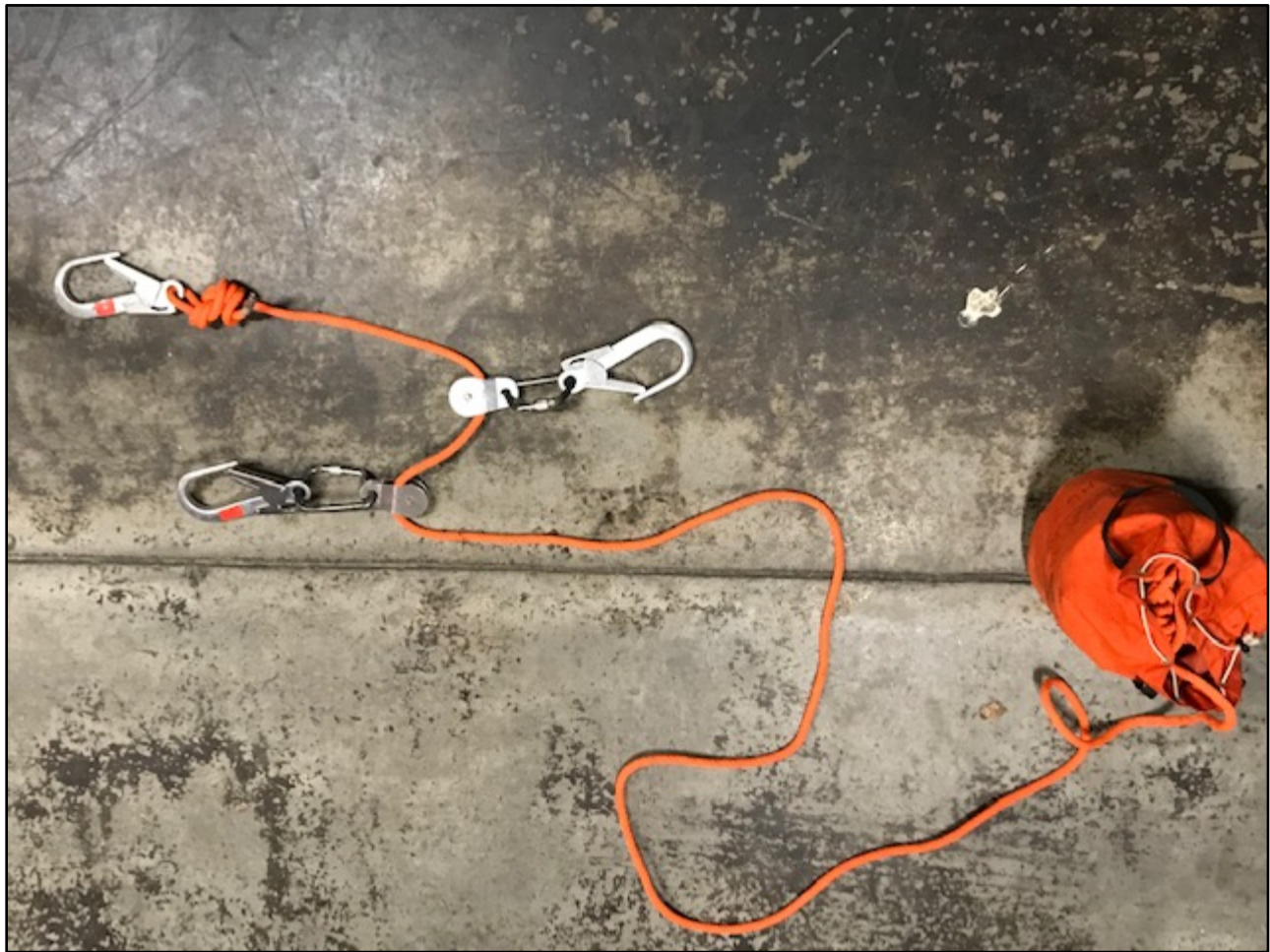


Photo 7: Equipment used for the emergency extraction system, which is known as the 2:1 haul system. The department carries this equipment on all apparatus.
(Photo courtesy of the Fire and Rescue Department.)

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The emergency extraction system (2:1) is a two pulley (one working pulley) system with three connection points. Two points connect to the high-point anchor (ladder) using two separate rungs if possible. The third point (the working end) is connected to the firefighter's converted harness (SCBA frame). This department's system used 3-inch pulleys and fall arrest hardware in place of carabiners. The large fall arrest connectors fit over both single and double rungs.



Photo 8: This photo shows firefighters lowering a simulated “downed” firefighter to the ground from a similar structure to that of Box 5-49. At this incident, L403 was lowered down a straight ground ladder. Also see Photo 7.
(Photo courtesy of the Fire and Rescue Department.)

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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, which ultimately result in an injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the fatality:

- Lack of continuous scene size-up and risk assessment
- Lack of incident management and command safety
- Lack of forecasting
- Lack of tactical objectives
- Loss of crew integrity
- Lack of rapid intervention crew(s)
- Below-grade fire
- Company staffing
- Personnel accountability system
- Arson

Cause of Death

According to the death certificate, the medical examiner listed the deceased firefighter's cause of death as smoke inhalation. The firefighter had a carboxyhemoglobin of 31%. The manner of death was homicide.

Recommendations

Recommendation #1: Fire departments should ensure a detailed scene size-up and risk assessment is conducted during initial fireground operations and throughout the incident. Incident commanders must continually reevaluate the strategy and adjust the incident action plan (IAP) based upon the continuous size-up and risk assessment.

Discussion: At this incident, the initial size-up determined that the fire was in the basement. The tactical priorities focused on the firefighting operations in the basement and a search for occupants of Side Bravo of the structure. There were no firefighting operations or search for fire extension on upper floors until fire broke out on the 1st floor Side Alpha. Engine 4 was immediately directed to stretch their hoseline to the front of the building on Side Alpha and then moved to the 1st floor Side Delta.

The strategy and IAP (tactics) of an incident are dictated by the size-up, initial risk assessment, and situational report made by the first arriving officer. The priority is to get fire department resources to Side Charlie as quickly as possible. However, unless an obvious life safety issue exists (e.g., visible victims requiring immediate assistance), interior firefighting operations should not commence until a report from Side Charlie is received. If physical barriers make the 360-degree size-up impractical for the 1st arriving officer, the delegation of the size-up of Side Bravo, Side Charlie, and Side Delta may go to another engine company or other resource on the 1st Alarm. Even if a 360-degree size-up was conducted, the assignment of resources should go to Side Charlie. Resources could include any unit—engine, truck, medic unit, or chief—, preferably an engine company with a hoseline [Fire and Rescue Departments of Northern Virginia (FRDNV) 2013]. Until the 360-degree assessment is completed,

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incident commanders must be cautious in committing fire crews, must constantly monitor changing conditions and must be prepared to immediately adjust crew commitments or withdraw crews all together.

The tasks that need to occur at any fire, regardless of the occupancy, are an initial on-scene report upon arrival, initial risk assessment, situational report, water supply, deployment of handlines and back-up handlines, search and rescue, ventilation, establishment of a RIC, ground and aerial ladder placement, fire attack and extinguishment, and salvage and overhaul.

At any incident, life safety is always the first priority, followed by incident stabilization (second priority) and then property conservation (third priority). The task of ensuring for the safety of firefighters is a continuous process throughout the incident. A sound risk management plan ensures that the risks are evaluated and matched with appropriate actions and conditions. The following risk management principles should receive use during fireground operations:

- Limit activities that present a significant risk to the safety of members to situations where there is a potential to save endangered lives
- Recognize activities that are routinely employed to protect property as inherent risks to the safety of members and take actions to reduce or avoid these risks
- Do not risk the safety of members when it is not possible to save lives or property
- Limit activities to defensive operations in situations where the risk to fire department members is excessive [NFPA 2018b].

Fireground operations are very dynamic and fast-paced. An incident commander must determine a strategy and then develop an IAP. Incident commanders must follow the decision-making model that includes identifying incident critical factors (through a situational evaluation or size-up), considering the standard risk management plan, declaring the strategy (offensive or defensive), and then setting tactical objectives. This model will lead to the development of an IAP, which serves as the tactical road map to effectively manage the incident. An IAP defines where and when resources are assigned throughout the incident, along with tasks and objectives [NFPA 2014].

To ensure a standard outcome for each incident, incident commanders should match the standard conditions to standard actions. This is the core of the incident command system and the basis for all operations. The incident commander should identify the incident's current critical factors before taking any action.

The initial and ongoing size-ups of the incident's critical factors should produce the information that becomes the basis for the current incident strategy and the IAP. The collection of current, accurate, and relevant information will provide the foundation for effective initial and ongoing actions. Ultimately, this systematic evaluation process will produce standard, safe, and well-managed incident outcomes [Blue Card 2018].

When developing an IAP, the strategic goals are developed first, followed by development of the tactical objectives that are assigned to responding companies. At each incident, the incident

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commander should start with a standard placement-oriented operational plan that develops a strong, dependable beginning for command and control of the incident [Brunacini 2002; FRDNV 2013]. Often the initial incident commander is a company officer who arrives on-scene prior to a chief officer. The company officer should provide a detailed size-up, which is communicated to all responding resources, including the Dispatch Center. The company officer assumes command and makes decisions regarding the strategy and the IAP. Events can occur very quickly before a detailed tactical worksheet or written IAP is developed. When the company officer does not have the ability or time to record the IAP on paper, a verbal IAP is appropriate when transferring Command [Brunacini 2002; Harms, 2010].

Once an officer assumes command, the overall strategy is communicated. Command should make specific assignments to arriving companies along with tactical objectives, such as search, rescue, fire attack, ventilation, utility control, and exposure protection. The responding chief officer should monitor radio communications and document tactical objectives on a tactical worksheet if possible. When the chief officer arrives on scene, an update from the initial incident commander should occur (face to face or by radio). The chief officer will then assume command at a stationary location. By following this process, the initial and subsequent incident commanders will have a stronger position to manage an incident should an emergency event occur [NFPA 2014].

NFPA 1561 defines an IAP as a verbal plan, tactical worksheet, written plan, or combinations thereof that reflects the overall incident strategy, tactics, risk management, and member safety that are developed by an incident commander. NFPA 1561, *Standard on Emergency Services Incident Management System and Command Safety* [NFPA 2014] requires the following regarding an IAP:

- 5.3.12.1. The incident commander shall be responsible for developing and/or approving an incident action plan.
- 5.3.12.2. This IAP shall be communicated to all staged and assigned members at an incident.
- 5.3.20. The incident commander shall be responsible for reviewing, evaluating, and revising the IAP and overall strategy of the incident (**See Diagram 11**).

The following are guidelines for developing an IAP for offensive and defensive operations.

Offensive Incident Action Planning

When an incident's critical factors and the risk management plan indicate an offensive strategy, Command will define the tactical objectives for entering the structure (hazard zone) to attempt to control the incident hazards. An offensive IAP is based on the standard offensive tactical priorities and their corresponding completion benchmarks:

- Water on the fire
- Life safety—primary and secondary—“all clear”
- Fire control—“under control”
- Property conservation—“loss stopped”
- Customer stabilization—short term [Blue Card 2018].

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DEVELOPING an INCIDENT ACTION PLAN

The Incident Action Plan is defined as the strategic goals, tactical objectives, and support requirements for the incident. All incidents require an action plan. For simple incidents, the action plan is not usually in written form. Large or complex incidents will require that the action plan be documented in writing.

After the size-up is completed, the officer begins the process of developing an Incident Action Plan, which should be used at all incidents. The Incident Action Plan (IAP) will assist the Incident Commander in completing two significant incident management tasks – identifying the incident strategy and the assignment of tasks that accomplish the strategy. During structural firefighting, the IAP will be verbal and communicated to all responders operating on the incident scene.

The acronym **SLICE-RS** was created to guide initial engine company operations. It is effective as an initial attack sequence for the initial arriving officer to determine tactical priorities. As the incident commander arrives, **S-RECEO-VS** is an effective acronym to use for overall strategic objectives guiding the incident.

INCIDENT ACTION PLAN COMPONENTS

- Scene Size-up
- Scene Size-up communicated to all responding companies
- 8 Critical Fireground Factors
- Incident Priorities
- SLICE-RS and S-RECEO-VS
- Staffing
- Risk Management Plan
- Fire Fighter Safety
- Utilize *ICS Form 202 – Incident Objectives* as a guide.

Tactical Worksheet

TACTICAL WORKSHEET COMPONENTS

- Strategy
- Tactical Objectives and Benchmarks Met
- Time Benchmarks
- Committed Resources
- Available Resources - Staging
- Personnel Accountability System
- Scene Diagram
- Tactical Level Management
- Safety Considerations
- *Continuous review of the Tactical Worksheet*

**LIFE SAFETY
PRIORITY ONE**

**INCIDENT STABILIZATION
PRIORITY TWO**

**PROPERTY CONSERVATION
PRIORITY THREE**

Diagram 11. Guide for developing an IAP at Type V and Type IV incidents, which communicated verbally.

(Diagram courtesy of FireFighterCloseCalls.com.)

As an incident progresses, Command needs to continually review and update the IAP. The following list serves as a guide for Command to consider:

- Firefighter safety
- Consider changing operational modes—go defensive
- Does the current strategy match the current conditions
- Consider changing operational modes—go defensive
- Does the current strategy match the current conditions
- All affected areas searched (“all clear”)
- Timing and support
- Adequate backup
- Adequate staffing and resources
- Develop “Plan B”

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- Corrective actions to the current conditions (fire control, all clear, loss stopped) [Blue Card 2018].

Defensive Incident Action Planning

A defensive situation is where the incident problem has evolved to the point that lives and property are no longer savable and offensive tactics are no longer effective or safe. The entire defensive strategy is based on protecting firefighters. Firefighter safety is the #1 defensive priority.

Defensive strategy tactical priorities and their corresponding completion benchmarks are:

- Define the hazard zone and keep firefighters out of the potential collapse zone(s)
- Establish cutoffs—forward progress stopped
- Search exposures—primary and secondary “all clear”
- Protect exposures—“fire control”—loss stopped.

Defensive operations represent a standard organizational response to when offensive tactics cannot control the situation. Command must write off lost property and decide where the cutoff comes between operating offensively or defensively. If defensive operations are conducted from the onset of the incident, the involved structure(s) will not have a primary search. During defensive campaign operations, Command will coordinate the rotation of crews for rest and rehydration.

Recommendation #2: Fire departments should ensure incident commanders forecast the direction of the incident early on, in order to build an effective incident organization. Forecasting should be a continuous process until the incident is stabilized or under control.

Discussion: At this incident, the initial size-up determined that the fire was in the basement. The tactical priorities focused on the firefighting operations in the basement and a search for occupants of Side Bravo of the structure. Eventually, the fire extended to the 1st floor and 2nd floor on Side Delta and then to the 3rd floor. This caused Command to assign companies to fire attack on the 1st floor and 2nd floor plus request an additional alarm.

The forecasting at a fire is an essential element for the incident commander. The IAP is developed based upon forecasting the direction of the incident. Where the fire has been and where it is going are two of the most important parts of forecasting. An IC must have a system in place where the rate of assigning companies to the emergency scene doesn't exceed the span of control. Command accomplishes this by forecasting and establishing responsibilities either geographically (division) and/or by function (group) that divide the incident scene into a more manageable framework. The IC must be forecasting throughout the incident and prepare for what the fire will look like in 30 minutes. The IC should be transmitting to fire dispatch, a preliminary report followed up by progress reports. These reports should paint a picture for not only fire dispatch but also responding resources on current conditions as well as the current status of the fireground operations suppression. An example:

- *doubtful or doubtful will hold* (e.g., The situation remains doubtful until changed by the transmission of "probably will hold" or "under control")
- *probably will hold* (e.g., There is enough apparatus, equipment, and personnel to contain the fire or emergency and prevent any further extension or escalation)

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- *under control* (e.g., Final extinguishment of the fire or control of the emergency will be accomplished by the apparatus, equipment, and personnel on the scene)
- *conditions improving* (e.g., Indicates that the fire forces are making headway, but that final extinguishment has not been achieved) [FDNY 2011b].

Conditions using *doubtful/doubt will hold, probably will hold, under control, or conditions improving* are designed to manage incidents plus involve the dispatch center. For incidents that are assigned a tactical channel, a tactical radio operator or dispatcher should be assigned to the designated tactical channel. The dispatcher handles all communications between units assigned to an incident and the dispatch center on the assigned tactical channel. The dispatch center upon receiving the *doubtful/doubtful will hold* needs to prepare for the next half hour or more much like the IC [FDNY 2011b]. The dispatch center needs to have procedures in place when a 2nd Alarm or additional alarm is transmitted based on IC's updates and reports. The procedures should provide dispatchers with an appraisal of fireground operations and conditions which may require the recall of off-duty personnel and/or the response of mutual aid. Fire departments should consider assigning a fire department liaison to the dispatch center on a full time basis. This ensures that the fire department has adequate representation to assist and support dispatchers.

Also, forecasting will help the IC to deal continuously with changes and base decisions on current information. An effective IC does not stick with the initial plan of action after tactical objectives are completed or not met. Successful incident operations require the IC to revise the IAP as needed by constantly reconsidering the incident's tactical objectives based upon conditions, actions, and needs (CAN) reports. If Command is not receiving CAN reports, the IC must request CAN reports from each division/group supervisor. This is why it is important to assign a chief officer as a division/group supervisor. This assures the best appraisal of interior conditions so the IC can update the IAP and continue to forecast. The chief officer provides strong tactical direction and leadership where the work is actually taking place plus maintains the accountability of companies [FIREScope 2015, Blue Card 2018].

