



Fire Fighter Dies after a Fall from the Platform of an Elevated Tower Ladder – New York

Executive Summary

On April 20, 2017, a 42-year-old male career fire fighter from Tower Ladder 135 died after being ejected from the platform of a tower ladder. At 1420 hours, the fire department dispatched Battalion 44, Engine 277, Engine 286, Engine 291, Ladder 112, and Tower Ladder (TL) 135 for Box 4017. Engine 277 arrived on scene at 1422 hours. Ladder 112 arrived on scene at 1423 hours. The officer of Ladder 112 radioed the borough dispatcher to transmit a 10-75 (working fire) for Box 4017 at 1425 hours. The additional response for the 10-75 to Box 4017 was: Battalion 35, Squad 252, which was assigned as Engine 252, Squad 288, Ladder 140 (FAST Truck), and Rescue 4. The fire was knocked down at 1431 hours. The outside

vent (OV) fire fighter for Tower Ladder 135 climbed into the tower ladder platform at approximately 1430 hours. The ladder company chauffeur (LCC) operated the platform from the pedestal and moved the platform to the 2nd floor of the fire building. He stopped the platform to check on a woman in a 2nd floor window. She needed no assistance and was told to shelter in place. The LCC moved the platform towards the 5th floor rooftop fire escape. As the platform passed the 4th floor the LCC radioed the OV fire fighter in the platform to take over the control of the platform. The time was approximately 1434 hours. The OV fire fighter talked to a woman on the 5th floor fire escape and she needed no assistance. She was sent to the ground through the Exposure B apartment building via the interior steps. The OV fire fighter moved the platform to the roof and over the parapet wall. After a brief conversation with the roof fire fighter from Ladder 112 the OV fire fighter tried to move TL135's platform. He thought he was having trouble with the platform's joystick, but actually the brackets under the platform were caught/stuck on the concrete cap of the parapet wall. The OV fire fighter asked the LCC to take control of the platform. The LCC also had trouble moving the platform and, like the OV, could not see the reason for the problem. At 14:38:59 hours, the platform suddenly released from the parapet cap



Tower Ladder 135 above the inside portion of the parapet wall. The platform jerked upwards after being released from the parapet wall ejecting the TL135 fire fighter from the platform.

(Photo courtesy of the fire department.)

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causing a violent upward movement and ejecting the OV fire fighter from the platform. The fire fighter fell 5 stories to the concrete sidewalk below. Fire fighters from other companies rushed to provide medical care of the fire fighter. The fire fighter was moved to a stretcher and placed in Medic Unit 45Y. He was transported to a trauma center at 1443 hours and arrived at 1445 hours. The fire fighter was pronounced dead at 1518 hours.

Contributing Factors

- *Building construction and roof operations*
- *Procedures for operation of a tower ladder*
- *Apparatus platform design*
- *Training*
- *Multi-family residential building not sprinklered*

Key Recommendations

- *Fire departments should ensure that fire fighters recognize roof design, height restrictions, and safety issues when operating tower ladders in the close vicinity of parapet walls*
- *Fire departments should ensure that tower ladders and other aerial platforms are designed to reduce or eliminate the potential for snagging on buildings or other surfaces*
- *Fire departments should ensure fire fighters use the escape harness carabineer or ladder belt to secure to the platform during tower ladder operations*
- *Fire departments should provide proficiency training for fire fighters on the operations of tower ladders.*

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH Fire Fighter Fatality Investigation and Prevention Program, which examines line-of-duty deaths or on-duty deaths of fire fighters to assist fire departments, fire fighters, the fire service, and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with state or federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency's reports do not name the victim, the fire department, or those interviewed. The NIOSH report's summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency's recommendations and is not intended to be definitive for purposes of determining any claim or benefit.

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



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Introduction

On April 20, 2017, a 42-year-old male career fire fighter from Tower Ladder 135 died after falling 5 stories from the platform of a tower ladder that was responding to a multiple dwelling fire. On April 24, 2017, the U.S. Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On June 11, an investigator and an occupational physician from the NIOSH Fire Fighter Fatality Investigation and Prevention Program traveled to New York to investigate this incident. The NIOSH investigators met with the department’s accident investigation team, officials of the fire department, and with representatives from the Uniformed Firefighters Association. The NIOSH investigators reviewed witness statements of fire fighters and officers involved in the incident plus examined incident scene photographs and video of the fireground. The NIOSH investigators also reviewed the department’s fireground standard operating procedures. The NIOSH investigators visited and photographed the incident site.

Fire Department

This career fire department employs approximately 10,200 uniformed members and over 3,600 uniformed EMTs and paramedics. The fire department provides fire protection; technical rescue; primary response to biological, chemical and radioactive hazards; and emergency medical services.

The department's executive staff is divided into two areas that include a civilian Fire Commissioner, who serves as the head of the department and the Chief of Department who serves as the operational leader of the department. The executive staff includes several civilian fire commissioners who are responsible for the many different bureaus within the department, including the Chief of Department, the Chief of Fire Operations, the Chief of EMS, the Chief Fire Marshal, and other staff chiefs. Staff chiefs include the seven citywide tour commanders, the Chief of Safety, the Chief of Fire Prevention, and the Chief of Training.

Operationally and geographically, the department is organized, into five Borough Commands. Within those five Borough Commands exist nine Divisions, each headed by a deputy division chief. Within each Division are four to seven Battalions, each led by a battalion chief. The department operates 49 battalions. Each battalion consists of three to eight firehouses and consists of approximately 180–200 fire fighters and officers. Each firehouse consists of one to three fire companies. Each fire company is led by a captain, who commands three lieutenants and nine to twenty firefighters. There are currently four shifts of fire fighters in each company. Tours can be either day tours (0900 hours to 1800 hours) or night tours (1800 hours to 0900 hours). Each tour/shift is commanded by a lieutenant or the company captain. An engine company is staffed by an officer and three to four fire fighters. A truck company or ladder company is staffed by an officer and five fire fighters. A rescue company is staffed

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by an officer and five fire fighters and a squad company is staffed by an officer and five firefighters. A marine company is staffed by an officer and four fire fighters and the hazardous materials (haz-mat) company is staffed by an officer and six fire fighters.

The department faces multifaceted firefighting challenges unique to this city. For example, the department responds to building types ranging from wood-frame single family homes to high-rise structures. In addition, the department is responsible for rescue operations in secluded bridges, tunnels, the city's subway system, and large parks and wooded areas.

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

Box Numbers

Each address in the city is assigned a box number, based on the closest street, special building or highway box. The term "box" refers to the Fire Alarm Boxes, which at one time lined street corners and in front of certain buildings. Each Fire Alarm Box was given a specific number by the department's Bureau of Communications. Even if the physical fire alarm box is no longer at a specific address or street corner, the address or street corner is still assigned that fire alarm box's number. Box numbers can be duplicated in different boroughs, which is why they are always identified by borough name or numerical prefix on the computer. If there is also a street address given to the dispatchers, the responding apparatus will get this information in the firehouse, over the air, and via their mobile data terminals (MDTs) in their apparatus, in addition to the Box number. At present there are about 16,000 physical fire alarm street boxes in the City, with many additional special building boxes and highway boxes, as well as "dummy boxes" used for special response assignments.

