FIRE DEPARTMENT CITY OF NEW YORK

SAFETY COMMAND

INVESTIGATIVE REPORT

BROOKLYN BOX 3-3 2075

10826 AVENUE N, BROOKLYN, NY

APRIL 24, 2022

CASE NUMBER SB 03/22

FATAL INJURY

FIREFIGHTER TIMOTHY PATRICK KLEIN

LADDER COMPANY 170

DETAILED TO ENGINE COMPANY 257

July 2023

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PREFACE

The purpose of this safety investigation is to aid in the New York City Fire Department's continuing effort to increase and ensure the safety of its members. To that end, after an event involving the fatal injury of a member, the department conducts an investigation to assess whether any modifications to operations, training, or equipment are warranted. Upon conclusion of the investigation, a report is released outlining the findings and any recommendations. The intent of this post-incident analysis is to capture the uniqueness of each incident, contextualize the judgment and discretion with which our members are entrusted while discharging their duties, and identify any subsequent measures that might be needed.

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BIOGRAPHY
TIMOTHY PATRICK KLEIN

Firefighter Timothy Patrick Klein dedicated his life to serving his community and protecting others. He was born on September 17, 1990, and raised in Belle Harbor, Queens. Timothy always knew he wanted to be a firefighter and help others in need.

Following in his father's footsteps, Timothy joined the New York City Fire Department on December 28, 2015, as part of the first probationary firefighting class of 2016 and later was assigned to Ladder Company 170 in Canarsie, Brooklyn. He quickly made a name for himself with his strong work ethic and unwavering dedication to the department. Timothy was always willing to go the extra mile to help his fellow firefighters and the community. In addition to his duties as a firefighter, Timothy was known for his volunteer work with the Fight for Firefighters Foundation. He was a founding member of the board and spent countless hours serving the organization, which helps first responders, their families, and those in their communities.

On April 24, 2022, while operating at Brooklyn Box 3-3 2075, Timothy made the ultimate sacrifice for the City of New York. Timothy is survived by his mother, father, and three sisters, who will always cherish his memory and the impact he had on their lives. Timothy's legacy lives on through the lives he touched and the sacrifices he made. He will always be remembered as a true hero and a shining example of what it means to be a firefighter.

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EXECUTIVE SUMMARY

On Sunday, April 24, 2022, Engine Company 257 responded to a structural fire at 10826 Avenue N in the Canarsie section of Brooklyn. Firefighter Timothy Klein of Ladder Company 170—detailed to Engine Company 257—was assigned the back-up position in Engine Company 257, which responded as the first-due engine. Upon arrival at 1353 hours, the first arriving units encountered heavy smoke blowing toward the street and found fire presenting from a two-story semi-attached private dwelling with a basement. Unknown at the time, the fire had already extended to the attic space of the adjoining Exposure #4 Building, 10824 Avenue N.

At 1356 hours, the request was made to supply water to Engine Company 257's hoseline. Over the next several minutes it was determined there was an issue with Engine Company 257's apparatus. Hoselines were transferred from Engine Company 257's apparatus to Engine Company 290's apparatus. This led to the delay of water on the main body of fire in the Fire Building. As a result, Engine Company 283 had water in their hoseline first and operated in the Fire Building. Engine Company 257 was directed to operate in Exposure #4 Building.

At 1407 hours, Firefighter Timothy Klein and the members of Engine Company 257 entered the Exposure #4 Building with a charged hoseline to extinguish a fire on the second floor. By 1409 hours, the fire on the second floor of the Exposure #4 Building was extinguished, and Engine Company 257 remained in position with a charged hoseline in the hallway on the second floor. The main body of fire on the first floor of the original fire building had been extinguished with the first hoseline operated by Engine Company 283. Ladder companies entered the Exposure #4 Building via the front door and the sliding glass doors at the rear of the first floor and basement. These members conducted searches on all floors of the Exposure #4 Building.

At 1410 hours, an undetected fire burning at the bottom of a vertical shaft in the Exposure #4 Building escaped from the vertical shaft and rapidly extended throughout the basement. The fire was immediately subjected to a powerful inflow of air from the open rear sliding glass door. The wind intensified this fire and drove it up the interior stairs to the floors above, causing multiple firefighters to become trapped or had to escape. In the following minutes, the quick application of water from the exterior improved conditions in the Exposure #4 Building. However, Firefighter

Timothy Klein was trapped directly in the flow path of the fire and could not escape. At approximately 1427 hours, he was found and removed from the Exposure #4 Building. Firefighter Timothy Klein was then transported to Brookdale Hospital, where he succumbed to his injuries.