Once an attack plan is in place, all fire conditions behave in 1 of 2 ways, conditions improve or conditions worsen. After assigned resources have had a chance to assume their key tactical positions and begin operations, the IC must quickly determine their effectiveness on controlling the incident problems:

- In general, a well-executed, offensive fire attack will quickly control the fire
- If the fire continues to grow despite control efforts, it is a sure sign the current plan is not working
- The IC must quickly determine whether they can solve the problem by:
 - Reinforcing current positions or
 - Establishing key attack position(s) that aren't yet covered
- If the fire is too big to control with handlines from interior positions, a strategic change from offensive to defensive is required
- This decision must consider how long it will take to get required resources into position, as well as how long it will take to evacuate and account for interior crews if conditions continue to worsen

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- Command should have available resources in Staging to respond in the event they are needed. When the current IAP doesn't solve the incident problem(s), the IC must revise it based on the bullet points listed above.

For the IC, there is a tempo for the fire - lines being stretched, searches being conducted, and CAN reports. The IC must implement and adjust their IAP to *reinforce, redirect or retreat* based on the CAN reports.

A tactical withdrawal or retreat must specify which hoselines must continue to operate as members who are conducting searches are systematically removed from the building. This evacuation must be orderly and controlled (if collapse is indicated this should be an emergency withdrawal), starting with upper floors first. All units or companies must be contacted individually and acknowledge the direction to tactically withdraw from the building. Then from the top down, hoselines are to be removed. A roll call and PAR should be conducted. The IC should resist the urge to reassign units into a building once a defensive operation is undertaken with large caliber devices.

Recommendation #3: The early establishment of divisions/groups provide an effective incident management organizational framework on which the IAP can be built upon and expanded. This enhances the accountability of resources operating in the hazard zone.

Discussion: The incident command system (ICS) organization must develop at a pace that stays ahead of the tactical deployment of resources. In order for the incident commander to manage the incident, they must first be able to direct, control, and track the position and function of all resources. Building an ICS organization is the best support mechanism incident commanders can utilize to achieve the balance between managing personnel and incident needs.

The basic configuration of command includes three levels:

- Strategic level – Overall direction of the incident
- Tactical level – Assigns operational objectives
- Task level – Specific tasks assigned to companies.

The strategic level involves the overall command of the incident. The incident commander is responsible for the strategic level of the ICS organization. The IAP should cover all strategic responsibilities, all tactical objectives, and all support activities needed during the entire operational period. The IAP defines where and when resources will be assigned to the incident to control the situation. This plan is the basis for developing an incident's organization, assigning resources, and establishing tactical objectives. The tactical level directs operational activities towards specific objectives. Tactical level officers include branch directors, division/group supervisors, who are in charge of specific resources. Tactical level officers are responsible for specific geographic areas or functions and supervising assigned personnel. A tactical level assignment comes with the authority to make decisions and assignments, within the boundaries of the overall IAP and safety conditions. The accumulated achievements of tactical objectives should accomplish the strategy as outlined in the IAP. The task level refers to those activities normally accomplished by individual companies or specific

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personnel. The task level is where the work is actually done. Task level activities are routinely supervised by company officers [FIREScope 2015].

The incident commander should begin to assign divisions/groups based on the following factors:

- When situations eventually involve a number of companies or functions, beyond the capability of the incident commander to directly control.
- When the incident commander can no longer effectively manage the number of companies currently involved in the operation.
- When companies are involved in complex operations (large interior or geographic area, hazardous materials, technical rescues, etc.).
- When companies are operating from tactical positions that the incident commander has little or no direct control over (e.g., out of sight).
- When the situation presents special hazards and close control is required over operating companies (i.e., unstable structural conditions, hazardous materials, heavy fire load, marginal offensive situations, etc.) [Blue Card 2018].

The incident commander should initially assign division/group responsibilities to a second company officer since the first due officer has an assignment and is operating on the task level. This allows the first company officer to work with his company and focus on the assigned task and more importantly prevents task saturation. The second company officer assigned as the division/group supervisor has the ability to operate on the tactical level, which ensures a broader view of the operations. Another benefit, if companies are operating with limited staffing, the company officer assigned to the position of division/group supervisor can assign his/her crew to the initial crew to improve company operations. When assigning resources to a division/group that is already established with a company officer, the IC must include:

- The location of the assignment
- The tasks required
- The tactical objectives to be addressed
- The division/group supervisor that they will be reporting to/working under.

Command must then contact the division/group supervisor and inform them what additional resources have been assigned to them. Company officer division/group supervisors have the same set of challenges as the fast attacking company officer incident commander. The challenges are:

- communications difficulties wearing full PPE
- working in a hazard zone (heat, visibility)
- supervising and accounting for their own crew members
- engaging and focusing in on task level activities.

The IC should consider assigning a chief officer as a division/group supervisor when two or more companies are assigned to the division/group.

If the division/group supervisor is operating or has to go into the IDLH atmosphere (hazard zone), the division/group supervisor should operate with another firefighter. The primary function of company officers working within a division/group is to direct the operations of their individual crews in

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performing assigned tasks. Company officers will advise their division/group supervisor of work progress, preferably face-to-face. All requests for additional resources or assistance within a division/group must be directed to the division/group supervisor. Division/group supervisors will communicate with the incident commander. When additional chief officers arrive, they should be assigned to a division or group to provide the best assessment for the incident commander and provide ongoing CAN reports. It is important to have visual observation of all four sides and the interior of an incident to influence the IAP. Without the observations and CAN reports, the incident commander will be limited in vital information.

This early establishment of division/group provides an effective incident management organization framework on which the operation can be built and expanded. One of the most important benefits of establishing divisions/groups early in the incident is that accountability is shifted to each division/group supervisor, which greatly improves the ability to track resources on the fireground. Subdividing the incident provides tactical supervision, direction and support to units assigned when operating in the hazard zone. This delegated management also helps the incident commander to achieve the incidents tactical objectives much more safely and effectively. Utilizing the appropriate divisions/groups:

- Reduces the incident commander's span of control
- Streamlines and creates more effective incident scene communication
- Allows the incident commander to focus on the strategic elements of the incident from a stationary command post
- Gives the incident commander an array of functions to choose from and match the particular needs to the incident
- Improves personnel accountability
- Places strong tactical direction and leadership where the work is actually taking place
- Improves firefighter safety by having dedicated officers directly manage and control the position and function of the operating companies assigned to them[Blue Card 2018].

When establishing a division/group, the incident commander will assign each division/group:

- A supervisor
- Tactical objectives
- Communications
- A radio designation (Roof Division, Division A, Rescue Group)
- The identity of resources assigned to the Division/Group.

The safety of firefighting personnel is the major reason for establishing divisions/groups. Each division/group supervisor must maintain communication with assigned companies to control both their position and function. The division/group supervisor must constantly monitor all hazardous situations and risks to members plus make sure all companies are operating in a safe and effective manner.

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Recommendation #4: Fire departments should use resources from the National Institute of Standards and Technology (NIST) and the Underwriter's Laboratories (UL) to develop and revise fireground operational procedures.

Discussion: In this department, recruit firefighters have received training based upon modern fire behavior research conducted by NIST, UL Fire Fighter Safety Research Institute (FSRI), and other research organizations as well as training on the fundamentals of modern fire behavior. The fire department also conducts annual live fire training drills. In this incident, the flow path extended to all three floors via the open utility chases. The fire extended through the walls and the ceiling on each floor. The fire was able to gain significant headway before crews were assigned to firefighting operations on each floor.

NIST and UL FSRI have conducted a series of live-burn experiments designed to replicate conditions in modern homes and residential structures and validate testing done in laboratory settings. The results of these experiments enable firefighters to better predict and react to the effects of fire in these types of occupancies. The fire research experiments were conducted in cooperation with the Fire Department of New York (FDNY); Chicago Fire Department (CFD); Spartanburg Fire and Rescue, Spartanburg, South Carolina; and other agencies. The live-burn tests are aimed at quantifying how fires are different today, largely because of new building construction and the composition of home furnishings and products. In the past, these products mainly were composed of natural materials, such as wood and cotton, but they now contain large quantities of petroleum-based products and synthetic materials that burn faster and hotter and generate large volumes of fuel-rich smoke. Where a fire in a room once took approximately 20 minutes to “flashover”—igniting all the contents—this can happen with today’s furnishings in as little as 4–5 minutes [Kerber 2012, Madrzykowski 2013].

The NIST and UL experiments evaluated individual and combinations of methods for strategically ventilating and isolating fires to prevent or delay flashover. In contrast, kicking a door open or breaking a window without knowledge of conditions inside could create a portal for air that can literally fan the flames by introducing oxygen into an oxygen-limited fire environment.

Traditionally, fire suppression operations were conducted from the interior of a structure to reduce water damage and limit fire damage. It is essential to coordinate these operations with the ventilation operations. Previous research and investigations of line-of-duty deaths have shown that ventilation events occurring prior to suppression while firefighters are in the structure have led to tragic results [NIOSH 2012a, 2013a, 2013b]. One method of eliminating this risk is by using a transitional attack. Prior to the firefighters entering the building, water should be directed into the structure from the exterior to cool the fire gases and reduce the heat-release rate of the fire. The major concern with this type of operation is the potential harm that can occur to people trapped in a structure or the amount of water damage to a structure. It is possible to lose structural integrity in less than 5 minutes once the floor assembly becomes involved in fire [Kerber et al. 2012]. Therefore, UL has shown that effective suppression operations, either from the interior or exterior, did not increase the potential burn injuries to the occupants. However, the delay of suppression operations provides the potential for longer occupant exposures and increased potential for further injury or death [Zevotek et al. 2017].

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Other challenges from basement fires and related tactical considerations were noted in a recent study conducted by the International Society of Fire Service Instructors (ISFSI) and UL FSRI on [Understanding and Fighting Basement Fires](#) [Madrzykowski and Weinschenk 2018]. Research has shown below-grade fires present a high risk to firefighters, stemming from unexpected floor collapse and high heat. Research also indicated the tools that firefighters have traditionally used to determine the structural integrity of the floor are not effective with lightweight construction [Madrzykowski and Weinschenk 2018].

The key findings are:

- Size-up is critical
- Below-grade fires are likely ventilation-limited
- Coordinating ventilation with water application is required to limit the growth of a ventilation-limited fire
- Ventilation without suppression was shown to increase the hazard to trapped occupants
- Water application in the below-grade space is key to smoke cooling
- Effective water application into below-grade space reduces the hazard throughout the structure
- Options exist to make a coordinated and effective attack
- It is best to fight the fire on its own level.

The ISFSI/UL FSRI study went beyond earlier research by increasing the size of the basement and incorporating three different ventilation and access conditions to the basement. Those access conditions included no exterior access to the basement, limited exterior access to the basement, and exterior access to the basement. The results of the experiments showed the importance of identifying a basement fire, controlling ventilation, and flowing an effective hose stream into the basement from a position of advantage as soon as possible.

The basement experiments highlighted the importance of identifying a basement fire during size-up and subsequently choosing the appropriate tactics that coordinate ventilation with suppression. In all experiments, the basement fire was ventilation limited. Various nozzles and appliances (Bresnan distributors, piercing nozzles, and cellar nozzles) were used to flow water into the basement. Water streams applied through the floor, through a small window remote from the seat of the fire, and through a basement-level access door controlled the fire and reduced the hazard throughout the structure.

Effective water application into a basement cooled the fire gases to prevent flashover, slowed the destruction of the structure and the floor assembly, and reduced the hazard from fire. This action made entry conditions into a basement with active burning possible for a fully protected firefighter. Effective water application also supported search operations and reduced the threat from heat and toxic gases for any trapped occupants [Madrzykowski and Weinschenk 2018].

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Based upon the NIST and UL research, fire departments should consider implementing the following fireground operations.

- **Size-up**
Size-up must occur at every fire. It is necessary to consider the resources available and situational conditions, such as weather, fire location, size of the fire and building, and the construction features. A 360-degree size-up should be conducted whenever possible. It also is necessary to develop, communicate, and implement tactical objectives for each fire.
- **Ventilation**
Fire departments should manage the openings to the structure to limit fire growth and spread and to control the flow path of inlet air and fire gases during tactical operations. It is necessary to coordinate all ventilation with suppression activities. Uncontrolled ventilation allows additional oxygen into the structure, which may result in a rapid increase in the fire development and increased risk to firefighters because of increased heat-release rates within the flow path.
- **Firefighting Operations**
Given the fuel-rich environment that the fire service operates in today, fire departments should apply water to the fire as soon as possible. In many cases, the best first action is water application through an exterior opening into a fire compartment, prior to committing firefighting resources to the interior. Fire departments should cool the interior spaces of a fire building with water from the safest location possible, prior to committing personnel into spaces with, or adjacent to, fully developed or smoldering (ventilation-limited) fire conditions.
- **Rapid Intervention**
Fire department rapid intervention procedures should include providing water on the fire as soon as possible and controlling ventilation openings during firefighter Mayday incidents [ISFSI 2013].

These research findings are presented to assist fire departments in making an informed decision related to changing fireground tactics. Much of this research was directed toward developing a better understanding of the characteristics of modern fire behavior. While firefighting always will have risk, this research represents a vital contribution to overall efforts to reduce risks and to save lives. A flow path is composed of at least one inlet opening, one exhaust opening, and the connecting volume between the openings. The direction of the flow is determined by difference in pressure. Heat and smoke in a high-pressure area will flow through openings toward areas of lower pressure. Based on building design and the available ventilation openings (doors, windows, etc.), several flow paths can exist within a structure. Any operation conducted in the exhaust portion of the flow path will place members at significant risk because of the increased flow of fire, heat, and smoke toward their position. Operations conducted in the flow path, between where the fire is and where the fire will travel, place firefighters at significant risk because of the increased flow of fire, heat, and smoke toward their positions. This risk is true for natural-ventilation cases with or without wind. In cases with the potential for wind to affect the heat release rate and the movement of the fire, it is important to keep the wind at your back and attack the fire from the upwind side [Fire Department of New York (FDNY) 2013; NIST 2013]. *Another important safety procedure to remember, practice, and utilize in the event of becoming trapped or in distress in the hazard zone is door control and isolation. This allows a firefighter or firefighters to have protection until a rescue can occur.*

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Firefighters and company officers must understand that the critical first step in evaluating the potential for a wind-impacted fire is recognition of any smoke movement in the flow path, wind speed, smoke forced under doors, and/or pulsing smoke or fire. Company officers should notify the incident commander immediately when any of these conditions are observed. The communication of this critical information to the incident commander and for all companies operating inside the building. This will allow Command to adjust the IAP as necessary.

Recommendation #5: Fire departments should develop and implement a standard operating procedure (SOP)/standard operating guideline (SOG) for tactical operations involving below-grade fires.

Discussion: Recognizing a below-grade fire is essential to ensuring that proper strategy and tactical objectives are developed for an incident. These types of fires are low-frequency/high-risk events for several reasons. Below-grade fires sometimes are difficult to initially detect; sometimes are difficult to access; and require adequate staffing for hoseline placement, operation, and ventilation. In addition, firefighters may be working over the fire [Madrzykowski and Weinschenk 2018].

These types of fires are high-risk events for several reasons:

- Limited ingress and egress into a basement
- Weakened floor joists and rafters
- Potential for becoming caught in the fire's exhaust portion of the flow path
- Unknown fire loading
- Ventilation concerns
- Utility panels and meters plus connections
- Hanging wires
- Furniture and appliances.

During below-grade fire operations, every firefighter should remember two key issues: access and ventilation. Access includes how easily a firefighter can get water in and how they can make an attack via a window or door. Ventilation may not exist in a below-grade area. There may be residential structures with no exterior vents to the basement or below-grade area. The main way for air and smoke to move through the home will be from the basement, up the stairs towards an open door or windows above grade. If the fire has not penetrated into the structure, you will see bi-directional flow at the doorway. The air supply to the fire is inefficient and limited, therefore the potential for flashover is reduced when no exterior vents to the basement are present.

Potential ventilation via windows or doors connected to the below-grade compartments enables rapid changes in fire growth. Unidirectional exhaust flows in the stairwell(s) result in an increased burning rate of a wood-floor assembly, increasing the potential for floor collapse and reducing safe operating time on the floor above. Ventilation of below-grade space was a key factor in several firefighter line of duty deaths, including the Pang Fire (Seattle, WA); the Cherry Road Fire (Washington, DC); the Squirrelsnest Lane Fire, Colerain, OH; the Berkley Way Fire, San Francisco, CA; and the Pater Road Fire, Hamilton, OH. [Madrzykowski and Weinschenk 2018].

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Key factors that aid in recognizing a below-grade fire are:

- Fire or smoke venting from a cellar window or smoke pushing from the chimney (especially during warmer weather)
- Heavy smoke with no visible fire on the 1st floor
- Floorboards not appearing hot—look for smoke around the edges of the baseboard or heating, ventilation, and air-conditioning ducts
- Smoke from attic windows or louvered vents, especially in older homes with balloon frame construction [Kerber et al. 2012; Madrzykowski and Kent 2011].

Below-grade fires in dwellings with balloon-frame construction likely will extend to the attic via hidden voids. Units operating above the basement must stretch enough hoseline to reach the upper floors. Checking the intermediate floors for fire before a hoseline is committed to the top floor is essential because floor construction can isolate the fire. Flooring systems and floor coverings are good insulators and may not transfer a significant amount of heat from a basement fire. Laboratory experiments, field-testing, and modeling have shown that in post-flashover basement fires, even after the floor supports start to lose structural integrity:

- High heat conditions may not generate to the floor above
- Thermal imagers may not provide clear information on the level of hazard
- Floor supports that hold up to a strike from a tool during sounding may not have the ability to carry the weight of a firefighter or firefighters [Kerber et al. 2012; Madrzykowski and Kent 2011].

A fire department's SOP/SOG for below-grade fires needs to include the following topics:

- Community risk assessment
- Scene size-up
- Building construction
- Strategy and tactics
- Use of a thermal imager
- Ventilation considerations
- Proper size and adequate hoselines.