Critical Information Dispatch System

Critical Information Dispatch System (CIDS, pronounced by the dispatcher as "SIDS") information is transmitted to units in the firehouse and enroute. It is information that is collected on a building during inspections and by public input, which would have an impact on fire-fighting operations, including

- warehoused apartments,
- type and length of line stretch (or hose),
- number of apartments per floor,
- unsafe conditions,
- standpipe conditions,
- and, anything else the Bureau of Fire Communications or the Staff Chiefs deem important.

This information is printed on the fire ticket and can be read by the dispatcher if requested. This information is also read automatically when a signal 10-75 (working fire) or higher signal is given or when the supervising dispatcher deems it is important for the units to have this information before arrival at an incident.

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Radio and Bell Code Signals

The Fire Department utilizes a system of ten-code radio signals as well as an internal one involving "bell codes" (...tracing their origin to the days when coded telegraph signals were sent over a closed, wired system within the Department...) to transmit and relay information involving both emergency communications and general, Departmental operations. There are 55 "10-codes" used by the Department. There are also sub-codes specific to some of them. The department is currently one of the last, large fire departments in the country using "10-Codes" as opposed to "plain English" to communicate information by radio

Engine Companies

Department engine companies are tasked with securing a water supply from a fire hydrant, then extinguishing a fire. The apparatus of an engine is known as a pumper truck and carries a pump (usually 1,000-2,000 gallons per minute), a water tank (usually 500 gallons), fire hoses of varying diameters (usually 1¾-inch, 2½-inch, 3-½ inch and 5-inch) in 50 foot lengths, emergency medical supplies, ground extension ladders, and an assortment of tools.

Engine companies are staffed with an officer and four to five fire fighters. Engine company members are designated for job assignments as follows:

- Officer
- Engine company chauffer (ECC)
- Nozzle – operates nozzle for fire attack
- Backup – assists nozzle with hoseline placement
- Control – hooks up hose to standpipe at high-rise events, controls hoseline stretch
- Doorman – assists in stretch (if the engine company has five fire fighters).

Ladder Companies

Department ladder companies (also known as truck companies) are tasked with search and rescue, forcible entry, and ventilation at the scene of a fire. A ladder company can operate three types of ladder trucks: an aerial ladder truck, equipped with a 100-foot aerial ladder mounted at the rear of the apparatus; a tower ladder truck, equipped with either a 75-foot or 95-foot telescoping boom and platform mounted in the center of the apparatus; or a tractor-drawn aerial ladder truck, or tiller/tractor trailer, equipped with a 100-foot aerial ladder. A ladder company carries various forcible entry tools, ventilation tools, an assortment of ground ladders, and rescue tools to deal with an assortment of fires and emergencies, including motor vehicle incidents.

Ladder companies are staffed with an officer and five fire fighters. Ladder company members are designated for job assignments as:

- Officer
- Ladder company chauffer (LCC)
- Roof – goes to roof or floor above fire
- Outside vent – goes to rear of structure: in high-rise operations, controls the elevator
- Irons – carries forcible entry tools

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- Can – carries a water can for firefighting

Rescue Companies

Department rescue companies are composed of the elite, highly and specially trained, most experienced members of the fire department. A rescue company is tasked with responding to and dealing with specialized fire and rescue incidents that are beyond the scope and duties of a standard engine or ladder company. Rescue companies operate rescue trucks, colloquially known as "tool boxes on wheels", which carry a wide variety of specialized tools and equipment to aide in operations at technical rescues, collapse/confined space rescues, water/dive rescues, or high-angle/below-grade rescues. They respond to all fires within their response district as well.

Squad Companies

Department squad companies are also composed of specially trained firefighters of the fire department. Squad companies were initially established to serve as "manpower companies" to supplement the manpower and operations of engine and ladder companies. Squad companies can function as either engine or ladder companies at the scene of a fire, but are also equipped with similar equipment and specialized tools as the rescue company. In particular, members of a squad company are highly trained in mitigating hazardous materials (haz-mat) incidents, supplementing the department's single haz-mat company. Squad companies also operate a small step van as a second piece of apparatus in response to haz-mat incidents. The department operates the following squad companies: Squad 1, Squad 18, Squad 41, Squad 61, Squad 252, Squad 270, and Squad 288.

Hazardous Materials Company

The department's hazardous materials (Haz-Mat) company responds to all major city-wide hazardous materials incidents, building collapses, contamination-related incidents, terrorism-related disasters, major emergencies, and a variety of other incidents in which their services may be needed. Like the rescue and squad companies, members of the haz-mat company are experienced and specially trained to deal with hazardous situations. The haz-mat company is supplemented by the squad companies primarily, the rescue companies, and a handful of engine companies whose members are certified haz-mat technicians. These engine companies, like the squad companies, also operate smaller step vans that carry haz-mat equipment.

Marine Companies

The department's Marine Companies are the Fire Department's fireboats and are tasked with SCUBA/dive rescue and off-land firefighting in the city's rivers and harbors. The department's three Marine Companies operate large fireboats and smaller, secondary rescue boats to respond to various marine-related emergencies

Fireboats

In addition to its engine, truck, and rescue companies, the department operates three Class I fireboats as Marine Companies:

- **Marine 1** – *Three Forty Three*

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- **Marine 6** – *Bravest*
- **Marine 9** – *Fire Fighter II*

Fire Department Vehicles

- **Battalion Chief's Unit:** A battalion chief's unit is a command vehicle tasked with the responsibility of delivering a battalion chief to the fire scene. Once on the fire scene, the battalion chief takes command, utilizing its radios and MDT equipment. There are 53 battalion chiefs in the department per shift.
- **Division Chief's Unit:** A division chief's unit, like a battalion chief's unit, is a command vehicle tasked with the responsibility of delivering a Division Chief to the fire scene. Once on the fire scene, the division chief takes command, utilizing its radios and MDT equipment. There are 10 division chiefs in the department per shift.
- **Mask Service Unit (MSU):** These vehicles deliver refilled breathing air cylinders used by fire fighters.
- **Recuperation and Care Unit (RAC):** A vehicle that is specially outfitted with equipment that will enable it to provide rehabilitation to fire fighters on a fireground.
- **Field Communications Unit (Field Comm):** A vehicle that is specially equipped with communication equipment such as telephones, broadband internet, and mobile radios. The main responsibility is to provide communication support to the on-scene incident commander.
- **Tactical Support Unit (TSU):** A 4x4 vehicle equipped with generators and a variety of high intensity lights to aid fire fighters during low light conditions. In addition, specialized equipment such as extrication tools and a six-person Avon boat is also carried.
- **Thawing Unit:** The thawing units are vehicles that carry a portable steam-generating boiler. The super-heated steam melts the ice off of hoses, ladders and vehicles.
- **Brush Unit:** A vehicle that is a four-wheel-drive, all-terrain unit used to reach hilly, remote and marshy areas to extinguish fires involving weeds, grass and other vegetation. Along with regular firefighting equipment, it carries its own water, as well as rakes, shovels, and backpack extinguishers.
- **Ambulance:** The fire department staffs EMT-Basic and EMT Paramedic ambulances to provide emergency medical services to the city. These are commonly referred to by the slang term *bus*.
- **Haz-Tac Ambulance:** 39 EMS Units are known as the hazardous material tactical units (Haz-Tac Ambulances), are trained to the haz mat technician level allowing them to provide emergency medical care and decontamination in a hazardous environment, in addition to their normal duties.
- **Rescue Medic:** An ALS or paramedic ambulance that are trained to the haz-mat technician level and are also trained as rescue medical technicians specializing in medical care in austere environments.
- **EMS Conditions Unit:** A vehicle that is assigned to an emergency medical service supervisor. An emergency medical service supervisor oversees ambulances within his or her assigned area.
- **Haz-Tac Battalion Unit:** A vehicle that is assigned to an emergency medical service supervisor. This officer is the commanding officer of the department's EMS Special Operations