CHAPTER 1. REPORT OVERVIEW

This chapter describes the structure of this report and defines the terminology used throughout. The New York City Fire Department (FDNY)'s Fatality Investigation Team has intended this report to be as reader friendly as possible while preserving the accuracy and completeness of the information presented. All abbreviations and naming conventions were adopted to maximize clarity and are defined below.

REPORT STRUCTURE

This report is divided into the following eight chapters and appendices:

- **Chapter 1: Report Overview**—Describes the report's structure and defines the terminology and abbreviations used.
- **Chapter 2: Investigation Methodology**—Provides an overview of the investigation process and identifies specific data sources used and subject-matter experts involved.
- **Chapter 3: Incident Information**—Provides a detailed description of the physical setting of the incident, including the Fire Building, local geography, and weather conditions.
- **Chapter 4: Photographs and Diagrams**—Provides photos of the fire scene and floor diagrams taken by FDNY members and the Robotics Unit at the fire scene.
- **Chapter 5: Fire Department Operations**—Provides a comprehensive accounting of actions taken and conditions encountered by FDNY members at the fire scene.
- **Chapter 6: Fire Behavior**—Provides a comprehensive accounting of the fire dynamics of the incident, including the origin of the fire and the process and sequence of fire travel.
- **Chapter 7: Critical Factors**—Provides a detailed discussion of several key concepts that were critical in determining the outcome of the operation.
- **Chapter 8: Findings and Recommendations**—Provides an itemized list of specific recommendations made by the Fatality Investigation Team following the investigation.
- **Appendices**—Provides supporting information and reference material.

ABBREVIATIONS

The following abbreviations are used throughout the report to simplify common terms and enhance the document's readability:

Fire Team Designators

- B battalion (for example, Battalion 58 = B58)
- D division (for example, Division 15 = D15)
- E engine company (for example, Engine Company 257 = E257)
- L ladder company (for example, Ladder Company 170 = L170)
- R rescue company (for example, Rescue Company 2 = R2)
- SQ squad company (for example, Squad Company 252 = SQ252)

Other Abbreviations

- ALS advanced life support
- BBL building-block-lot
- BFI Bureau of Fire Investigation
- BIN building identification number
- CFR certified first responder
- DEP Department of Environmental Protection
- EAB emergency alert button
- EFAS Electronic Fireground Accountability System
- EMS emergency medical service(s)
- EMT emergency medical technician
- ETA estimated time of arrival
- FAST Firefighter Assist and Search Team
- FDNY New York City Fire Department
- FDOC Fire Department Operations Center
- FDS Fire Dynamics Simulator
- FE forcible entry
- FF firefighter

- FFIT FDNY Fatality Investigation Team
- FSRI Fire Safety Research Institute
- HT handie-talkie
- HTB Haz-Tac Battalion
- HTRU Handie-Talkie Recorder Unit
- HVAC heating, ventilation, and air conditioning
- IC incident commander
- IDLH immediately dangerous to life or health
- MDT Mobile Data Terminal
- MPI Mental Performance Initiative
- MSU Mask Service Unit
- NIST National Institute of Standards and Technology
- OCME Office of the Chief Medical Examiner
- OMA Office of Medical Affairs
- OV outside vent
- PASS Personal Alert Safety System
- PSP public safety personnel
- PTT Push-to-talk
- R&D research and development
- RESL Resource Unit leader
- SCBA self-contained breathing apparatus
- SOC Special Operations Command
- SSL Special Operations Command Support Ladder
- UL Underwriters Laboratories
- VEIS vent, enter, isolate, and search

NAMING CONVENTIONS

To maximize clarity, this report refers to all FDNY members by their company and riding position and treats this designation as a proper noun. For example, instead of "the officer of Ladder Company 170," this report refers to this member as "L170 Officer." The exception is Firefighter Timothy Klein, who is identified by his name instead of his company and riding position.

The phrase "Inside Team" refers to the members of the ladder company, which include the Officer, Forcible Entry (FE) Firefighter, and Extinguisher (Can) Firefighter.

The phrase "Nozzle Team" refers to the members of the engine company, which include the Officer, Nozzle Firefighter, and Back-up Firefighter.

