

# LINE OF DUTY DEATH REPORT

F2019-18 • March 25, 2022

1000 FREDERICK LANE, MORGANTOWN, WV 26508 • 304.285.5916

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

### **Executive Summary**

On November 13, 2019, a 39-year-old career lieutenant died, and four other firefighters were injured while fighting a multi-family residential structure fire. At 01:00:06, Fire Alarm dispatched Car 4, Engine 15, Engine 2, Engine 13, Engine 12, Ladder 5 Ladder 3, Rescue 1, and Ladder 4 (rapid intervention team (RIT)) to Box 15-14 for a fire with occupants on the 2nd floor and a baby on the 3rd floor. At 01:02:27, Engine 15 arrived on scene and reported a Type V structure with heavy fire showing on the 2<sup>nd</sup> floor of Side Bravo. At 01:03:37, Car 4 arrived and had assumed Command. Engine 2 also arrived at this time and was assigned to stretching a supply line from a hydrant to Engine 15. Command reported smoke showing from the roof and 3<sup>rd</sup> floor Side Bravo and requested a 2<sup>nd</sup> alarm. Engine 5, Engine 6, Ladder 1, and Car 3 were dispatched at 01:04:25. Engine 15 did a quick transitional attack to fire venting on Side Delta from the 2<sup>nd</sup> floor. Within minutes, Engine 15 and Ladder 5 were going to the 2<sup>nd</sup> floor on Side Delta. Engine 13 was going to the 2<sup>nd</sup> floor on Side Alpha and Ladder 3 was going to the roof. Engine 13 was knocking down the exterior fire on Side Bravo. Engine 12 was assigned to supply Ladder 3 with water. At 01:09:59, Rescue 1 split into two teams. Team 1 went to Division 2 and Team 2 went to Division 3. At 01:14:41 Rescue 1-Team 2 encountered heavy fire on the 3<sup>rd</sup> floor hallway Side Alpha and Engine 2 knocked down fire in the front stairwell on their way to assist Rescue 1. At approximately 01:19:16, Engine 13 made it to the doorway of the room of the fire origin which was the bedroom midway on the 2<sup>nd</sup> floor in the Side



Companies operating defensively at Box 15-14 after the Mayday occurred and was cleared.

*(Photo courtesy of the fire department)*

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Bravo. Engine 13 knocked down the fire, but it wasn't completely extinguished. At 01:21:40, Engine 6 used a yard lay off of Engine 12, which was pumped by Engine 15 and went to the 3<sup>rd</sup> floor. Engine 5 also was assigned to the 3<sup>rd</sup> floor. At 01:23:56, Ladder 5 re-entered the structure and went to the 3<sup>rd</sup> floor. At 01:27:36, the lieutenant from Ladder 5 called a Mayday. The lieutenant stated they were on Division 3 with fire all around them, exit blocked, and they did not have a personnel accountability report (PAR). Command acknowledged the Mayday and sent in a rapid intervention team (Ladder 4) to the 3<sup>rd</sup> floor. Command advised the lieutenant there was a ladder (Ladder 3 platform) on 2<sup>nd</sup> floor Side Bravo. At 01:28:37, the lieutenant stated they were trapped, it was very hot, and they needed a hose line. The lieutenant and chauffeur of Ladder 5 had temporarily taken shelter in a shed on the porch at the Bravo/Charlie corner. At approximately 01:32, the lieutenant of Ladder 5 grabbed the chauffeur of Ladder 5 and pushed him out of a window on the 3<sup>rd</sup> floor of Side Charlie to get him out of the hazardous area. He fell approximately 15 feet, hitting an awning over the basement man-door, then rolled off and fell about another 10 feet to the ground. At 01:34:03, Car 400 notified Command that a civilian stated a firefighter was lying in the backyard (Side Charlie). At 01:34:21, Engine 5 located the Ladder 5 chauffeur on the ground and requested EMS. Over next 23 minutes, Ladder 4 (RIT), Ladder 1, Rescue 1-Team 2, Engine 12, Engine 4 and Car 2 encountered heavy fire while trying to get to the 3<sup>rd</sup> floor and locate the lieutenant. Crews struggled to access the 3<sup>rd</sup> floor due to limited space in the enclosed stairwell that had high heat, zero visibility due to smoke, and the added obstruction of a hose line that had burned through and was gushing water between the 2<sup>nd</sup> and 3<sup>rd</sup> floors in the Side Delta/Charlie stairwell. At 02:07:20, Rescue 2 (Rescue 1-Team 2 and Ladder 4) (**Note:** This designation was assigned by the officer of Ladder 4) reached the 3<sup>rd</sup> floor of the Side Delta/Charlie stairs, but debris blocked the entrance to the porch. A member of Rescue 2 breached the wall to the porch. Several minutes later, after crawling across the porch and avoiding holes, Rescue 2 made it to the porch shed door where the lieutenant had returned to take shelter. Rescue 2 could hear the lieutenant's personal alert safety system (PASS) sounding. Rescue 2 breached the shed door and found the lieutenant. Rescue 2 accompanied by Ladder 1 located grabbed the lieutenant. Crews from Ladder 4, Ladder 1, and Engine 4 moved the lieutenant from the 3<sup>rd</sup> floor to the 1<sup>st</sup> floor down the Side Delta/Charlie stairs. The lieutenant was brought out the Side Delta/Charlie rear door where an EMS crew was waiting at approximately 02:13. The lieutenant was transported by EMS to the local trauma center where he was pronounced deceased. Command advised Fire Alarm that the fire at Box 15-14 was declared under control at 04:05 and was marked out at 06:31.

### ***Contributing Factors***

- *Building construction and contents enhanced fire spread*
- *Wind driven fire*
- *Lack of scene size-up and risk assessment*
- *Lack of incident management and command safety*
- *Lack of a defined incident action plan*
- *Lack of crew integrity*
- *Poor survivability profile*
- *Inadequate company level staffing*
- *Lack of professional development opportunities*

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- *Lack of required sprinkler system*

### Key Recommendations

- *Incident commanders should ensure a detailed size-up and define a strategy and incident action plan (IAP) based on the scene size-up and risk assessment. Incident commanders should continually reevaluate the strategy and adjust the IAP based on continuous size-up, risk assessment, risk management, and the completion of tactical objectives*
- *Fire departments should use risk management principles, including occupant survivability profiling, at all structure fires*
- *Fire departments should develop and implement standard operating procedures/standard operating guidelines (SOP/SOG), training programs, and tactics for wind-driven fires*
- *Fire departments should ensure that all companies are operating based upon the assignment given by the incident commander, eliminating freelancing and ensuring tactical priorities are met*
- *The early establishment of divisions/groups provides an effective incident management organizational framework that the IAP can build on and expand. This enhances the accountability of resources operating in the hazard zone.*
- *Fire departments need to ensure that critical incident benchmarks are communicated to the incident commander throughout the incident*
- *Fire departments should ensure that once Command is established at an incident, the incident commander maintains control of situation status, resource status, fireground communications, and ensures the completion of the tactical objectives*
- *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*
- *Fire departments should ensure adequate staffing for deployment to urban incidents involving high hazard occupancies and a concentrated population.*

The National Institute for Occupational Safety and Health (NIOSH) initiated the Fire Fighter Fatality Investigation and Prevention Program to examine deaths of fire fighters in the line of duty so that fire departments, fire fighters, fire service organizations, safety experts and researchers could learn from these incidents. The primary goal of these investigations is for NIOSH to make recommendations to prevent similar occurrences. These NIOSH investigations are intended to reduce or prevent future fire fighter 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](http://www.cdc.gov/niosh/fire) or call toll free 1-800-CDC-INFO (1-800-232-4636).





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## **Introduction**

On November 13, 2019, a 39-year-old career lieutenant died, and four other firefighters were injured responding to a multi-family residential structure fire. On November 13, 2019, the U.S. Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On December 13-20, 2019, a general engineer, an investigator, and a safety specialist from the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) traveled to Massachusetts to investigate this incident. The NIOSH investigators met with fire department officials including the fire chief, the deputy chief of operations, the deputy chief of services, the chief of safety, the chief of training, and members of the department's fire investigation unit. The NIOSH investigators also met with representatives of the International Association of Fire Fighters local and representatives from the city buildings and zoning office. The NIOSH investigators visited the city's dispatch center and obtained a copy of the fireground audio; visited the incident site; and conducted interviews with the fire department officers and firefighters directly involved in the fatal incident. The NIOSH investigators inspected and photographed the victim's personal protective clothing and the self-contained breathing apparatus (SCBA). They also reviewed department training records and standard operating procedures. On January 14-16, 2020, the general engineer and the investigator returned to complete the interview process.

## **Fire Department**

The career fire department provides fire protection and life safety services to an area encompassing 39 square miles and a population of 206,000. The daytime population increases to well over 230,000. The city encompasses a diverse range of structures from densely populated multi-family dwellings, residential occupancies, 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 emergency medical care. Basic life support (BLS), advanced life support (ALS) and transportation is 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) (dive rescue operations) vehicles from 10 fire stations. Fire operations are divided into North Division (Car 3) and South Division (Car 4) with a district chief overseeing operation within each district. Car 3 and Car 4 are also staffed with an incident command technician. The fire department employs a total of 409 uniformed personnel within the operations, fire prevention, and support services divisions.

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

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

The firefighters' 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 fire department based at the airport. The fire department responded to a total of 29,185 incidents (1,584 fire and 27,601 non-fire) during 2020. 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 one handheld Pak-Tracker locator system devices.

### **Training and Experience**

The Commonwealth of Massachusetts has no mandatory minimum requirements to become a firefighter, although the fire department in this incident has adopted the Commonwealth of Massachusetts civil service system, which requires a candidate to 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 results from both examinations are provided to the city's human resources division. The municipality then conducts the following:

- Background check
- Drug screen

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- 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 2022b]
- Psychological examination
- City residency requirements check.

Preference is given to veterans, city residents, and family members 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 they have previous firefighting experience. The recruit class curriculum is equivalent to the Fire Fighter I and Fire Fighter II requirements of NFPA 1001, *Standard for Fire Fighter Professional Qualifications* [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 (as incorporated in NFPA 470, *Hazardous Materials/Weapons of Mass Destruction (WMD) Standard for Responders* [NFPA 2022a]), to the level of Operations Level Responder.

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

- 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
- Is 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.

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

**Note:** *The Pro Board is a non-profit corporation that was incorporated in 1990 as the "National Board on Fire Service Professional Qualifications". The organization is commonly known as the ProBoard.*

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.

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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 in an effort to ensure that firefighters are familiar with their equipment and basic skills, such as, ladder handling and placement, SCBA emergency drills, etc. 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), emergency medical responder, and hazardous materials operations level responder. Special operations training is also 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, additional staff 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: 100-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: Assessment center and panel interview; 1 year in grade as a district chief
- Fire Chief: Assessment center; 1 year in grade as a deputy chief.

The fire department established a biannual officer school for all firefighters on the eligible promotional list for lieutenant that are anticipated to be promoted. It is 1 week-long. The department does not have a position for fire apparatus operator or require certification for fire apparatus operators.

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

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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 lieutenant from Ladder 5 (L500) was hired by the fire department in 2010. As a firefighter, he served on 2 engine companies and 1 ladder company and was then promoted to lieutenant in October 2018. He was the lieutenant on ladder 4 before being transferred to Ladder 5 in January 2019. The lieutenant took multiple courses in HazMat, EMS, rapid intervention, live burns, special operations with 4 gas meters, large area search, thermal imagers, fireground strategy and tactics, and radio emergency button/mayday activation. The lieutenant had recent certificates in Fire Prevention Officer-Basic (May 2018), ICS-100: Introduction to Incident Command System (April 2017), ICS-200: ICS for Single Resources and Initial Action Incident (April 2017), IS-700: National Incident Management System (NIMS), An Introduction (May 2017), and IS-800: National Response Framework, An Introduction (May 2017).

The district chief (Car 4) was hired by the fire department in 1991. As a firefighter, he served on 4 engine companies then promoted to lieutenant on February 1, 1998. He was promoted to captain in December 2009. He was the captain on engine 16 then later promoted to district chief in December 2014 where he was assigned to the training division. In December 2015, he was assigned to Car 4. The district chief took multiple courses in HazMat, EMS, rapid intervention, live burns, fireground strategy and tactics, special operations–dive team training, dive rescue, and IED and Homemade explosives familiarization. The District Chief completed training in Responding to Hybrid/Electric Vehicle Incidents (August 2015) and had recent certificates in ICS-100: Introduction to Incident Command System (April 2017), ICS-200: ICS for Single Resources and Initial Action Incident (April 2017), IS-700: National Incident Management System (NIMS), An Introduction (May 2017), IS-800: National Response Framework, An Introduction (May 2017), and ICS-300: Intermediate ICS Expanding Incidents (October 2019).

### **Apparatus, Staffing, and Communications**

At 01:00:06 hours, Fire Alarm dispatched the following resources for the 1<sup>st</sup> Alarm assignment for Box 15-14 for a report of structure fire. Note: Minimal staffing of most apparatus per NFPA 1500.

<b>Resource</b>	<b>Staffing</b>
Car 4	District Chief and ICT
Engine 15	Acting Lieutenant and 2 firefighters
Engine 2	Lieutenant and 2 firefighters
Engine 13	Lieutenant and 3 firefighters
Engine 12	Lieutenant and 2 firefighters
Ladder 5	Lieutenant and 2 firefighters
Ladder 3 (spare apparatus)	Lieutenant and 3 firefighters
Rescue 1	Lieutenant and 4 firefighters
Ladder 4	Acting Lieutenant and 2 firefighters
<b>TOTAL</b>	<b>30</b>



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At 01:04:25 hours, Fire Alarm dispatched the following resources for the 2<sup>nd</sup> Alarm assignment for Box 15-14.

<b>Resource</b>	<b>Staffing</b>
Car 3	Acting District Chief and ICT
Engine 6	Lieutenant and 2 firefighters
Engine 5	Lieutenant and 2 firefighters
Ladder 1	Acting Lieutenant and 2 firefighters
<b>TOTAL</b>	<b>11</b>

At 01:29:27 hours, Fire Alarm dispatched the following resources for the 3<sup>rd</sup> Alarm assignment for Box 15-14.

<b>Resource</b>	<b>Staffing</b>
Engine 7	Lieutenant and 3 firefighters
Engine 4	Lieutenant and 3 firefighters
Ladder 7	Lieutenant and 2 firefighters
<b>TOTAL</b>	<b>11</b>

At 02:09:19 hours, Fire Alarm dispatched the following resources for the 4<sup>th</sup> Alarm assignment for Box 15-14.

<b>Resource</b>	<b>Staffing</b>
Engine 16	Lieutenant and 3 firefighters
Engine 3	Lieutenant and 2 firefighters
<b>TOTAL</b>	<b>7</b>

The fire department operates on a Motorola Association of Public Safety Communications Officials (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 portables are equipped with an emergency call button which, when activated, the emergency radio receives priority on that talk group and must be acknowledged by the dispatcher. The radio system was installed in 2016 and is a 3-site system each with a repeater system located strategically throughout the city.

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.

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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 responding EMS provider can utilize Charlie channels. The radio system has one direct channel, which is not recorded or routed through the repeater.

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

The training for new dispatchers is based upon curriculum from 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
- 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 only.
  - At the request of the incident commander dispatch will sound a unique tone on the tactical channel
- If a Mayday is missed by the incident commander, but the dispatcher acknowledges the Mayday, the dispatcher verifies and sounds a unique tone on the tactical channel.
- 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.

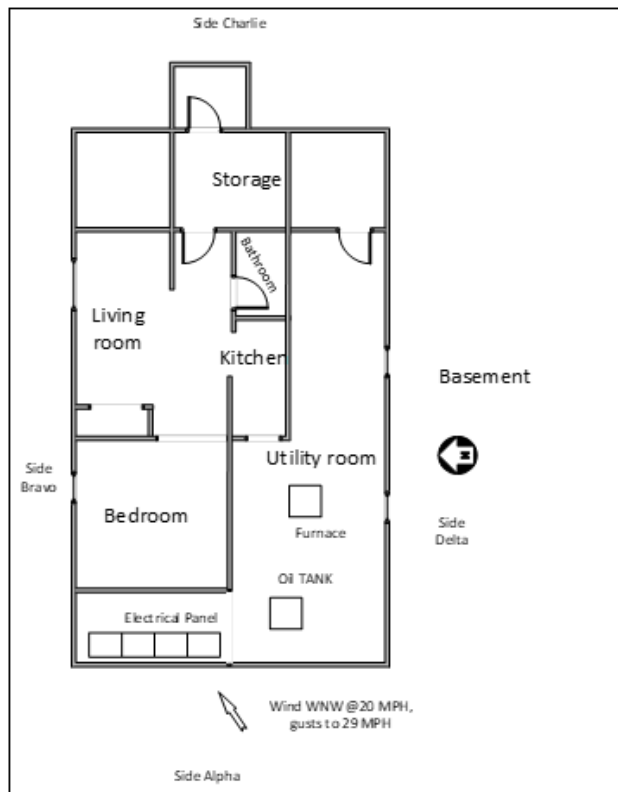
- All fire incidents are dispatched by “Still Box”
- All fire incidents are assigned a box number
- Dispatcher will broadcast time stamp every 10 minutes for the first 60 minutes during an incident, then every 30 minutes thereafter, unless the incident commander (IC) requests dispatch to continue broadcasting 10-minute time stamps.