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Command (SOC) unit. The officer is trained as a hazmat technician and as rescue technician. The unit responds to specialty assignments to oversee the medical management at special assignments and the overall operation of the Haz-Tac Battalion.

Training and Experience

The state of New York requires that fire departments train career fire fighters to a level equivalent to National Fire Protection Association (NFPA) 1001, *Standard for Fire Fighter Professional Qualifications* [NFPA 2013a]. The state also requires 100 hours of annual in-service training.

The fire department operates and maintains its own fire training academy. Recruits are selected from a civil service examination list maintained by the city. The fire department requires all fire fighters to complete an 18-week training program at the department's fire academy. At the completion of recruit school, the fire fighter recruit receives the following certifications:

- NFPA 1001, *Standard for Fire Fighter Professional Qualifications*; Fire Fighter I and Fire Fighter II
- NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents, Awareness and Operations*
- Certified First Responder – Defibrillator (CFR-D).

After graduating from the fire academy, the recruits go through an 18-month probationary period. The recruit fire fighter becomes a probationary fire fighter and is assigned to an engine company or ladder company. The probationary fire fighter is evaluated by the officer at 3, 5, 8, 11, and 17 months.

In-service training for fire department members consists of the following:

- Company-level training
- Fire Academy – All companies attend training at the Fire Academy at least twice a month. As many as 60 companies per day go out of service and report to the academy for training.
- KIOSK training: The fire department operates a number of websites and on-line training materials devoted to member training, safety, and preparedness. This training process is designed to assist with keeping members informed of the latest tactics and information from department and fire service subject matter experts. Members are required to complete 1 hour of training per each tour worked (day and night tours).

All training at the Fire Academy is tracked electronically allowing the training division staff to identify fire fighters whose training needs updating. All instructors at the Fire Academy are New York-state certified fire instructors (NFPA 1041, *Standard on Fire Service Instructor Professional Qualifications*).

All new company officers receive both company officer level training and certified instructor training at the Fire Academy. This company officer development training includes:

Lieutenant

- First Line Supervisor School – 6 weeks (state of New York mandated)

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- NFPA 1041, *Standard on Fire Service Instructor Professional Qualifications*, Instructor I;
- Participate in MOAD (Mother of All Drills);

Captain

- 6 weeks of Officer In-Service Training
- MOAD Drills
- Focus on Personnel Management

Battalion Chief

- 7 weeks of Officer In-Service Training
- Incident Management System Training
 - High-Rise Strategy and Tactics
 - Hazardous Materials Mitigation

Deputy Chief

- 2 weeks of Officer In-Service Training
- ICS Training
 - Forecasting

Specialized Training

Chauffeur's School

- Engine
- Ladder
- Rescue

Battalion Chief's Aide/Staff Assistant

- Training Program

Mobile Training Vehicle

- Field Training
- Fireground Self-Extraction/Self Rescue (Mayday)

Daily Training

- 60 companies out of service per day
 - 20 companies during the daytime
 - 20 companies during the afternoon
 - 20 companies at night

The fire fighter who was riding the outside vent position on TL 135 on April 20, 2017 had the following training and certifications.

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Course Description	Completion Dates
CFR-D Program	12/07/2003
Fire Suppression and Control	12/07/2003
Hazardous Materials – Operations Level	12/07/2003
CPR Refresher	12/07/2003
Positional Harness and Life Safety Rope	01/16/2004
Fire Scenario – Private Dwellings	05/16/2004
EEO Training	05/12/2004
EEO Training	08/25/2004
Fire Scenario – Subway Drill	10/04/2004
Emergency Response Plan	05/26/2005
Critique Vehicle Extraction – Hurst Tool	11/02/2005
Personal Safety System	03/12/2006
Critique Search Tactical Unit	04/13/2006
Critique Search Rope Tactical Unit	04/13/2006
Tactical FAST Pack	04/13/2006
Unconscious Fire Fighter Removal	04/13/2006
Foam Carrier Training	04/26/2006
Tactical Search Rope	11/21/2006
Tactical FAST Pack	11/21/2006
Unconscious Fire Fighter Removal	11/21/2006
CFR-D Refresher	12/07/2006
Personal Safety System	03/04/2007
Flashover Simulator	04/25/2007
LIRR Hillside Yard Subway Familiarization	07/13/2007
Critique Life Saving Rope	08/01/2007
Subway Emergencies (Practical Drill)	10/09/2007
Chauffeur – Engine Company	02/27/2008
Flashover Simulator	05/12/2008
Injury Reduction Program	05/14/2008
LIRR Hillside Yard Subway Familiarization	05/16/2008
Injury Reduction Program	05/19/2008
Vehicle Extrication – Hurst Tool	08/06/2008
Wind Driven Fires	08/25/2008
Personal Safety System	02/05/2010
Ice and Cold Water Rescues	08/24/2010
Surf Rescue	08/24/2010
Personal Safety System	12/04/2010
Subway Emergencies (Practical Drill)	01/04/2011
Forcible Entry	04/02/2011

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Course Description	Completion Dates
SCBA Mask Confidence Course	04/02/2011
Mayday Drill	04/02/2011
MTA Hybrid Bus Drill	05/05/2011
Fire Fighter Survival, PPE and Safety	05/27/2011
Fire Dynamics	05/27/2011
Mayday – PPT	05/27/2011
AED – Health and Fitness	05/27/2011
Terrorism Awareness	05/27/2011
Subway Tactical Drill	07/18/2011
SCBA Mask Confidence Course	09/17/2011
Mobile Training Vehicle	09/17/2011
Mayday Drill	09/17/2011
Forcible Entry	09/17/2011
Life Safety Rope	09/27/2011
Life Safety Rope	06/06/2012
Flashover Simulator	08/20/2012
Search	08/20/2012
Fire Fighter Survival, PPE and Safety	08/20/2012
Flashover	08/20/2012
Emergency Response/Terrorism Awareness	01/08/2013
Unconscious Fire Fighter Removal	03/22/2013
FAST Company Operations	03/22/2013
FAST Pak	03/22/2013
Subway Emergencies (Practical Drill)	05/08/2013
Subway Emergencies (Practical Drill)	06/07/2013
FAST Company Operations	08/29/2013
Foam Carrier Training	10/23/2013
Subway Tactical Drill	01/29/2014
Forcible Entry	04/01/2014
Nasal NARCAN Training	05/04/2014
Roof Operations	08/06/2014
Search	02/11/2015
Mayday Communications	07/23/2015
Forcible Entry	10/03/2015
Subway Emergencies (Practical Drill)	02/24/2016
Emergency Response to Terrorism	09/01/2016

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The fire fighter who was the ladder company chauffeur from TL135 on April 20, 2017 had the following training and certifications.