BUILDING AND FLOOR DESIGNATIONS

At this incident, the fire involved two adjoining buildings (10824 Avenue N and 10826 Avenue N), both of which comprised a basement, two floors, and an attic space. A full description of these buildings appears in Chapter 3, Incident Information.

The fire originated at 10826 Avenue N, referred to as the "Fire Building," and spread to 10824 Avenue N, the "Exposure #4 Building," where Firefighter Timothy Klein was operating.

The "Exposure #2 Building," 10828 Avenue N, was separated from the Fire Building by an alley. The "Exposure #4A Building," 10822 Avenue N, was separated from the Exposure #4 Building by an alley.

Each of these buildings comprises three floors—a basement, first floor, and second floor—and an attic space. Figure 1 illustrates these building and floor designations.

Figure 1. Building and floor designations during the incident.

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CHAPTER 2. INVESTIGATION METHODOLOGY

This chapter describes the methodology of the investigation undertaken by the FDNY Safety Command following the line-of-duty death of Firefighter Timothy Klein. The investigative process began at the scene of the fire operation on April 24, 2022, and concluded with the release of this final report. Due to the complexity of the operation and the breadth of information and data available, the investigation progressed through several distinct phases, each building on the results of the previous phase and informing the phases that followed:

- Phase 1: Safety Command response and FFIT formation
- Phase 2: Research and information collection
- Phase 3: Analysis and incident reconstruction
- Phase 4: Safety investigation report production

PHASE 1: SAFETY COMMAND RESPONSE AND FFIT FORMATION

On April 24, 2022, Safety Battalion 1 was dispatched to Brooklyn Box 2075 at 1400 hours upon the transmission of the second alarm. The unit arrived at 1419 hours and learned of a missing member. At 1432 hours, Firefighter Timothy Klein was removed from the building and transported to Brookdale Hospital. The Safety Battalion Chief immediately notified Assistant Chief Michael V. Meyers, the Chief of Safety. Chief Meyers implemented AUC 314, "Incident Command and Safety Investigations." Chief Meyers ordered the activation of both on- and off-duty safety-trained chiefs and technicians to assist with the investigation. The safety chiefs and safety technicians formed working groups for specific tasks, including documenting the scene, collecting physical evidence, conducting debriefings, and taking photographs.

The Safety Command and the Bureau of Fire Investigation maintained control of the scene for approximately one week to conduct a thorough examination. During this time, the Safety Command requested the assistance of subject-matter experts (SMEs) at the scene. These included fire-behavior specialists from Underwriters Laboratories (UL) and two FDNY fire officers who hold licenses as professional engineers. These SMEs collected and analyzed evidence from the fire scene.

On May 4, 2022, the Safety Command convened a meeting at the Safety Command Building at Fort Totten to discuss the evidence gathered over 11 days from the fire scene and to determine the next steps. The Safety Command formed the FFIT and tasked it with investigating the circumstances that lead to the line-of-duty death of Firefighter Timothy Klein.

PHASE 2: RESEARCH AND INFORMATION COLLECTION

Once the FFIT was formed and granted the authority to conduct the investigation, it began gathering as much information about the incident as possible. This process involved conducting debriefings, obtaining and transcribing fireground and dispatch communications, and collecting a wide range of electronic data and other information.

Debriefings

The FFIT conducted 130 debriefings of FDNY members who operated at the incident and other emergency responders who were present, including

- FDNY firefighters, fire officers, and chief officers;
- FDNY EMS personnel; and
- Emergency room personnel (Brookdale Hospital).

Members of the Safety Command conducted all debriefings. In the case of FDNY members, representatives of the appropriate union were present as well. As with any investigation of this magnitude, some statements from debriefed members conflicted or showed inconsistencies. It is the opinion of the FFIT that these inconsistencies were the result of differing perspectives, varying memories, and the unavoidable impact of psychological stress. They did not result from any intention to mislead, distort, or conceal facts.

Handie-Talkie Audio Recordings

Audio recordings of handie-talkie transmissions made at the incident were accessed via the Handie-Talkie Recorder System, which is designed to capture all handie-talkie transmissions made at the scene. Battalion chiefs' vehicles are equipped with this system, and upon their return to quarters, the audio data recorded are automatically uploaded to a remote data warehouse. These audio recordings are accessed via secure terminals at the Handie-Talkie Recorder Unit (HTRU), a component of the Safety Command.