Below-grade fires are one of the most challenging situations firefighters encounter. As with all fires, use of a risk assessment and an occupant survivability profile can evaluate what is at risk, lives or property. Fire departments should conduct a post-incident analysis for significant incidents, especially following below-grade fires. Findings from these analyses can help in updating the department's community risk assessment program and SOPs/SOGs [NIOSH 2018].

Recommendation #6: Fire departments should ensure incident commanders establish a stationary Command Post that is tied to a vehicle for effective incident management, which includes the use of a tactical worksheet.

Discussion: When a Command officer (e.g., battalion chief, district chief, deputy chief) arrives on scene, the Command officer should automatically assume a standard stationary, exterior, and remote

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command position and immediately assume Command. Command officers should function inside their vehicle or at the rear of the vehicle, which has a command board with a tactical worksheet.

NFPA 1561, *Standard on Emergency Services Incident Management System and Command Safety*, 5.3.1 states, “The incident commander shall have overall authority for management of the incident.” The incident commander must establish and maintain a Command Post outside of the structure in order to assign companies, delegate functions, and continually evaluate the risk versus gain of continued firefighting efforts [NFPA 2014].

In establishing a Command Post, the incident commander shall ensure the following:

- The Command Post is located in or tied to a vehicle to establish presence and visibility
- The Command Post includes radio capability to monitor and communicate with assigned tactical, Command, and designated emergency traffic channels for that incident
- The location of the Command Post is communicated to the communications center
- The incident commander, or the incident commander’s designee, is always present at the Command Post
- The Command Post is located in the incident cold zone [NFPA 2014].

The incident commander also needs to have the ability to hear all radio transmissions, especially from those operating in the hazard zone. This will enable the incident commander to have the best position possible to hear critical radio transmissions [NFPA 2014].

The use of a tactical worksheet can assist the incident commander with tracking various task assignments on the fireground. The tactical worksheet identifies critical incident information in a fill-in format and allows for the tracking of initial alarm assignments, additional alarms, division/group assignments, and tactical/functional considerations. It is important that the incident commander start using the tactical worksheet as early in the incident as possible [NFPA 2014], along with pre-plan information and other relevant data, to integrate information management, fire evaluation, and decision-making. The tactical worksheet should record unit status, benchmark time, and include a diagram of the fireground, occupancy information, activities checklist(s), and other relevant information. The tactical worksheet also can help the incident commander in continually conducting a situation evaluation and maintaining personnel accountability [NFPA 2014]. The tactical worksheet provides reminders, prompts, and a convenient workspace for tracking companies and apparatus. It allows the incident commander to slow down during an incident and record vital information that may help make future operational decisions [NFPA 2014].

The advantages of using a tactical worksheet are that the tactical worksheet:

- Includes a location to quickly note individual assignments
- Provides prompts for the incident commander, such as time, air management, and PARs
- Provides tactical benchmarks, such as “water on the fire,” “primary search complete,” “fire under control,” and “loss stopped”
- Documents the Command structure—strategic, tactical, and task
- Facilitates consistent, organized information
- Documents assignments and responsibilities

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- Expedites passing of Command or support for the incident commander
- Provides resource status [NFPA 2014].

Fire departments should have a Communications SOP/SOG coupled with an effective training program. These procedures should include the use of clear text (specifically, no ten-codes, or other terms that may perhaps be unfamiliar to other responders), a separate radio channel for Dispatch, and a separate tactical channel for use during the incident [NFPA 2014].

When a division or group is implemented, a fire department should provide a Dispatch channel, a Command channel, and a Tactical channel(s). A fire department should provide the necessary number of radio channels with multiple Tactical channels, depending on the type of incident and the complexity of the incident. The fire department should have procedures for the announcement of emergency conditions, using the term “emergency traffic” as a designation to clear radio traffic. The incident commander, tactical level management unit, or member who identifies a high-risk situation on the fireground (e.g., power lines down, signs of impending collapse) should declare emergency traffic to alert members that the incident commander is ordering the evacuation of the building [NFPA 2014]. Use of the term Mayday should stay reserved for only those situations when a firefighter(s) is in trouble or facing a life-threatening emergency.

Effective fireground or incident scene communications are essential to the success of the personnel accountability system (resource status). A member who is responsible for maintaining the location and status of all assigned resources at an incident should handle the resource status function. This is separate from the role of the incident commander. Because of the importance of responder safety, the function as an accountability officer or resource status officer should be assigned as early into the incident as possible. Several members could function in this role, including an incident command technician, a chief officer, a chief’s staff aide, apparatus driver/operator, or other responder. Many means are available to account for resources, which can include a tactical worksheet, apparatus riding lists, company responder boards, and electronic bar-coding systems, the tracking of resources. Use of these components in conjunction with one another can facilitate the tracking of responders by both location and function. It is important to have modular components of the resource accountability system that can expand with the size and complexity of the incident [NFPA 2014].

Recommendation #7: Fire departments should incorporate the principles of command safety into the incident management system during the initial assumption of command. This ensures that strategic-level safety responsibilities are incorporated into the command functions throughout the incident.

Discussion: At this incident, the incident commanders experienced several command safety issues. The fire department is addressing these issues as part of its recovery process. They include fireground communications, stationary Command Post, personnel accountability, use of a tactical worksheet that compliments personnel accountability and crew integrity, and a continuous scene size-up and risk assessment.

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The purpose of command safety is to provide the incident commander with the necessary guidance on how to use, follow, and incorporate safety into the incident management system at all incidents. Command safety is incorporated into the eight functions of Command developed by Fire Chief Alan V. Brunacini. The principles of command safety describe how the incident commander must use the regular, everyday command functions to complete the strategic-level safety responsibilities during incident operations. Using the command functions creates an effective way to ensure a close connection between incident safety and incident management.

The *eight functions of Command* are:

- Deployment
- Assume, Confirm, and the Positioning of Command
- Situation Evaluation
- Strategy/Incident Action Planning
- Communications
- Organization
- Review, Evaluate, Revise
- Continue, Support, and Terminate Command [Brunacini 2002; NFPA 2014].

A vital command function involves the incident commander using the initial scene size-up, consideration of critical factors (building type, occupancy, life safety, fire conditions, and available resources), the standard risk management plan, the forecast of incident conditions, and a standardized decision-making process. The choice of strategy (offensive or defensive) is independent of location (inside or outside) as it relates to the hazard area or hazard zone. The strategy may change over the course of an incident, but only one of the two strategies is used at any one time [Blue Card 2018]. Any strategy should include a simple understandable plan that describes in basic terms how close the emergency responders will get to the incident's hazards. The incident's overall strategic decision is based on the incident's critical factors weighed against the risk management plan (**See Diagram 12**).

Declaring the incident strategy up front, as part of the initial radio report will:

- Announce to everybody the overall incident strategy
- Eliminate any question on where firefighters will operate on the incident scene inside the structure [Blue Card 2018].

Once the overall incident strategy is determined and the IAP developed, the incident commander should manage the completion of the tactical priorities for the chosen strategy. Each strategy has a different set of tactical priorities to complete. Tactical priorities provide the incident commander with a simple short list of major categories that are designed to act as a practical guideline during the difficult initial stages of fireground planning. The IAP is short and simple. A complicated IAP tends to break down during this critical time.

In general, the incident commander tries to achieve the same basic objectives from one incident to the next. Tactical priorities offer a regular set of tools which the incident commander can utilize for tactical activities in order to develop a standard approach to solving incident problems. With this

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standard approach, the incident commander can manage the basic work sequence at every incident in the same manner.

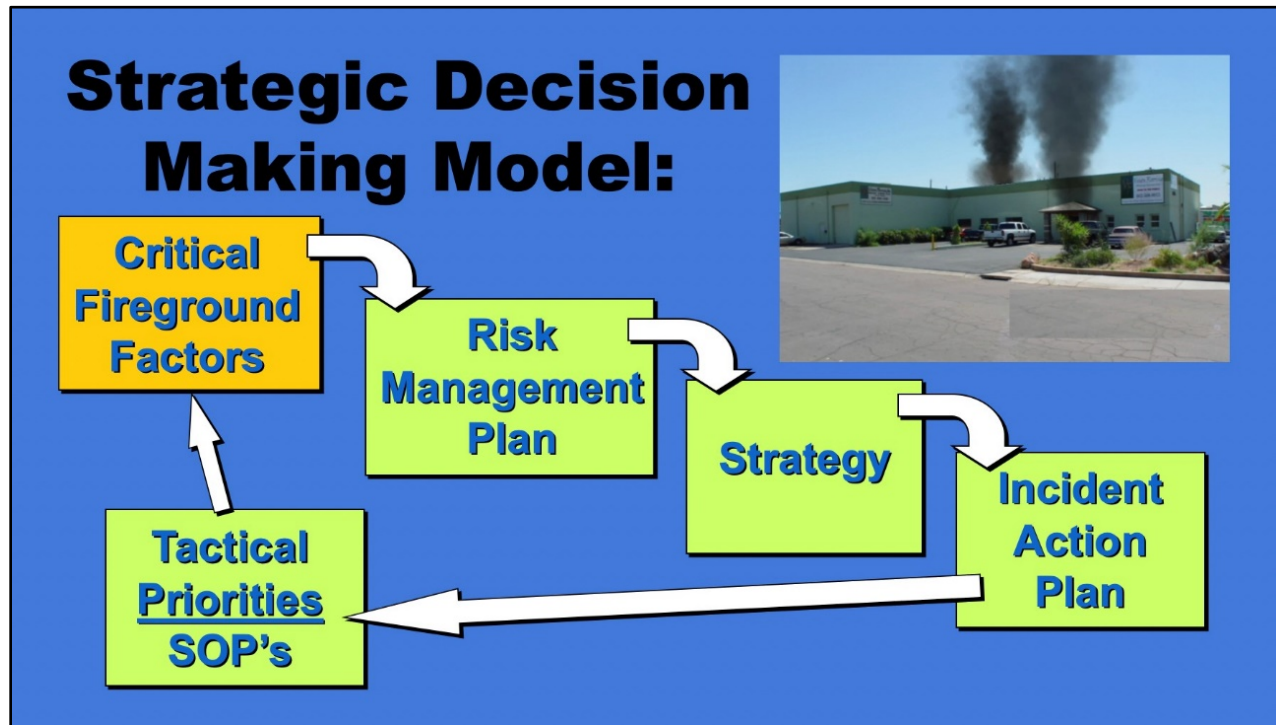


Diagram 12. This model conforms the decision-making process into a standard sequence. The incident commander identifies the incident’s significant critical factors and develops a risk management plan. The incident commander then bases the strategy and IAP on the evaluation of those factors. This leads to the tactical priorities for the incident. *(Diagram courtesy of Blue Card [Blue Card 2018].)*

Dispatch Centers should contact the incident commander every 10–15 minutes on the assigned fireground tactical channel with elapsed-time reminders. These 10–15-minute notification reminders serve as cues for the incident commander to reevaluate conditions, restate the current strategy, and consider the length of time firefighters operate in the hazard zone. The incident commander develops the strategy and the IAP based on the initial size-up of the incident’s critical factors. These critical factors are very dynamic. Incident operations are either getting better or they are getting worse, but they never stay the same. The incident conditions drive the strategy, IAP, and risk management plan [Blue Card 2018; NFPA 2014].

An integral part of the personnel accountability system is to make sure that all assigned resources working in the hazard zone are initially accounted for. Throughout the incident, it is necessary to conduct a PAR periodically to ensure that all assigned resources are accounted for by the accountability officer or resource status officer.

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The accountability officer also should request a PAR from each division or group supervisor whenever a change in conditions occurs that could cause unsafe operation, such as an “emergency traffic” announcement to “all companies evacuate the building.” When a division or group supervisor is requested to conduct a PAR, this supervisor is responsible for reporting on the accountability of all companies or members working within their area of responsibility [NFPA 2014]. With a strategic mode change, a PAR should occur to ensure that all assigned resources are accounted for and are out of the hazard zone. Defensive operations should not start until the PAR is completed and all members are accounted for by resource status.

The eight functions of Command serve as the foundation for addressing command safety issues. The incident commander should follow each of these functions in order without skipping or missing any function. Automatically connecting and integrating safety with Command becomes a simple and essential way that the incident management system protects assigned resources at an incident. These functions serve as a practical performance foundation for how the incident commander fulfills the responsibility as the strategic-level incident manager and the overall incident safety manager [Brunacini and Brunacini 2004].

Recommendation #8: Fire departments need to ensure that critical incident benchmarks are communicated to the incident commander throughout the incident.

Discussion: Company officers should communicate with Command when benchmarks are met or not met. This is an essential element of the IAP because this process allows Command to consider and account for changing fireground conditions. Moreover, Command must be able to forecast the direction of the incident in order to stay ahead of the fire. Without this information, the IAP becomes out of sequence with the phase of the fire.

Fire departments should consider incident management system training and a certification program for company officers and chief officers that prepares members for dynamic events that they will encounter. This program would benefit officers who serve in the role of incident commander, as well as those who supervise and manage emergency and hazard zone operations for everyday local National Incident Management System, Type V and Type IV incidents [NFPA 2014].

Fireground benchmarks are an essential element for accomplishing successful and safe outcomes. To ensure that the proper benchmarks are communicated at fireground incidents, fire departments should develop and maintain a consistent process for communicating critical benchmarks in the form of an SOP/SOG. The SOP/SOG should include effective hands-on classroom and practical training programs with annual live fire training, a defined department deployment model, an effective incident management system, adequate radio equipment (mobile and portable radios), and adequate radio channels (dispatch, tactical, and command channels) [NIOSH 2014a, NIOSH 2014b, NIOSH 2015].

The first arriving fire department resource initiates the incident command process by giving a brief initial report. It is the responsibility of every firefighter to stay connected with crew members. Freelancing by any member, crew, or company should be strictly prohibited. The ultimate responsibility for crew integrity and ensuring no members get separated or lost rests with the company

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officer. The company officer must maintain constant contact with their assigned members by visual observation, voice, or touch while operating in a hazard zone. The company officer must ensure they stay together as a company or crew. If any of these elements are not adhered to, crew integrity is lost, and firefighters are placed at great risk. A company officer can track personnel in smoky conditions by calling out to crew members. This becomes necessary when conducting a PAR. Because it is possible to have crew members with the same first name, it is best to use the member's last name.

Because the incident commander is located at the Command Post (outside the hazard zone), interior crews should communicate the interior conditions to the incident commander as soon as possible. Interior conditions can change the incident commander's strategy and IAP. Interior crews can aid the incident commander in this process by providing reports of the interior conditions as soon as they enter the fire building and by providing regular updates, especially when benchmarks are met (e.g., "primary search complete, all clear" and "the fire has been knocked down").

A fire department's communications SOP/SOG should include communications necessary to gather and analyze information to plan, issue orders, and manage operations. For example:

- Additional resources required
- Status of water on the fire
- Assignment completed
- Unable to complete an assignment
- Special information
- Emergency Traffic or Mayday [FIREScope 2015].

Communication of critical incident factors and their possible consequences offer the basis for a standard incident management approach. A standard information approach is the launching pad for effective incident decision making and successful operational performance. Incident commanders should use the critical factors in their order of importance, as the basis for making the specific assignments that make up the IAP. Incident commanders should not assume the action-oriented responders engaged in operational activities will stop what they are doing so they can feed the incident commander with a continuous supply of top-grade, objective information. It is the incident commander's responsibility to do whatever is required to stay effectively informed [Brunacini 2002].

For all members operating at an incident scene, radio discipline is essential. All members on the fireground should receive training on and use the thought process of "is my transmission necessary" as a part of fireground behavior. It is necessary to reserve all radio transmissions for relevant messages, such as benchmarks, CAN report, PARs, safety issues or concerns, needed resources, changing conditions, emergency traffic, and a Mayday. Members should refrain from transmissions that add little information to the IAP.

As the incident progresses, the following information needs to occur between Command and companies operating on the fireground:

- Follow-up radio report—A CAN Report (conditions, actions, needs)
- Safety concerns
- Status of water on the fire

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- Additional detailed report of fire/smoke conditions and location(s)
- Status of personnel accountability (announce the initial accountability location)
- Disposition of resources
- Rapid intervention crew in place and location
- Any notable results of the initial fire attack [Blue Card 2018].

Recommendation #9: Fire departments should ensure that all companies are operating based upon the assignment given by the incident commander. The Task-Location-Objective assignments should be communicated over the radio, which eliminates freelancing and ensures that tactical priorities are met.

Discussion: The IAP is a methodical process that ensures life safety, incident stabilization, and property conservation. Assigning the tactics in the order of accomplishment will aid in the coordination of the fireground activities. Companies should communicate their progress reports on the tactical objectives given them by Command to complete the tactical priorities. This keeps the operation focused on making sure everyone is out and okay, eliminating the incident problem, and reducing the damage to the customer's property. Incident operations are conducted around the completion of the tactical priorities. Incident communications should mirror this simple concept. This will help keep communications short and effective. It also maximizes the available free airtime. The incident commander must structure unit assignments around:

- Addressing the incident's critical factors
- Completing the tactical priorities
- Having tactical reserve (On Deck) [Blue Card 2018].

The incident commander will need to use the following structure when assigning any unit into the hazard zone:

- Tasks
- The location of these tasks
- The objectives of these tasks [Blue Card 2018].

The incident commander has a choice of available methods to implement the IAP. One option is assigning tactics. It is necessary to assign tactics in order of accomplishment, which will aid in the coordination of the fireground activities [USFA 2009]. Assigning tactics also limits the amount of radio traffic needed to implement the IAP, allows companies to react immediately to unforeseen or changing conditions, and reduces the demands placed on the incident commander.

An assigned tactic provides a direction to a company, which serves as the basis for feedback to the incident commander as to whether the tactic is completed. If a company is unable to complete the assignment, the incident commander needs to know as soon as possible in order to adjust the IAP. The incident commander also must understand why the company is not capable of completing its assigned tactic, such as no water, unanticipated conditions, or conditions that have deteriorated since the original assignment [USFA 2009].