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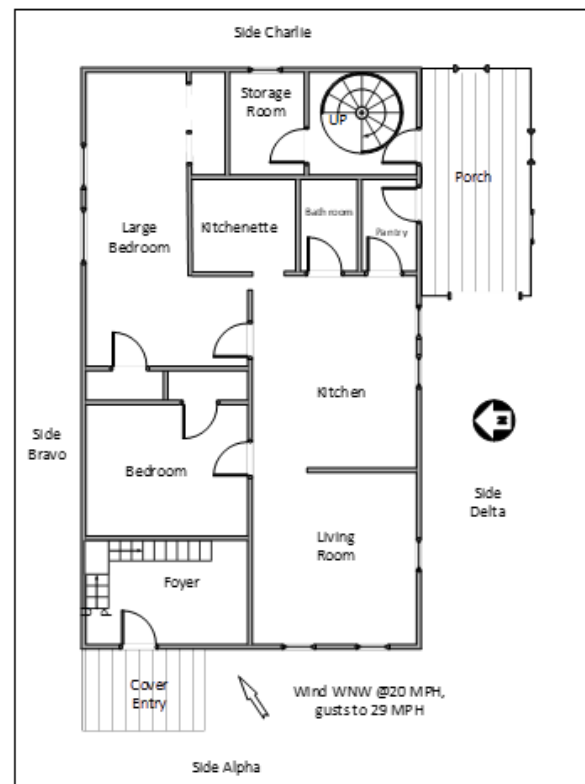
- On incidents of 3<sup>rd</sup> alarms or greater, the fire department's Chief of Special Operations will respond to the dispatch center. The chief is responsible for assisting dispatchers with alarm assignments, mutual aid response, backfilling empty fire stations, response deployment, and any other necessary tasks.

### Building Construction

The multi-family residential structure was built in the 1900s. The 3-story structure had 3 floors plus a walkout basement, and each floor was approximately 1,033 square feet (See **Diagrams 1- 4 and Photos 1- 4**). Each floor was a separate apartment with the basement being a small unpermitted apartment. The structure was balloon frame construction (this construction method was common in the New England area in the 1900s) with vinyl siding on the exterior and was approximately 25 feet wide by 41 feet long. The 2<sup>nd</sup> and 3<sup>rd</sup> floors had an enclosed porch on Side Charlie with a large center window and an enclosed storage shed on the Bravo/ Charlie corner. The 1<sup>st</sup> and 2<sup>nd</sup> floors had a small exterior porch on Side Delta near the Side Charlie corner.

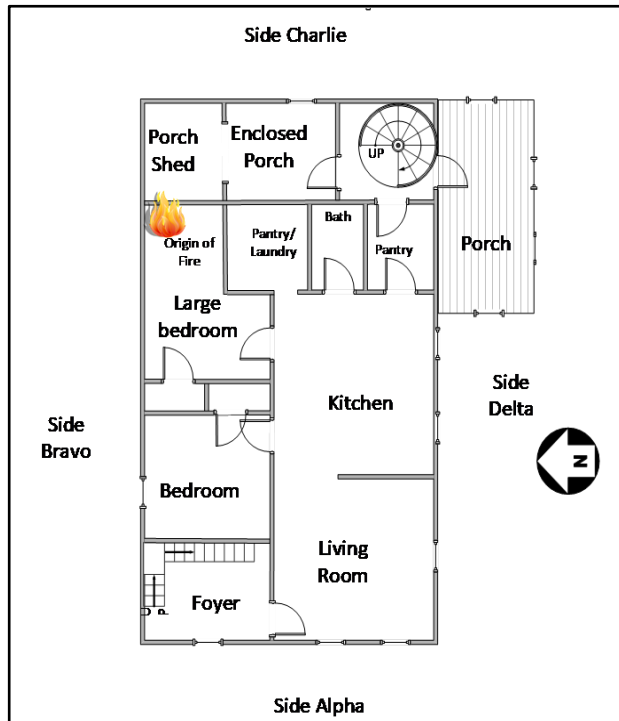


**Diagram 1. Basement Floor Plan. Note: This apartment was not approved for occupancy by the city's Building and Zoning Office.**

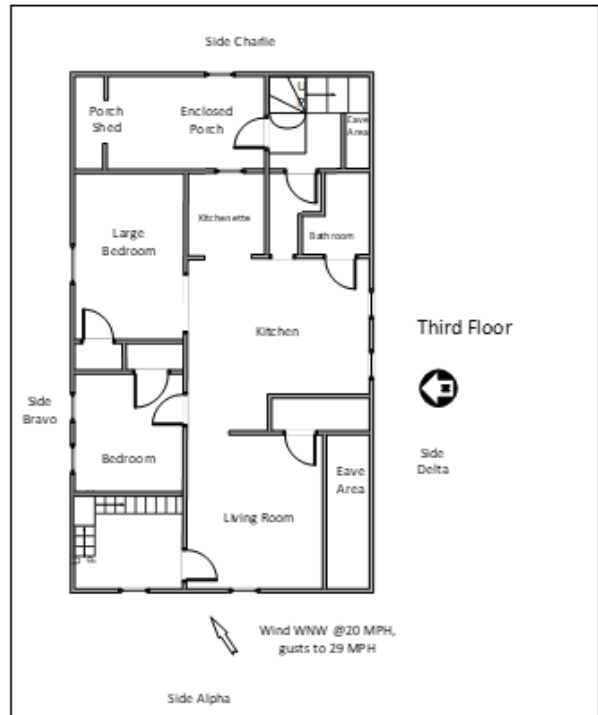


**Diagram 2. 1st Floor Plan**

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**Diagram 3. 2nd Floor Plan. Note: The origin of the fire started in the large bedroom.**



**Diagram 4. 3rd Floor Plan. Note: Enclosed porch is where the crew of Ladder 5 was trapped.**



**Photo 1. Side Alpha and Side Delta of the structure.**  
*NIOSH Photo*



**Photo 2. Side Bravo of the structure. Note the heavy fire damage from the bedroom where the fire originated.**  
*NIOSH Photo*



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**Photo 3. Side Bravo and Side Charlie of the structure. Note: The awning over the basement door was where the chauffeur of Ladder 5 landed when the lieutenant pushed him out the 3<sup>rd</sup> floor window.**  
*NIOSH Photo*



**Photo 4. Side Delta of the structure. Engine 15 entered the door on Side Charlie to attack the fire on the 2<sup>nd</sup> floor.**  
*NIOSH Photo*

### Timeline

The following timeline is a summary of events that occurred as the incident evolved on November 13, 2019. 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 fire department response and fireground operations. All times are approximate and rounded to the closest minute.

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
911 Call. Caller stated fire was on 2 <sup>nd</sup> floor, people still inside.	0058 Hours	

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
Fire Alarm dispatched Car 4, Engine 15, Engine 2, Engine 13, Engine 12, Ladder 5, Ladder 3, Rescue 1, and Ladder 4 (RIT) for a structure fire for Box 15-14. Incident Safety Officer (Captain) responded.	01:00:06 Hours	
Fire Alarm to Car 4: Caller states there is a fire on the 2 <sup>nd</sup> floor with people still inside and a baby on the 3 <sup>rd</sup> floor.	01:00:47 Hours	
Fire Alarm advised Car 4, “We have reports that the baby is on the 3 <sup>rd</sup> floor and is unconscious. Occupants are trying to get him out now. <i>Note: The baby was out of the residence prior to the arrival of Engine 15, but this information was not relayed to Car 4 or other responding companies.</i> ”	01:01:27 Hours	
“Engine 15 is on arrival. We have a 2½ story, Type V with heavy fire showing Bravo Side 2 <sup>nd</sup> floor.”	01:02:17 Hours	
	01:02:36 Hours	Car 4 to Engine 2, “Secure a hydrant for Engine 15.”
“Car 4 is on arrival. We're assuming Command. We have smoke showing from the roof and the 3 <sup>rd</sup> floor Bravo Side. Fire Alarm, give me a 2 <sup>nd</sup> Alarm.”	01:03:27 Hours	
Engine 2, Engine 13, and Ladder 5 arrived on-scene.	01:03:42 to 01:03:50 Hours	

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<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
Fire Alarm dispatched a 2 <sup>nd</sup> Alarm for Box 15-14. Engine 6 (PAR 3), Engine 5 (Par3), Ladder 1 (PAR 3), and Car 3 (PAR2) were dispatched.	<b>01:04:25 Hours</b>	
	<b>01:04:28 Hours</b>	Command ordered Engine 13 to stretch a hose line off of Engine 15.
	<b>01:05:14 Hours</b>	Ladder 5 entered the structure on Side Delta/Charlie and went to the 2 <sup>nd</sup> floor for search.
	<b>01:06:07 Hours</b>	Command to Car 400, “I have Engine 15 and Ladder 5 going to the 2nd floor. Engine 13 is going to the 2 <sup>nd</sup> floor through the front. Ladder 3 is going to the roof in the platform.”
Rescue 1 arrived on-scene.	<b>01:07:11 Hours</b>	
	<b>01:07:14 Hours</b>	Command ordered Rescue 1 to the 2 <sup>nd</sup> floor and 3 <sup>rd</sup> floor. Rescue 1, Team 1 went to the 2 <sup>nd</sup> floor via Side Delta/Charlie and Rescue 1, Team 2 went to the 3 <sup>rd</sup> floor via Side Alpha.
Engine 12 on scene.	<b>01:07:27 Hours</b>	Command ordered Engine 12 to lay a supply line to supply Ladder 3.
	<b>01:07:44 Hours</b>	Engine 13 knocked down the fire on Side Bravo with a hose line off Engine 15. E13 then moved to enter the front door on Side Alpha.

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
Ladder 4 arrived on-scene. Ladder 4 assigned as RIT in front of the building.	<b>01:08:16 Hours</b>	
Engine 5 arrived on-scene followed by Engine 6, Ladder 1, and Car 3.	<b>01:09:39 Hours</b>	Command ordered Engine 5 to take a handline off Engine 15 and go to the 3 <sup>rd</sup> floor and meet Rescue 1, Team 2.
	<b>01:10:12 Hours</b>	Command ordered Engine 6 to take a handline off Engine 12 and go to the 3 <sup>rd</sup> floor through Side Alpha. Command advised Engine 6 it was a long hose lay.
	<b>01:11:41 Hours</b>	Engine 13 advised Command that they had water on the fire on the 2 <sup>nd</sup> floor.
	<b>01:12:08 Hours</b>	Engine 2 took a hose line to the 3 <sup>rd</sup> floor via Side Alpha stairs.
Fire Alarm advised Command that he was 10 minutes into the incident from the first arriving apparatus. Fire Alarm advised Command that the power company had an ETA of 10 minutes.	<b>01:13:13 Hours</b>	
	<b>01:14:32 Hours</b>	Rescue 1, Team 2 advised Command that there was heavy fire on the 3 <sup>rd</sup> floor. They needed a hose line.
	<b>01:15:34 Hours</b>	Rescue 1, Team 1 advised Command they are encountering a large amount of debris on the 2 <sup>nd</sup> floor, Side Delta. The debris including a mattress was that blocking the doorway.



## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>01:15:53 Hours</b>	Rescue 1, Team 2 called Command and asked for a hose line to the 3 <sup>rd</sup> floor. Command advised that Engine 2 was trying to get to the 3 <sup>rd</sup> floor but there was heavy fire on the 2 <sup>nd</sup> floor.
	<b>01:16:37 Hours</b>	Command advised Engine 13 there was heavy fire still showing on Side Bravo near the Side Charlie corner.
	<b>01:18:04 Hours</b>	Command called Ladder 3 and asked if the roof had been vented. Ladder 3 advised the power saw wouldn't start due the smoke. Ladder 3 was trying to vent the roof with an axe.
	<b>01:19:07 Hours</b>	Engine 13 called Command and advised that Engine 13 was knocking down the fire in the bedroom on the Side Bravo/Side Charlie corner.
	<b>01:20:03 Hours</b>	Ladder 5 advised Command they were out of the building to change air cylinders and had PAR.
	<b>01:21:35 Hours</b>	Engine 6 advised Command that Engine 6 and Ladder 1 were at the front door (Side Alpha) going to the 3 <sup>rd</sup> floor.
	<b>01:21:55 Hours</b>	Ladder 3 advised Command the roof was vented.
	<b>01:22:35 Hours</b>	Rescue 1, Team 2 out of the building to change cylinders.

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>01:22:57 Hours</b>	Rescue 1 on the 3 <sup>rd</sup> floor needed a hose line and was checking for extension.  Command assigned E2 as Division 3.
	<b>01:23:38 Hours</b>	Engine 15 acting lieutenant out of the building. E1503 (Engine 15 jumpseat) was still on the 2 <sup>nd</sup> floor with Rescue 2, Team 1.
	<b>01:23:49 Hours</b>	Incident Commander and Ladder 5 officer had a face to face; Ladder 5 was ordered to the third floor through the Delta/Charlie stairwell along with the Incident Safety Officer.
Fire Alarm advised Command that he was 20 minutes into the incident.	<b>01:24:02 Hours</b>	Primary search still being conducted.
	<b>01:24:25 Hours</b>	Engine 13 was out of the building.
	<b>01:24:43 Hours</b>	Rescue 1, Team 2 was in the basement securing utilities.
	<b>01:25:25 Hours</b>	Command called Division 3 for a status update.  Division 3 reported that Engine 2 was advancing further into the kitchen area. They were checking for extension, but not finding anything.
	<b>01:25:41 Hours</b>	Command called Division 3 and advised the 3 <sup>rd</sup> floor room at the Side Bravo/Side Charlie corner looks like its lighting up a little bit. Engine 6 moved to that bedroom.

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>01:26:13 Hours</b>	Command called Ladder 1 and ordered them to the 3 <sup>rd</sup> floor to pull ceilings.
	<b>01:26:44 Hours</b>	Division 3 to Command, “we're in the kitchen area going into the bedroom on the Side Bravo/Side Charlie corner. We have fire. We only have room for 2 companies up here. Keep the stairway clear.”
	<b>01:27:17 Hours</b>	Rescue 1 to Command, “We have fire showing in that 3 <sup>rd</sup> floor stairwell, the rear stairs (Side Delta).
	<b>01:27:36 Hours</b>	Ladder 5 officer called a Mayday. “Mayday, Mayday, Mayday.”
	<b>01:27:44 Hours</b>	Ladder 5 officer Division 3, “Fire is all around us, we are blocked. We do not have PAR. It is very hot up here.”
	<b>01:28:08 Hours</b>	Command ordered Ladder 4 (RIT) to the 3 <sup>rd</sup> floor.
	<b>01:28:31 Hours</b>	Division 3 to Command, “Division 3 is at yellow. We're going to be leaving the 3 <sup>rd</sup> floor.”
Command to Fire Alarm, “Strike a 3 <sup>rd</sup> Alarm for Box 15-14.” Fire Alarm acknowledged.	<b>01:28:47 Hours</b>	
Fire Alarm dispatched a 3 <sup>rd</sup> Alarm for Box 15-14. Engine 7 (PAR 4), Engine 4 (PAR 4), and Ladder 7(PAR 3).	<b>01:29:27 Hours</b>	

## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	01:30:03 Hours	Ladder 4 RIT to Command, “They say there's one more member. I'm on the back porch at the top of the ladder. What's their location?”
	01:30:13 Hours	Command to Ladder 4 RIT, “They're on the 3 <sup>rd</sup> floor trying to find an exit. Command to Ladder 5, “Get to a window. Let us know where you are.”
	01:30:20 Hours	Ladder 4 officer called Ladder 4's crew, “Ladder 4, I want the ladder on Side Delta on the porch. Heavy fire on Side Charlie.
	01:30:34 Hours	Command to Ladder 5, “Get to a window. We have Ladder 3 on the Side Bravo. We have a ladder there. A bucket.”
	01:31:10 Hours	Ladder 5, “We need a line.” Same message transmitted at 01:31:35 Hours.
	01:31:53 Hours	Engine 6 to Command, “We're on the 3 <sup>rd</sup> floor front right now. We made it to the front living room, but that is as far as we made it with a crew on another line.”
	01:32:49 Hours	Ladder 5, “We can't get out.” <i>Note: This was the last radio transmission from the Ladder 5 officer.</i>
Incident at 30 minutes.	0133 Hours	



## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	01:33:13 Hours	Ladder 1 to Command, “Chief we're on the 3 <sup>rd</sup> floor at the top of the stairs. We have heavy fire over our head. We have a line.”
	01:34:03 Hours	Car 400 to Command, “I'm getting a report at the truck that a firefighter fell out the back of building and he's on the ground.”
	01:34:13 Hours	Command to Car 400, “Engine 5 is checking Side Charlie.” <i>Note: The chauffeur of Ladder 5 was pushed out a 3<sup>rd</sup> floor window by the officer of Ladder 5. The chauffeur landed on an awning for the entrance to the basement apartment on Side Charlie. The chauffeur eventually rolled off the awning and landed on the ground, which was witnessed by a civilian. The civilian relayed this information to Car 400.</i>
	01:35:01 Hours	Engine 5 to Command, “We have one firefighter from Ladder 5 on Side Charlie.” <i>Note: The chauffeur was conscious and alert. He was treated and transported by EMS to the local trauma center.</i>
	01:36:06 Hours	Engine 6 to Command, “We got heavy fire. We're knocking it down in the front room. I'm up here with Ladder 1. My crew's outside, but we're knocking it down with Ladder 1. We've started advancing the line in.”