The quality of the audio data captured depends on many factors, including the location of the battalion vehicle, radio frequency drift, the type of building construction, heat and atmospheric conditions, local topography, the position of the antenna, and battery power of the handie-talkie used. Interference from simultaneous handie-talkie transmissions on the same channel may also affect the recording. As a result, the transmissions recorded by each vehicle system may differ in quality or, in some cases, even capture different transmissions. For these reasons, the recorders may capture transmissions not received by members on the fireground or may not even capture transmissions made on the fireground. To maximize the number and accuracy of recordings captured, the investigation based its analysis on a compilation of audio data collected by all handie-talkie recording systems present at the scene. In total, audio data from three recorders were collected and compiled.

Once the audio recordings were collected, members of the FFIT and HTRU listened to them at different speeds to clarify what had been recorded. This process was undertaken in the quiet, controlled environment of the HTRU, which eliminated any interfering ambient noise of a fire operation and allowed for a more thorough analysis. In this environment, members of the HTRU constructed a complete transcription of all handie-talkie transmissions recorded at the operation (see Appendix B).

Electronic Fireground Accountability System

The remote Electronic Fireground Accountability System (EFAS) is designed to provide the identity of the handie-talkie used to make each transmission on the fireground via a computer monitor on all battalion and division chiefs' vehicles. Each time the push-to-talk (PTT) button is pressed on a handie-talkie, the monitor instantly displays the name, company, and riding position of the member assigned to that handie-talkie. EFAS also captures and displays all activations of the emergency alert button (EAB), including the associated name, company, and riding position.

In addition to this real-time display at the scene of the fire operation, EFAS electronically logs each time a PTT is pressed down and its duration. Electronic logs for each EFAS present at the scene have been maintained by Systems Definition Inc., the contractor responsible for the system. The FFIT can download the EFAS log for all systems present via a secure web portal and compile them into a single data set containing all handie-talkie PTT activations captured at the scene.

Videos

The FDNY Bureau of Fire Investigation (BFI) collected video evidence from a variety of sources, including footage captured by stationary surveillance and security cameras, as well as personal cellphone cameras. The video sources are as follows:

- Surveillance/security cameras,
- Security cameras on the Exposure #4 Building,
- Security cameras on a building on Flatlands 9th Street,
- A doorbell camera on the Exposure #4 Building,
- Doorbell cameras on several buildings on Avenue N,
- Cellphone cameras,
- Cellphone video from the adjoining yard (in the rear),
- Cellphone video from the street (in the front), and
- Cellphone video posted to social media (various perspectives).

Accurate time-stamp data were available for all video from surveillance/security cameras and from the cellphone video taken from the rear of the building. Time-stamp data were not available for cellphone video taken from the front of the building or video posted to social media (e.g., Citizen App, Twitter, and Facebook). These videos were synchronized utilizing handie-talkie transmissions and recorded actions.

Photos and Images

Throughout the investigation, photos and other images of the fire scene were taken:

- Three-dimensional imaging products,
- Drone images,
- Safety Command photos,
- BFI photos,
- Underwriters Laboratory's Fire Safety Research Institute photos,
- Engineers' photos, and
- Geographic Information System images.

Other Data Sources

In addition to the principal sources, the following data were used:

- FDNY Brooklyn dispatcher recordings and transcripts,
- Emergency medical dispatch recordings and transcripts,
- 9-1-1 phone calls,
- FDNY incident history report,
- Electronic BF-4 (riding lists),
- Computerized Injury Reporting System,
- New York Fire Incident Reporting System,
- Department of Buildings building information system, and
- Official weather report.

PHASE 3: ANALYSIS AND INCIDENT RECONSTRUCTION

Upon the collection and compilation of all available evidence, the FFIT began analyzing this information, with the goal of re-creating a complete timeline of the events. To develop a comprehensive understanding of the incident, the FFIT coordinated with SMEs from various related fields of expertise, both within the FDNY and from outside organizations.

Bureau of Fire Investigation

In addition to the safety investigation conducted by the FFIT, the FDNY BFI conducted its own investigation to determine the cause and origin of the fire. The FFIT relied on the BFI's expertise in this area and deferred to its determination of the cause and origin of the fire.

Underwriters Laboratories Research Institutes

The UL Research Institutes is a global safety science company widely recognized as a leader in the research and understanding of fire dynamics and growth. Its expertise in fire behavior and experience from previous investigations was a valuable asset to this investigation. UL's fire modeling and simulation informed the FFIT's understanding of the behavior of this fire and ability to visualize the critical fire dynamics at play. (see Appendix D)

Licensed Professional Engineers

Two FDNY fire officers, both licensed professional engineers, performed a forensic structural investigation and provided a report that tracked the fire and combustible gas flow paths.