Course Description	Completion Dates
Fire Suppression and Control	12/07/2003
Hazardous Materials – Operations Level	12/07/2003
CPR Refresher	12/18/2003
Positional Harness and Life Safety Rope	01/16/2004
CFR-D Refresher	12/18/2013
Foam Carrier Training	10/13/2004
Search Rope	10/14/2004
Life Saving Rope	10/14/2004
Roof Operations	04/26/2005
Life Saving Rope	05/13/2005
Roof Operations	05/13/2005
Emergency Response Plan	05/17/2005
EEO	08/24/2005
Personal Safety System	03/06/2006
Flashover Simulator	05/30/2006
Hose Lays and Stretches	09/14/2006
Personal Safety System	10/06/2007
Vehicle Extrication – Hurst Tool	10/17/2007
Hazardous Materials Awareness	12/24/2007
Subway Emergencies (Practical Drill)	01/30/2008
LIRR Hillside Yard Subway Familiarization	04/18/2008
Flashover Simulator	04/25/2007
LIRR Hillside Yard Subway Familiarization	07/13/2007
Injury Reduction Program	08/01/2007
Subway Emergencies (Practical Drill)	10/09/2007
Chauffeur – Engine Company	02/27/2008
Flashover Simulator	05/12/2008
Injury Reduction Program	09/24/2008
Mayday	10/01/2008
Search Operations	10/01/2008
Flashover Simulator	11/07/2008
Mayday	10/01/2008
Search Operations	10/01/2008
Subway Emergencies (Practical Drill)	07/02/2009
Life Saving Rope	11/19/2009
Cell Phone Site – PPT Presentation	01/15/2010
Forcible Entry	01/15/2010

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Course Description	Completion Dates
Communications Leader - ICS	01/15/2010
Wind Driven Fires/Fire Blanket Operations	01/15/2010
Patient Packaging	01/15/2010
Search Operations	08/19/2010
Gas Emergencies	01/25/2011
Search Operations	01/25/2011
Mayday – PPT	01/25/2011
Terrorism Awareness	01/25/2011
Personal Safety System	06/01/2011
Water Safety Kit	08/05/2011
FAST Pak	08/08/2011
FAST Company Operations	08/08/2011
Mayday Drill	10/26/2011
Unconscious Fire Fighter Removal	03/09/2012
FAST Pak	03/09/2012
Subway Emergencies (Practical Drill)	09/05/2012
Emergency Response/Terrorism Awareness	02/14/2013
Pak Tracker Operations	08/15/2013
Foam Carrier	10/23/2013
Foam Carrier	09/08/2014
Unconscious Fire Fighter Removal	09/19/2014
Nasal NARCAN Training	11/14/2014
Personal Safety System	01/16/2015
Personal Safety System	07/18/2015
Forcible Entry	10/03/2015
Emergency Response to Terrorism	09/28/2016
Emergency Response to Terrorism	01/17/2017

Equipment and Personnel

On April 20, 2017 at 1420 hours, Box 4017 was transmitted for an apartment fire. The following units were dispatched:

- Battalion 44:
 - A battalion chief and chief's aide
- Engine 277:
 - Officer
 - Engine company chauffer (ECC)
 - Nozzle
 - Backup
 - Control

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- Engine 286:
 - Officer
 - Engine company chauffer (ECC)
 - Nozzle
 - Backup
 - Control

- Engine 291:
 - Officer
 - Engine company chauffer (ECC)
 - Nozzle
 - Backup
 - Control

- Ladder 112
 - Officer
 - Ladder company chauffer (LCC)
 - Roof
 - Outside vent
 - Irons
 - Can

- Tower Ladder 135
 - Officer
 - Ladder company chauffer (LCC)
 - Roof
 - Outside vent
 - Irons
 - Can

Apparatus

The apparatus involved was a 75-foot tower ladder manufactured in a 2010. The apparatus was placed in service on March 4, 2011 as Tower Ladder 135. The department operates both 75-foot and 95-foot tower ladders.

The boom assembly consists of four box sections which telescope within each other. The first section is alloyed steel and the three telescope sections are aluminum alloy. The extension mechanism consists of two double acting cylinders which provide power extension and retraction. The basket or platform is constructed of alloy aluminum and has a floor area of approximately 15 square feet. Permanently mounted on the front surface of the platform is a Stang Intelligiant Nozzle, permitting flexibility in

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water tower operations. The underside of the floor and the front railing of the basket may be covered with a fire resistant shield.

Whenever a tower ladder is in operation, the pedestal position must be staffed. This provides an extra pair of eyes to warn of impending danger and override basket controls in an emergency. Three controls similar to those on a metal aerial ladder are provided on the turntable. These controls are for raising and lowering, extending and retracting, and rotating the boom assembly. Operating controls at the pedestal allows for smoother operation than the controls in the basket. The controls include:

- Master Power Switch - Supplies electrical power for the Master Control Valve, Master Console panel lights, engine start, dead-man control and platform (basket) controls
- Engine Start Button - allows engine to be re-started in case of stall from the Master Control Console
- Platform Control (Basket) - Activates the basket control station
- Dead-man Control - Depressing the foot pedal at base of console (pedestal) activates the system and the engine throttle control. This movement also deactivates the basket controls by activating the hydraulic system in case of electrical failure. The use of the platform control switch is necessary whenever members or civilians enter or leave elevated basket. This is to insure against movement of basket by accidentally touching the platform control handle.

The tower ladder is provided with an intercommunication system (intercom), allowing for basket to pedestal communications and vice versa, which is the most effective means of communications between basket and pedestal.

In the department's SOP on tower ladder operations, under General Precautions, the following safety precaution is described. "No member shall operate in the basket unless he is wearing the installed safety belt or a life belt or Personal Harness which is secured to a substantial part of basket. If this is too confining, it is possible to provide working room by forming a loop, one foot in diameter, in a lifesaving rope around a substantial part of the basket using a bowline to secure the loop, then hook the life belt or Personal Harness onto this loop."

Structure

The structure was a five-story H-Type apartment building, which was classified as a Class 3 Non-fire proof occupancy (**See Photo 1**). The apartment building was constructed in 1927. The building had wing stairs (stairs served that wing only and did not transverse to the other wing). There are 10 apartments per floor, 5 in the "A" wing and 5 in the "B" wing on all floors except the 1st floor which had 9 apartments. There were no elevators in this building.