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When units arrive on the scene, they should announce that they are staged. Dispatch should not acknowledge any staged units over the tactical channel. Command should contact the staged units and assign them based on the IAP.

Orders to 1st Alarm-staged units should follow a Task-Location-Objective format:

- Tasks
- Location of the tasks
- Objectives of the tasks.

Location of those tasks should include:

- What floor to operate on
- What occupancy/exposure to operate in
- What side to make entry on
- What side to operate on (defensive).

When assigning a unit to deploy a hoseline, the incident commander should designate the following:

- What the company needs to do with their apparatus
 - Lay a supply line
 - Pump a supply line
 - Park the apparatus out of the way (manpower only).
- Where the company will get the handline from:
 - Their own company
 - Another forward pumper designated by Command.

The task objectives should focus on the completion of the tactical priorities (objective = completion benchmark):

- Search/rescue = primary and secondary “all clear”
- Fire control = “under control”
- Loss control = “loss stopped” [Blue Card 2018].

When assigning companies to areas that already have units assigned, the incident commander should inform the newly assigned unit to whom it will report to/work under. The incident commander also should inform the division/group supervisor of the newly assigned companies(s).

Recommendation #10: Fire departments should ensure that all firefighters and fire officers are trained in managing a Mayday.

Discussion: At this incident, four Maydays were called. A Mayday was transmitted from the second floor bedroom on Side Delta. A Mayday also was transmitted from Side Alpha and two from Side Charlie. As the recommendation states, this process involves strategic level, tactical level, and task level responses. It is imperative that Command know exactly who is missing and the location.

The ability of a firefighter to call a Mayday is a complicated behavior that includes the affective, cognitive, and psychomotor domains of learning and performance. Any delay in calling a Mayday

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reduces the chance of survival and increases the risk to other firefighters trying to rescue the “downed” firefighter. Firefighters should have 100% confidence in their competency to declare a Mayday. Fire departments should ensure that any personnel who enter a hazard zone meet the department standards for Mayday competency throughout their active duty service. A RIC typically is not activated until a Mayday is declared. Any delay in calling a Mayday reduces the window of survivability and increases the risk to the RIC [NFPA 2018b].

The National Fire Academy has a 1-hour course addressing the firefighter Mayday Doctrine, *Q133 Firefighter Safety: Calling the Mayday*, which covers the cognitive and affective learning domains of the firefighter *Mayday Doctrine*. As with any training, practical training should supplement the classroom training. The important factor is to ensure fire departments understand the true magnitude of a Mayday. When a firefighter calls a Mayday, the response must include effective incident management, proper fireground and radio communications plus dispatcher support, adequate resources (staffing), tools and equipment, and emergency medical services support [NIOSH 2011].

One important point is that every firefighter should be equipped with a portable radio when operating in the hazard zone. If a firefighter becomes lost or trapped in the hazard zone, the firefighter should activate the emergency button (orange) on the portable radio prior to transmitting a Mayday. This action will give the member in distress the best chance for the dispatcher and/or IC to acknowledge the Mayday. This ensures the Mayday will be addressed in a timely manner. This process should be supported by a SOP/SOG and practical training.

The rescue of a lost, missing, trapped, or injured firefighter is time sensitive. A very narrow window of survivability exists for a firefighter who is out of air or trapped in a hazardous environment. Firefighters must not delay in communicating a Mayday, ensuring the incident commander is notified. When it comes to rapid egress or removing a downed firefighter, the most appropriate action to take due to conditions may be to use a window in the immediate area. A task such as this can be challenging if it is not trained on or practiced regularly. It is important to remember that the safest way to remove a downed firefighter from an upper level of a building is by using a staircase if at all feasible.

Firefighters may be forced to use windows for removal for a variety of reasons. The route taken into the structure may have been altered or changed during the course of operations by collapse, deteriorating fire conditions, the malfunction of a self-contained breathing apparatus (SCBA), an air-supply issue or disorientation. Factors such as surroundings, fire conditions, collapse or building construction can further increase the challenges that must be overcome. A constricted-space window removal requires at least three rescuers. These maneuvers are labor intensive and will require a RIC to be operating on the exterior as well as the interior. Communication between these crews is of highest priority. The exterior RIC will need to know the specific equipment and exact location necessary to affect the rescue. This will normally take place after the initial RIC locates the downed firefighter. Two of the most common ways to perform a removal of this nature are the "Denver" and "Fulcrum" techniques [Pindelski, J. 2010].

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The incident commander is required to revise the strategy and IAP (tactics) to incorporate a priority rescue. This will impact fireground communications as well. A Mayday condition is transmitted on the radio, using distinctive emergency traffic alert tones. Then the incident commander and/or Dispatch Center is responsible for taking action to clear the radio channel and to determine the member's location, situation, and resources needed to remedy the situation. In the event of a Mayday, a rescue group supervisor will take responsibility for the resolution of the Mayday. It is necessary for the incident commander to support the rescue group supervisor with appropriate and adequate resources to manage the Mayday. At the same time, the incident commander should reinforce the surrounding groups and division to continue the incident mitigation. Projecting resource requirements for the rescue group operations has the potential to increase the survivability of a Mayday situation.

The incident commander should ensure that firefighting operations are continued in conjunction with the rescue operations, especially in the area of the Mayday, by assigning this responsibility to a division or group supervisor. This allows the availability of adequate resources to hold or extinguish the fire while the rescue operations are conducted [Blue Card 2018]. The two most important Mayday rescue tasks that must occur are protecting the “downed” firefighter from fire and getting air to the “downed” firefighter. The incident commander has the responsibility for ensuring these two tasks are assigned and occurring.

Responsibilities of the rescue group include:

- Responding to the Mayday from the inside out
- Managing communications with the “downed” firefighter
 - The incident commander is required to revise the strategy and IAP (tactics) to incorporate a priority rescue, which impacts fireground communications as well
 - Command should declare the use of emergency traffic only until the situation is resolved
 - Once a Mayday condition is broadcast on the radio, using distinctive emergency traffic alert tones, the incident commander and/or Dispatch Center is responsible for taking action to clear the radio channel and determine the member's location, situation, and the resources needed to remedy the situation
- Managing the search and rescue efforts for the “downed” firefighter if necessary
- Increasing and maintaining resources assigned to the rescue group
- Managing the logistical support well
- Improving survivability and tenability
- Improving ventilation
- Increasing exterior access for the rescue group
- Utilizing the RIC bag and requesting additional RIC bags if necessary
- Recognizing and supporting the help order of a Mayday
- Positioning or staging crews in an On-Deck position or outside of the rescue group as a tactical reserve
- Requesting additional resources from the incident commander
- Overseeing crews from other groups or divisions
- Requesting additional staged resources
- Communicating with surrounding divisions and groups.

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When a Mayday occurs, this requires action at the strategic, tactical, and task levels. Each level plays a critical role in the successful outcome of a Mayday [Blue Card 2018].

Mayday Operational Procedures (Task, Tactical, and Strategic Levels)

Task/company/firefighter level Mayday responsibilities

The affected firefighter must:

- Call for a Mayday after realizing that it is not possible to safely exit the hazard zone
- Declare a Mayday (three times) to ensure priority radio traffic, unkey the microphone, and wait for Command to acknowledge the Mayday
- Give a CAN (conditions, actions, and needs) report that includes:
 - Who—identity (unit, unit riding position, or entire name)
 - What caused the condition(s) of the Mayday—what was the assignment
 - Where—identify current location/surroundings or the last known location
 - Needs—the needs that will help resolve the Mayday (critical)
- Calm down and begin your self-help/self-rescue techniques
- Conserve your air
- Activate PASS alarm if appropriate
- Maintain radio contact with the incident commander or division supervisor as required [Blue Card 2018].

Other companies operating in the hazard zone during a Mayday must:

- Maintain radio silence
- Transmit Mayday announcements and priority traffic and status reports only
- Prepare to assist with the rescue if able to do so
- Continue with interior fire control efforts when a Mayday occurs [Blue Card 2018].

Tactical level Mayday responsibilities (if in place)

A division supervisor who is in place at the entry point when a Mayday occurs in the supervisor's division must perform the following:

- Take strong control of entry point
- Assess resources available in the division
- Request resources
- Support the firefighting when necessary
- Consider the critical factors in the division
- Develop the Division's rescue IAP
- Refrain from flooding the interior with resources
- Organize, properly equip, and brief On-Deck units before deployment
 - **Note:** "On-Deck" is defined as a forward staging position located just outside the immediate hazard zone, safely distanced from the entrance of a tactical position/division/group supervisor; On-Deck crews are supervised either by the division/group supervisor or the company officer; the On-Deck company remains On-Deck until assigned by the incident commander or division/group supervisor.
- Provide clear, realistic objectives to the rescue teams
- Implement, react to, and reinforce the rescue efforts as required in the division [Blue Card 2018].

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Strategic level Mayday responsibilities

When a Mayday is declared on the fireground, the incident commander must:

- Confirm the critical factors, the risk management plan, and the overall strategy
- Take strong control of the communications process
- Follow the Mayday communication algorithm
- Change the IAP to a high-priority rescue effort
- Implement a no PARs policy
- Assign officers into divisions, if not already assigned
- Coordinate and support the rescue efforts with the divisions as required
- Expand the command organization and verify with Dispatch that the next alarm level and EMS strike team were dispatched
- Support the firefighting when necessary
- Establish a treatment group
- Consider the medical and technical requirements for the rescue [Blue Card 2018].

If a division supervisor is in place where the Mayday is declared and Command has completed the Mayday communication algorithm, Command should assign the division supervisor to manage the Mayday. The division supervisor is in the best position to manage the rescue activities that need to take place in the division to resolve the Mayday. The incident commander is then in the best position to coordinate and support the rescue, firefighting, and treatment efforts with the other divisions and companies as required by the incident's critical factors.

If no division supervisor is in place when a Mayday is declared on the incident scene, the incident commander should continue to manage all tactical rescue efforts required to resolve the Mayday after completing the Mayday communication algorithm procedure.

Recommendation #11: Fire departments should provide a Mayday tactical worksheet for incident commanders in the event of a Mayday.

Discussion: When a Mayday is transmitted, the incident commander has a very narrow window of opportunity to locate the lost, trapped, or injured member(s). The incident commander must restructure the strategy and IAP (tactics) to include a priority rescue [NFPA 2014].

Some departments have adopted the term *LUNAR*—location, unit assigned, name, assistance needed, and resources needed—to gain additional information in identifying a firefighter who is in trouble and in need of assistance. The incident commander, division/group supervisors, company officers, and firefighters need to understand the seriousness of the situation. It is important to have the available resources on scene and to have a plan established prior to the Mayday [Brunacini and Brunacini 2004; NFPA 2014]. **Note:** A checklist is provided in **Appendix Two, Incident Commander's Tactical Worksheet for Mayday**.

This checklist can assist the incident commander in ensuring the necessary steps are taken to clear the Mayday as quickly and safely possible. This structured checklist serves as a guide, and it is possible to tailor the checklist to any fire department's Mayday procedures. This process is too important to

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operate from memory and risk missing a vital step that could jeopardize the outcome of the rescue of a firefighter who is missing, trapped, or injured.

Recommendation #12: Fire departments should ensure that firefighters are trained in fireground survival procedures.

Discussion: As noted, training frequently is limited to breathing apparatus emergencies, egress through small openings, emergency window egress, etc. It is necessary to place additional emphasis on appropriate procedures for tactical withdrawal under worsening fire conditions and structural collapse situations.

As part of emergency procedures training, firefighters need to understand that their PPE and SCBA do not provide unlimited protection. PPE that are not properly donned, worn, or activated may provide reduced protection or no protection at all. The IAFF and the IAFC have 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; TFRD 2012]. After quickly assessing the tenability of their location, a fire fighter should transmit a Mayday following these procedures:

- Activate the emergency alert button (EAB) on the portable radio pushing the button for 1 to 3 seconds to activate
- 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 that the PASS device is activated.

Firefighters must transmit a Mayday while still having the capability and sufficient air, noting 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.

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 incident commander 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 or 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. 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.

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Emphasis on appropriate procedures for tactical withdrawal 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 incident commander shall initiate an operational retreat whenever the operational area is deemed unsafe for emergency personnel. All personnel operating in the unsafe area shall evacuate as the operational retreat procedures are initiated. Operational retreat shall begin with radio traffic announcing “emergency traffic” with directions for all emergency personnel to evacuate the operational area. An emergency egress signal shall sound [IAFF 2010; LAFD 2016]. For example:

- Repeated short air horn blasts of approximately 10 seconds, followed by 10 seconds of silence
- The sequence of the air horn blast for 10 seconds, followed by 10 seconds of silence, repeated three times.

Upon hearing the 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 personnel they are responsible for and report the results to the incident commander.

Firefighters need to understand the psychological and physiological effects of the extreme level of stress encountered when they become lost, disoriented, injured, run low on air, or become trapped. Most fire training curriculums do not discuss the psychological and physiological effects of extreme stress 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 becoming trapped by extreme fire behavior or building collapse, can result in sensory distortions and decreased cognitive processing capability.

Recommendation #13: Fire departments should ensure all fire officers and firefighters are familiar with interior firefighting “Watch Out” situations.

Discussion: There are eighteen “watch out” situations that have been identified when working in a wildland scenario. The failure to recognize “Watch Outs” by firefighters has on more than one occasion have contributed to the injury or death of firefighters. With this in mind the following list of twelve “Watch Out” situations have been developed for interior structure firefighting [LAFD 2016]. Although not all inclusive, the following twelve structure “Watch Outs” should certainly provoke communication among members. Experienced firefighters should recognize having been in these situations and share their experience.

Interior Firefighting “Watch Outs”:

- *You have a working fire and your entry will be delayed.* This may occur for any number of reasons, not the least of which are the forcible entry challenges facing the department
- *Multiple companies have been assigned to enter through one entry.* Single door entry/exits are designed for a single person to pass through in a non-emergency environment. Consider the impact of trying to evacuate multiple companies through

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- a 36” opening in a flashover condition
- *Roof Division is being driven off as you prepare to go inside.* Coordination between Roof and Interior are critical for making decisions on offensive versus defensive operations and the extent of interior commitment by engine companies. Radio communications are a necessity
 - *Air is being drawn in rapidly in zero visibility and the heat is banking down.* Oxygen is being fed into the fire. The temperature is rising rapidly and radiating downward. Your location will soon become untenable and require a rapid retreat
 - *You can hear the fire burning above you but can't see it.* The sound of a burning building is very distinctive as it burns and comes apart. Lack of ventilation will allow a smoke layer to generate below the flame level reducing visibility to zero. This is an indication that members should retreat to a safer working location until conditions improve
 - *You realize you are working underneath a mezzanine.* Mezzanines (and more recently facades) have been recognized as significant threats to the safety of firefighters. This is discovered in interior firefighting operations when a member attempts to open a ceiling with a pike pole only to discover that there is additional decking overhead. Often this decking is used for storage of materials above the office area. In addition, mezzanines are often constructed illegally and often use inferior construction techniques. Keep in mind that it would be unusual to find a mezzanine inside a rolling steel doorway. Consequently, rolling steel doorways should be utilized for interior operations, if possible. They are easier to see, offer a much larger exit and will normally not have a mezzanine or façade above them. If confronted with an interior rolling steel fire door (fusible link), make sure to block the door open so as to prevent accidental closure due to heat buildup
 - *You feel uncomfortable.* Listen to your instincts, they are generally correct
 - *Your SCBA alarm bell (EOSTI) sounds and you still haven't found the fire.* Time stamping an incident that involves interior operations at a working fire is very important. One of the most effective ways to time stamp is to recognize the amount of time it typically takes before your low air warning sounds. If in the 10 to 20 minutes it takes for this to occur you have been unable to find a working fire in zero visibility, serious consideration needs to be given to a change in tactics. In some cases, allowing additional ventilation to occur prior to entry will assist in locating the seat of the fire and identifying improved access
 - *You flow water for several minutes and make no progress.* Additional and/or larger lines larger lines are needed if insufficient GPM or water is not reaching the fire
 - *You hear the sound of roof ventilation being conducted behind you.* Conditions on the roof including lightweight construction may require the ventilation teams to initiate operations further from the seat of the fire. Coordination is critical to prevent ventilation holes from pulling the fire over the interior companies
 - *You are unable to communicate with the incident commander, your division supervisor, or group supervisor.* The Incident Commander has overall responsibility for both resource and situation status. If you are unable to communicate interior conditions and the status of your crew, or if you are unable to receive incident status information, you need to retreat to a safety zone until communication is established
 - *You are working with unfamiliar members.* Responsible officers must ensure that any members not normally assigned to the company are familiar with all SOPs/SOGs. This information needs to be passed on immediately upon reporting for assignment [LAFD 2016].

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Recommendation #14: Fire departments should ensure that the standards of coverage incorporate multiple alarm, greater alarm, and general alarm fires.

Discussion: At this incident when Box 7-25 was struck, Command struck a 4th Alarm for Box 5-49. Because of the commitment of resources, Fire Alarm had no available resources to respond to the 4th Alarm at Box 5-49. Fire departments need to expand their deployment models to include standards of coverage to ensure resources are available to respond during multiple alarm or greater alarm fires. The standards of coverage ensures that a fire department is staffed and equipped to meet routine service demands, which includes simultaneous requests for service. Fire department administrators should design deployment strategies to address situations when on-duty resources (e.g., staffing and apparatus) capacity is exceeded. Additionally, fire department administrators should also consider including emergency response resources that are external to the department in the deployment strategies. Specifically, these strategies should have allowances for recalling off-duty personnel, as well as automatic aid and mutual aid. Requesting these resources is to not only to assist on the scene of large fires, but also to support adequate coverage within the jurisdiction for simultaneous incidents. The use of automatic aid and mutual aid is outlined in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2016 edition, §5.2.1.2, “The fire department shall be permitted to use established automatic aid and mutual aid agreements to comply with the requirements of Section 5.2—*Fire Suppression Services*” [NFPA 2016].