FDNY Mental Performance Initiative

Members of the FDNY Mental Performance Initiative (MPI) offered their expertise in the field of psychological stress and its impact on emergency response and firefighting operations. Contributions by MPI members (who are active-duty members of the FDNY) enhanced the FFIT's understanding of the critical role of psychological stress in a firefighting operation and its specific influence on individual firefighters.

FDNY Mask Service Unit

The FDNY Mask Service Unit (MSU) provided expertise concerning the operation of self-contained breathing apparatus (SCBA) and tested SCBA #0900013542, which was used by Firefighter Timothy Klein. During this process, the MSU worked with 3M Scott Fire & Safety, the manufacturer of Klein's SCBA.

FDNY Fleet Services

FDNY Fleet Services contributed its expertise in the operation and serviceability of FDNY apparatus and conducted tests of E257's apparatus, SP 20007. During this process, Fleet Services worked with the Allison Transmission Corporation and the Seagrave Corporation, the manufacturer of this apparatus.

FDNY Research and Development

The FDNY Research and Development (R&D) Unit, a component of the Safety Command, is the subject-matter expert in specifying, evaluating, and deploying life safety equipment for the department. The unit offered expertise in the construction and operational capabilities of firefighting hoses.

Office of the Chief Medical Examiner

The New York City Office of the Chief Medical Examiner (OCME) provided an expert forensic analysis of Firefighter Timothy Klein's body to determine an accurate cause of death. The OCME performed an autopsy and issued a report of its findings.

PHASE 4: SAFETY INVESTIGATION REPORT PRODUCTION

The final phase of the process was the compilation of the results of the investigation into a single, cohesive, and comprehensive safety investigation report. The FFIT produced this report based on the insights collected over months of intensive research, analysis, and deduction. This final report is presented here, accompanied by supporting documentation (e.g., videos and photos) and related reference material (see Appendices A–E).

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CHAPTER 3. INCIDENT INFORMATION

This chapter describes the physical setting of the incident including the building, local geography, construction zone, and weather and wind conditions.

BUILDING DESCRIPTION

The fire originated at 10826 Avenue N and extended to 10824 Avenue N, the attached residence on the exposure #4 side. Although these residences are attached, they are separate occupancies. See Figure 2 for a street view.