The parapet was the standard 41 inches high with a concrete cap (**See Photo 2**). The building had an inverted roof or raised roof. **Note:** *A raised roof is defined as a roof which is raised above the roof beams and supported by 2 x 4"s. The extent to which it is raised varies, to provide proper roof drainage. The result is a large open cockloft where fire can spread easily. This type of roof is also called an inverted, reversed or rain roof.* The apartment building had 2 fire escapes on the front (Side

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Alpha), 2 in the rear (Side Charlie), and 3 on the Exposure 2 Side (Side Bravo) courtyard. The apartments were designated by the number of the floor and the letter is the apartment number (e.g. Apartment 2A is the A apartment on the 2nd floor.



Photo 1. The fire building is the H-Type apartment building, second from the left.
(NIOSH diagram adapted from Google Earth.)

This apartment building was called a New Law Tenement, which were tenements built between 4/12/1901 and 4/18/1929. The following was a basic design of these tenements:

- Generally six or seven stories high
- 35 feet to 50 feet wide
- 85 feet in depth
- Five to six apartments per floor
- The first floor (cellar ceiling) is of fireproof construction and unpierced
- The entrance to the cellar is by way of exterior stairs
- The interior stairs are fireproof and enclosed in partitions of fireproof construction
- Apartment doors are constructed of fire resistant materials
- The second means of egress is either another stairway or an exterior fire escape. The fire escape is more generally found in these buildings.
- All interior walls and furred partitions are required to be fire stopped at each story.
- Steel "I" beams were introduced to carry floor joists which couldn't span the enlarged floor areas. These steel beams generally were supported by masonry walls.

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Photo 2. The parapet wall on the roof of the fire building. The height of the parapet wall is 41 inches including its concrete cap.
(NIOSH Photograph.)

New law tenements built between 1916 and 1929 had the following design features:

- These tenement had a much larger floor area (e.g. 150 feet x 200 feet)
- To avoid being required to be built of fireproof construction, the floor areas were broken up into areas of 2,500 square feet or less. This means that between some apartments there are brick or fireproof partitions which effectively limit the horizontal spread of fire. However, these dividing walls only go as high as the ceiling of the top floor. This results in a very large undivided cockloft area. Fire can, and often does, spread throughout this large cockloft area.
- Unprotected steel beams are used to support some of the wood floor joists. These steel beams are supported by vertical steel columns which run the height of the building.

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- Wooden floor joists (beams) run horizontally from brick wall to a steel girder or from a steel girder to a steel girder.
- There are dumbwaiter shafts located in the apartments. In most cases, 2 apartments share 1 dumbwaiter. They terminate on the roof in a bulkhead with a skylight on top.
- The structure is not sprinklered.

Timeline

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

Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
9-1-1 call received at the borough dispatch center for a report of an apartment fire.	1419 Hours	
Response ticket assigned and units dispatched for an apartment fire. Battalion 44, Engine 277, Engine 286, and Engine 291; Ladder 112 and Ladder 135 were dispatched on the 1 st Alarm for Box 4017.	1420 Hours	
Engine 277 arrived on scene.	1422 Hours	
Dispatcher advised the officer of E277 of two additional addresses for the apartment fire in addition to the original address. Ladder 112 arrived on scene.	1423 Hours	Ladder 112 trying to locate the fire apartment based upon the dispatcher's information.
Engine 286 and Tower Ladder 135 arrived on scene.	1424 Hours	Engine 286 preparing to stretch a 1¾-inch hoseline to the fire apartment.

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
<p>Ladder 112 Officer advised the Borough Dispatcher transmit a “10-75” for Box 4017. The additional response for the 10-75 to Box 4017 was: Battalion 35, Squad 252, which was assigned as Engine 252, Squad 288, Ladder 140 (FAST Truck), and Rescue 4</p> <p>The officer of Ladder 112 assumed Command.</p>	<p>1425 Hours</p>	<p>The fire located in Apartment 2A in a middle apartment building on the block. The ladder company chauffeur (LLC) of Ladder 112 raised the aerial ladder to the roof.</p>
<p>Battalion 44 arrived on scene at Box 4017. BC44 assumed Command.</p>	<p>1430 Hours</p>	
	<p>1431 Hours</p>	<p>The roof fire fighter from L112 advised that the bulkhead door to the fire building was open. Also civilian was located next to the bulkhead door.</p> <p>The officer of E277 advised the borough dispatcher that the fire was knocked down. A primary search is still being conducted in the fire apartment.</p>
	<p>1432 Hours</p>	<p>The officer of Ladder 112 advised Command that the fire was in Apartment 2A and the primary search was negative. The officer of Tower Ladder 135 advised Command that the primary search in Apartment 3A was negative.</p>

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	1434 Hours	<p>The OV fire fighter for TL135 was in the platform of the tower ladder. The LCC had the tower ladder at Exposure 2 (Exposure Bravo) and then moved the tower ladder to the fire building.</p> <p>The LCC moved the tower ladder towards the roof of Exposure Delta. The LCC of TL135 asked the OV fire fighter to take over operations of the tower ladder from the platform as the tower ladder extended.</p>
Battalion 35 arrived on scene.	1435 Hours	
	1436 Hours	Command called TL135 to shut off the electrical service in Apartment 2A.
	1437 Hours	<p>The TL135 roof fire fighter walked to the platform of TL135 to ask the TL135 OV about the occupant on the roof.</p> <p>The OV tried to move the TL135 platform, but no movement occurred.</p> <p>The OV of TL135 asked the LCC to take over operations of the tower ladder from the platform due to issues with the joystick.</p>
	14:38:58 Hours	The platform broke free of the concrete cap, ejecting the OV out of the platform.

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
	14:38:59 Hours	Mayday was called for the OV fire fighter falling five stories and landing on the concrete sidewalk.
	1439 Hours	The OV fire fighter of TL135 is on the sidewalk being treated by other fire fighter. Command advised the L112 roof fire fighter not to move the platform.
	1440 Hours	Again, Command advised the LCC of TL135 not to move the platform. Medic Unit 45Y continued patient care.
	1441 Hours	TL135 Roof fire fighter to Apartment 2A. Command advised E277 and L112 to continue firefighting operations in Apartment 2A

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
<p>The Borough Dispatch Center transmitted a 10-66 for Box 4017.</p> <p><i>Note: The following units are dispatched for a lost, missing, trapped, or seriously injured fire fighter, which increases the response by transmission of the next higher alarm. Units dispatched are 1 additional deputy chief, 2 battalion chiefs, the collapse unit from the borough of incident, a collapse rescue task force, an additional squad, a SOC Support ladder, a FAST unit, a CFR-D engine, SOC Logistics support van, SOC Compressor truck, SOC Dewatering unit, Public Information officer, EMS division captain, EMS Haz-Tac officer, a BLS ambulance, an ALS ambulance, an EMS Rescue Paramedic ambulance, OMA response physician and a medical officer.</i></p> <p>Command advised the Borough Dispatcher to cancel the 10-66 except for the response of the Safety Battalion.</p> <p>Medic Unit 45Y advised the Borough Dispatcher they were enroute to the hospital. BC35 was in the ambulance with TL135 OV fire fighter.</p>	<p>1442 Hours</p>	
	<p>1443 Hours</p>	<p>The L112 advised Command that the secondary search was negative.</p>
<p>Command requested police for traffic control.</p>	<p>1444 Hours</p>	

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Dispatch Communications & Fire Department Response	Time	Fireground Communications & Fireground Operations
Command (BC44) advised that the borough dispatcher the status of the fire was “will hold”.	1451 Hours	
Command to Borough Dispatcher, “Command has been dissolved and all units are clearing.”	1956 Hours	

Personal Protective Equipment

At the time of the incident, the OV fire fighter from Tower Ladder 135 was wearing his full array of firefighting turnout gear including boots, bunker pants, bunker coat, self-contained breathing apparatus (SCBA) with integrated PASS device, fire resistant hood, and helmet. The fire fighter had his structural firefighting gloves, but was not wearing them. The OV fire fighter was equipped with a personal escape system but was not tethered to the platform.