Fire departments should plan for the worst-case scenario of multiple concurrent escalating emergencies, both large and small, that require additional resources and then determine how to address these by immediately summoning additional capacity. Section 5.2.4.5.2 of NFPA 1710 states, “The fire department shall have the capability to deploy additional alarm assignments that can provide for additional command staff, members, and additional services, including the application of water to the fire; engagement in search and rescue, forcible entry, ventilation, and preservation of property; safety and accountability for personnel; and provision of support activities that are beyond the capability of the initial full alarm” [NFPA 2016].

However, this does not mean that a department should rely exclusively on mutual aid to address demand or simultaneously occurring incidents on a routine basis. The NFPA Handbook states, “Mutual aid or mutual response should not be relied upon for routine emergencies because there could be times when local commitments will preclude the anticipated assistance. Mutual aid agreements do not reduce the responsibility of each jurisdiction to maintain adequate resources to handle normal fire protection needs. It must also be assumed that teamwork and tactical efficiency at a fire will be somewhat less than that expected of equal units from the same department under a unified Command” [NFPA 2008].

Although it may be assumed that suppression operations are similar from jurisdiction to jurisdiction, this usually is far from the truth. For any team to function efficiently and effectively co-training and compatible equipment is necessary. Section 4.8.2 of NFPA 1710, 2016 edition states, “Procedures and training of personnel for all fire departments in mutual aid, automatic aid, and fire protection agreement plans shall be comprehensive to produce an effective fire force and to ensure uniform operations.” [NFPA 2016]. Departments should coordinate automatic aid and mutual aid agreements

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that require routine training with other response agencies. Such training will ensure that when automatic aid and mutual aid companies respond into the jurisdiction and vice versa, all responders will understand their expected roles and responsibilities.

Recommendation #15: Fire departments should ensure that adequate staffing and deployment of resources are based on the community's risk assessment.

Discussion: At this incident, access to Charlie Side required more firefighters per hoseline due to the distance. The two buildings that had to be searched totaled more than 14,500 square feet spread across four levels. In addition, the fire had to be fought on several levels as the balloon frame construction, stairways, and utility chases provided vertical flow paths to enable rapid vertical fire extension. These conditions should indicate a need for more than 26 firefighters.

Fire departments should consider deployment strategies to ensure that adequate resources are on scene to conduct fire suppression operations for the likely hazards within their jurisdiction. These deployment strategies should involve a comprehensive assessment of risk within the community and consider factors such as service demands on the department, demographics, socioeconomic, building and occupancy types, and other elements that can help to identify the likelihood of fire. Fire departments also should consider obstacles that firefighters will encounter during firefighting operations. Additionally, the first arriving resource must determine the structure size which is considered when implementing a strategy for this incident. Also, this information is transmitted to the dispatch center and all responding resources as part of the preliminary size-up report.

In 1984, the results of the *Dallas Fire Department Staffing Level Study* were published and the 91 various simulations that were conducted indicated that inadequate staffing results in the following problems:

- Delays in the performance of critical tasks
- Increased risk to victims because of the length of delays is increased, the likelihood of survival decreases
- Loss of critical functions
- A cumulative effect created by combined delays and the lost functions on the part of each crew resulting in an even greater loss of overall effectiveness
- Increased physiological stress on firefighters as they try and compensate for the lower staffing level
- Increased risk to the firefighter when aggressive procedures are undertaken without the support to complete them safely [DFD 1984].

Insufficient numbers of emergency response units or inadequate staffing levels on those units exposes civilians and firefighters to increased risk. It also drains already limited fire department resources and stresses the emergency response system by requiring additional apparatus to respond from further distances. Failing to assemble enough resources on the scene of a fire in time to stop the spread and extinguish the fire, conduct a search, and rescue any trapped occupants puts responding firefighters and occupants in a dangerous environment (See **Table 1**) [NIST 2010; NIST 2013].

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Impact of reducing company staffing from 1 officer & 3 firefighters to 1 officer & 2 firefighters

	Engine Company	Ladder/Truck Company
Unit Effectiveness	<p>With a firefighter functioning as a pump operator for an engine or pumper, only two members are available to position attack line.</p> <p>This is almost impossible if the fire is in the rear of a building or on an upper floor of a building. This is much easier with a third firefighter's help with the stretching of the hoseline.</p>	<p>With a firefighter functioning as the aerial operator to position the aerial,* this leaves only two members to perform "forcible entry" and form a single 2-person search and rescue team.</p> <p>* A tower ladder requires two firefighters. One firefighter to operate the bucket and one firefighter to operate the platform.</p>
Flexibility	<p>Depending on the circumstances, the 4th firefighter can hook-up the supply line to the hydrant, or act as forcible entry when the engine company arrives on scene first.</p>	<p>If all three members enter the building that only allows for a single "search and rescue team" since members cannot operate alone. If four members enter the building, they can form two teams.</p>
Assigning a company officer as a Division/Group Supervisor	<p>Using the company officer as a division/group supervisor either makes the division/ group ineffective or leaves the engine company with one firefighter operating by themselves.</p> <p>The incident commander should consider combining companies to increase company staffing and enhance crew integrity and personnel accountability.</p>	<p>Using the company officer as a division/group supervisor either makes the division/ group ineffective or leaves the ladder/truck company with one firefighter operating by themselves.</p> <p>The incident commander should consider combining companies to increase company staffing and enhance crew integrity and personnel accountability.</p>

Table 1: The impact of decreasing company staffing from 1 officer and 3 firefighters to 1 officer and 2 firefighters

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If the available staffing and deployment are insufficient for the situation encountered, the risk assessment should steer the initial strategy toward focusing on primary search and at least a single hose line to protect the firefighters assigned to a primary search. Prior to having the resources for this approach, the incident commander should consider a defensive position until additional resources arrive. During this time, the fire will continue to grow and have negative effects on the structural integrity of the building, making an offensive attack much less desirable and certainly more dangerous.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* requires a minimum full alarm assignment of 14 firefighters and 1 command officer, for a total of 15 members on the scene of a residential structure fire in a typical 2,000-foot, two-story single-family dwelling without a basement and with no exposures within 8 minutes of travel time [NFPA 2016]. If the aerial or platform is in operation, 17 members are required. This staffing allows for one attack line to be placed in operation on the 1st floor or 2nd floor, with one back-up line, one search and rescue crew (3 fire fighters), one ventilation crew (2 fire fighters), and a 2-member rapid intervention crew.

However, best practices suggest that residential structures that exceed these characteristics, but do not fit a high-rise or high-hazard occupancy, should receive a minimum full-alarm assignment of 26 firefighters, 1 command officer, and one incident command technician for a total of 28 personnel on the scene of a structure fire within 8 minutes of travel time [NFPA 2016]. This staffing allows for two attack hoselines to be stretched to an upper floor, one back-up hoseline, at least two search and rescue crews, one interior forcible entry/ventilation crew, on exterior ventilation crew (2-3 firefighters), and a 4-person rapid intervention crew.

The standard also requires staffing of engine companies and truck companies with a minimum of four on-duty personnel. To better match resources to service demands and address risk, the standard also states that companies shall have a minimum of five on-duty members in jurisdictions with high numbers of incidents or geographical restrictions or six on-duty members in jurisdictions with tactical hazards, high-hazard occupancies, or dense urban areas as identified by the authority having jurisdiction (AHJ) [NFPA 2016].

The effectiveness when increasing staffing per piece from 3 firefighters to 4 firefighters was more pronounced when measured for a larger building than the one assumed by NFPA 1710 that was used to justify a 15-member response in 8 minutes [NFPA 2016] (**See Diagram 13**). The community served by the fire department in this investigation was comprised of buildings with basements, close exposures, and more than two floors, indicating that the increase in efficiency would be greater than that calculated by National Institute for Standards and Technology (NIST) for smaller structures.

At the scene of a structure fire, the driver/operator of the first engine company on the scene must remain with the apparatus to operate the pump. This leaves one firefighter to assist the operator in securing a water source from a hydrant and two firefighters to deploy a hoseline and stretch it to the fire. After assisting the operator, the third firefighter should begin to assist the other two firefighters with advancing the hoseline into the building and to the location of the fire. Before initiating firefighting operations, the officer of the first arriving engine company conducts a complete walk

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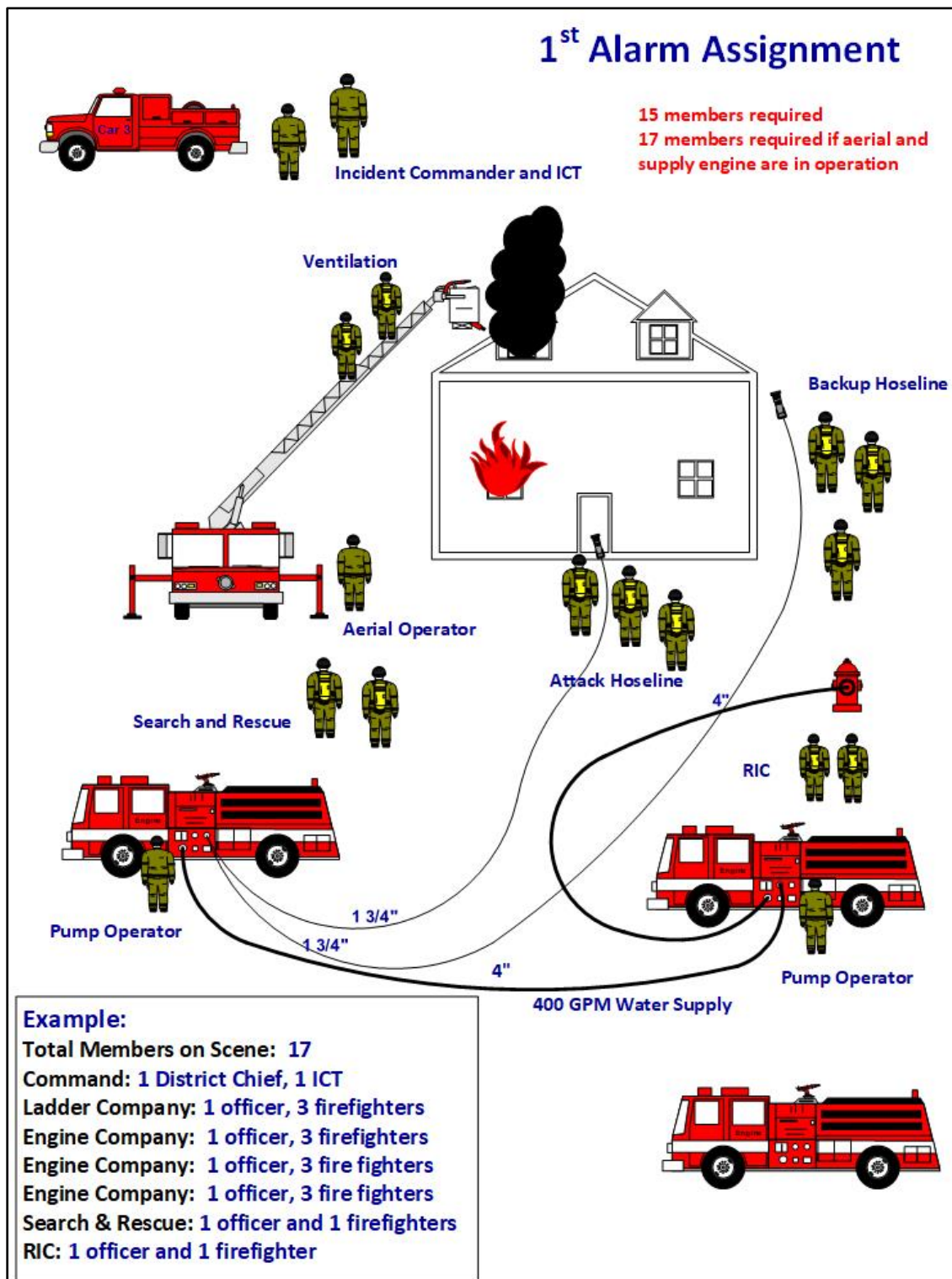


Diagram 13: Initial full alarm assignment for a 2,000 square-foot, two-story single-family dwelling capability deployed within 8 minutes per NFPA 1710.

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around of the structure to assess the situation, determine the extent of the fire, request any additional resources, and assume Command [NFPA 2016]. The driver/operator of the first arriving ladder company must remain with the apparatus to operate and position the aerial device, while the other three firefighters perform critical fireground tasks, such as ventilation and search and rescue.

The initial full alarm assignment to a single-family dwelling structure fire in a typical 2000 square foot, two-story single-family dwelling without basement and with no exposures shall provide for the following:

- Establishment of incident command outside of the hazard area for the overall coordination and direction of the initial full alarm assignment with a minimum of one member dedicated to this task
- Establishment of an uninterrupted water supply of a minimum of 400 gallons per minute (gpm) for 30 minutes with supply line(s) maintained by an operator
- Establishment of an effective water flow application rate of 300 gpm from two hoselines, each of which has a minimum flow rate of 100 gpm with each hoseline operated by a minimum of two members to effectively and safely maintain the line
- Provision of one support member for each attack and backup line deployed to provide hydrant hookup and to assist in laying of hoselines, utility control, and forcible entry
- Provision of at least one victim search and rescue team with each such team consisting of a minimum of two members
- Provision of at least one team, consisting of a minimum of two members, to raise ground ladders and perform ventilation
- If an aerial device is used in operations, one member to function as an aerial operator to maintain primary control of the aerial device at all times
- Establishment of a RIC consisting of a minimum of two properly equipped and trained members [NFPA 2016].

There can be incidents or areas where the response criteria are affected by circumstances such as response personnel who are not on duty, unstaffed fire station facilities, natural barriers, traffic congestion, insufficient water supply, and density of population or property. The reduced level of service should be documented in the written organizational statement by the percentage of incidents and geographical areas for which the total response time criteria are achieved.

The evaluation of the fire department's provided level of service needs to be performed against the authority having jurisdiction's (AHJ) established service delivery performance objectives. These objectives should be based on a jurisdictional risk assessment. The objectives established within this standard are based on a 2000-square foot two-story, single-family home without a basement and having no exposures. The AHJ's response objectives should be established based on numerous factors such as the circumstances affecting response personnel, adopted building codes, required fire/life safety-related engineering controls, accepted turnout/travel times, complexity of facilities, and occupancy hazards within the jurisdiction [NFPA 2016]. NFPA 1700 requires the following:

- **4.1.2.5.1*** The fire department shall evaluate its level of service and deployment delivery and alarm handling time, turnout time, and travel time objectives on an annual basis.

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- **A.4.1.2.5.1** The evaluation of a fire department's provided level of service needs to be performed against the AHJ established service delivery performance objectives. These objectives should be based on a jurisdictional risk assessment. The objectives established within this standard are based on a 2000-square foot (186 m²), two-story, single-family home without a basement and having no exposures. The AHJ's response objectives should be established based on numerous factors such as the circumstances affecting response personnel, adopted building codes, required fire/life safety-related engineering controls, accepted turnout/travel times, complexity of facilities, and occupancy hazards within the jurisdiction. *Note: The Annex material is provided for information purposes and is not a requirement of the standard.*
- **4.1.2.5.2*** The evaluations shall be based on emergency incident data relating to level of service, deployment, and the achievement of each time objective in each geographic area within the jurisdiction of the fire department.
- **A.4.1.2.5.2** The collection of data is required to determine the organization's ability to meet its locally determined objectives and the performance objectives contained in the standard with regard to emergency incidences (warning lights and sirens). Organizations respond to numerous types of emergency and nonemergency incidents. While the collection and analysis of all of the response data is important, attainment of the 90 percent objective is only to be evaluated against emergency incident responses. *Note: The Annex material is provided for information purposes and is not a requirement of the standard.*
- **4.1.2.6** The fire department shall provide the AHJ with a written report annually.
- **4.1.2.6.1** The annual report shall define the geographic areas and/or circumstances in which the requirements of this standard are not being met.
- **4.1.2.6.2** The annual report shall explain the predictable consequences of these deficiencies and address the steps that are necessary to achieve compliance.

Recommendation #16: Fire departments should ensure that company officers are trained to operate with limited staffing, to ensure the essential task level functions are performed.

Discussion: At this incident, the fast spreading fire; the significant amount of fire on Floors 1, 2, and 3; the four Maydays; and limited staffing created issues with span of control and crew integrity.

Fire departments should ensure that company officers are trained to operate in a hazard zone with 2-person or 3-person staffing to function on the task level properly and safely. Crew integrity means firefighters stay together as a team of two or more. Crew integrity becomes even more critical when a company enters a structure to perform interior firefighting operations. Crew integrity starts with the company officer ensuring that all members of the company understand their assignment and have the proper PPE, tools, and equipment. Fire departments that operate three-person company level staffing (chauffeur/engineer, company officer, and firefighter), proves difficult for the company officer. The company officer must supervise but also participate in critical fire ground tasks such as back-up firefighter, nozzleman, or division/group supervisor [TSFRS 2013, FIRESCOPE 2015, Blue Card 2018]. All members should be educated and trained to understand the consequences of reduced staffing and company effectiveness.

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Task level operations may take longer and be less efficient. The incident commander must understand that two companies may have to be assigned to perform the same tactical objective that a heavier staffed company may be able to accomplish on its own. In addition, SOPs/SOGs must be written in a realistic manner that recognize not all tactical objectives may be able to be addressed immediately with reduced staffing. Tactical objectives must be prioritized by the incident commander, so that the most critical tactical objectives, (e.g., search and rescue, extinguishment) can be initiated as soon as possible.