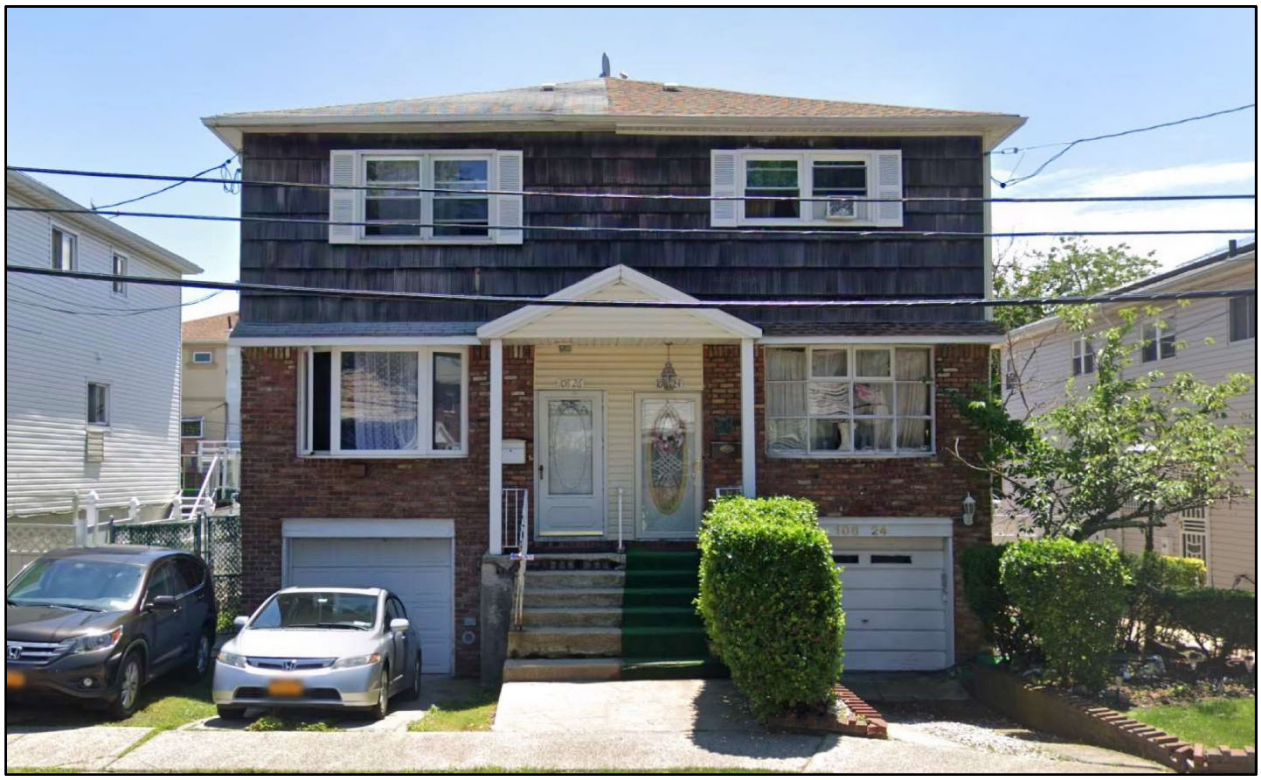


Figure 2. Street view of 10826 and 10824 Avenue N before the fire.
Source: Google Maps.

In New York City, every structure is issued its own building identification number (BIN) associated with the structure's activities, and every tax lot is issued its own building-block-lot (BBL) number to record activity related to that plot of land, or tax lot. These numbers are utilized by the New York City Fire Department, the New York City Department of Buildings, the

Department of City Planning, and the Department of Finance. Each residence at 10826 Avenue N and 10824 Avenue N, respectively, has its own BIN and BBL, indicating that each is a separate building on a distinct tax lot. The identifiers of these buildings are as follows:

- 10826 Avenue N: 3233321 BIN; 3082730030 BBL
- 10824 Avenue N: 3233320 BIN; 3082730029 BBL

These two buildings were constructed as mirror images of each other and have the same physical dimensions and descriptions.

Both buildings were non-fireproof, semi-attached, single-family dwellings. Constructed in 1965, they were subject to the 1938 NYC Building Code, which identified them as Class 4 buildings of wood frame construction. A demising wall, constructed of a concrete masonry unit that extended from the basement floor to the underside of the roof beams, demarked the separation of these two buildings (and tax lots). This demising wall served as a fire partition between the two buildings.

The buildings were approximately 32 feet high and consisted of three levels. Each building was 17 feet wide and 40 feet deep and had a wood-framed deck on the first floor in the rear.

The main entrance to each building was located at the top of a seven-step masonry stoop. The buildings shared a portico (a common gabled porch roof) over the landing at the top of the stoop. The basement level of each building had a one-car garage adjacent to the stoop, with its entrance slightly below grade. The basement consisted of a one-car garage, a small storage area, a stairwell leading to the first floor, a utility area, and a large room in the rear. The first floor consisted of a foyer, staircases leading to the floors above and below, a living room, a dining room, a bathroom, a closet, and a kitchen in the rear. The second floor consisted of three bedrooms, a staircase, a hallway, a hallway closet, and a bathroom.

On each side of the masonry demising wall, furring strips were attached vertically to secure gypsum board to the walls. These strips were attached in a staggered fashion on each floor, creating horizontal and vertical voids from the basement level to the attic. These voids created an additional path for smoke and fire travel.

Common to 10826 and 10824 Avenue N was a double thick wall containing a vertical shaft serving as a chase for plumbing, sewer vent pipes, and an HVAC vent. This vertical shaft was approximately 1 foot deep by 3 feet wide and varied in shape from the first floor to the second floor. This vertical shaft was located 12 feet from the building's rear wall, behind the first floor closet, and extended into part of the full bathroom. The vertical shaft contained the air supply duct for the second floor and vents for the furnace and water heater. The vertical shaft extended from the basement level to the attic along the demising wall without fire stops between the floors.

Both 10826 and 10824 Avenue N had walk-out basements, which typically have separate entrances or access to the outdoors at ground level or slightly above ground level. Called a "walk-out" because an occupant can access the outside from the basement without traversing the main floor of the building, this type of basement is usually situated on a sloping or hilly terrain, allowing for natural light and convenient access to the backyard or patio area. Walk-out basements are often used as additional living spaces or recreation areas, and they maximize the use of a sloping lot (see Figure 3).