None of the fire fighter’s turnout gear or SCBA were evaluated or tested and were not considered to be contributing factors in this incident.

Weather Conditions

At 1351 hours on April 20, 2017, the following weather conditions were reported. The temperature was 60 degrees Fahrenheit (60° F), the dew point was 50 degrees Fahrenheit (50.09° F), the relative humidity was 69%, and the winds were from the ENE at 8 miles per hour. There were scattered clouds with 10 miles visibility. There had been no precipitation in the past 5 hours [Weather Underground 2017]. The weather was not considered to be a factor in this incident.

Investigation

On April 20, 2017 at 1420 hours, the fire department dispatched Battalion 44, Engine 277, Engine 286, Engine 29, Ladder 112, and Tower Ladder 135 for Box 4017. This was for a report of an apartment fire in a 5-story apartment building. Prior to the dispatch of Box 4017, a 10-77 (working high-rise multiple dwelling fire) was transmitted for another box near across the border from the borough Box 4017 was transmitted. Due to the 10-77 being transmitted, this altered the response ticket to this incident. On this block there were four 5-story apartment buildings connected to each other. The dispatcher gave responding units two additional addresses for the fire. The addresses were for two of these apartment buildings. The apartment fire was actually in the apartment building that was not identified by address.

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Engine 277 arrived on scene at 1422 hours. Ladder 112 arrived on scene at 1423 hours. The outside vent (OV) fire fighter from Ladder 112 found the fire, which was communicated, to the officer of Ladder 112, who then called a 10-75 at 1425 hours. Per the department's SOP, a ladder company has the responsibility to find the location of the fire at all fire incidents.

The officer of Ladder 112 called a 10-75 (*Note: A 10-75 is a notification signal transmitted when, in the judgment of the Incident Commander, conditions indicate a fire or emergency that requires an additional response of resources*) for Box 4017 at 1425 hours. The officer of Ladder 112 was Command until the arrival of Battalion 44 at 1430 hours. The additional response for the 10-75 to Box 4017 was: Battalion 35, Squad 252, which was assigned as Engine 252, Squad 288, Ladder 140 (FAST Truck), and Rescue 4.

Tower Ladder 135 arrived on scene behind Ladder 112 at 1424 hours. Engine 277 stretched a 1¾-inch hoseline into the fire building. The fire was located in Apartment 2A. Engine 291 stretched the back-up 1¾-inch hoseline into the building. The officer of Tower Ladder 135, the forcible entry man, and can man went to the 3rd floor (Apartment 3A). The roof man of Tower Ladder 135 went to the roof via Ladder 112. He met the roof man of Ladder 112. The outside vent fire fighter (OV) of Tower Ladder 135 was going around to the rear of the building (Side 3 or Side Charlie) but stayed on Side 1 (Side Alpha) due to the occupants in the windows. He then went to the platform of the tower ladder. The ladder company chauffeur (LCC) of Tower Ladder 135 was on the pedestal. The LCC first placed the tower ladder to Exposure Bravo, but then moved the platform over to the fire building to a 2nd floor window to check on a woman. The woman was fine and told to stay in her apartment. The LCC then moved the platform towards the 5th floor for a woman on the fire escape. At this time, the LCC radioed the OV fire fighter to take over the controls of the platform as it neared the 4th floor. The LCC stated he couldn't judge depth perception, so it was better for the OV fire fighter to operate the platform. The OV fire fighter checked on the woman on the 5th floor fire escape. The woman was fine and told to go down to the street by the interior stairs of the next apartment building.

Battalion 44 arrived on scene at 1430 hours and assumed Command. The fire was knocked down at 1431 hours as communicated from the officer of Engine 277 to Command (Battalion 44). The fire was knocked down with one 1¾-inch hoseline.

The OV fire fighter from Tower Ladder 135 then started to move the platform towards the roof. The OV fire fighter placed the platform over the parapet wall of the fire building. The roof man from Ladder 112 walked over to talk to the OV fire fighter. The platform was on the inside of the parapet wall and at almost maximum extension. With the fire knocked down in Apartment 2A, the Tower Ladder L135 OV fire fighter tried to raise, but not extend the platform, which did not move. The OV fire fighter wasn't sure of the problem that was keeping the platform from raising. The OV fire fighter asked the LCC to take over the operations of the platform. Unknown to the OV fire fighter, the platform was caught on the inside of the parapet wall underneath the platform by brackets used to stabilize the platform (**See Photo 3 and Photo 4**). The investigation was unable to determine what caused the platform to come loose from the parapet wall. The violent reaction of the platform coming

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loose from the parapet wall caused the OV fire fighter to be thrown out of the platform. The TL135 OV fire fighter fell 5 stories (approximately 60 feet) to the concrete sidewalk below.

Battalion 35 arrived on scene at 1435 hours as part of the “10-75” response. Battalion 35 was in the street with the apparatus awaiting an assignment.

After the OV fire fighter fell, a Mayday was transmitted by Battalion 35 at 1439 hours, which was 19:52 minutes into the incident. A 10-66 was then transmitted for Box 4017 followed by the transmission of a 2nd Alarm for Box 4017 at 1442 hours. The 2nd Alarm was then cancelled by Command. All units on the 2nd Alarm were cancelled except for the Safety Battalion.

Fire fighters from other companies rushed to provide medical care to the fire fighter. The fire fighter was moved to a stretcher and placed in Medic Unit 45Y, which departed the fire scene at 1443 hours arriving at the trauma center at 1445 hours. The fire fighter was pronounced dead at 1518 hours.



**Photo 3. The yellow circles indicate the damage caused by the brackets on the bottom of TL135 when the platform came loose from the parapet wall.
(NIOSH Photograph.)**

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The fire was declared under control at 1456 hours by Command (BC44). Command was dissolved at 1956 hours.