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>01:37:08 Hours</b>	Car 400 conducted a (PAR). Only 6 companies were contacted when the PAR was stopped. This was due to trying to locate the officer from Ladder 5.
	<b>01:39:09 Hours</b>	Ladder 4 to Command, “Negative. Negative. We’re in the stairway on the 3 <sup>rd</sup> floor. We bypassed the fire. We stopped in front of it. We’re in the stairwell. Come up with a 1¾- inch.”
	<b>0140 Hours</b>	Engine 6 is out of the building changing air cylinders, PAR 3.
	<b>01:41:48 Hours</b>	Ladder 1 is out of the building changing air cylinders, PAR 3.
	<b>01:42:22 Hours</b>	Ladder 4 to Command, “We’re stuck. We got fire behind us on the 2 <sup>nd</sup> floor stairwell. We’re on the 3 <sup>rd</sup> floor stairway. Fire on the still on the 2 <sup>nd</sup> .”
	<b>01:43:15 Hours</b>	Ladder 4 to Command, “Ladder 4 is making our way down the stairs. The rear 3 <sup>rd</sup> floor stairs on the porch, trying get out now. Trying to get down the stairs.”
Fire Alarm advised Command that he was 40 minutes into the incident.	<b>01:44:04 Hours</b>	
	<b>01:44:29 Hours</b>	Ladder 4 is out of the building, PAR 3.
	<b>01:45:57 Hours</b>	Engine 4 to Command, “We are on the 2 <sup>nd</sup> floor. We have the line. We have never been able to advance the line to the 3 <sup>rd</sup> floor.

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>01:48:08 Hours</b>	Command advised that Engine 2 and Engine 13 were heading to the 3 <sup>rd</sup> floor from Side Alpha. Engine 4 was going from the rear side (Side Delta/Charlie) trying to make progress.
	<b>01:51:31 Hours</b>	Engine 4 to Command, “We are on the back stairs, we’re hitting the fire. We’re not making progress, any progress, but we’re hitting the fire. Heavy fire still on the 3 <sup>rd</sup> floor. Engine 5, give me some more line.”
	<b>01:52:08 Hours</b>	Engine 13 to Command, “We knocked down the fire in the 3 <sup>rd</sup> floor. The fire is coming up from the 2 <sup>nd</sup> floor on the Side Delta, in the front of the building, where the closets are.”
Incident at 50 minutes.	<b>0153 Hours</b>	
	<b>01:54:17 Hours</b>	Engine 2 to Command, “Engine 2 and Engine 13 are in the first room in on Side Alpha, 3 <sup>rd</sup> floor and we are getting fire from the closet. Engine 13 is about to start backing out. They’re getting low on air.”
	<b>01:54:35 Hours</b>	Engine 4 and Engine 7 are out of the building. Both companies had PAR.
	<b>01:55:46 Hours</b>	Command to all companies, “No one go in the building without direction from Command.”
	<b>01:56:10 Hours</b>	Command advised the Ladder 4 officer and Rescue 1-Team 1 were heading to the 3 <sup>rd</sup> floor rear.

## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	01:57:10 Hours	Car 400 to Command, “I got that. I still have Engine 6, Engine 2, and Ladder 7 on the 3rd floor.”
	01:57:20 Hours	Ladder 4 to Command, “I got a PASS alarm going off about 20 feet in front of me. ”
	01:58:29 Hours	Engine 2 to Command, “We got fire in the kitchen on the 3 <sup>rd</sup> floor. We don't need any more guys up on the 3 <sup>rd</sup> floor with us. It's too tight up here.”
	01:59:22 Hours	Engine 2 to Command, “We are in the 3rd floor kitchen area. We have fire coming above and below. We're knocking it down. Engine 2 should be the only company on the 3rd floor Side Alpha wing. It's getting tight up here.”
	02:00:48 Hours	Ladder 4 to Command, “We just lost the stairs. We just lost the stairs. They are collapsing.”
	02:01:02 Hours	Ladder 4 to Command, “The stairs collapsed. That PASS alarm is right in there. Going off the whole time.”
Incident at 60 minutes.	02:03:13 Hours	Rescue 1 to Command, “That line that's going in from the 1 <sup>st</sup> floor rear stairwell. It's burst. It's dumping out. Can we shut down that 1 <sup>st</sup> floor rear stairwell line?” <i>Note: The wrong hose line was shutdown leaving Ladder 4 on the 3<sup>rd</sup> floor with no water. Eventually, Ladder 4's hose line was charged again.</i>

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts***

<b>Dispatch Communications &amp; Fire Department Response</b>	<b>Time</b>	<b>Fireground Communications &amp; Fireground Operations</b>
	<b>02:06:11 Hours</b>	Engine 2 to Command, “We're in the back bedroom, Side Bravo/Side Charlie on the 3 <sup>rd</sup> floor with heavy fire.”
	<b>02:07:20 Hours</b>	Ladder 4 to Command, “Alright, we’re going to be, our designation is Rescue 2, alright? Our designation is Rescue 2. We're trying to make our way back up. We got a good location; We got a line. We need another working crew to follow that line to the 3 <sup>rd</sup> floor over the porch.”
	<b>02:08:03 Hours</b>	Ladder 4 to Command, “We're in the Side Charlie/Side Delta corner on the stairs. The doorway, like everything around the doorway has collapsed, but the stairs are intact. We have a PASS alarm going off. We have a large amount of fire right over that area.”
Car 1 to Fire Alarm, “Strike a 4 <sup>th</sup> Alarm for Box 15-14.”	<b>02:08:39 Hours</b>	
Fire Alarm dispatched Engine 16 and Engine 3 for the 4 <sup>th</sup> Alarm for Box 15-14.	<b>02:09:19 Hours</b>	
	<b>02:09:55 Hours</b>	Rescue 2 to Command, “We're breaching the stairway wall. We're breaching the stairway wall. That doorway's impassable. We're at the top of the stairs. We're getting closer. We're getting closer.”
	<b>02:11:43 Hours</b>	Rescue 2 to Command, “We got him.”



## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	02:11:50 Hours	Rescue 2 to Command, “We’re just getting to him now. He is stuck behind the doorway.
Incident at 70 minutes.	02:13:15 Hours	Rescue 2 to Command, “We’re at the stairway. We’re trying to make our way out. Clear the stairway except, Ladder 1.”
	02:13:55 Hours	Rescue 2 to Command, “Clear that stairwell. We’re coming out on vibralert. One member on vibralert.”
Command changes the strategy to defensive	02:14:22 Hours	Rescue 2 has the officer of Ladder 5 out of the building.
Command to Fire Alarm, “The fire at Box 15-14 is under control.”	0405 Hours	
Command to Fire Alarm, “The fire at Box 15-14 is out.”	0435 Hours	
Command to Fire Alarm, “Command is dissolved, and all units are clear from Box 15-14.”	0631 Hours	

### Personal Protective Equipment

At the time of the incident, the Lieutenant was wearing his station uniform, turnout coat and pants, gloves, hood, helmet, boots, and self-contained breathing apparatus. The Lieutenant carried a portable radio and flashlight assigned by the fire department. The NIOSH investigators inspected and photographed the personal protective clothing and equipment at the fire department’s headquarters facility. As part of this investigation, the self-contained breathing apparatus (SCBA) worn and used by the Lieutenant was shipped to the NIOSH National Personal Protective Technology Laboratory (NPPTL) in Morgantown, West Virginia, for evaluation and testing. A summary of the NIOSH evaluation is included in **Appendix One**.

The full evaluation and report can also be downloaded from the [NIOSH NPPTL PPE](#) website.

## ***Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts***

The lieutenant's turnout gear and equipment were not considered to be a contributing factor in this incident.

### **Weather**

At 0054 hours on December 13, 2019, the weather was fair with an approximate temperature of 17° F. The dew point was 0° F, the relative humidity was 47%, the winds were 17 miles an hour (MPH) gusting to 26 mph from the west northwest (WNW). The barometric pressure was 28.90 inches and there had been no precipitation in the past 24 hours [Weather Underground 2019].

### **Investigation**

On November 13, 2019, a 39-year-old career lieutenant died and four other firefighters were injured while responding to a multi-family residential structure fire with heavy fire showing (See Photo 5). At 01:00:06, Fire Alarm dispatched Car 4, Engine 15, Engine 2, Engine 13, Engine 12, Ladder 5, Ladder 3, Rescue 1, and Ladder 4 (Rapid Intervention Team), to a fire with a report of people on the 2<sup>nd</sup> floor and a baby on the 3<sup>rd</sup> floor. The Safety Officer (one of four Captains) on duty responded as well. At approximately 01:02:17, Engine 15 arrived on scene and reported a Type V structure with heavy fire showing on the 2<sup>nd</sup> floor on Side Bravo. At 01:03:37, Car 4 arrived and assumed Command. Engine 2 also arrived at this time and was assigned to stretching a supply line from a hydrant to Engine 15. Command reported smoke showing from the roof and 3<sup>rd</sup> floor Side Bravo and struck a 2<sup>nd</sup> Alarm for Box 15-14. Engine 5, Engine 6, Ladder 1, and Car 3 were dispatched at 01:04:25. Engine 15 did a quick transitional attack on fire venting on Side Delta from the 2<sup>nd</sup> floor. Command ordered Engine 13 to hit the fire venting from the exterior on Side Bravo of the 2<sup>nd</sup> floor. Within minutes, Engine 15 and Ladder 5 were going to the 2<sup>nd</sup> floor on Side Delta. Engine 13 was going to the 2<sup>nd</sup> floor on Side Alpha and Ladder 3 was going to the roof.

## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts

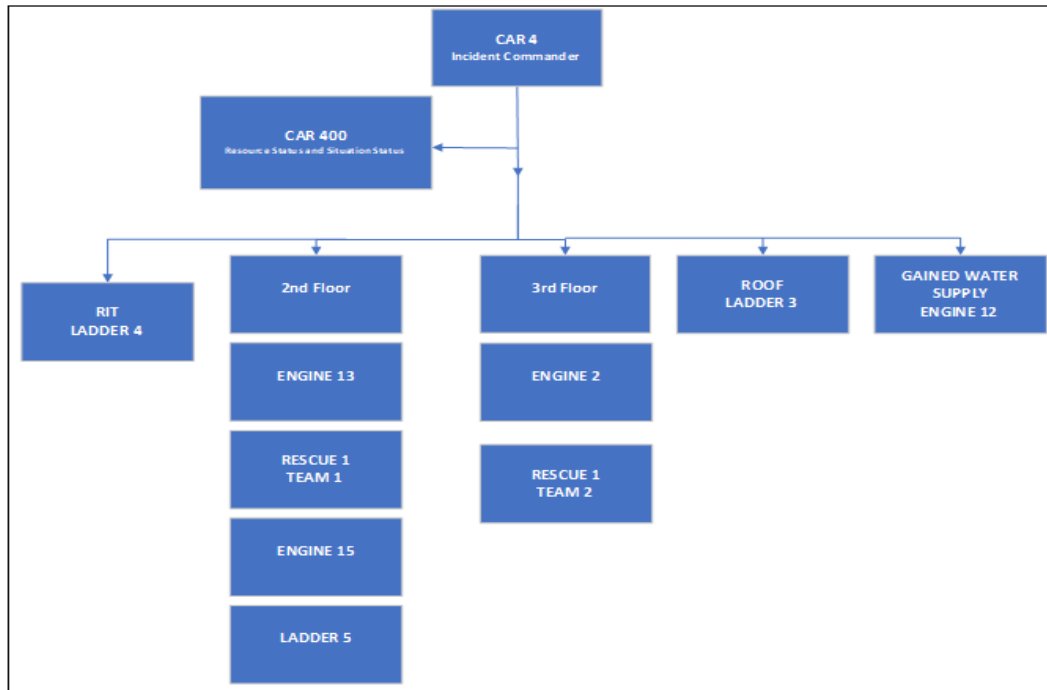


**Photo 5. The fire building. There was access to all three floors by Side Alpha and Side Delta stairs.**  
*(Courtesy of Google Earth)*

Prior to entering the building, Engine 13 was knocking down the fire on the 2<sup>nd</sup> floor on Side Bravo near the Side Charlie Corner. Command ordered Engine 13 to get water on the fire on Side Alpha and the fire that re-ignited on Side Bravo. Engine 15 was down to less than a half tank of water. A firefighter from Engine 2 charged the hydrant and provided Engine 15 with water (See Diagram 5). Rescue 1 informed Command that they were splitting into 2 teams. Rescue 1-Team 1 went to the 2<sup>nd</sup> floor and Rescue 1-Team 2 went to the 3<sup>rd</sup> floor. Rescue 1-Team 2 encountered heavy fire on the 3<sup>rd</sup> floor hallway on Side Alpha. Engine 2 brought a hose line to assist Rescue 1-Team 2.

At approximately 01:10:42, the 2<sup>nd</sup> Alarm companies arrived on scene. Engine 5 and Engine 6 were assigned to the 3<sup>rd</sup> floor on Side Alpha. Ladder 1 was assigned to get Ladder 3 another power saw. Ladder 14 was ordered to assist Engine 2 at the front door on Side Alpha to get a hose line to the 3<sup>rd</sup> floor. At approximately 01:13, Fire Alarm informed Command they were 10 minutes into the incident and the power company had been contacted per standard procedure for a working fire and had an arrival time of 10 minutes. Engine 13 requested more water pressure on their hose line as Side Bravo still had heavy fire showing.

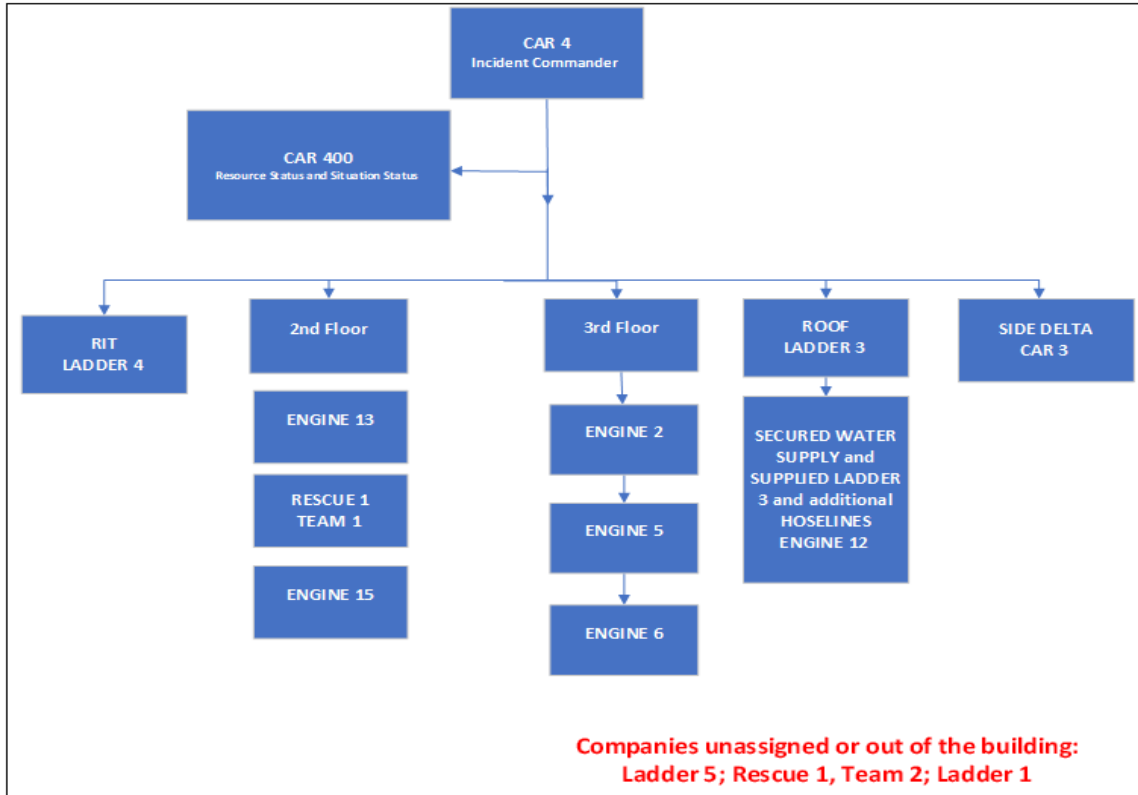
## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts



**Diagram 5. The location and accountability of the 1<sup>st</sup> Alarm companies at Box 15-14. The time was approximately 0110 hours**

Rescue 1-Team 1 informed Command that there was a huge pile of debris in the doorway to the 2<sup>nd</sup> floor on Side Delta. Rescue 1-Team 2 was still conducting a primary search on the 3<sup>rd</sup> floor, Side Alpha. Ladder 3 was trying to ventilate the roof, but their power saw would not run due to the smoke. Ladder 3 started using an axe while Command ordered Ladder 1 to get Ladder 3 another power saw. At approximately 01:19, Engine 13 made it to the origin of the fire, the bedroom on the 2<sup>nd</sup> floor in the Bravo-Charlie corner, Engine 13 temporarily knocked down the fire, but it continued to re-ignite (**See Photo 6**). At 01:20:03, Ladder 5 informed Command they were out of the building to change air cylinders, Command acknowledged and requested to see the Ladder 5 Lieutenant out front for an update (**See Diagram 6**). Command requested a report from Engine 13, then Rescue 1-Team 2 notified Command they were coming out for new air cylinders. At 01:22:35 Engine 6 and Ladder 1 entered side Alpha to go to 3<sup>rd</sup> floor. Command advised E2 that he was now Division 3. Ladder 3 reported the roof was vented (**See Photo 7**). At 01:23 hours, Engine 15 exited the building and Ladder 5 re-entered to head to the 3<sup>rd</sup> floor. Command was notified by Fire Alarm that he was 20 minutes into the incident. Engine 13 notified Command they were out of the building and the fire was knocked down. They left the hose line at the doorway for the next crew. Engine 13 stated they had another hose line that was operating from Side Charlie. At 01:24:43, Rescue 1-Team 1 was in the basement securing the utilities. Command requested a report on the 3<sup>rd</sup> floor. At 01:25:25, Division 3 reported that Engine 2 was advancing further into the kitchen area. They were checking for extension, but not finding anything. Command ordered Ladder 1 to hook the 3<sup>rd</sup> floor ceiling to check for extension in the attic. At approximately 01:26:44, Division 3 called Command and advised that Engine 2 was in the kitchen area going into the bedroom on the Side Bravo/Side Charlie corner with Engine 6. They noted that there was only room for 2 companies and asked that the stairway be kept clear.

## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy–Massachusetts



**Diagram 6. The location and accountability of the 1<sup>st</sup> and 2<sup>nd</sup> Alarm companies at Box 15-14. The time was approximately 0120 hours.**



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**Photo 6. 2<sup>nd</sup> floor bedroom that was on the Side Bravo/Side Charlie corner.**  
*NIOSH Photo*



**Photo 7. Roof vented by Ladder 3 on Side Bravo.**  
*NIOSH Photo*

At 01:27:17, Rescue 1 reported fire in 3<sup>rd</sup> floor stairwell on Side Delta. While Ladder 5 and Safety 2 were advancing to floor 3 they were overcome by fire. The safety officer who was behind Ladder 5 grabbed Ladder 503 and pulled him through fire to the Floor 2 landing. Ladder 503 exited the building through the interior stairway while the safety officer exited the Side Charlie porch via a ground ladder. At 01:27:36, the lieutenant of Ladder 5 called a Mayday and stated Ladder 5 was on Division 3 with fire all around them, and Ladder 5 did not have a PAR. *Note:* The chauffeur of Ladder 5 that was with the officer of Ladder 5 and stated they were near the porch window on the 3<sup>rd</sup> floor on Side Delta with fire all around them. The chauffeur stated his hands were getting hot through his gloves when the lieutenant called the Mayday. Command acknowledged, sent in Ladder 4, the Rapid Intervention Team, and stated there was a ladder on 2<sup>nd</sup> floor side Bravo. Engine 2 was on the 3<sup>rd</sup> floor but was unable to locate where Ladder 5 might be. They thought perhaps Ladder 5 meant 2<sup>nd</sup> floor. The Ladder 5 Lieutenant radioed an immediate need for a hose line. *Note:* The Ladder 5 chauffeur was with the lieutenant from Ladder 5 on the 3<sup>rd</sup> floor. The chauffeur stated that they had looked for an exit, saw the porch shed, and ran into the cluttered shed for protection from the fire.

At 01:28:47 Command ordered a 3<sup>rd</sup> Alarm for Box 15-14. At 01:29:47, Engine 7, Engine 4, and Ladder 7 were dispatched on the 3<sup>rd</sup> Alarm. At 01:31:10 hours, the lieutenant from Ladder 5 radioed that they needed a hose line. Command instructed Ladder 5 to move towards Side Alpha or find a window. At approximately 01:32, the lieutenant of Ladder 5 transmitted his final message, “Can’t get out”. *Note:* The chauffeur from Ladder 5 stated his hands were getting burnt holding the shed door and his mask was turning black. They decided to run for the stairs. The chauffeur stated the next thing he knew the lieutenant grabbed him and threw him out the window which was at approximately 0133 (See Photos 8 and Photo 9). The lieutenant took shelter back in the storage shed on the porch on the Side Bravo/Side Charlie corner.

Approximately five minutes after the Mayday, Ladder 1 with the officer of Engine 6 was on Floor 3 Side Alpha, reporting heavy fire above them and operating a hose line. At 01:34:03, Car 400 informed

## **Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts**

Command that a civilian had advised him that a firefighter was lying on the ground on Side Charlie. Engine 5 was sent to locate the firefighter on Side Charlie and requested EMS who treated and transported the chauffeur to the local trauma center.

Ladder 4 placed a ground ladder to the Side Delta porch 2<sup>nd</sup> floor. Ladder 4 took the stairs to the 3<sup>rd</sup> floor before running into heavy fire. Engine 6 was on the 3<sup>rd</sup> floor with Engine 2 on their way out.



**Photo 8. 3<sup>rd</sup> floor porch window Ladder 5 firefighter went out of and initially landed on awning over basement door.**  
*NIOSH Photo*

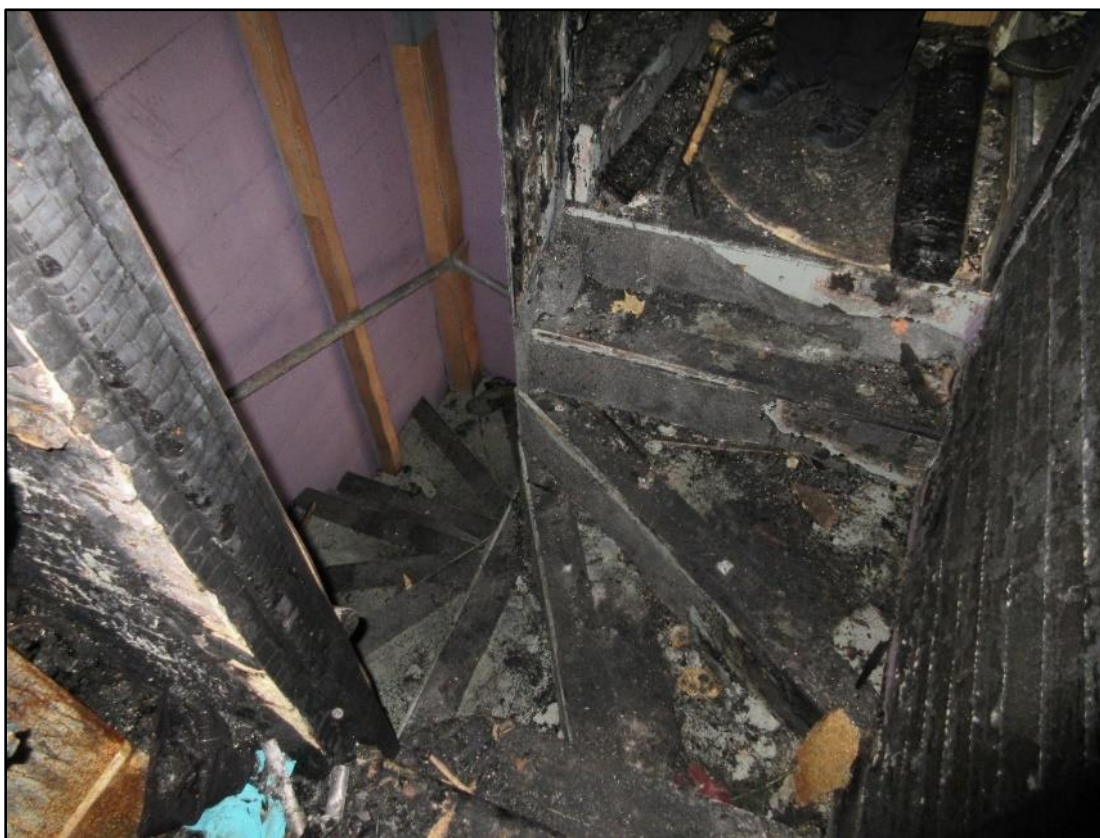


**Photo 9. View of awning which reduced the impact when the Ladder 5 firefighter hit the concrete pad on the ground.**  
*NIOSH Photo*

Ladder 4 reported to Command that Ladder 4 was in the stairwell trying to make it to the 3<sup>rd</sup> floor, but it was fully involved in heavy fire. Ladder 4 needed a back-up hose line. Command sent Engine 7 to the 2<sup>nd</sup> floor on Side Alpha to operate a line that was already in place. At approximately 01:35, Ladder 4 reported the first hose line from Engine 15 had burned through and burst right inside the door to the 2<sup>nd</sup> floor at the side Delta stairway (**See Photo 10**). Engine 6 and Ladder 1 were on the 3<sup>rd</sup> floor knocking down heavy fire in the front room on Side Alpha. At 01:37:08, Command called an emergency PAR, but it was never completed due to the strain on communications from heavy radio traffic trying to locate the missing lieutenant.



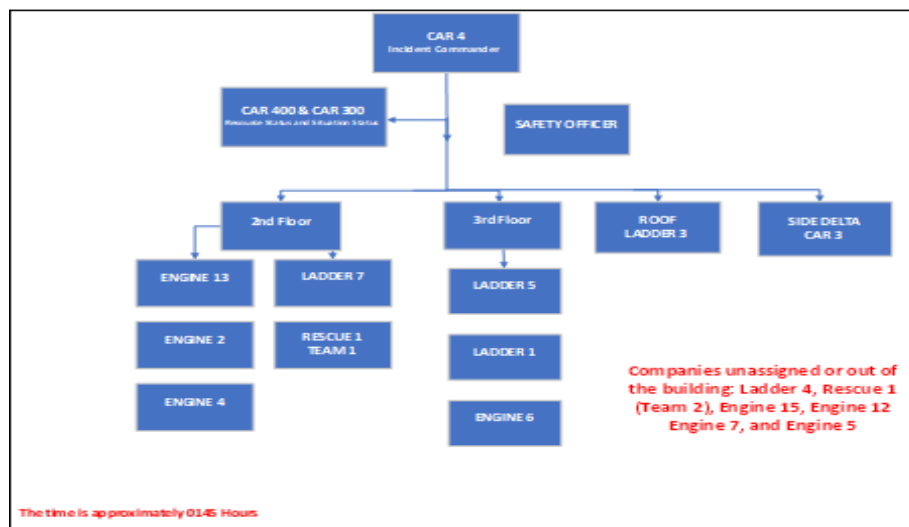
## Career Lieutenant Dies and Four Firefighters Injured at a 3-Story Multi-Family Residential Occupancy—Massachusetts



**Photo 10. Side Delta stairwell second floor where first entry hose line burst.**  
*NIOSH photo*

Ladder 4 reported to Command they were in the Side Delta/Charlie stairway going to the 3<sup>rd</sup> floor, and they had fire behind them and needed an additional hose line. Ladder 4 repeated the first hose line had burned through and burst in the stairway on the 2<sup>nd</sup> floor. Engine 6 and Ladder 1 (out of the building changing air cylinders), and Rescue 1 reported a PAR. Command radioed Ladder 4 that a hose line was coming up the rear stairwell to them. Also, Command asked if Ladder 4 could get out and if they had a PAR. The Ladder 4 officer responded that he had 2 members outside and there were 2 members inside with a member of Rescue 1 on a landing with fire below them in the 2<sup>nd</sup> floor stairwell. Ladder 7 was headed to Side Delta/Charlie stairwell from Side Alpha with a hose line. At 01:43:15, Ladder 4 reported they were on low air and coming down the stairs. Ladder 4 reported they were out of the building and reported a PAR. Engine 4 was on the 2<sup>nd</sup> floor Side Delta/Charlie stairs and advised that they couldn't advance to the 3<sup>rd</sup> floor. Command ordered Engine 4 to keep trying. At 01:44:14, Fire Alarm radioed Command that he was 40 minutes into the incident (see **Diagram 7**).

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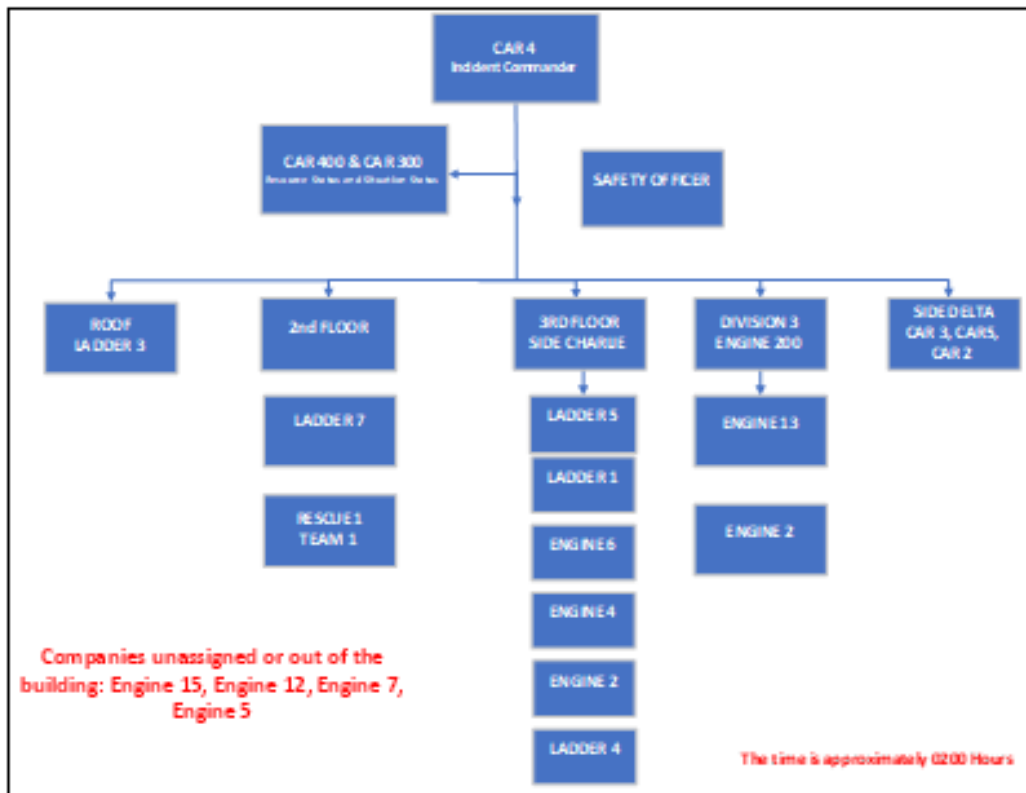
**Diagram 7. The location and accountability of all companies operating at Box 15-14 at approximately 0145 hours.**

At approximately 01:47, Engine 13 was being assisted by Ladder 7 on the Side Alpha stairs between the 2<sup>nd</sup> and 3<sup>rd</sup> floors, trying to get to the 3<sup>rd</sup> floor. Engine 12 and Engine 4 were on the 2<sup>nd</sup> floor Side Charlie, and Engine 7 was on the 2<sup>nd</sup> floor near the Side Bravo/Side Charlie corner fighting fire and opening walls. All crews reported having PAR. Engine 13 reported knocking down the fire on the 2<sup>nd</sup> floor and requesting hooks to open the ceiling. At 0153 hours, Fire Alarm notified Command that the incident was at 50 minutes. At approximately 0154 hours, Engine 2 was on Side Alpha 3<sup>rd</sup> floor attacking the fire in the Side Alpha/Side Delta corner closet area. The fire was coming up from the 2<sup>nd</sup> floor. Engine 13 had been assisting Engine 2 but had to head towards 3<sup>rd</sup> floor stairs to exit as they were getting low on air. Engine 4 and Engine 7 were out of the building to change cylinders. Ladder 4, with a member from Rescue 1, informed Command they were going to make entry on the Side Delta/Charlie stairs and try to get to the 3<sup>rd</sup> floor. At 01:55:46, Command announced no one was to enter the building without direction from Command. Engine 13 exited the building and Command replaced them with Engine 6. Ladder 7 was on the 2<sup>nd</sup> floor and had knocked down the fire in the kitchen and was overhauling this area.

At 01:57:20, Ladder 4 heard a PASS alarm sounding and advised Command, “***I got a PASS alarm going off about 20 feet in front of me.***” Engine 2 was on Side Alpha of the 3<sup>rd</sup> floor and reported they had fire coming from below and above them. Engine 2 advised Command not to send any more crews to the 3<sup>rd</sup> floor on Side Alpha due to lack of room. Command had Engine 6 on the 2<sup>nd</sup> floor stairway landing backing up Engine 2. Car 2 informed Command that fire had been knocked down on the exterior of side Charlie and the hose line was shut down.

At 02:00:48, Ladder 4 radioed “We just lost the stairs - We just lost the stairs; They’re collapsing”. Command ordered a ground ladder to 3<sup>rd</sup> floor Side Charlie. Ladder 4 reported they could hear a PASS (see **Diagram 8**).