The task level is where the work is performed by assigned companies. The strategic and tactical levels are in place to support the task level. Task level activities are supervised by company officers working with the members of their companies directly in the hazard zone. The task level is the most important level on the incident site because it solves the incident problems taking place in a hazard zone, which could result in firefighter injuries or deaths. Companies working on the task level have the greatest stake in the personnel accountability system because they operate inside a hazard zone. No hazard zone management system can outperform unsafe behaviors on the task level. Task level responsibilities include:

- Following all staging procedures
- Making sure that everyone is assigned properly into the hazard zone
- Using the personnel accountability system properly
- Staying together as a company
- Attaching all members to a hoseline
- Maintaining an adequate air supply at all times to safely exit the hazard zone
- Entering no more than 175 feet into a structure, based on air supply
- Refraining from freelancing [Blue Card 2018].

Training with limited staffing can be beneficial to properly prepare for actual fireground operations, especially for an engine company in which deploying hoselines and flowing water are essential skill sets. While training with limited staffing is difficult and time consuming, it must take place. In order to maximize time, fire departments should focus on individual skill work (stretching hoselines, throwing ground ladders, establishing a water supply) while in service. This allows the company to focus on one skill at a time to achieve competency, then utilize complex evolutions to put all of the skills together. No matter what method is used, training with the actual company staffing level has to occur.

If the company officer is first-due on the alarm or box, the company officer should assume Command. In conjunction with assuming Command, a scene size-up and risk assessment has to occur. While this may seem like an everyday task for a company officer with limited staffing, every second counts. The initial size-up and strategic decision made on the initial radio report of the overall incident conditions provide the necessary direction for the incident. Whenever possible, prior to making entry into a structure fire, a fast attacking company officer/incident commander shall perform a 360-degree assessment of the fire building/area to:

- Determine the fire's size, location, and extent
- Verify the basement type (if present) and the stories/floors from Side Charlie
- Determine the ventilation profile of the structure (the identification of flow paths – or potential flow paths)

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- Identify the safest, most appropriate attack position
- Establish the life safety profile of the incident
- Confirm the initial strategy and IAP [Blue Card 2018].

With a limited crew, the company officer must decide what size hoseline to use. Offensive attack hoseline evolutions/stretches must be highly mobile—as mobility is slowed, attack activities begin to become more defensive in nature and effect. The selection of the hoseline must match the conditions encountered.

If the company officer arrives before a command officer, the company officer should assume Command for a finite period of time, but no more than 5 – 6 minutes. The first arriving unit or officer will establish command until arrival of a higher-ranking officer (command officer). Many times, the strength of the incident command system is the fast-attacking incident commander, who directly supervises the use of quick force at the beginning of the event. That action is reinforced and upgraded by response chiefs who come in behind the initial fast attacking IC to quickly establish a stationary, exterior command post that supports and expands on the fast-attacking IC's initial actions. The fast-attacking command position provides the front-end command structure for that capability. A fast attacking company officer incident commander will also directly supervise and assist their crew members with the tasks required to bring the incident's problems under control. The company officer/incident commander may find it necessary to assign additional companies in order to complete the necessary task functions such as hoseline stretch, or search. In this situation, another company officer can move up to manage this combined company [Blue Card 2018].

Upon arrival of a higher-ranking officer, they will be briefed by the on-scene incident commander. The higher-ranking officer will then assume Command. This transfer of command is to be announced. The officer being relieved of command responsibilities will be reassigned by the new Incident Commander, most often as a division/group supervisor. This establishes tactical level operations in the hazard zone. Each division/group supervisor is responsible for the tactical deployment of the resources at their disposal, in order to complete the objectives assigned by the incident commander. Division/group supervisors are also responsible for communicating needs and progress to the incident commander. The company officer is now responsible for the companies assigned (span of control) and to manage tactical level accountability [FIREScope 2015, Blue Card 2018].

Conditions dictate actions, but planning, training, and SOPs/SOGs are essential to ensure that company operations with limited staffing provide the essential job tasks when responding to residential structure fires. It is imperative for company officers and their crews to train for any potential staffing scenarios. The best scenario is for the engine company is to make a search a priority along with fire attack. It is important to establish these procedures and train on what will work for the department in a variety of scenarios and train all your members at all three positions. Also, fire departments should consider combining companies to operate as a 4-person or 5-person crew, which will make accomplishing task level operations easier and safer.

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Recommendation #17: Fire departments should consider appointing shift safety officers.

Discussion: At this incident, the department did not have a predesignated safety officer. The Chief of Safety responded from home on the 2nd Alarm for Box 5-49.

NFPA 1561 *Standard on Emergency Services Incident Management System and Command Safety*, states in Paragraph 5.3.1 that “The Incident Commander shall have overall authority for management of the incident.” NFPA 1561 Paragraph 5.3.2 states, “The incident commander shall ensure that adequate safety measures are in place” [NFPA 2014]. With the advent of ICS, the goal is to ensure that the incident commander is responsible for the safety and welfare of all members and other first responders that are on scene at an incident.

Based upon the size and complexity of an incident, the incident commander should delegate responsibilities that include safety. ICS can expand to include functions necessary to effectively command and control an incident. Though the incident commander still is responsible for the safety and welfare of all members and first responders on the scene, this responsibility is delegated to the safety officer. A predesignated safety officer responds automatically to incidents defined by the fire department. Upon arrival at the incident, the safety officer should meet with the incident commander to confirm the safety officer assignment and become integrated into the personnel accountability system.

Upon confirmation, the safety officer should obtain the following information:

- Overall situation status, resource status, the strategy, and IAP
- Known hazards and concerns, plus the establishment of control zones
- Status of rapid intervention crews
- Establishment of the rehabilitation group
- Confirmation of established radio communication channels (command channel, tactical channels) [NFPA 2014].

Once the information is obtained, the safety officer should don PPE appropriate for the potential hazards that the safety officer could face. The safety officer also should vest or helmet for identification purposes. The safety officer should perform a reconnaissance of the incident and begin initiating functions of this position. If the safety officer must enter the hazard zone, the safety officer must go with another firefighter or fire officer. Based upon the size and complexity of the incident, the safety officer may request the appointment of assistant safety officers.

Types of incidents that might require expansion of the safety officer role include the following:

- Incidents covering a large geographical area (e.g., high-rise structure) that include numerous branches, divisions, or groups
- Incidents where significant acute or chronic responder health concerns require coordination and input to the planning section (responsible for accounting for the organizational structure availability of resources, deployment of resources, and the situation status reports)
- Incidents requiring interface with local, state, federal, or other health and safety representatives
- Multi-agency incidents where Unified Command is established
- Incidents where Area Command is established.

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Assistant safety officers assigned to branches, divisions, or groups are addressed according to their area of responsibility. For example, an assistant safety officer assigned to Division Alpha is addressed as Division Alpha assistant safety officer. The assistant safety officers assigned to branches, divisions, or groups report to and follow direction from the safety officer of the Command staff. The assistant safety officer works with the supervisory person in the assigned branch, division, or group to assure that safety conditions are met [FIREScope 2017; NIMSC 2008; NFPA 2014; NIOSH 2012b].

NFPA 1561 defines the role of the safety officer at an incident scene and identifies duties such as reconnaissance of the fireground and reporting pertinent information back to the incident commander; ensuring the department's accountability system is in place and operational; monitoring radio transmissions and identifying barriers to effective communications; and ensuring that established safety zones, collapse zones, hot zones, and other designated hazard areas are communicated to all members on scene [NFPA 2014].

Larger fire departments should consider having one or more full-time dedicated safety officers who are on duty and can routinely respond to working fires (e.g., full-time shift safety officers). In smaller departments, every officer should have the ability to function as the safety officer when assigned by the incident commander. The presence of a safety officer does not diminish the responsibility of individual firefighters and fire officers for their own safety and the safety of others.

The safety officer serves as a key figure on fireground operations (not tactics) by gathering a broad overall perspective of the fireground and acting as the eyes and ears for the incident commander. When the incident commander is tasked with strategic objectives and may not have time to give full attention to every safety detail, the safety officer can assist the incident commander. A safety officer should have training beyond that of a company level officer, with increased focus on safety issues such as:

- Fire department safety officer training
- Fire department health and safety officer training (acute and chronic threats to firefighter health)
- Fire ground risk assessment
- Risk management
- Accountability
- Fire ground hazards and hazard recognition, evaluation, mitigation, and elimination
- Building construction and collapse
- Fire behavior
- Fire ground tactics and strategy
- PPE use, capabilities, and limitations
- Firefighter rehabilitation [NFPA 2014].

Fire departments should establish a training and education program for safety officers. This ensures that officers who are appointed on scene as the safety officer have the necessary knowledge, skills, and abilities to effectively function in this position. For large scale incidents, such as this incident, departments should consider appointing assistant safety officer(s).

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Recommendation #18: *Fire departments should use a functional personnel accountability system, requiring a designated accountability officer or resource status officer.*

Discussion: At this incident, the incident command technician for Car 4 was assigned to manage the resource status at the accountability board on the vehicle. The department designated a staging area for additional alarm companies. Most companies went to the Car 4's incident command technician for check in. Some companies did not check in because the placement of their apparatus on the fireground.

A personnel accountability system is a system that readily identifies both the location and function of all members operating at an incident scene [NFPA 2014]. The philosophy of the personnel accountability system starts with the same principles of an incident management system—company unity and unity of Command. It is possible to fulfill unity initially and maintain it throughout the incident by documenting the situation status and resource status on a tactical worksheet or a resource status/accountability board.

A personnel accountability system shall be adopted and routinely used to collect and maintain the status and location of the resources working in, or potentially working in, an immediately dangerous to life and health (IDLH) environment at an incident. All members operating at an incident are responsible for understanding and participating in this system. The incident commander should be responsible for the overall accountability for the incident. Incident commanders may delegate to other appropriate staff members, the facilitation of the accountability for those resources to meet those goals, objectives, and tasks as needed. An integral part of the accountability system is to make sure that the firefighters who are assigned and operating in the hazard zone are accounted for, starting with the initial operations through the entire incident.

One of the most important functions of command safety is for the incident commander to initiate a personnel accountability system that includes the functional and geographical assignments at the beginning of operations until the termination of the incident. NFPA 1561, *Standard on Emergency Services Incident Management System and Command Safety*, states in Paragraph 8.12.4, “The incident commander and members who are assigned a supervisory responsibility that involves three or more companies or crews under their command shall have an additional member(s) (e.g., staff aide) assigned to facilitate the tracking and accountability of the assigned companies or crews” [NFPA 2014].

An important aspect of a personnel accountability system is the PAR. PAR is an on-scene roll call in which supervisors reports the status of their crew when requested by the incident commander [NFPA 2014]. It is necessary to conduct the PAR every 15–20 minutes or when benchmarks are met.

A functional personnel accountability system requires the following:

- Development and implementation of a departmental SOP/SOG
- Necessary components and hardware, such as an accountability board, individual name tags, and company name tags
- Training for all members on the operation of the system
- Strict enforcement during emergency incidents.

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A functional personnel accountability system should have the ability to identify:

- All members operating in the hazard zone (who)
- Where all members are in the hazard zone (where)
- The conditions in the hazard zone (conditions)
- What actions are in use in the hazard zone (actions)
- Paths of access and egress in and out of the hazard zone (exits)
- RICs and their assignments.

Many different methods and tools are available for resource accountability, including:

- Tactical worksheets
- Command boards
- Apparatus riding lists
- Company responding boards
- Electronic bar-coding systems
- Accountability tags or keys [NFPA 2014].

Personnel who are responsible for maintaining the location and status of all assigned resources at an incident should handle resource accountability. As the incident escalates, resource status should be placed under the Planning Section. This function is separate from the role of the incident commander. The incident commander is responsible for the overall command and control of the incident. Because of the importance of responder safety, the size and complexity of the incident should help determine resource status assignments. A properly initiated and enforced personnel accountability system enhances firefighter safety and survival.

For the personnel accountability system to properly function, the process should include an SOP/SOG that defines each function's responsibility and the necessary hardware required to ensure this process is successful on the fireground. Another key to the success of the personnel accountability system is to include a training component (both classroom and practical) to ensure this process functions properly during emergency incidents.

Recommendation #19: Fire departments should review the standard operating procedure/standard operating guideline for Rapid Intervention Crews (RIC) operations, including the use of a RIC bag and air supply for trapped or downed firefighter(s).

Discussion: At this incident, Ladder 1 was assigned as the RIC on the 1st Alarm. Ladder 1 operated in this capacity until the Mayday was sounded at 0446 hours, and Ladder 1 assisted with the rescue of E402 out of the 2nd floor window on Side Alpha. When the third and fourth Maydays were sounded, after assisting with the rescue of E402, Ladder 1 resumed their role as RIC. Ladder 1 and other available resources were put to work trying to get the firefighter from Ladder 5 and the firefighter from Ladder 4 out of the building on Side Charlie. At large occupancy incidents, fire departments should consider assigning a RIC to each division or side of the structure.

RIC should consider the following tools and equipment for use: **Note:** *The list of considerations is not all encompassing. It is intended to be a starting point. Fire department should constantly strive to*

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upgrade rapid intervention equipment and tactics. Company officers should ensure that the rapid intervention equipment is in a state of readiness and is appropriate for the potential rescue situation.

- Thermal imagers
- Additional RIC Kits/Escape Canisters
 - The RIC SCBA Kit consists of the following:
 - Nylon bag with sling and carrying handles, 60 minute air bottle, 1st stage pressure reducer with 20-feet of intermediate pressure hose, facepiece, 2nd stage regulator, 150-foot of drop bag line, flashlight, and escape canister.)
- Quartz lights to entrances and windows identified as possible exits.
- Apparatus rechargeable lights to entrances and exits of the structure
- Lightweight forcible entry tools. (axe, pike pole, hook)
- Rotary saws
- Chalk
- Inside ladder (12-foot or 14-foot)
- Lighted rescue lines
- Consider a 2½-inch hoseline with straight tips to penetrate and knockdown the fire
- Mattress carrier
- Strobe lights
- Cyalume© light sticks
- Extra SCBA cylinders
- Litter basket (Litter can be used to carry up equipment to the access point).
- To reduce noise, consider electric fans used for air bags for ventilation when positive pressure ventilation is indicated and there is sufficient time available
- Tool staging tarp
- Rescue SCBA (RIC pack)
- Forcible entry tools such as a Halligan bar or other pry tool
- Stokes basket
- 150-foot rope for search and rescue
- Wire cutters
- Rebar cutter
- Thermal imager
- Life belt
- Elevator keys for buildings with elevators [FDNY 2011a; LAFD 2016; TSFRS 2014].

It is important to stage all necessary RIC equipment in an expedient manner. The RIC officer, accompanied by one member of the RIC, should perform an incident scene survey while the remaining RIC members assemble the RIC equipment. If the size of the structure negates a 360-degree survey of the building, the incident commander needs to learn about this as soon as possible. This should serve as a benchmark for Command to designate another RIC in order to effectively cover all sides of the building.

During this survey, the RIC officer and members should look for ways in and out of the structure, including window configuration, fire escapes, and construction features. The RIC officer should note the feasibility for placement of ground ladders for rescue or escape purposes. The RIC officer should

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have the responsibility for setting up and securing a suitable secondary egress for interior crews. This may include placing ladders at multiple sides of the structure. Once the RIC has determined the need for an egress ladder, it is necessary to remove the window glass, but only after conferring with Command that the removal of the window will not affect firefighting operations. Placing the egress ladder(s) at the window(s) is announced over the radio by the RIC officer [TFRD 2012].

After the above tasks are completed, the RIC equipment is put in place and then the RIC officer should inform Command that a 360-degree survey is complete and the RIC is ready to intervene, if necessary. The entire RIC should stay in an area immediately accessible to the building in order for rapid deployment and should maintain radio contact with Command. The RIC officer should brief all RIC members with the results of the incident scene survey. The RIC should operate as one unit. The addition of more crews can support the team as necessary. When more than one company is added as part of the RIC, a rescue group is formed with a rescue group supervisor [TFRD 2012]. Another consideration for Command is to request the response of an advance life support (ALS) engine company or truck company as a component of the RIC Group. The members of an ALS company are trained to operate in a hazard zone and can function as part of the RIC. They also can provide ALS to affected firefighters [FDNY 2011].

The RIC officer and members will coordinate with Command to formulate rescue plan contingencies and to continue to monitor radio and fireground conditions. RIC protection is not a passive assignment. This is a process of ongoing information gathering and diligent scene monitoring until the unit is released by the incident commander.

To ensure that firefighters and fire officers are properly trained to conduct RIC operations, they should meet the requirements of NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews* [NFPA 2015a].

Rapid intervention operations can only be successful when skills are practiced, and swift intervention tactics are employed. It is easier to practice sound fireground tactics to prevent the need to rescue one of our own. Based on these considerations, the importance of company accountability, communications, risk versus gain evaluations, and firefighter safety cannot be overstated.

Recommendation #20: Fire departments should ensure that all unassigned resources are dispatched to a designated staging area or base.

Discussion: At this incident, the department did not have a SOP/SOG addressing staging.

During fireground operations, the incident commander may need resources beyond those that are already operating on the fireground. When Command identifies a task that is needed, Command chooses the proper resource, confirms availability, and then orders the resource into action. Managing incident operations in this fashion is how the incident management system coordinates and incorporates all the efforts of multiple units into a single, cohesive operation [Blue Card 2018].

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Staging is the function and location designated at the incident that is used to position uncommitted resources so that they are immediately available for assignment (within 3 minutes) [NFPA 2014]. The incident scene can quickly become congested with personnel and equipment if not managed effectively. During incidents when companies are involved in investigative operations or when companies have not yet received assignment, additional responding equipment normally will stage one block from the incident in the direction of travel. This will provide more flexibility in the use or clearing of resources at an incident. When additional resources or alarms are requested, the incident commander should establish a staging area and designate a location as soon as possible. Requesting a separate Tactical channel for staging ensures that the Tactical channel used by on scene resources is not overrun with radio traffic. The first uncommitted company arriving at the staging area is responsible for staging (staging area manager). Staging reports to the incident commander until operations are established. In the expanded organizational structure, all resources within Staging are under the direct control of the operations section chief [Virginia Beach Fire Department (VBFD) 2015].