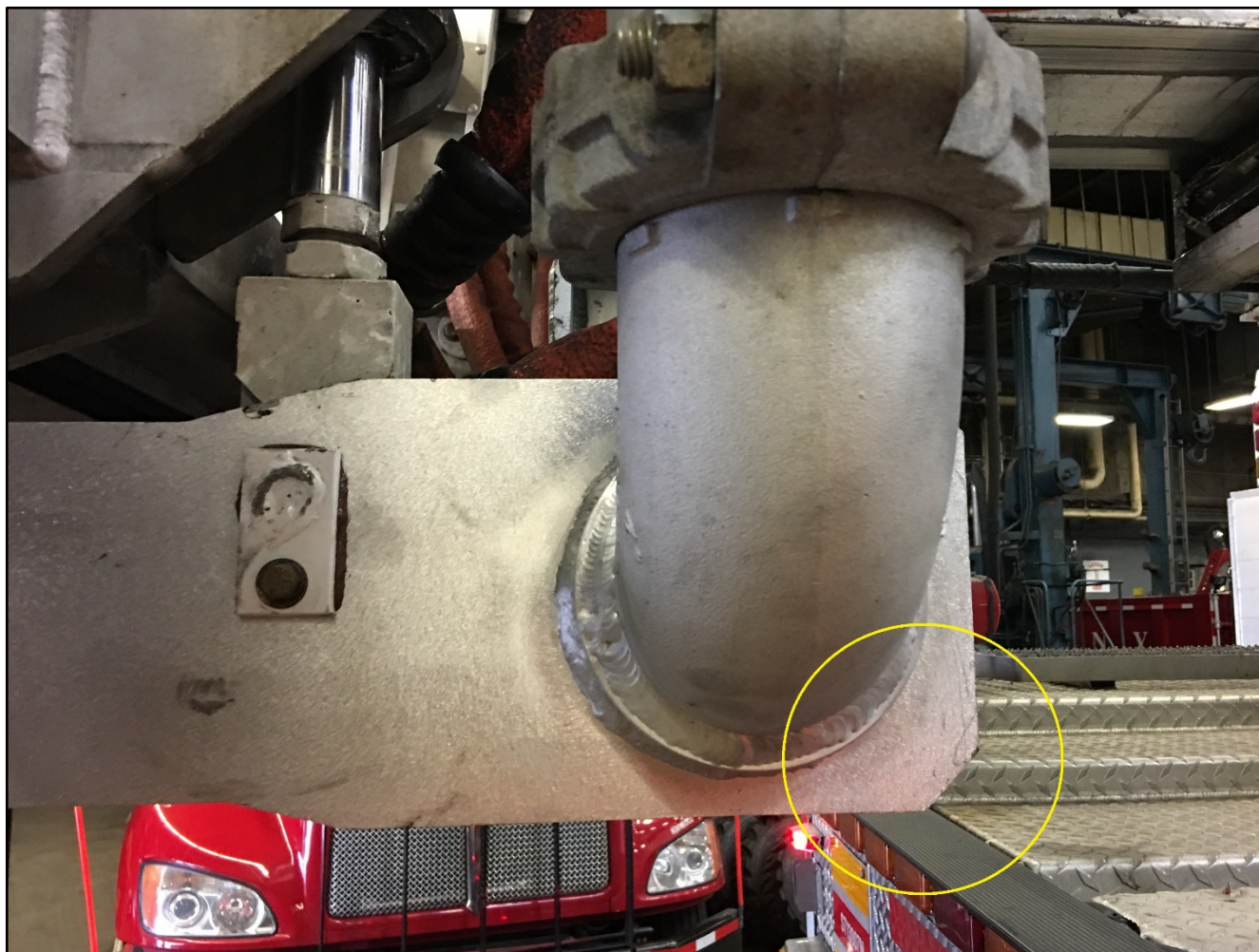


Photo 4. The yellow circle indicates the part of the tower ladder that was caught on the parapet wall. Each tower ladder has a bracket on both sides of the platform. This is not the tower ladder involved in the incident, but one with the same design as Tower Ladder 134.

(NIOSH Photograph.)

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 fatality:

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- Building construction and roof operations
- Procedures for operation of a tower ladder
- Apparatus platform design
- Training
- Multi-family residential building not sprinklered

Cause of Death

According to the death certificate, the medical examiner listed the fire fighter's cause of death as multiple blunt impact injuries.

Recommendations

Recommendation #1: Fire departments should ensure that fire fighters recognize roof design, height restrictions, and safety issues when operating tower ladders in the vicinity of parapet walls.

Discussion: The department's standard operating procedures (SOPs) for aerial ladders and tower ladders discuss placement and operations for the variety of buildings encountered throughout the different boroughs of the city. It is impossible to describe each scenario that a ladder company will encounter during fireground operations. The fire department provides the necessary training for fire fighters that operate aerial ladders and tower ladders. The fire department's SOP states, "While 75 feet is the nominal height, the actual working height (the bottom of the basket at its highest elevation), is little more than 70 feet when boom is at the maximum angle of 75 degrees." The tower ladder was at almost maximum extension.

In this incident, the stabilizing bars attached to the waterway underneath the platform snagged on the concrete cap of the parapet wall, as the OV fire fighter of TL135 was positioning the platform near the roof. The OV fire fighter positioned the platform on the inside of the parapet wall which caused the platform to become stuck. With the fire knocked down in Apartment 2A, the TL135 OV fire fighter tried to raise, not extend, but the platform would not move. The OV fire fighter wasn't sure of the problem which kept the platform from raising. The OV fire fighter asked the LCC to take over the operations of the platform. The OV fire fighter indicated he thought there was a problem with joystick operations.

The duties of the outside vent position of a ladder company include: assisting the ladder company chauffeur in front of the fire building when aerial or portable ladders are needed for rescue or removal; to ventilate the fire area from the exterior providing horizontal ventilation; or if the location of the fire apartment is not obvious from the exterior of the building, the OV should communicate with their officer.

The OV fire fighter for TL135 was originally going to go to Side 3 (Side Charlie) to determine if ventilation needed to occur, when the tower ladder arrived. The OV fire fighter for TL135 never made an attempt to go to the rear of the building due to the occupants in the front of the building. He noticed

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a civilian in a 2nd floor window. He got into the platform of TL135 and told the LCC to take him to the 2nd floor window. Eventually, the fire fighter took the platform to the roof of the fire building.

At this incident, there was no need for the rescue of occupants of the fire building via the tower ladder. There was one resident on the front fire escape of the fire building that the OV fire fighter was going to put into the platform. However, the occupant stated she did not need assistance. The OV fire fighter from TL135 then positioned the platform over the parapet. The roof fire fighter had talked to the OV fire fighter and then turned away when he heard a loud noise and the OV fire fighter was not in the platform. He rushed to the parapet wall and saw the OV fire fighter laying on the sidewalk. Based upon the interviews of fire fighters at this incident, no one realized that the platform was stuck on the parapet wall.

Recommendation #2: Ensure that tower ladders and other aerial platforms are designed to reduce or eliminate the potential for snagging on buildings or other surfaces.

Discussion: Aerial platform apparatus are typically required to be maneuvered in close proximity to buildings and structures of various different configurations and construction materials. The aerial device should be designed to reduce or eliminate the potential to snag or catch on buildings or other structures as the platform is being maneuvered into place. Some options, such as lifting eyes or lights that protrude below the platform should be avoided. While it may be impossible to reconfigure a manufacturer's basic aerial platform design, it is essential that aerial operators be aware of any possible snag or catch hazards and operate accordingly.