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**Diagram 8. The location and accountability of all companies operating at Box 15-14 at approximately 0200 hours.**

Ladder 4 requested another company and hose line on the 3<sup>rd</sup> floor and advised that the hose line had burst on the landing. Ladder 7 and Rescue 1 called Command and requested the burst hose line be shut down. Command had Engine 15 shut down the hose line. Ladder 4 started exiting the 3<sup>rd</sup> floor via the stairway and assumed there were enough stairs left to get to the 1<sup>st</sup> floor. At 02:03:13, Rescue 1 called Command, “The hose line that’s going in from the 1<sup>st</sup> floor rear stairwell. It’s burst. It’s dumping out. Can we shut down that 1<sup>st</sup> floor rear stairwell line?” **Note:** *The wrong hose line was shut down, leaving Ladder 4 on the 3<sup>rd</sup> floor with no water.* Eventually, Ladder 4’s hose line was charged again. Also, Fire Alarm advised Command that the incident was at 60 minutes. At 02:07:20, Ladder 4 called Command, “Alright, we’re going to be, our designation is Rescue 2, alright? Our designation is Rescue 2. We’re trying to make our way back up to the 3<sup>rd</sup> floor. We got a good location; We got a line. We need another working crew to follow that line to the 3<sup>rd</sup> floor over the porch.” **Note:** *Rescue 2 consisted of Ladder 4, Ladder 1, and a firefighter from Rescue 1.* Rescue 2 confirmed that the Side Delta/Charlie stairs were intact and that the wall around the 3<sup>rd</sup> floor door had collapsed on the stairs. Engine 2 reported they were in the back bedroom on the Side Bravo/Side Charlie corner and trying to knock



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down the fire, which was on the other side of the wall from the shed where the lieutenant from Ladder 5 was located.

At 02:08:03, Rescue 2 advised Command that they had a good location on the lieutenant. They reached the top of the Side Delta/Charlie stairwell, but wall debris had blocked the entrance to the Side Charlie porch. Rescue 2 breached the wall onto the porch. At 02:08:39 Command struck a 4<sup>th</sup> alarm for Box 15-14.

Engine 6 had relieved Engine 2 on the 3<sup>rd</sup> floor near the Side Bravo/Side Charlie corner and requested hooks be brought up to pull ceiling. Engine 2 exited the building with a member of Ladder 3. Engine 5 made entry and headed to the 3<sup>rd</sup> floor with hooks to assist Engine 6.

At 02:09:55, Rescue 2 crawled across the porch avoiding holes in the floor that were covered by a ground ladder. Rescue 2 and made it to the porch shed door and they could hear the lieutenant's PASS alarm. (See **Photo 11**). At 02:11:43, Rescue 2 breached the porch shed door. The lieutenant was stuck behind the shed door (See **Photo 12** and **Diagram 9**). Rescue 2 navigated the holes in the porch floor with the lieutenant. Most of Rescue 2 was low on air, so they requested the stairwell be cleared. Rescue 2 handed off the lieutenant to Ladder 1. Crews brought the lieutenant out the Side Delta/Charlie rear door where an EMS crew was waiting at 02:14:22. The lieutenant was transferred to a stretcher and transported to the local trauma center where he was pronounced deceased.



**Photo 11. Holes in 3<sup>rd</sup> floor porch shown from 2<sup>nd</sup> floor.**  
*NIOSH Photo*

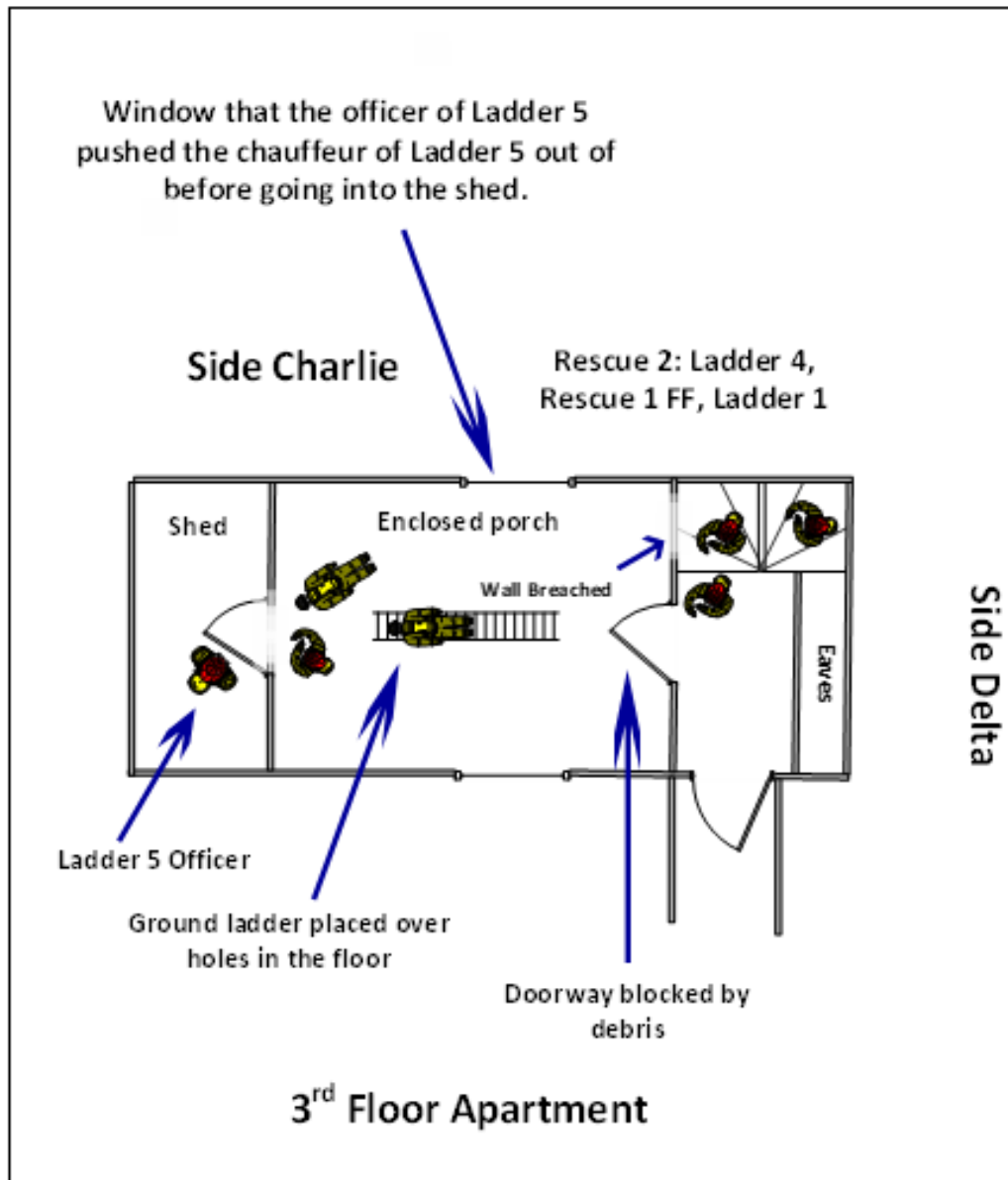
At 02:15, Command evacuated the structure and changed the strategy to defensive. The fire was declared under control at 04:05 by Command.

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**Photo 12. Third floor porch shed breached by Rescue 2 where Ladder 5 Lieutenant took shelter.**  
*NIOSH Photo*

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**Diagram 9. Rescue 2 advanced to porch shed trying to locate the officer of Ladder 5. A ground ladder was used to avoid holes in the porch floor.**

### Contributing Factors

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

- Building construction and contents enhanced fire spread

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- Wind driven fire
- Lack of scene size-up and risk assessment
- Lack of incident management and Command Safety
- Lack of a defined incident action plan
- Lack of crew integrity
- Survivability profile
- Company level staffing
- Lack of professional development opportunities
- Lack of required sprinkler system

### **Cause of Death**

According to the death certificate, the state medical examiner listed the lieutenant's cause of death as thermal injuries and the inhalation of products of combustion. The carboxyhemoglobin was less than 12%. The manner of death was accidental.

### **Recommendations**

***Recommendation #1: Incident commanders should define a strategy and an Incident Action Plan based on the scene size-up and risk assessment. Incident commanders should continually reevaluate the strategy and adjust the IAP based on the continuous size-up, risk assessment, risk management, and the completion of tactical objectives.***

Discussion: Standard conditions are identified as the incident's critical factors. Fire Officers/Command should identify the incident's critical factors before taking any action. An initial size-up produces the information that becomes the basis for the incident strategy and the corresponding incident action plan (IAP). Investing a small amount of time evaluating the critical factors is extremely important to beginning and on-going command, operational success, and firefighter safety. The incident commander (IC) needs a simple system to deal with all basic incident information. Critical factors offer such a system. There 8 basic critical factor categories:

- Building Type
- Occupancy
- Arrangement
- Life safety
- Fire
- Resources
- Action
- Special circumstances

Standard conditions are identified as the incident's current and forecasted critical factors. The IC should:

- Identify the incident's critical factors before taking any action
- The initial and ongoing size-up of the incident's critical factors should produce the information that becomes the basis for the current incident strategy and IAP

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- Current, accurate and relevant information provides the informational foundation for effective initial and ongoing action.

This systematic evaluation process continually produces standard, safe, well-managed incident outcomes [Blue Card 2018].

At any incident, life safety is always the 1<sup>st</sup> priority, followed by incident stabilization as the 2<sup>nd</sup> priority, and property conservation as the 3<sup>rd</sup> priority. The task of ensuring 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 be used 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 2021].

A radio report of conditions, including those on Side Charlie, should be transmitted over the assigned tactical channel to the IC and the dispatch center. The transmission should include the following:

- Smoke and fire conditions, with an emphasis on identifying the seat of the fire. The initial radio report from the first arriving unit for a structural fire should include the signal for a working fire, number of stories, type of occupancy, and location of fire. This lays the foundation for additional reports and serves as notification to responding units as to the type of standard operating procedure (SOP) to implement.
- If there is critical building description information available through the critical incident dispatch system (CIDS) for the response address, then this information would aid in implementing or adjusting SOPs. The CIDS could contain information that would necessitate alternative actions to fulfill identified operational goals.
- Building features: e.g., number of stories (particularly if there is a difference between Side Alpha and Side Charlie).
- Basement access and type.
- Any other life or safety hazards [FDNY 2011a].

Another issue to consider are red flags. Red flags are pieces of information that should be addressed because these are situations or conditions that can result in a line of duty death or serious injury. The IC should always take a pessimistic approach when sizing-up, assuming the worst until determining otherwise. A red flag will not necessarily change the overall incident strategy or incident action plan, but it should be identified and addressed by the IC and the rest of the hazard zone team. Some examples of red flags include:

- Fire in an attic space
- Fire in a basement
- Operating above a fire (basements, floor above the fire)
- Zero visibility



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- Encountering high heat
- Reports of, “We can’t find the fire”, beyond the normal discovery time
- More than one request to back up an attack position
- A report that states the fire is “under control,” but you can still see active fire conditions from the command post
- Victim(s) located
- Wind-driven fires
- Smoke/fire showing from cracks in walls [Blue Card 2018].

The first arriving fire department unit initiates the command process by giving an initial radio report, which includes:

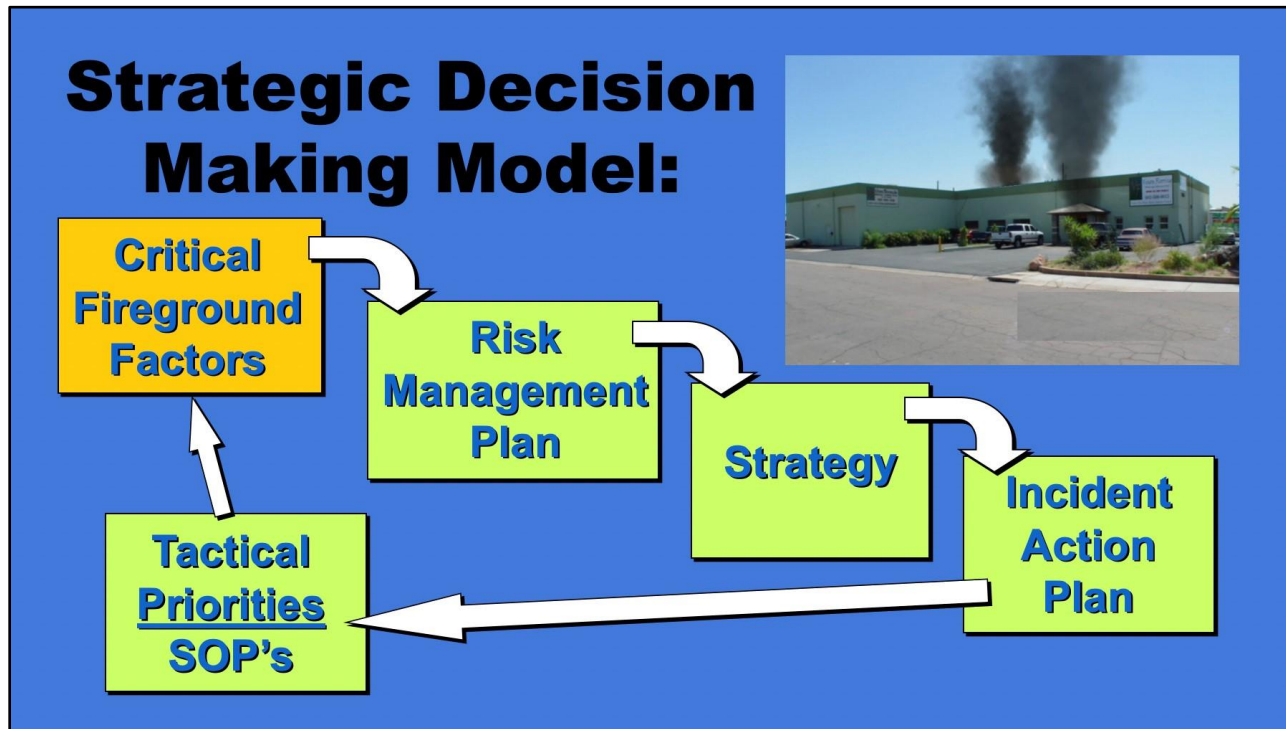
- Clear alarm
- Unit designation/on the scene
- Building/area description
  - Occupancy
  - Size (large, medium, small)
  - Height (assumed 1 story unless reported otherwise)
- Obvious problem/conditions
  - Nothing showing (indicates checking)
  - Smoke showing (amount and location)
    - Working fire
  - Fire showing (amount and location)
    - Working fire
  - Fully involved
- Action taken
  - Assuming Command
  - Laying a line
  - Attacking with...etc.
- Declaration of Strategy
  - Offensive or defensive
- Command confirmation with name [PRSOPs 2018].

Fireground operations are very dynamic and fast-paced. Incident commanders should determine a strategy and then develop the incident action plan (IAP) to ensure that the proper actions are implemented to take control of the incident. Incident commanders should follow the decision-making model that includes identifying incident critical factors (through a situational evaluation or size up), define the acceptable level of risk using the standard risk management plan, declare a strategy (offensive or defensive), and then establish the tactical objectives. This model will lead to the development of the IAP, which serves as the tactical road map to effectively manage the incident. The IAP defines where and when resources will be assigned throughout the incident, along with tasks and objectives [Blue Card 2018, NFPA 2021] (**See Diagram 10**).

During the initial stage of an incident, the IAP should be communicated verbally to all staged and assigned resources at an incident. For Type IV (heavy timber) and Type V (wood-framed) incidents,

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the IC should verbally communicate the IAP during the initial stages and throughout the incident as benchmarks are met or not met [NFPA 2020a].



**Diagram 10. The components of the Strategic Decision-Making Model. 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.**

*(Courtesy of Blue Card 2018)*

To ensure a standard outcome of each incident, the incident commander should match the standard conditions to standard actions. This is the core of the incident command system and is the basis for all operations. Standard conditions are identified as the incident's *current* critical factors:

- Identify the incident's critical factors before taking any action.
- Initial and ongoing size-up of the incident's critical factors must produce the information that becomes the basis for the current incident strategy and IAP.
- Current, accurate, and relevant information provides the foundation for effective initial and ongoing action.
- The goal of this systematic evaluation process continually produces standard, safe, well-managed incident outcomes [Blue Card 2018].

The IAP should match the defined strategy established by an incident commander for a particular incident. The defined strategy describes the overall approach to incident operations and drives the IAP.

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The IAP provides the tactical assignments required to achieve the offensive/defensive objective. The order of occurrence is key—the strategic goals are developed first and then the tactical objectives. At each incident, the incident commander should start with a standard placement-oriented operational plan that develops a strong, dependable beginning for command and control of the incident. While developing the strategic goal for the incident is the first component, the incident commander needs to produce detailed tactical objectives that can be assigned to responding companies. This is the purpose of the IAP [Brunacini 2002; Fire and Rescue Departments of Northern Virginia 2013].

The initial incident commander, most often, is a company officer who arrives on-scene prior to a command 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 decides a strategy and develops the IAP. The company officer may not have the ability or time to record the IAP on paper and provide documentation when transferring command. In this case, a verbal IAP is appropriate. As with this or any incident, events can occur very quickly before a detailed tactical worksheet or written IAP is developed [Brunacini 2002; Harms, 2010].

The IAP can be as simple as a verbal transmission to all units assigned to an incident. Once an officer assumes command, the overall strategy – either offensive or defensive – is communicated. Command can make specific assignments to arriving companies along with tactical objectives such as search, rescue, fire attack, ventilation, utility control, and exposure protection. The responding command officer should be monitoring radio communications and documenting tactical objectives on a tactical worksheet if possible. When the command officer arrives on-scene, an update from the initial incident commander can occur (face-to-face or by radio). The command officer will then assume command at a stationary location. By following this process, the initial and second IC will be in a stronger position to manage an incident should an emergency event occur [NFPA 2020a; NFPA 2021].