The staging area manager has the following major responsibilities:

- Establish layout of staging area
- Post areas for identification and traffic control
- Provide check-in for incoming resources
- Determine required resource reserve levels from the incident commander or the operations section chief
- Contact the operations section chief or incident commander when reserve levels reach minimums
- Maintain and provide status of all resources in staging area to the resource unit
- Respond to the incident commander or operations section chief requests for resources
- Request logistical support for personnel and/or equipment as needed
- Maintain staging area in an orderly condition
- Demobilize or move staging area as required
- Maintain a unit log (ICS Form 214—Unit Log) [NFPA 2014].

NFPA 1561, *Standard on Emergency Services Incident Management System and Command Safety*, Paragraph 5.10.1.8.1 states, “The incident management system shall provide a standard system to manage reserves of responders and other resources at or near the scene of the incident.” In addition, NFPA 1561, Paragraph 5.10.1.8.2 states, “When emergency activities are being conducted in a location where there would be a delay in activating staged resources, the incident commander shall establish staging areas close to the area where the need for those resources is anticipated” [NFPA 2014].

Staging provides a standard method to keep reserves of responders, apparatus, and other resources ready for action close to the scene of an incident. Staging also provides a standard method to control, record, and account for the arrival of such resources and their assignment to specific activities. When resources are dispatched to assist at working incidents, Dispatch should assign them to a designated staging or base area, where they can stay ready for assignment when required by the incident commander. This process helps the incident commander track the resources that are on the scene and

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know which are available for assignment, where they are located, and where specific units already are assigned (See Photo 9).



Photo 9. These companies are assigned to Staging. The staging area manager can assign the resources in Staging as requested by Command. These resources are no more than 2–3 minutes from the incident scene.

(Photograph courtesy of the Los Angeles Fire Department)

The incident commander should attempt to keep reserves of responders, equipment, and supplies available to rotate assignments with fatigued crews. It is good to anticipate equipment failures and have supplies ordered to the scene in time and in sufficient quantities to provide a safe margin for unanticipated needs. The ability to provide these reserves is dependent on available resources. Every fire department should have plans to maximize its use of available resources and contingency plans to obtain resources from other departments that are possibly available [NFPA 2014].

The term *Base* often is used to refer to a more remote location where standby resources are gathered but are not available for immediate action. As needed, resources can move up to a staging location where they are ready for immediate action. An example is a high-rise building where apparatus are parked at a safe distance from the building and responders and equipment are moved to stand by in Staging on a safe floor below the fire level. Base is the location at which primary support activities are

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performed, including all equipment and personnel support operations. It also is designated as the initial gathering point for resources not immediately available for assignment. Base most commonly is used during incidents involving high-rise structures, hazardous materials, and wildland incidents. The fire officer or firefighter managing Base reports to Command unless a Logistics Section is established. The term *Base* is used for its radio designation [VBFD 2015].

It generally is desirable to keep staged resources in locations where they are ready for action within 3 minutes. In some cases, particularly where imminent hazards exist, it is advisable to keep an immediate response capability in a state of readiness in a safe location with immediate access to the area [NFPA 2014].

Recommendation #21: Fire departments should ensure adequate incident scene rehabilitation is established in accordance with NFPA 1584, Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises.

Discussion: It is essential at any working fireground incident to have a rehabilitation area. Establishing incident scene rehabilitation ensures the health and safety of firefighters during the incident. This should include a medical treatment area so firefighters can receive immediate treatment and transportation if necessary.

NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*, establishes the minimum criteria for developing and implementing a rehabilitation process for fire department members at incident scene operations and training exercises while operating within an incident management system [NFPA 2015c]. Incident scene rehabilitation or *Rehab* is a term often used for the care given to firefighters and other responders while performing their duties at an emergency scene. It is important to monitor the physical and mental condition of personnel as part of the overall assessment. This ensures a firefighter's health does not deteriorate to the point that it affects the safety of other firefighters or endangers the safety and integrity of the operation. An incident commander should consider the circumstances of each incident and make suitable provisions for rest and rehabilitation of personnel. This process should include medical evaluation and treatment, food and fluid replenishment, and rest and relief from extreme climatic conditions.

When the size of the operation or geographic barriers limit member's access to the rehabilitation area, incident commanders should establish more than one rehabilitation area. The radio is used to communicate information about the establishment of Rehab area(s), so all members know the location of Rehab or know where to report when assigned to Rehab.

Several considerations for rehabilitation sites include placing them in a location:

- That offers space for physical rest for firefighters to recuperate from the demands and hazards of an emergency incident or training evolutions
- Far enough away from the scene that personnel may safely remove turnout gear and SCBA and get physical and mental rest from the stress and pressure of an emergency incident or training evolution (with provisions available for having SCBA cylinders refilled)

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- Where firefighters are protected from prevailing environmental conditions, with a cool, shaded area during hot weather and a warm, dry area during cold weather
- Where personnel are free of exhaust fumes and noise from apparatus, vehicles, or equipment, including those involved in rehabilitation group operations
- Large enough to accommodate multiple crews, based on the size of the incident
- Easily accessible by emergency medical service units
- That allows for prompt reentry into the emergency operation upon complete recuperation
- Crews assigned to rehab will turn portable radios off and/or have radio and thermal imager portable batteries recharged or exchanged [USFA 2008] (See **Diagram 14**).

The Rehab Group supervisor should secure all necessary resources required to adequately staff and supply the rehabilitation area. The supplies should include the following items:

- Fluids: water, activity beverage, oral electrolyte solutions, and ice
- Food: soup, broth, or stew in hot/cold cups
- Medical devices: blood pressure cuffs, stethoscopes, oxygen administration devices, cardiac monitors, intravenous solutions, and thermometers
- Other: awnings, fans, tarps, heaters, dry clothing, extra equipment, floodlights, blankets, towels, traffic cones, and fire-line tape (to identify the entrance and exit of the rehabilitation area)
- Hygiene facilities to decontaminate all exposed skin surfaces
- Restroom facilities [USFA 2008].

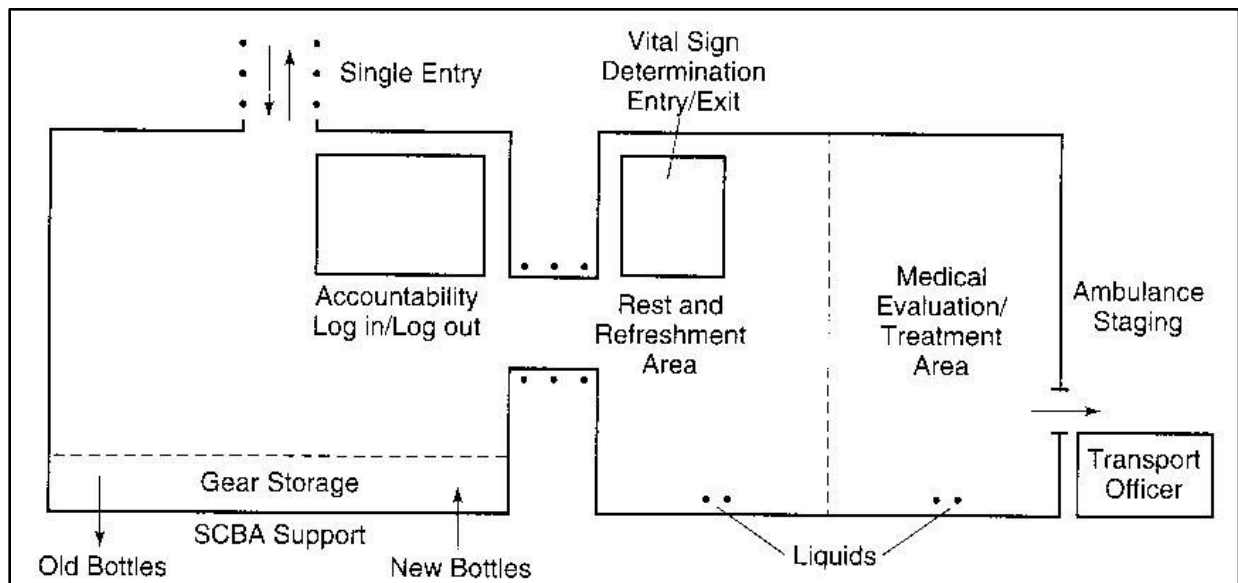


Diagram 14. An example of how a Rehab area is organized. This is just one of many ways to establish an effective Rehab area.

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Recommendation #22: Fire departments should define the job functions and develop a training program or revise the current training program for incident command technicians or field incident technicians.

Discussion: The incident command technicians (Car 400 and Car 300) at this incident operated resource status at Car 4. The struggle was that Command was located on Side Alpha plus resources arrived on scene at different locations. This created issues for maintaining crew integrity and accountability of on-scene resources. These issues demonstrate the need to revise the department's incident management system to include Command Safety. The fire department involved in this incident has a 6-hour course for firefighters who are assigned as an incident command technician. It is necessary to complete this training prior to functioning as an incident command technician.

The function of an incident command technician (e.g., field incident technician, chief's aide, staff assistant staff aide, or emergency incident technician) is an essential component of the incident management system [Brunacini 2002]. Incident command technicians can maintain the tactical worksheet; maintain personnel accountability of all members operating at the incident (resource status and situation status); monitor radio communications on the dispatch, command, and fireground channels; control information flow by computer, fax, or telephone; and access reference material and pre-incident plans [Brunacini and Brunacini 2004; LAFD 2011; NFPA 2014]. NFPA 1561, *Standard on Emergency Services Incident Management System and Command Safety*, states in Chapter 8, *Command Safety*, that the staff assistant is assigned to facilitate the tracking and accountability (resource status) of the assigned companies or crews [NFPA 2014c].

Some fire departments use firefighters as staff assistants, and other fire departments use fire officers to serve as a staff assistant for the incident commander. Regardless of the rank of the staff assistant, the staff assistant should receive training in the duties and responsibilities in order to proficiently function and meet the expectations of the incident commander. These job functions include:

- Size-up of the incident
 - Address of incident
 - Type of incident
 - Name of incident
 - Resources assigned and responding to the incident
 - Life hazard
 - Additional resources needed
 - Exposure problems
 - Location of the Command Post
- Communications with the Dispatch Center or Fire Department Communications Center
 - Dispatch channel
 - Command channel
 - Tactical channels
- Situation status (What is the status of the incident?)
 - Are we making progress on this incident?
- Resource status (What/where are assigned resources?)
 - Personnel accountability system, accountability board, or tactical worksheet

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- How, what, and where are companies operating?
- Who is in staging?
- Staging
 - Who is/are the staging area manager(s)
 - What is the assigned tactical channel
- Tactical worksheet
 - Printout of an Incident Briefing (ICS Form 201) to gather basic information
 - Upon arrival, immediate transfer of information to the department's tactical worksheet and documentation of companies by assignment or location (personnel accountability system)
 - Diagram of the incident, starting with Side Alpha
 - Documentation of divisions and groups with assigned supervisor
 - Documentation of response of other resources on scene (e.g., law enforcement, other fire departments).

As the incident expands, an officer sometimes is assigned as a division supervisor or group supervisor. The assigned officer proceeds to the division or group, evaluates conditions, and reports these conditions to the incident commander. If directed by the incident commander, the assigned officer assumes responsibility for directing resources and operations within their assigned area of responsibility. Division/group supervisors assigned to operate within the hazard zone must have a second individual along, such as an incident command technician. The incident command technician can aid the division/group supervisor by maintaining accountability of the resources assigned to that particular division/group. The division/group supervisor and the incident command technician should wear the appropriate protective clothing and have the equipment required for their area of responsibility [LAFD 2011].

Recommendation #23: Fire departments need to ensure that members who function as acting officers have the necessary training and competencies.

Discussion: It is necessary to adequately prepare firefighters and fire officers who are detailed to acting positions so they can function in these various positions. Fire departments should develop a training and education program (e.g., Officer Candidate School), coupled with the position task book program, to ensure firefighters and fire officers have the necessary knowledge, skills, abilities, and competencies to function as acting officers.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, Chapter 5, *Training, Education and Professional Development*, states in paragraph 5.1.9, “As a duty function, members shall be responsible to maintain proficiency in their skills and knowledge and to avail themselves of the professional development provided to members through department training and education programs” [NFPA 2018b]. Fire departments should develop and implement a written training program that ensures members are trained and competencies are maintained in order to perform all responsibilities effectively, efficiently, and safely [NFPA 2018b]. This is consistent with the organizational statement for a fire department, which establishes the existence of the fire department, the services the fire department is authorized and expected to perform, and the organizational structure.

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An important component of the training program is to ensure that firefighters and fire officers who function in acting positions receive the proper education, training, and obtain the necessary competencies. Fire departments need to prepare firefighters and fire officers with the same education and training programs used for members who are promoted to these positions. NFPA 1021, *Standard for Fire Officer Professional Qualifications*, serves as the foundation to ensure that firefighters and fire officers possess the knowledge, skills, and abilities to perform in various positions as fire officers [NFPA 2020]. The intent of this standard is to provide clear and concise job performance requirements, which are used for evaluation and certification [NFPA 2020].

One of the best methods for ensuring the competency of members functioning in acting positions is the use of a training and education program coupled with a position task book. This system is one in which the primary criteria for qualification is individual performance as observed by an evaluator using approved standards. The position task books, which contain the approved standards, are the primary tool for observing and evaluating performance. After members complete the necessary education and training programs as defined and provided by the fire department, a member is given a task book to complete. The task book lists the performance requirements (tasks) for a specific position in a format that allows for evaluation of the member's comprehension of the written procedures and policies. Successful completion of all tasks, as observed and recorded by evaluators, will result in recommending the member for certification [Springfield Fire Department (SFD) 2014].

Position task books are designed with a specific focus on the job responsibilities and functions of a particular position. Therefore, they contain a narrower set of skills and knowledge than is possibly needed for success in that position. It is presumed that the member has the requisite knowledge of the position prior to issuing of the position task book. For example, the member who initiates a *Lieutenant Task Book* must have the knowledge, skills, and abilities contained in the *Firefighter Position Task Book* for successful completion of lieutenant position tasks [SFD 2014].

For a firefighter or fire officer to become certified at a specific level, the member should successfully complete the job performance requirements in sequence. Before a job performance evaluation is conducted, it is necessary to satisfy all requisite knowledge and skills. The job performance requirements covered in the position task book should meet or exceed all NFPA published standards for the certification level at the time of completion.

Recommendation #24: Fire departments should ensure that all members engaged in emergency operations receive annual proficiency training and evaluation on fireground operations, including live fire training.

Discussion: As part of the recovery process, the fire department involved in this incident is evaluating their annual proficiency training and live fire training requirements for all members.

In order to ensure the proficiency and competency of fire department members, fire departments should conduct annual skills evaluations to verify minimum professional qualifications. This annual evaluation should address the qualifications specific to the member's assignment and job description. Evaluation of skills should occur on a recurring cycle with the goal of preventing the degradation of

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skills and abilities and ensuring the safety of members. Proficiency evaluation and training provides an opportunity to ensure that all fire officers and firefighters are competent in fireground operation knowledge, skills, and abilities. This process should include annual live fire training.

NFPA 1500, *Standard for a Fire Department Occupational Safety, Health, and Welfare Program*, requires a fire department to establish and maintain a training, education, and professional development program with the goal of preventing occupational deaths, injuries, and illnesses. This ensures member competencies are maintained in order to effectively, efficiently, and safely execute all responsibilities [NFPA 2018b]. This process is consistent with the organizational statement that establishes the existence of the fire department, the services the fire department is authorized and expected to perform, the organizational structure, and the job descriptions and functions of fire department members [NFPA 2018b].

As members progress through various job duties and responsibilities, the department should ensure the necessary knowledge, skills, abilities, and the required ability to demonstrate competencies for the defined position. The training and education process also should provide the ongoing development of existing skills [NFPA 2018b].

NFPA 1410, *Standard on Training for Initial Emergency Scene Operations*, defines basic evolutions, which are adaptable to local conditions and serve as a method for the evaluation of minimum acceptable job performance during initial fireground operations [NFPA 2015b]. Proficiency training for fireground operations and emergency incidents should occur annually. This training should include, but is not limited to, scene size-up, situational awareness, use of an incident management system, personnel accountability system, strategy and tactics, search and rescue, hoseline operations, ladder operations, ventilation, thermal imaging cameras, fireground communications, use of RICs, and Mayday operations.

Recommendation #25: Fire departments and the appropriate city/county offices should ensure information on hazardous or unsafe buildings is readily available. The fire department's computer-aided dispatch process should include this information.

Discussion: Fire departments should work with city/county authorities to develop and implement a strategy to identify, mark, and secure unsafe structures/properties within their jurisdictions. It is important to identify hazards and enter them into a collective data base that is accessible to the fire department, building officials office, assessor's office, planning department, housing department, and the 9-1-1 Dispatch Center. Occupied structures in deteriorated conditions pose numerous hazards to the health and safety of firefighters and the general public [Cleveland Fire Department (CFD) 2010].

Cities should address properties that are hazardous or pose health risks. The city's response to these properties depends on the severity of the problem. On one end of the spectrum, a nuisance ordinance is possibly effective in dealing with problems such as junk vehicles or tall grass. At the other end of the spectrum, the statutory hazardous building process may provide the appropriate tool to demolish a hazardous building. The city should evaluate their options and determine the best resolution. Examples of unsafe properties include:

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- Hazardous excavations
- Buildings damaged by fire or explosion
- Unsecured vacant buildings
- Garbage houses
- Hazardous buildings [League of Minnesota Cities (LMC) 2019].