When a fire fighter wants to lower an aerial platform that is several inches above a parapet wall or resting on it, the fire fighter must make sure that the aerial platform is clear of the parapet wall before lowering the aerial platform. When the platform needs to be repositioned, the fire fighter should raise the platform, lifting the platform several feet above the parapet wall. Then the fire fighter can retract the platform without snagging or catching the aerial platform on the parapet wall [Dunn 1988]. Therefore, just about every manufacturer stipulates that their aerial device is designed to be operated in cantilever (above the roof) and should not be placed directly on the roof. Instead, the aerial device should be positioned so a gap exists between the platform and the roof. If at this time, the aerial device touches the roof or parapet, there should not be force created by personnel to create any damage.

Preplanning, group discussions, drills and post fire critiques all aid immeasurably in the development of an efficient firefighting unit. They, in turn, provide the climate for the teamwork and coordination that is so vital at tenement fires where lives so frequently depend on the proper execution of numerous and diverse assignments. Assignments should be carried out and objectives achieved. If fire fighters have to improvise to accomplish their objectives, then that too becomes part of their tasks. Decisions on the fireground must be made instantaneously and under great stress. Firefighters continuously study and train to improve their knowledge, skills, and abilities so they are fully prepared to make the best decision possible when confronted with difficult or unusual situations.

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At this incident, the OV fire fighter for Tower Ladder 135 raised to the platform to the roof of the fire building. The fire fighter placed the platform over the parapet wall. He did not realize the brackets on the bottom of the platform became caught on the parapet wall.

Recommendation #3: Ensure fire fighters use a ladder belt and escape harness carabineer to secure to the platform during tower ladder operations.

Discussion: The use of safety belts when operating on an aerial ladder or tower ladder is required by the NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness* [NFPA 2018]. Paragraph 8.6.12 states, “When members are operating from aerial devices, they shall be secured to the aerial device with a system in compliance with NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services*” [NFPA 2018].

NFPA 1901, *Standard for Automotive Fire Apparatus* requires that a platform have attachment points in which fall protection harnesses or rope can be attached. At least one attachment point should be available for each 250 pounds load rating of the platform. Anchorage points provided for fall protection harnesses should be clearly labeled and rated for a minimum of 450 pounds [NFPA 2016].

The fire department’s SOP on tower ladder operations, under *General Precautions*, describe the following safety precaution. “No member shall operate in the basket unless he is wearing the installed safety belt or a life belt or personal harness, which is secured to a substantial part of basket. If this is too confining, it is possible to provide working room by forming a loop, one foot in diameter, in a lifesaving rope around a substantial part of the basket using a bowline to secure the loop, then hook the life belt or personal harness onto this loop.” Each fire fighter and fire officer in the department wears turnout gear equipped with a personal escape system (**See Photo 5**). The personal escape system has the five common components:

- an anchor hook with hitching slot.
- a descent control device.
- 50 feet of heat-resistant and cut-resistant rope (typically 7.5 mm diameter).
- a connection carabineer.
- a carrying pack that contains the above and fits into the bellows pocket of turnout gear pants.

A fire fighter operating in a tower ladder platform should know the attachment points for the personal escape system carabineer. This would prevent the fire fighter from being ejected from the platform due to a violent reaction similar to the incident involving Tower Ladder 135

The fire fighter assigned to the roof from Tower Ladder 135 stated that he saw the OV fire fighter outside of the platform when it was stuck on the parapet wall. He thought the fire fighter was going to jump or climb down to the roof.

Fire departments must ensure that before an aerial platform is moved, there is clear communications between the fire fighter in the platform and the ladder company chauffeur as to what needs to occur in

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terms of safety. The fire department standard operating procedure should require that the fire fighter in the platform exit the platform if possible. If this is not an option, then the fire fighter in the platform should be secured or tethered to the interior of the platform.



Photo 5. The webbing and carbiner used by the fire department as part of their personal escape system.

(Photograph from the World Wide Web.)

At this incident, the OV fire fighter was equipped with a personal escape system but was not tethered to the platform. When the platform came loose from the parapet wall, the violent reaction caused the fire fighter to be catapulted over the rails of the platform.

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Recommendation #4: Fire departments should provide proficiency training for fire fighters on the operations of tower ladders.

Discussion: All members of the fire department should be required to maintain proficiency of their defined duties and functions. NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program* requires this to occur annually. Paragraph 5.3.3 states, “Members shall practice assigned skill sets on a regular basis but not less than annually [NFPA 2018].

The New York State Public Employee Safety and Health (PESH) Act document, [Firefighter Annual Refresher Training Guidance](#) is designed to maintain proficient fire fighter knowledge, skills and abilities in accordance with 29 CFR 1910.156(c)(2) and increase overall firefighter safety in accordance with other applicable OSHA/PESH standards. This document pertains only to the annual refresher training. OSHA/PESH Standard 29 CFR 1910.156(c)(2) requires that fire department training programs be designed to address annually the proficiency of each member’s knowledge and abilities as it relates to that member’s expected assignment. Such assignments may include exterior fire fighter, interior fire fighter, apparatus operator, fire officer/incident commander and fire training officer [NYS PESH 2018].

The annual refresher training should be comprised of current content and of sufficient duration so that each member can demonstrate knowledge and abilities in their assigned duties. It is important to maintain documentation of all training conducted to comply with these requirements. While no specific time is allotted to the annual training or specific topics (e.g. 8 hours), this clarification is not intended to shorten the previously established timeframe, but to provide the flexibility to adjust the length of time spent on specific topics that the department feels are necessary [NYS PESH 2018].

Many fire departments have chosen to use a minimum company standards program to meet or comply with the proficiency evaluation requirements of NFPA 1500, *Standard on Fire Department Occupational Safety, Health, and Wellness Program* [NFPA 2018]. This can be done on the company level or through the fire department’s training academy.

Also, fire departments should ensure information regarding the operations of tower ladders near parapet walls is in their standard operating procedure.

In this incident, based upon the training records, it is unknown if the OV fire fighter was annually evaluated on the operations of the tower ladder.

Recommendation #5: Code-setting organizations and municipalities should consider requiring the use of sprinkler systems in multi-family residential structures.

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:

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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 fire fighter 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 presents one of the greatest risks fire fighters are exposed to during fireground operations. This risk exposure to fire fighters 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 by the activation of one or two sprinkler heads prior to fire department arrival. An automatic fire sprinkler system also reduces the exposure risk to fire fighters during all phases of fireground operation and allows the safe egress of building occupants before the fire department arrives on-scene. Finally, by controlling fire development, the risks associated with the potential for structural collapse and during overhaul operations are greatly reduced, if not eliminated.

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Investigator Information

This incident was investigated by Murrey E. Loflin, Investigator and Dr. Tom Hales, Medical Officer with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, West Virginia. An expert technical review was provided by Bill Peters of Peters Associates, FACS, Inc. A technical review was also provided by the NFPA Public Fire Protection Division.

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