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 2020a] requires the following regarding an incident action plan:

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

### **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.

Offensive strategy tactical priorities and their corresponding completion benchmarks are:

- Water on the fire

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- Life Safety—Primary and Secondary “All Clear”
- Fire Control— “Under Control
- Property Conservation— “Loss Stopped”
- Customer Stabilization— Short term

The offensive tactical priorities establish the major operational activities required for a complete, integrated effort, and they identify the three major functions needed to establish the overall incident response [Blue Card 2018].

**DEVELOPING an INCIDENT ACTION PLAN**

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

After the size-up is completed, the officer begins the process of developing an IAP. The IAP will assist the incident commander in completing two significant incident management tasks – identifying the incident strategy and the assignment of the tactical objectives 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
- Eight critical fireground factors
- Incident priorities
- SLICE-RS and S-RECEO-VS
- Staffing
- Risk management plan
- Firefighter safety
- Use *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 to 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 incident action plan at Type V and Type IV incidents. For these types of incidents, the incident action plan is most often communicated verbally.**

*(Courtesy of FireFighterCloseCalls.com.)*



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### **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 Number 1 defensive priority.***

Defensive strategy tactical priorities and their corresponding completion benchmarks include:

- Define the hazard zone and keep fire fighters out of the potential collapse zone(s)
- Establish cut-offs—Forward progress stopped
- Search exposures—Primary and Secondary “All Clear”
- Protect exposures— “Fire Control”—Loss Stopped.

Defensive operations represent a standard organizational response to situations that cannot be controlled with offensive tactics. When conditions go beyond the safety systems required for interior operations, Command should conduct defensive operations from outside the hazard area. Command should write off lost property and decide where the cut-off will take place. If defensive operations are conducted from the onset of the incident, a primary search will not be completed for the involved structure(s). During defensive campaign operations, Command will coordinate the rotation of crews for rest and rehydration.

A basic defensive IAP includes the following tasks:

- Scene size-up
- Identify critical fireground factors
- Determine the need for additional resources
- Evaluate fire spread/write-off lost property
- Determine collapse zones and ensures no entry
- Search exposures
- Protect exposures
- Prioritize master streams; provide big, well-placed streams
- Surround and drown [Blue Card 2018].

As an incident progresses, Command should continually review and update the IAP. The following list serves as a guide for Command to consider. Continuous review and evaluation should occur when benchmarks are met, or conditions change, and benchmarks have not been achieved.

- Firefighter safety
- Consider changing operational modes – go defensive
- Does the current strategy match the current conditions
- Location(s) of fire attack
- Effect of the fire attack
- All affected areas searched (“All clear”)
- Timing and support
- Adequate back-up
- 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].

### ***Recommendation #2: Fire departments should use risk management principles, including occupant survivability profiling, at all structure fires.***

Discussion: While it is recognized that firefighting is an inherently hazardous occupation, established fire service risk management principles are based on the philosophy that greater risks will be assumed when there are lives to be saved and the level of acceptable risk to firefighters is much lower when only property is at stake. Interior (inside a structure) offensive firefighting operation can increase the risk of traumatic injury and death to firefighters from structural collapse, burns, and asphyxiation. Established risk management principles suggest that more caution should be exercised in abandoned, vacant, and unoccupied structures and in situations where there is no clear evidence indicating that people are trapped inside a structure and can be saved. More importantly, the fire department should establish a standardized method or approach to assess the risks encountered at each incident, especially structure fires. Structure fires are very dynamic and fast paced operations with little room for error, or miscalculations of the significance of the risk encountered.

The IC is specifically responsible for managing risk at the incident. However, one person cannot be expected to apply these principles to an incident if the organization has not integrated a standard approach to risk management into its SOPs/SOGs and its organizational culture. To be effective, risk management principles should be integrated into the entire operational approach of the fire department organization. They should be incorporated within the duties and responsibilities of every officer and member. The single most important reason to establish an effective incident management system is to ensure that operations are conducted safely. Every individual assigned to the incident is responsible for monitoring and evaluating risks and for keeping the IC informed of any factor that causes the system to become unbalanced. Continuous risk assessment should be reprocessed with every benchmark or task completed until the incident is ended.

A standardized evaluation of the situation should occur at each incident starting with the first arriving officer or member of the department arriving on scene of the incident. This process starts with the scene size-up. This responsibility starts with the first arriving unit that should look at the entire incident scene versus focusing on a small part of the situation. During the initial size-up, incident commanders should consider the following incident priorities:

- Life Safety
- Incident Stabilization
- Property Conservation
- Continuous – firefighter safety

Situations where there is clear evidence or indication that there is a life safety (imminent rescue or trapped occupants) changes the focus of the strategy and incident action plan. Established risk management principles dictate that more caution is exercised in abandoned, vacant, and unoccupied structures.

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In general terms, the risk management plan should consider the following:

- risk nothing for what is already lost—choose defensive operations
- extend limited risk in a calculated way to protect savable property—consider offensive operations
- and, extend very calculated risk to protect savable lives—consider offensive operations.

NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program*, Section 8.4 addresses the use of risk management principles at emergency operations. Subsection 8.4.4 states, “Risk management principles shall be routinely employed by supervisory personnel at all levels of the incident management system to define the limits of acceptable and unacceptable positions and functions for all members at the incident scene.” [NFPA 2021]

If occupant survival isn’t possible, the IC should evaluate conditions based upon the risk to firefighters and revise the strategy and IAP. The IC should take a more cautious approach to fireground operations. Fire control should be obtained before proceeding with the primary and secondary search efforts [Morris 2020].

A fire in a building today is not what it was 50 years ago. Yet, fireground tactics have not changed to be consistent with the effects of fire conditions in today’s modern furnishings. As a result of the increased use of plastics in our buildings, today’s fires are hotter and flashover occurs more quickly than in the past, releasing extreme levels of toxins. Fire models reflect that flashover can occur in less than five minutes and reach a temperature of more than 1,100°F. When exposed to fire, plastics burn hotter and produce highly toxic gases. For example, a pound of wood when burned produces 8,000 British thermal units (BTUs). On the other hand, a pound of plastic can produce 19,900 BTUs when burned. The human limit for temperature tenability is 212 degrees. On many occasions, flashover can occur as the first fire companies are arriving on the scene. In such circumstances, the survivability of any victims in the affected compartment can be very limited or nonexistent [Marsar 2010]. Firefighter fatality reports reflect what can happen without a thorough size-up that includes a survivability profile [Morris 2020].

The effects of carbon monoxide poisoning on a victim are well known to the fire service. Due to the increased use of plastics and synthetic materials, carbon monoxide is produced in very high concentrations and very quickly in structure fires. As a result, victims die sooner than in the past. What’s not as well-known but is evolving as a killer for both the victim and firefighters, is cyanide poisoning. Hydrogen cyanide (HCN) is formed when natural fibers and common synthetic materials are not completely consumed during a structure fire. HCN can enter the body by adsorption, inhalation, or ingestion and targets the major organs of the body. Where carbon monoxide kills by blocking oxygen absorption in the blood, cyanide kills the body’s organs. Literature reflects that a low concentration of 135 PPM of cyanide and carbon monoxide will kill a person in 30 minutes. At 3,400 PPM, it can kill in less than one minute. It’s not uncommon for a fire in today’s buildings to routinely produce 3,400 PPM of cyanide. Where a victim may be resuscitated from the effects of carbon monoxide poisoning, the victim may not survive the organ damage caused by cyanide poisoning [Marsar 2010].

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Research findings by the Underwriters Laboratories (UL) show that modern furnishings in a fire environment can contribute to flashover occurring up to 8 times faster than with legacy furnishings. An experiment was conducted by UL with two side by side living room fires. The purpose was to gain knowledge on the difference between modern and legacy furnishings and how they contribute to fire growth. Both rooms contained similar amounts of like furnishings. Both rooms were ignited by placing a lit stick candle on the right side of the sofa. The fires were allowed to grow until flashover. The modern room transitioned to flashover in 3 minutes and 30 seconds and the legacy room at 29 minutes and 30 seconds [Underwriters Laboratories Firefighter Safety Research Institute 2020]. For these reasons, the conditions within a fire compartment are becoming untenable much sooner than in the past. The bottom line: victims die quicker today than in the past.

The International Association of Fire Chiefs (IAFC) recently revised and updated their [Rules of Engagement for Firefighter Survival](#) and the Incident Commander's Rules of Engagement for Firefighter Safety as a recommended best practice model which fire departments can adopt and apply to enhance fire ground safety. Both documents stress the need to determine the occupant survival profile ranking as the second most important action to take on the fireground, behind only the initial size-up [IAFC 2012] (See **Diagram 12**).

**RULES OF ENGAGEMENT FOR FIREFIGHTER SURVIVAL**

1. Size up your tactical area of operation.
2. Determine the occupant survival profile.
3. DO NOT risk your life for lives or property that cannot be saved.
4. Extend LIMITED risk to protect SAVABLE property.
5. Extend VIGILANT and MEASURED risk to protect and rescue SAVABLE lives.
6. Go in together, stay together, come out together.
7. Maintain continuous awareness of your air supply, situation, location and fire conditions.
8. Constantly monitor fireground communications for critical radio reports.
9. You are required to report unsafe practices or conditions that can harm you. Stop, evaluate and decide.
10. You are required to abandon your position and retreat before deteriorating conditions can harm you.
11. Declare a Mayday as soon as you THINK you are in danger.

**THE INCIDENT COMMANDER'S RULES OF ENGAGEMENT FOR FIREFIGHTER SAFETY**

1. Rapidly conduct, or obtain, a 360-degree situational size-up of the incident.
2. Determine the occupant survival profile.
3. Conduct an initial risk assessment and implement a SAFE ACTION PLAN.
4. If you do not have the resources to safely support and protect firefighters, seriously consider a defensive strategy.
5. DO NOT risk firefighter lives for lives or property that cannot be saved. Seriously consider a defensive strategy.
6. Extend LIMITED risk to protect SAVABLE property.
7. Extend VIGILANT and MEASURED risk to protect and rescue SAVABLE lives.
8. Act upon reported unsafe practices and conditions that can harm firefighters. Stop, evaluate and decide.
9. Maintain frequent two-way communications, and keep interior crews informed of changing conditions.
10. Obtain frequent progress reports and revise the action plan.
11. Ensure accurate accountability of every firefighter's location and status.
12. If after completing the primary search, little or no progress toward fire control has been achieved, seriously consider a defensive strategy.
13. Always have a rapid intervention team in place at all working fires.
14. Always have firefighter rehab services in place at all working fires.

**Diagram 12. The IAFC's Rules of Engagement for Firefighter Survival and the IC's Rules of Engagement for Firefighter Safety**

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***Recommendation #3: Fire departments should develop and implement standard operating procedures, training programs, and tactics for wind-driven fires.***

Discussion: Based on the analysis of results from current research and field studies, adjusting firefighting tactics to account for wind conditions in structural firefighting is critical to enhancing the safety and the effectiveness of firefighters. A wind-driven fire may be one of the most dangerous operations firefighters will encounter. The term “wind-driven” fire is used to describe a fire in which the wind has the potential to, or is already causing, a dramatic and sudden increase in fire, heat, and smoke conditions. Experienced fire officers and firefighters who have survived wind-driven fires have all described the following:

- Upon arrival, conditions appeared to be routine
- Within seconds, fire, heat, and smoke conditions changed without warning “from routine to life threatening.”
- An operating 2½-inch hose line flowing from the downwind position or into the exhaust portion of the flow had little or no effect on the incredible heat being produced; flowing water into the intake or inlet side of the flow path is very effective.
- Directly attacking these fires with one or even two 2½-inch hose lines proved ineffective and ultimately led to firefighters incurring serious injuries [FDNY 2013].

When responding to a reported structure fire, an overriding consideration concerning size-up should include wind conditions and their potential effect on the fire. The key to successfully operating at wind-impacted fires in a structure depends on recognizing that a seemingly routine fire may change into a “blowtorching” fire when the fire is impacted by wind conditions. The impact of the wind will be affected by the size of the window opening, the fuel load, and the stage of the fire when a window fails. When wind-impacted fire conditions exist in a structure, the incident commander should notify the dispatcher so this information can be relayed to all responding units. Also, the incident commander should make an announcement on the tactical channel as well. Once the contributing factors are identified, steps can be taken to minimize the hazards to fire fighters [FDNY 2013].

Fire departments should develop a SOP/SOG for incidents with high-wind conditions and for areas where high-wind conditions are likely. It is important that fire officers and firefighters develop an understanding of how wind conditions influence fire behavior and fireground tactics that may be necessary under wind-driven conditions. Wind conditions can have a major influence on structural fire behavior. When wind speeds exceed 10 mph (16 km/hr) the incident commander, division/group supervisors, company officers, and firefighters should use caution and take wind direction and speed into account when selecting a strategy and developing tactical objectives. The National Institute of Standards and Technology (NIST) has determined that wind speeds as low as 10 mph (16 km/hr.) are sufficient to create wind-driven fire conditions if the flow path is uncontrolled [NIST 2013a]. A NIST study showed that wind speeds as low as 10 mph can turn a routine “room and contents fire” into a floor to ceiling fire storm or “blowtorch effect,” generating untenable conditions for fire fighters, even outside of the room of origin. Temperatures in excess of 600 °C (1100 °F) and total heat fluxes in excess of 70 kW/m<sup>2</sup> were measured at 4 feet above the floor along the flow path between the fire room and the downwind exit vent. These conditions were attained within 30 seconds of the flow path being



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formed by an open vent on the upwind side of the structure and an open vent on the downwind side of the structure [NIST 2013a].

Fire departments are encouraged to develop and implement a SOP/SOG addressing such issues as obtaining the wind speed and direction, considering the possible fuel load associated with a particular occupancy, determining proper strategy and tactics for fireground operations, considering ventilation, and establishing possible scenarios associated with the wind speed based upon risk assessment. Under wind-driven conditions, an exterior attack from the upwind side of the fire may be necessary to reduce fire intensity to the extent that fire fighters can gain access to the involved compartments [Fire Protection Research Foundation 2013].

The strategy and tactics of an incident are dictated by the size-up, initial risk assessment, and situational report of the first arriving officer. If physical barriers make the 360-degree size-up impractical for the first arriving officer, the size-up of Side Charlie may be delegated to another fire department unit. 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 [Fire and Rescue Departments of Northern Virginia 2013].

In simulations and in previous full-scale experiments, it has been demonstrated that wind can increase the thermal hazards of a structure fire [Fire Protection Research Foundation 2013; ISFSI 2013]. Therefore, wind must be considered as part of the initial size-up of the fire conditions and be monitored and reported throughout the fire incident. It is critical that firefighters are not in the exhaust portion of the fire flow path. The directional nature of the fire gas flow path results in higher temperatures than the area adjacent to the flow path or upwind of the fire. The flow path can be controlled by limiting ventilation. Previous studies demonstrated that applying water from the exterior into the upwind side of the structure can have a significant impact on controlling the fire prior to beginning interior operations [Fire Protection Research Foundation 2013; ISFSI 2013].

Current fire control training guides state, “Whenever possible, approach and attack the fire from the unburned side to keep it from spreading throughout the structure.” It should be made clear that in a wind-driven fire, it is most important to use the wind to your advantage and attack the fire from the upwind side of the structure, especially if the upwind side is the burned side. The unexpected ventilation from a broken window can suddenly change the interior thermal conditions. Interior operations need to be aware of potentially rapidly changing conditions.

A fire department should incorporate the following into their training and education component on wind-impacted fires:

- Ensure that an adequate initial size-up and risk assessment of the incident scene is conducted before beginning interior fire-fighting operations.
- Ensure that firefighters, company officers, division/group supervisors, and the incident commander have a sound understanding of fire behavior and the ability to recognize indicators of fire development and the potential for extreme fire behavior (such as smoke [color, velocity, and density], visible fire, and heat).



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- Ensure that firefighters and company officers are trained to recognize the potential impact of windy conditions on fire behavior and implement appropriate tactics to mitigate the potential hazards of wind-driven fire.
- Ensure the incident commander's strategy considers high-wind conditions if present.
- Ensure that fire fighters understand the influence of ventilation on fire behavior and effectively apply ventilation and fire control tactics in a coordinated manner.
- Ensure that firefighters and officers understand the capabilities and limitations of thermal imagers.
- Ensure a thermal imager is used as part of the size-up process.
- Ensure that firefighters are trained to check for fire in overhead voids upon entry and as charged hose lines are advanced.
- Develop, implement, and enforce a comprehensive Mayday standard operating procedure and train and educate firefighters to ensure they understand the process and know how to initiate a Mayday.
- Ensure firefighters are trained in fireground survival procedures.
- Ensure all fire fighters on the fire ground are equipped with radios capable of communicating with the incident commander and the dispatch center [FDNY 2014].

In this incident, the wind, building construction, roof ventilation completed 22 min into the incident all compounded to create an untenable environment at 01:27:36.

### ***Recommendation #4: Fire departments should ensure that all companies are operating based upon the assignments given by the incident commander and ensuring that tactical priorities are met.***

Discussion: 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. The company officer should maintain constant contact with their assigned members by visual observation, voice, or touch while operating in a hazard zone. The company officer should 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.