Cities should identify structures/properties that pose extraordinary hazards to first responders because of their construction, use, or state of maintenance. City services (e.g., fire, police, building official, code enforcement) should document dangerous situations and communicate that information through predetermined channels. This process should encourage an active working relationship between the fire department, building officials office, assessor's office, planning department, housing department, and the 9-1-1 Dispatch Center. This information should become part of the critical incident dispatch system with structures/properties entered in an unsafe structures/properties list that is limited to those that pose extraordinary threat to firefighters. All members involved in emergency response should know the properties that are inherently dangerous to life. When companies are dispatched to a location with confirmation on an address that is designated as unsafe, fire dispatchers should make a verbal announcement over the radio to responding companies that the property at the dispatched location is designated as unsafe.

While enroute or upon arrival, the command officer should access the information on the mobile data computer and consider the condition of the structure when formulating an IAP. Command officers should reconsider standard strategy and tactics when operating on scene at a structure/property identified as unsafe. They also should consider the risk versus the benefit of what is possible to accomplish before committing personnel to an interior fire and/or rescue operation. This consideration should include the occupants reported as trapped, occupants known as missing or unaccounted for, exposures, potential for structural collapse, and the extent and time of fire involvement.

A critical incident dispatch system program could include these situations:

- Hazardous chemicals, liquids, and substances (always indicate floor and location)
- High-voltage equipment, such as transformers containing polychlorinated biphenyl (always indicate floor and location of such equipment)
- Interconnected, odd, or unusually shaped buildings (indicate which floors are interconnected)
- Buildings with structural hazards or heavy fire loading
- Renovated buildings with hidden voids or duplex apartments (indicate which floors give access and the direction of travel to duplex apartments)
- Truss buildings (describe type of truss)
 - *Note: The fire department designation of BWSTRG is utilized for bowstring trusses*
- Metal bar joist, Q-deck roofs or floors, and steel-plated buildings
- Individuals with disabilities or significant mobility limitations (where possible, specify the location)
- Schools with students with disabilities, special extinguishing systems, and the location of related controls
- Siamese locations, if not in a normal location or readily visible
- Location of Outside Screw And Yoke valves or alarm panels, if not located in an easily

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found location

- Sub-cellar levels and access locations
- Location of guard dogs
- Telephone numbers of knowledgeable persons, such as the owner, building engineer, or superintendent
- Occupied buildings that have or have had vacant apartments
- High-rise multiple dwellings where a three-length stretch would not be sufficient
- High-rise multiple dwellings with communication systems
- High-rise multiple dwellings with sprinklers in areas other than below-grade
- Non-standpipe, low-rise fireproof multiple dwellings where 1¾-inch hose is possible to use
- Medical facilities that do not warrant a first responder response [FDNY 2014].

Note: This is not an all-inclusive list. The list also can include other conditions or hazards if the fire department wants to include them.

Cities dealing with properties which are hazardous or pose health risks need to evaluate the options and determine a strategy that make buildings safer for residents. Moreover, this process should encourage an active working relationship between the fire department, building officials office, assessor's office, planning department, housing department, and the 9-1-1 Dispatch Center. The ultimate goal is to improve firefighter safety and the community the fire departments serves.

Recommendation #26: State, local, and municipal governments, building owners, and authorities having jurisdiction should consider requiring the use of smoke alarms in all residential occupancies regardless of when they were constructed. When renovations or substantial alterations occur to the occupancy, the fire warning (alarm) system should meet the requirements of the current fire and building codes.

Discussion: At this incident, the caller reporting the fire did advise the dispatcher that all occupants were out of the structure. During the investigation of this fire by the fire investigation unit, only one smoke detector was determined to be operational at the time of the fire.

This recommendation focuses on fire prevention and minimizing the impact of a fire. The National Fire Protection Association (NFPA) *Fire Protection Handbook* states: "Throughout history there have been building regulations for preventing fire and restricting its spread. Over the years these regulations have evolved into the codes and standards developed by committees concerned with fire protection. The requirements contained in building codes are generally based upon the known properties of materials, the hazards presented by various occupancies, and the lessons learned from previous experiences, such as fire and natural disasters" [NFPA 2008]. Municipalities have adopted specific codes and standards for the design and construction of new buildings, but structures erected prior to the enactment of these building codes sometimes are not compliant. However, use of these codes can help improve the safety of existing structures [NFPA 2008]. For example, when renovation takes place in older structures, consideration should include requiring the fire alarm system which includes a fire warning to meet the requirements of current fire code standards.

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An operational fire alarm system which includes fire warning devices can allow the occupants to escape before the arrival of the fire department. A compliant fire alarm system for a multi-family occupancy should include smoke and heat detectors, manual pull stations, audible and visible alarms, automatic sprinkler system water flow switches (if a sprinkler system is installed), and fire alarm signals be automatically transmitted directly to the local fire department, or to a monitoring service, notifying the fire department of an emergency [NFPA 2019]. The need is to have strong retro-active fire alarm requirements, particularly in multi-unit buildings when renovations occur to the structure or the fire alarm system needs to meet the current fire codes.

Although any type of alarm system reduces the risk to occupants, and consequently positively impacts the risk/benefit analysis on the fireground, more modern alarms systems are more effective than older versions. A battery powered smoke alarms system reduces the risk to occupants by 23% while a hard-wired fire alarm system reduces the risk by over 50% (See **Diagram 15**) [Ahrens 2019].

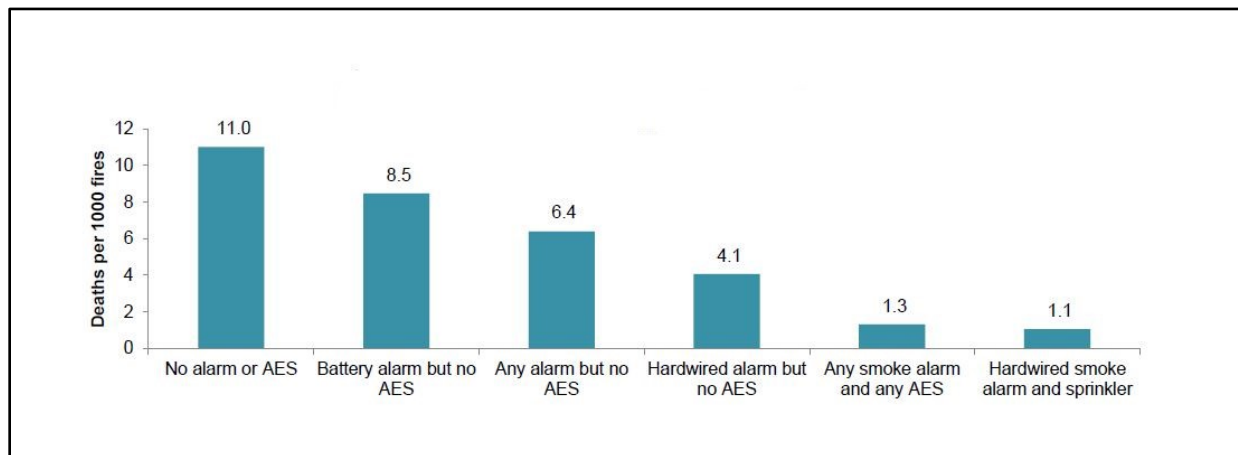


Diagram 15. Average fire death rate per 1,000 reported home structure fires by presence of smoke alarms and automatic extinguishing systems (AES) 2012-2016 (Ahrens 2019.)

The NFPA provides fire prevention messages to the public which includes call 9-1-1 from outside the occupancy, get out and stay out, and meet the fire fighters to let them know that everyone is out or who may still be inside. It is also important to educate the public to advise the 9-1-1 dispatcher whether all occupants are outside. If anyone is still inside the structure, what is/are the occupant(s) possible location(s). Moreover, this information must be relayed to responding companies by dispatch that the occupants who have evacuated and if some is still inside. This information greatly impacts the fire department in terms of risk/benefit decisions on the fireground. If occupants do relay this information to the first arriving company, the first arriving company should announce this information over the radio. This information effects the incident commander's IAP and tactical objectives [NFPA 2019]. Firefighters have been killed and/or seriously injured searching for occupants who had escaped and were standing in the backyard or across the street from the building. The average person does not

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understand that the responding firefighters will run into the building they just ran out of, solely to rescue the occupants.

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Investigator Information

This incident was investigated by Murrey E. Loflin, investigator; Tim Merinar, safety engineer; and Karis Kline, occupational health and safety specialist with the FFIPP, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH, located in Morgantown, WV. Expert technical reviews were provided by Joseph M. Fleming, deputy chief, Boston Fire Department, and George Healy, deputy chief, FDNY. Also, a technical review was provided by Dan Madrzykowski and Stephen Kerber with Underwriters Laboratory Firefighter Safety Research Institute and the NFPA Public Fire Protection Division.

Additional Information

National Institute for Standards and Technology (NIST) and Underwriters Laboratories (UL)

These two agencies provide information, including training videos, reviewing the findings from NIST and UL research for [the development of more effective tactics](#) conducted in cooperation with the Fire Department of New York on Governor's Island in 2012.

Underwriters Laboratory (UL), Firefighter Safety Research Institute (FSRI)

UL FSRI Director Steve Kerber, Fire Protection Engineer Dan Madrzykowski and Los Angeles County Fire Department, Assistant Chief Derek Alkonis team up to present a 7-part video lecture series titled [NIST and UL Research on Fire Behavior and Fireground Tactics](#). The presentations were filmed at the 2013 IAFF Redmond Symposium and these slides and videos have been integrated into the presentations for a better learning experience. Part 4: Case Studies is most relevant to this investigation.

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International Association of Firefighters (IAFF) Fire Ground Survival Program

The purpose of the IAFF [Fire Ground Survival Program](#) is to ensure that training for Mayday prevention and Mayday operations is consistent among all firefighters, company officers, and chief officers. Firefighters must receive training to perform potentially life-saving actions if they become lost, disoriented, injured, low on air, or trapped. Funded by the IAFF and assisted by a grant from the U.S. Department of Homeland Security through the Assistance to Firefighters (FIRE Act) grant program, this comprehensive fireground survival training program applies the lessons learned from firefighter fatality investigations conducted by NIOSH FFFIPP. It was developed by a committee of subject matter experts from IAFF, IAFC, and NIOSH.

NFPA 1561, Standard on Emergency Services Incident Management System and Command Safety (2014 edition)

The primary focus of the revision to NFPA 1561 in the 2014 edition was aimed at reducing and eliminating fireground injuries and fireground deaths of fire department members. The most apparent change to this edition is the inclusion of “Command Safety” in the document title and the creation of a new chapter, Command Safety. This chapter is intended to provide a foundation on how to incorporate the incident management system at all emergency incidents, especially Type V and Type IV incidents.

The chapter Command Safety clearly defines the requirements for the incident commander, including establishing a fixed Command Post, maintaining personnel accountability, using staff aides, using rapid intervention crews, and appointing a safety officer and assistant safety officer(s) as needed. It also defines the expectations and authority of the safety officer. Annexes cover topics such as functional assignments for high-rise building incidents, development of subordinate officers or implementing a more efficient management system, incident management for the fire service on Type V or Type IV incidents, and structural firefighting—risk assessment and operational expectation.

It is possible to purchase [NFPA 1561, Standard on Emergency Services Incident Management System and Command Safety](#) (2014 edition), from NFPA.

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Appendix One Summary of Personal Protective Equipment Evaluation Status Investigation Report of Two Self-Contained Breathing Apparatus Submitted by the NIOSH Division of Safety Research for the Fire Department

NIOSH Task Number 22942

Note: The full report is available at [is at Self-Contained Breathing Apparatus, Completed Reports | NPPTL | NIOSH | CDC](#)

Background

As part of the National Institute for Occupational Safety and Health (NIOSH), Fire Fighter Fatality Investigation and Prevention Program (FFFIPP), the National Personal Protective Technology Laboratory (NPPTL) agreed to inspect, evaluate, two self-contained breathing apparatus (SCBA) unit identified as Scott Safety Air-Pak Model 75 4.5, 45-minute, 4500 pounds per square inch (psi) units.

This SCBA status investigation was assigned NIOSH Task Number 22942. The NIOSH FFFIPP investigators and the fire department were advised that NIOSH NPPTL would provide a written report of the inspection and any applicable test results.

The SCBA units were submitted to NIOSH NPPTL by NIOSH DSR for the fire department for evaluation. The SCBA units were delivered via FedEx in a plastic box to Lab H1513 at the NIOSH facility in Morgantown, WV, on February 12, 2019.

On February 25, 2019, NPPTL employees Jay Tarley and Angie Andrews inspected the SCBA units. The SCBA units remained in Lab H1513 throughout the inspection and testing process. The SCBAs were identified as belonging to the fire department and were examined visually, component by component, in the condition received to determine the conformance of the units to the NIOSH-approved configuration. The units both were identified as the Scott Safety Air-Pak Model 75 4.5, 45-minute, 4500 psi units, with NIOSH Approval Number TC-13F-212CBRN.

SCBA Inspection

On February 25, 2019, NPPTL employees Angie Andrews and Jay Tarley inspected the SCBA units. The SCBAs were identified as belonging to the fire department and were examined visually, component by component, in the condition received, to determine the conformance of the unit to the NIOSH-approved configuration. The units were identified as the Scott Safety Air-Pak Model 75, 45-minute, 4500 psi unit, NIOSH Approval Number TC-13F-212CBRN.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

SCBA Testing

The SCBA units inspected and evaluated by NPPTL were Scott Safety Air-Pak Model 75, 45-minute, 4500 psi units with NIOSH Approval Number TC-13F-212CBRN. The firefighter was wearing one unit when the event occurred (L4-3). A second unit was provided for the victim during the rescue attempt (L1-4). One facepiece was used during the event, which was assigned to L4-3. The fire department provided a cylinder for testing with both SCBAs. Overall, the SCBAs were in good condition. The NFPA approval label was present and readable. The PASS, heads up display (HUD), and alarm systems functioned.

Unit# L4-3:

The SCBA did not meet the requirements of the NIOSH Positive Pressure Test [NIOSH Standard Test Procedure 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)], which made the unit fail the Rated Service Time Test [NIOSH Standard Test Procedure No. 121 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b)]. The unit passed the NFPA “Airflow Performance” Test and all the other NIOSH tests.

Unit# L1-4:

The SCBA did not meet the requirements of the NIOSH Positive Pressure Test [NIOSH Standard Test Procedure 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)], which made the unit fail the Rated Service Time Test [NIOSH Standard Test Procedure No. 121 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b)]. The unit passed the NFPA “Airflow Performance” Test and all the other NIOSH tests.

Summary and Conclusions

The SCBAs did not meet the requirements of the NIOSH Positive Pressure Test [NIOSH Standard Test Procedure 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)], which made them fail the Rated Service Time Test (NIOSH Standard Test Procedure No. 121 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b)). The units passed the NFPA “Airflow Performance” Test and all the other NIOSH tests.

The information obtained during this investigation does not suggest that the units contributed to the fatality. The SCBAs were returned to the shipping container for shipment back to the fire department.

If these units are to be placed back in service, the SCBAs must be repaired receive, testing, and cleaning, as well as replacement and inspection of any damaged components by a qualified service technician, including such testing and other maintenance activities as prescribed by the schedule from the SCBA manufacturer. Typically, a flow test is required on at least an annual basis.

No evidence was identified to suggest that the SCBA units inspected and evaluated contributed to the fatality. NIOSH determined that there was no need for corrective action with regards to the approval holder or users of SCBAs manufactured under the approval number granted to this product.

Career Firefighter Dies After Becoming Disoriented in a Three-Story Apartment Building—Massachusetts

Appendix Two Incident Commander’s Tactical Worksheet for a Mayday

LOS ANGELES FIRE DEPARTMENT

MAYDAY "IC PROCEDURES"

INITIATE EMERGENCY TRAFFIC TONES FOR 3 SECONDS
"ALL COMPANIES CLEAR THIS CHANNEL FOR A MAYDAY, MEMBER CALLING THE MAYDAY GO"
ACKNOWLEDGE AND DETERMINE (WHO WHAT WHERE)
"MEMBER CALLING MAYDAY INITIATE GRAB LIVES HELP IS ON THE WAY"
DEPLOY THE RIC/RIG
INITIATE EMERGENCY TRAFFIC TONES FOR 3 SECONDS "ALL COMPANIES WE HAVE A MAYDAY (WHO WHAT WHERE) MAINTAIN CURRENT OPERATIONAL POSITION UNLESS REDIRECTED FOR RESCUE. CONDUCT A PAR"
MAINTAIN COMMUNICATIONS WITH THE MEMBER DECLARING THE MAYDAY
"METRO WE HAVE A MAYDAY (WHO WHAT WHERE)"
COORDINATE THE RESCUE AND MAINTAIN SUPPRESSION EFFORTS
OBTAIN A PAR FROM EACH COMPANY ASSIGNED TO THE INCIDENT PRIOR TO RESUMING NORMAL RADIO COMMUNICATION

"MAYDAY" RESCUE WORK SHEET

COMPANY	"WHO"		"WHAT"		TIME MAYDAY	ASSIGN/TASK
	CAPTAIN	ENGINEER	DOWN	MISSING		
	A/O	FF	TRAPPED	SCBA		

"WHERE"

"GRABLIVES"

RADIO CHANNEL	SCBA GAUGE: E	¼	½	¾	FULL
ACTIVATE PASS	YES				NO
CONTROL BREATHING	YES				NO
STAY LOW	YES				NO
TURN ON LIGHT	YES				NO
MAKE NOISE	YES				NO
EXIT/SHIELD AIRWAY	YES				NO

RAPID INTERVENTION GROUP

MFC NOTIFIED

ADDITIONAL RESOURCES

COMPANIES ASSIGNED	LF	ENG	USAR	BC	RA
RESCUE CHANNELS	TAC	TAC			
DEPLOYMENT TIME	1 ST TEAM @ _____		2 ND TEAM @ _____		

MEMBER/COMPANY FOUND AT = _____

MEMBER/COMPANY OUT AT = _____

COMPLETE PAR/CAR

ANNOUNCE "MAYDAY" CLEARED AT = _____

Diagram 16. Mayday Tactical Worksheet
(Diagram courtesy of the Los Angeles Fire Department)