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 need to periodically communicate their progress on the tactical objectives given to them by Command. This keeps the operation focused on making sure everyone is out and okay, managing the incident problem, and reducing the damage to the 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. Incident commanders should structure unit assignments around:

- Addressing the incident's critical factors
- Completing the tactical priorities

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- Having tactical reserve (On Deck) [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 needs to 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].

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 1<sup>st</sup> 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 hose line, 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].

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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 #5: Fire department should establish divisions/groups early on in an incident which provides an effective incident management organizational framework that the IAP can build on and expand. This enhances the accountability of resources operating in the hazard zone.***

Discussion: The incident command system (ICS) organization should develop at a pace that stays ahead of the tactical deployment of resources. 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 and 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 personnel. The task level is where the work is 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 several 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).

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- 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].

Incident commanders 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 can 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 should then contact the division/group supervisor and inform them of the additional resources 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:

- communication difficulties wearing full PPE
- working in a hazard zone with high heat and low 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 in or must 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 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 needs to 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 conditions, actions, and needs (CAN) reports. It is important to have visual observation of all four sides and the interior to develop and monitor the IAP. Without the observations and CAN reports, the incident commander's knowledge of vital information will be limited.

The 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

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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 needs to the incident
- Improves personnel accountability
- Places strong tactical direction and leadership where the work is 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 needs to maintain communication with assigned companies to control both their position and function. The division/group supervisor needs to constantly monitor all hazardous situations and risks to members and make sure all companies are operating in a safe and effective manner.

***Recommendation #6: Fire departments should 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 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 the dynamic events they will encounter. This program benefits 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 (NIMS) Type V and Type IV incidents [NFPA 2021].



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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 SOPs/SOGs for communicating critical benchmarks. The SOPs/SOGs 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, assurance of adequate radio equipment (mobile and portable radios), and assurance of adequate radio channels (dispatch, tactical, and command channels) [NIOSH 2014a, NIOSH 2014b, NIOSH 2015].

Because the IC is located at the Command Post (outside the hazard zone), interior crews should communicate the interior conditions to the IC as soon as possible. Interior conditions can change the incident commander's strategy and IAP. Interior crews can aid the IC 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 offers 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. An IC 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 IC with a continuous supply of top-grade, objective information. It is an IC'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. Members should refrain from transmissions that add little information to the IAP. As the incident progresses, the following relevant information needs to be exchanged between Command and companies operating on the fireground:

- Follow-up radio report—A CAN Report
- Safety concerns
- Status of water on the fire
- Additional detailed report of fire/smoke conditions and location(s)
- Status of personnel accountability (announce the initial accountability location)
- Disposition of resources

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- Rapid intervention crew in place and location
- Any notable results of the initial fire attack [Blue Card 2018].

***Recommendation #7: Fire departments should ensure that once Command is established at an incident, incident commanders maintain control of situation status, resource status, fireground communications, and ensures the completion of the tactical objectives.***

Discussion: Fireground SOPs/SOGs define the strategic goals and tactical objectives for the coordinated deployment of departmental resources for specific incidents and occupancies. SOPs/SOGs are based on factors not limited to but including department staffing; deployment capabilities; training competencies; apparatus, tools, and equipment; community risk assessment and building information, including height, area, construction class, and type of occupancy; and potential life hazard.

The first arriving resource will establish command of an incident. The initial scene size-up is communicated to the initial responding units with or without a command officer on the scene. The intent is to maximize efficiencies while minimizing confusion and duplication of effort. The strategy and tactics for an incident are dictated by the size-up, initial risk assessment, and situational report from the first arriving officer. If physical barriers make the 360-degree size-up impractical for the first arriving officer, the size-up of Side Bravo, Side Charlie, and Side Delta may be delegated to another fire department resource. The priority is to get a fire department unit to Side Charlie of the structure. However, unless an obvious life-safety issue exists (e.g., visible victims requiring immediate assistance), interior fire-fighting operations should not commence until a report from Side Charlie is received. A radio report of conditions, including those on Side Charlie, should be transmitted over the assigned tactical channel to the IC and the dispatch center.

The goal of effective fireground procedures is to increase the safety of the fire fighters, eliminate confusion, and prevent the loss of life [Fire and Rescue Departments of Northern Virginia 2013; NIOSH 2015]. This will ensure a strong command structure is developed and essential strategic-, tactical-, and task-level functions are performed by the incident commander, division/group supervisors, company officers, and firefighters.

**Strategic Level.** This organizational level is designed around the incident commander and incident advisory team operating in the command mode. The strategic level involves the activities necessary for overall operational control, considering critical fireground factors and the risk management plan in establishing objectives, determining the strategy, and developing an IAP, continuous review of the strategy, setting priorities, and allocating resources.

Strategic-level responsibilities include the following:

- Determining the appropriate strategy: offensive or defensive
- Establishing a strategic plan for the incident
- Setting priorities
- Obtaining and allocating resources
- Predicting outcomes and planning
- Assigning specific objectives to tactical-level units.

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**Tactical Level.** The first management “subdivision” of incident scene organization is accomplished by assigning division/group responsibilities. Officers operating at this level are responsible for the tactical deployment of assigned resources, evaluation, and communication with the IC. They are assigned by the IC and are supervised directly at the site of the assigned activity to meet the operational objectives given to them by the IC.

When Command appoints division supervisors, one of the most critical functions of Command is to ensure the division supervisor is accountable for all resources assigned under their span of control and for coordination with Command, the operations section chief, or other supervisory personnel at the same level. The division supervisor has the following responsibilities:

- Implement and manage the division IAP, which matches incident commander’s IAP
- Implement a risk management plan in the division
- Complete tactical priorities in the division
- Ensure positions always match conditions in the division
- Coordinate with other division supervisors as needed
- Manage the passport accountability system within the division
- Assist with division air management
- Manage work-rest cycles within the division
- Manage recycle & rehab within the division [Blue Card 2018].

**Task Level.** The task level of the organization is where the work is performed by assigned companies and other resources. The strategic and tactical levels are in place to support the task level. Company officers routinely supervise task-level activities [NFPA 2020a].

Additionally, this process compliments the defined knowledge, skills, abilities, competencies, and fireground experience to assist:

- The IC in how to plan and implement an effective strategy and IAP
- Division/group supervisors to formulate and follow tactics and maintain accountability of assigned resources
- Company officers to successfully carry out assigned tasks,
- Individual members to effectively perform their duties [FDNY 2011b; FIREScope 2015].

There are necessary tasks that need to occur at any fire regardless of the occupancy, such as the initial on-scene report upon arrival, initial risk assessment, situational report, water supply, deployment of hose lines and back-up hose lines, search and rescue, ventilation, initial rapid intervention crews, ground and aerial ladder placement, fire attack and extinguishment, and salvage and overhaul. Any change to operational priorities or responsibilities based on the above size-up should be clearly communicated to Command, all responding units, and the dispatch center via the assigned tactical radio channel [FDNY 2011b; TSFRS 2014]. Command is then obligated to re-broadcast and receive acknowledgement from all operating companies.

The procedures developed for fireground operations should be flexible enough to allow for change if any of the following issues occur or are present:

- Life hazard (must be given first priority)

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- Problems with water supply and water application
- Volume and extent of fire, requiring large caliber streams
- Location of the fire, if inaccessible for hand-line operations
- Materials involved in the fire and explosion potential compounding the problem
- Exposure problems where further fire spread would be a major concern
- Stability of the structure, which would be dependent on the condition of the structural components of the building, the intensity, and the duration of the fire [ISFSI 2013].

***Recommendation #8: 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: 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. The principles of command safety describe how the incident commander must use 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 2020a].

These 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].

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

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(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.

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

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 IC to re-evaluate 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 2021].

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.

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 2020a]. With a strategic mode change, a PAR should occur to ensure that all assigned resources are accounted for and are out



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of the hazard zone. Defensive operations should not start until the PAR is completed and all members are accounted for by resource status.

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

***Recommendation #9: Fire departments should ensure adequate staffing for deployment to urban incidents involving high hazard occupancies and a concentrated population.***

Discussion: Fire departments should ensure adequate staffing and a deployment strategy to ensure adequate resources are on-scene to conduct fire suppression operations for the likely hazards in their jurisdiction. The deployment strategy should allow for mutual aid for large fires and maintain adequate coverage for smaller incidents in their jurisdiction in cooperation with neighboring departments.

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* contains recommended guidelines for minimum staffing of career fire departments [NFPA 2020b]. NFPA 1710 states: “On-duty fire suppression personnel shall be comprised of the numbers necessary for firefighting performance relative to the expected firefighting conditions.” These numbers shall be determined through task analyses that consider the following factors:

- Life hazard to the populace being protected
- Provisions of safe and effective fire-fighting performance conditions for the firefighters
- Potential property loss
- Nature, configuration, hazards, and internal protection of the properties involved
- Research by NIST and UL on methods for strategically ventilating and isolating fires to delay or prevent flashover by use of manual door control (requires additional staffing)
- Types of fireground tactics and evolutions employed based on standard operating procedures, staffing, type of apparatus used, and results expected to be obtained at the fire scene [NFPA 2020b].

Following a community hazard/risk assessment, fire service leaders need to prepare a plan for timely and sufficient coverage of all hazards and the adverse risk events that occur. This plan is often referred to as a ***Standard of Response Coverage***. Standards of response coverage can be defined as written policies and procedures that establish the *distribution* and *concentration* of fixed and mobile resources of an organization [NIST 2013].

Resource distribution is associated with geography of the community and travel time to emergencies. Distribution is typically measured by the percent of the jurisdiction covered by the first-due units within a specified time frame [NFPA 2020b]. Concentration is also about geography and arranging the timing of multiple resources so that an initial “effective response force” can arrive on scene within the time frames established by community expectation and fire service leadership. Response time goals for

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first-due units (distribution) and for the total effective on-scene emergency response force (concentration) drives fire department objectives like fire station location, apparatus deployed, and staffing levels. The service level objectives established in any community drive response time performance of all responding resources and the assembly of effective on-scene firefighting (or EMS) response force. Both response time performance and assembly times subsequently drive resource distribution and concentration. If response times and force assembly times are low, it is more likely that sufficient resources have been deployed, which is associated with more positive outcomes from risk events. Conversely, if response times and force assembly times are high, it is more likely that insufficient resources have been deployed, which is associated with more negative outcomes. Other considerations by fire service leaders should include an assessment of the probability or likelihood that a particular event will occur.

Many cities struggle with staffing and deployment challenges. However, NFPA and best practices have suggested a minimum of 18 fire fighters (3 engines, a ladder, and a battalion chief with an incident command technician (ICT)) for a single-family residential structure fire. This deployment model example may or may not meet some fire departments' needs. Rapid intervention teams and rehabilitation also need to be taken into consideration in the deployment model.

NFPA 1710 states that both engine companies and truck companies shall be staffed with a minimum of four on-duty personnel. The standard also states that companies shall be staffed with a minimum of five or six on-duty members in jurisdictions with tactical hazards, high-hazard occupancies, high-incident frequencies, geographical restrictions, or other pertinent factors identified by the authority having jurisdiction. [NFPA 2020b]

Staffing studies have concluded that four-person crews were more effective than three-person crews once a water supply from an external source is established. Tasks that may be accomplished by a four-person crew include:

- two-person interior search and rescue with no hand-held back-up line
- two-person interior structural firefighting with no rescue component and no hand-held back-up line
- limited roof-level ventilation operations
- laddering operations
- salvage operations.

Four-person crews, depending on the circumstances, may also be capable of completing the following:

- use of a 2½-inch hose line
- establishment of a water supply from a static source
- establishment of a second point of entry and approach to the fire location in the structure
- preparing for search and rescue for person(s) in need of rescue.

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 15 firefighters and 1 command officer, for a total of 16 members on the scene of a residential structure fire in a typical 2,000-foot, two-story single-family

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dwelling without a basement and with no exposures within 8 minutes of travel time [NFPA 2020b]. If the aerial or platform is in operation, an additional member is 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, one ventilation crew, and a rapid intervention crew.

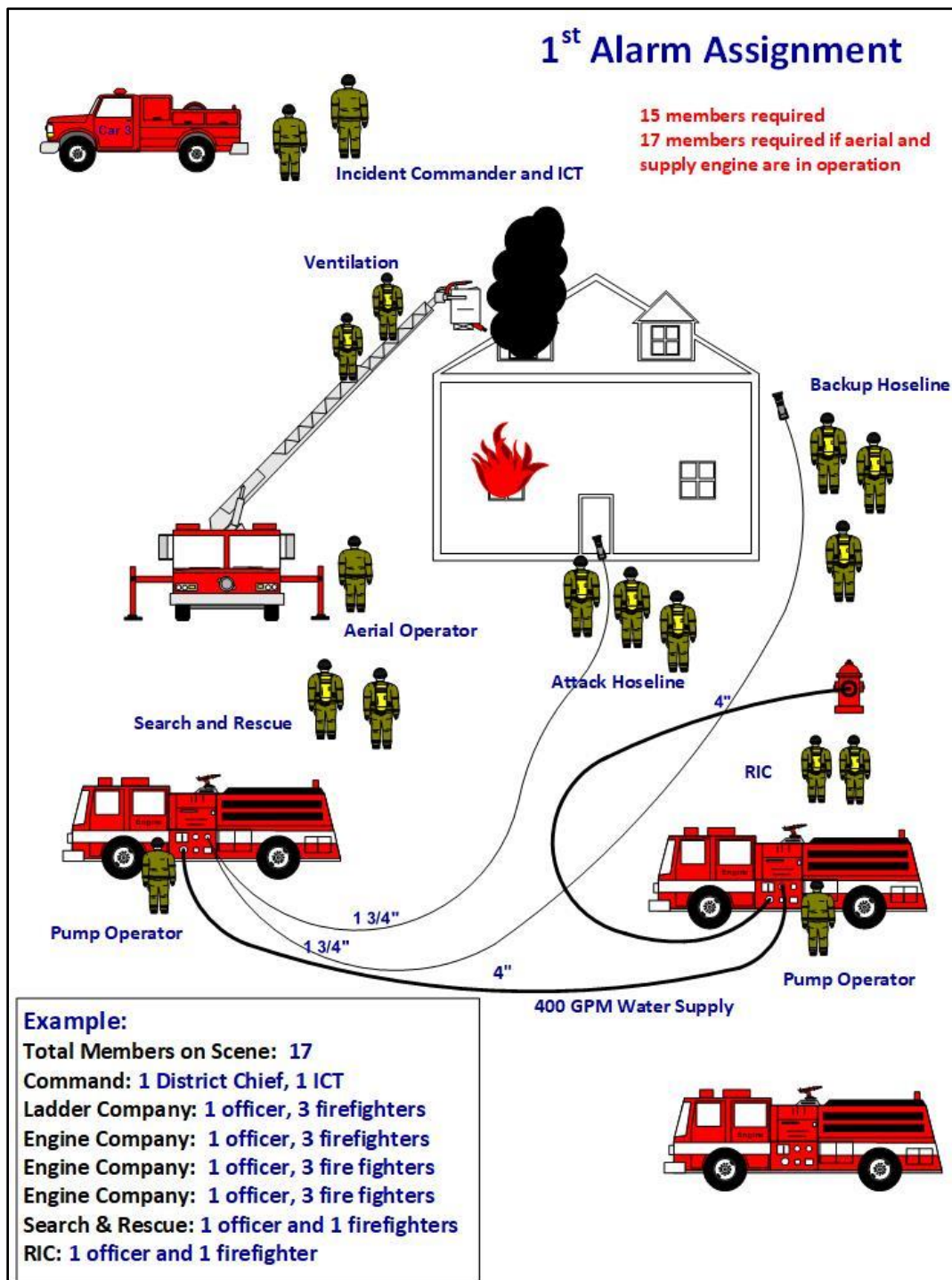
However, best practices suggest that residential structures that exceed these characteristics, but do not fit a high-rise or high-hazard occupancy, should receive a minimum full-alarm assignment of 25 firefighters, 1 command officer, and 1 incident command technician for a total of 27 personnel on the scene of a structure fire within 8 minutes of travel time [NFPA 2020b]. If the aerial or platform is in operation, an additional member is required. This staffing allows for two attack lines to be stretched to an upper floor, one back-up hose line, two search and rescue crews, one interior forcible entry/ventilation crew, one exterior ventilation crew, and a 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 [NFPA 2020b].

The effectiveness of increasing staffing 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 2020b] (**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, and indicated 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 should 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 hose line and stretch it to the fire. After assisting the operator, the third firefighter should begin to assist the other two firefighters with advancing the hose line 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 around of the structure to assess the situation, determine the extent of the fire, request any additional resources, and assume Command. The driver/operator of the first arriving ladder company should 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.

In many departments, company officers are primarily responsible for crew management, crew safety, crew accountability, and communication with other operating units on scene and with the incident commander. These company officers do not directly engage in stretching hose lines, advancing and operating hose streams, normal truck company operations including ventilation, or related tasks. The officer can be available to focus on crew management, situational awareness, and crew accountability.

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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.**

However, officers will assist in conducting searches and removing victims when necessary. These officer tasks are essential to firefighter and civilian life safety, since studies show that situational



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awareness and human error are contributing factors in nearly 20% of the fireground line-of-duty deaths, and that 40% of firefighter injuries are attributed to situational awareness [NIST 2013]. Urban fire departments should staff companies commensurate with the tactical hazards, high-hazard occupancies, high incident frequencies, geographic restrictions, and other pertinent factors that are common in urban environments.

At this incident, engine and ladder companies operated with an officer and two firefighters. The staffing levels are consistent throughout the city. Based upon the workload of the fire department (call volume, working fires, and deployment criteria), this staffing allows for tasks to be completed based upon the capabilities of the company.

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

Discussion: 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 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 Rapid Intervention Crew (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 2021].

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 priority on the radio channel and will provide 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. It is important to remember that the safest way to remove a downed firefighter from an upper level of a building is by using stairs if feasible.



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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. 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 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 removal through a window are the "Denver" and "Fulcrum" techniques [Pindelski, J. 2010].

The IC is required to revise the strategy and IAP (tactics) to incorporate a priority rescue. This will impact fireground communications. A Mayday condition is transmitted on the radio, using distinctive emergency traffic alert tones. Then the IC 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 IC to support the rapid intervention group supervisor with appropriate and adequate resources to manage the Mayday. At the same time, the IC 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 IC should ensure that firefighting operations are continued in conjunction with the rescue operations, especially in the area around 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 rapid intervention group 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 rapid intervention group include:

- Responding to the Mayday from the inside out
- Managing communications with the "downed" firefighter
- Managing the search and rescue efforts for the "downed" firefighter if necessary
- Increasing and maintaining resources assigned to the rapid intervention group
- Managing the logistical support well
- Improving survivability and tenability
- Improving ventilation
- Increasing exterior access for the rapid intervention group
- Utilizing the RIC bag and requesting additional RIC bags if necessary
- Recognizing and supporting the help order of a Mayday

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- Positioning or staging crews in an on-deck position or outside of the rapid intervention group as a tactical reserve
- Requesting additional resources from the IC
- Overseeing crews from other groups or divisions
- Requesting additional staged resources
- Communicating with surrounding divisions and groups.

### **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 self-help/self-rescue techniques
- Conserve 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

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*company officer; the on-deck company remains on-deck until assigned by the IC 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].

### ***Strategic level Mayday responsibilities***

When a Mayday is declared on the fireground, the IC 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 the dispatch center 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 IC 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 IC 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: A checklist can assist the incident commander in ensuring the necessary steps are taken to clear the Mayday as quickly and safely possible. A 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 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.

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

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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 2020a]. **Note:** A checklist is provided in **Appendix Two, Incident Commander's Tactical Worksheet for Mayday**.

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

Discussion: Training is frequently 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 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.

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. Per the IAFF Fire Ground

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Survival Training Program, 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 that company officers are trained to operate with limited staffing, to ensure the essential task level functions are performed.***

Discussion: Most fire departments face or struggle with budget shortages which impact their staffing capabilities, training needs, equipment upkeep, and policy compliance which ultimately effects the safety of their firefighters. 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 should 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.

Task level operations may take longer and be less efficient. The incident commander needs to 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 recognizes that not all tactical objectives may be able to be addressed



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immediately with reduced staffing. Tactical objectives should 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 hose line
- 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 hose lines and flowing water are essential skill sets. While training with limited staffing is difficult and time consuming, it needs to take place. In order to maximize time, fire departments should focus on individual skill work (stretching hose lines, 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 must 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)
- Identify the safest, most appropriate attack position
- Establish the life safety profile of the incident
- Confirm the initial strategy and IAP [Blue Card 2018].

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

If the company officer arrives before a command officer, the company officer should assume Command for a finite period, 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 hose line 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, 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; 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.

***Recommendation #14: Fire departments should ensure that all unassigned resources are dispatched to a designated staging area or base per standard operating procedures.***

Discussion: 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 resources, confirms availability, and then orders the resources into

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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].

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 2020a]. 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 2020a].

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 2020a].

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

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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 know which are available for assignment, where they are located, and where specific units already are assigned.

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 2021].

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 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 2020a].

***Recommendation #15: Fire departments should develop and implement a professional development plan for firefighters to ensure for career enhancement and maintain knowledge, skills, abilities, and competencies for emergency response.***

Discussion: The primary goal of all training, education, and professional development programs is the reduction of occupational injuries, illnesses, and fatalities. As members progress through various duties and responsibilities, the department should ensure the introduction of the necessary knowledge, skills, and abilities to members who are new in their position as well as ongoing development of existing skills. To build a successful training plan, it is critical to develop the plan in a systematic and functional manner. Training occurs in the fire service to improve the skills of firefighters as well as the overall response capabilities of the department while meeting national standards. Therefore, it is critical to build a structured plan that meets all these criteria [Clark 2017].

Each fire department should develop an annual training plan that will be a combination of minimum company standards, special operations training, and opportunity training. This process should consist

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of fire suppression, EMS, hazardous materials, technical rescue, water rescue, and various firefighter safety topics. The annual training plan should serve as the training calendar for the given year but is also the basis for multi-year planning. Classes should be rotated on a minimum three-year basis to ensure a variety of opportunities are offered. Classes such as Instructor I and II, Fire Officer I and II, National Fire Academy classes, and others will be offered on a rotating basis. Live fire training evolutions should be conducted at least once every year. All training should be delivered in varying formats. Classroom presentations, quick drills, practical evolutions, or web-based training should be utilized throughout the course of the year [Springfield Fire Department 2014].

When developing a formal training plan, the first step is to evaluate and build upon existing training standards, such as NFPA professional qualifications standards. Each fire department is structured differently to meet the needs of their community. Therefore, training plans must be designed based on services provided by a fire department and the department's mission statement. NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program*, Chapter 4, "Fire Department Administration," states in paragraph 4.1.2, "The fire department shall prepare and maintain written policies and standard operating procedures that document the organization structure, membership, roles and responsibilities, expected functions, emergency operations. and training requirements, including the following:

- The types of standard evolutions that are expected to be performed and the evolutions that must be performed simultaneously or in sequence for different types of situations
- The minimum number of members who are required to perform each function or evolution and the manner in which the function is to be performed in accordance with NFPA 1710 [NFPA 2020b] or NFPA 1720 [NFPA 2020c]
- The number and types of apparatus and the number of personnel that will be dispatched to different types of incidents in accordance with NFPA 1710 [NFPA 2020b] or NFPA 1720 [NFPA 2020c]
- The procedures that will be employed to initiate and manage operations at the scene of an emergency incident
- Post-incident control and mitigation of emergency scene contaminants" [NFPA 2021]

These programs should include information to ensure that members are trained prior to performing individual duties, as well as ongoing professional development to ensure competency. The training plan continues to serve as a comprehensive all-hazards approach that meets or exceeds federal, state, and local regulations as well as the needs of fire department personnel. This approach allows the department to maintain operational and response capabilities to the customers they serve. The plan is designed to be specific yet allows for flexibility in the event of training that is made available or as departmental needs dictate. The plan includes a detailed calendar for the year, which allows the company officers and command staff to balance other duties and priorities throughout the course of the year [Maness 2013].

Training programs should include but not be limited to the following:

- Community risk reduction (fire prevention, public education, investigation, etc.)
- Safety, health, and wellness
- Fire suppression
- Emergency medical services



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- Human resources (leadership, supervision, interpersonal dynamics, equal employment opportunity, etc.)
- Incident management system
- Hazardous materials
- Technical rescue
- Information systems and computer technology
- Position-specific development (fire fighter, company officer, chief officer, telecommunicator, investigator, inspector, driver/operator, etc.) [NFPA 2021].

NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness 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 the members through department training and education programs” [NFPA 2021].

Finally, the responsibility of the fire service is to save lives, stabilize incidents, and conserve property. This is accomplished through effective and structured training prior to an emergency response. A well-developed annual training plan will ensure continuity across a fire department and will maintain and improve knowledge, skills, and abilities in all members. All members must take it upon themselves to continually improve and train new fire service members so the department can respond effectively to any emergency incident.

***Recommendation #16: States and municipalities should consider adopting and enforcing regulations for interventions to reduce or eliminate the spread of fire in renovated multi-family structures, including automatic sprinkler systems and self-closing doors.***

Discussion: This recommendation focuses on fire prevention and minimizing the impact of a fire if one does occur. 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]. Although municipalities have adopted specific codes and standards for the design and construction of buildings, structures erected prior to the enactment of these building codes may not be compliant. Such new and improved codes can improve the safety of existing structures [NFPA 2008]. Sprinkler systems are one example of a safety feature that can be retrofitted into older structures. Sprinkler systems can reduce firefighter and civilian fatalities since such systems can contain and may even extinguish fires prior to the arrival of the fire department.

Fire development beyond the incipient stage is one of the greatest hazards that firefighters face in today’s combustible environment. This exposure and risk to firefighters can be dramatically reduced when fires are controlled or extinguished by automatic sprinkler systems. NFPA statistics show that most fires in sprinklered buildings are controlled prior to fire department arrival by the activation of

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one or two sprinkler heads. The presence of automatic fire sprinklers also reduces the exposure risk to firefighters in rescue situations by allowing the safe egress of building occupants before the fire department arrives on-scene. Finally, the exposure to hazards such as building collapse and overhaul operations are greatly reduced, if not eliminated, when fire development is arrested and controlled.

The Commonwealth of Massachusetts requires the installation of a sprinkler system in renovated 3-family occupancies. It is unclear when this occupancy was last renovated from 3-family to 4-family occupancy and whether the renovation occurred after this code was enacted.

Another important factor is requiring self-closing apartment exit doors to ensure that a fire does not spread due to an open apartment door. Closed doors can reduce the flow path of a fire, prevent fire spread, and protect other building occupants from smoke and fire. Self-closing doors are an effective method for slowing down the spread of a fire providing sometimes critical, life-saving time for fire and rescue personnel to do their job and allow individuals to escape the fire or be rescued. It is imperative that where such doors are in place or required that they are unobstructed and that the self-closing mechanisms are always fully operational. Such self-closing mechanisms should be included as a routine inspection item to ensure proper operation of the mechanism. In situations where the mechanism is not functioning due to resident action, management should treat this as a violation of the lease and take appropriate action on a case-by-case basis. The importance of the proper functioning of self-closing doors should be addressed during regular, on-going resident education programs on fire safety.

Finally, emergency egress doors in residential properties should never be locked from the inside barring emergency egress. There are some exceptions to this in certain types of facilities, but where this is necessary there are specific procedures that must be followed in accordance with local/state requirements [USDHUD 1999].

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### **Investigator Information**

This incident was investigated by Matt Bowyer, General Engineer, Murrey Loflin, Investigator, and Jeff Funke, Occupational Health and Safety Specialist with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. An expert technical review was provided by Vincent P. Mulray, Deputy Chief, Philadelphia Fire Department. A technical review was also provided by the National Fire Protection Association, Emergency Response & Responder Safety 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.

### **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 (2020 edition)**

The primary focus of the revision to NFPA 1561 in the 2020 edition, the standard has mostly been refined to reflect the latest information and best practices in incident management. New requirements for positional best colors have been added to the mandatory section of the standard. This will make incident management team members universally identifiable based on the color of vest they don for

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their assigned role. Language was added to prevent the “incident within an incident” practice of managing emergencies or Maydays at large-scale incidents. It is imperative that the incident commander stay in control of the entire incident and not become overly committed to the emergency. This can be accomplished by assigning a supervisor to the rapid intervention group to the emergency. Annex C: *Use the Planning “P” When Developing an Initial Incident Action Plan* has been completely revised to reflect the latest “Planning P” diagram and the best practices for creating an incident action Plan.

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\*](#) (2020 edition), from NFPA.

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### **Appendix One SCBA Evaluation and Testing Report 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 23616**

**Note: The full report is available at is at:**

[PPE Case Report TN-23616 Fire Department, Massachusetts – Status Investigation Report \(cdc.gov\)](#)

#### **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, one 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 report provides a summary of NPPTL's inspection and evaluation methods, and findings for a SCBA that was used by the fire department lieutenant during a fatal event. The SCBA was the Scott® Safety Air-Pak® Model 4.5, 45-minute, 4500 psi unit. The NIOSH Division of Safety Research, Surveillance and Field Investigation Branch, Fire Fighter Fatality Investigation and Prevention Program (NIOSH/DSR/SFIB/FFFIPP) investigators and the fire department were advised that NIOSH NPPTL would provide a written report of the evaluation and any applicable test results.

NIOSH/DSR/SFIB/FFFIPP investigators submitted fire department SCBA unit to NIOSH NPPTL for evaluation and testing. The SCBA unit was delivered via FedEx in a plastic box to Lab H1513 in the NIOSH facility in Morgantown, West Virginia on December 18, 2019.

On December 31, 2019, NPPTL employees Jay Tarley and Angie Andrews inspected the SCBA unit. The SCBA unit remained in Lab H1513 throughout the inspection and testing process. The SCBA was identified as belonging to the fire department and was visually examined, component by component, in the condition received to determine the conformance of the unit to the NIOSH-approved configuration. The unit was identified as the Scott® Safety Air-Pak® Model 4.5, 45-minute, 4500 psi unit, with NIOSH Approval Number TC-13F-212CBRN.

#### **SCBA Inspection**

On December 31, 2019, NPPTL employees Jay Tarley and Angie Andrews inspected the SCBA unit. The SCBA unit remained in Lab H1513 throughout the inspection and testing process. The SCBA was identified as belonging to the fire department and was visually examined, component by component, in the condition received to determine the conformance of the unit to the NIOSH-approved configuration. The unit was identified as the Scott® Safety Air-Pak® Model 4.5, 45-minute, 4500 psi unit, with NIOSH Approval Number TC-13F-212CBRN.

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### **SCBA Testing**

The SCBA unit inspected and evaluated by NPPTL was a Scott® Safety Air-Pak® Model 4.5, 45-minute, 4500 psi unit with NIOSH Approval Number TC-13F-212CBRN. The firefighter was wearing the unit when the event occurred. A corresponding facepiece was provided with the unit. The provided cylinder was not suitable for testing; therefore, we used one of NPPTL's cylinders for testing.

Overall, the SCBA was in fair condition. The NFPA approval label was present and readable. The PASS, HUD, and Vibralert all functioned. The SCBA unit leaked air from the high-pressure hose until approximately 3500 pounds per square in gauge (psig) during the NIOSH Positive Pressure Test and still met the test requirements, as the SCBA maintained a positive pressure for the 45-minute minimum duration of the test. The unit passed all the other NIOSH tests, as well as met the requirements for the NFPA "Airflow Performance" test. The information obtained during this investigation does not suggest that the components tested contributed to the fatality. The SCBA was returned to the shipping container to be shipped back to the fire department.

### **Summary and Conclusions**

No evidence was identified to suggest that the SCBA unit inspected and components evaluated contributed to the fire fighter fatality. NIOSH determined that there was no need for corrective action with regards to the approval holder or end user of the SCBA manufactured under the approval number granted to this product.

Actions to be taken by the fire department with SCBAs involved in an incident:

- Any SCBA unit involved in an incident may not be placed back in service until the SCBA has been repaired, tested, cleaned, and any damaged components replaced and inspected by a qualified service technician, including such testing and other maintenance activities as prescribed by the schedule from the SCBA manufacturer.
- All SCBA units, even those not involved in an incident, must undergo a flow test on at least an annual basis.
- Sign up for [NPPTL's Listserv](#) to receive email notifications relevant to PPE.

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## Appendix Two Incident Commander’s Tactical Worksheet for a Mayday

### LOS ANGELES FIRE DEPARTMENT

**MAYDAY  
"IC PROCEDURES"**

INITIATE EMERGENCY TRAFFIC TONES FOR 3 SECONDS
--

<b>"ALL COMPANIES CLEAR THIS CHANNEL FOR A MAYDAY, MEMBER CALLING THE MAYDAY GO"</b>
--

ACKNOWLEDGE AND DETERMINE (WHO WHAT WHERE)
--

<b>"MEMBER CALLING MAYDAY INITIATE GRAB LIVES HELP IS ON THE WAY"</b>
---

DEPLOY THE RIC/RIG
--------------------

INITIATE EMERGENCY TRAFFIC TONES FOR 3 SECONDS
--

<b>"ALL COMPANIES WE HAVE A MAYMAY (WHO WHAT WHERE) MAINTAIN CURRENT OPERATIONAL POSITION UNLESS REDIRECTED FOR RESCUE. CONDUCT A PAR"</b>
--

MAINTAIN COMMUNICATIONS WITH THE MEMBER DECLARING THE MAYDAY
--

<b>"METRO WE HAVE A MAYDAY (WHO WHAT WHERE)"</b>
--

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**

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

**"WHERE"**

**"GRABLIVES"**

RADIO CHANNEL	SCBA GAUGE: E	1/4	1/2	3/4	FULL
ACTIVATE PASS	YES				NO
CONTROL BREATHING	YES				NO
STAY LOW	YES				NO
TURN ON LIGHT	YES				NO
MAKE NOICE	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 <sup>ST</sup> TEAM @		2 <sup>ND</sup> TEAM @		

MEMBER/COMPANY FOUND AT = \_\_\_\_\_  
 MEMBER/COMPANY OUT AT = \_\_\_\_\_  
 COMPLETE PAR/CAR  
      ANNOUNCE "MAYDAY" CLEARED AT = \_\_\_\_\_

**Diagram 14. Mayday Tactical Worksheet**  
(Diagram courtesy of the Los Angeles Fire Department)