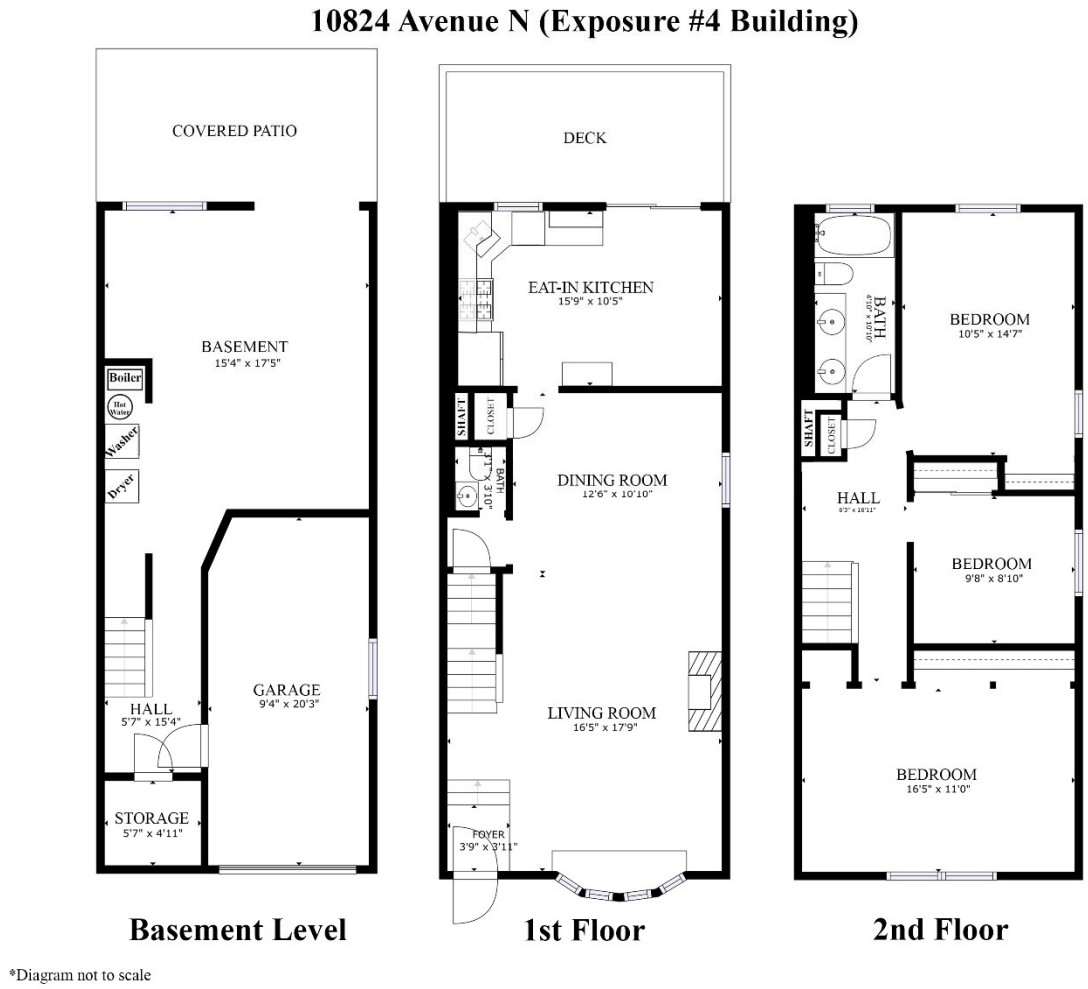


Figure 3. Floor plan of 10824 Avenue N, created by the FDNY Robotics Unit.

LOCAL GEOGRAPHY

The fire buildings, 10826 and 10824 Avenue N, were located in a waterfront area of Brooklyn, known as Canarsie, on a dead-end block. The buildings were situated on the south side of Avenue N, approximately 215 feet east of East 108th Street and 40 feet west of the dead end. The dead end was situated along Fresh Creek of Jamaica Bay, approximately 40 feet from the water's edge.

At the time of the incident, an ongoing construction project at the dead end of Avenue N was secured by a chain-link fence. This fence was located between the fire buildings and the end of the

block. Both the fence and overhead wires prevented optimal ladder apparatus coverage of the buildings and the engines' use of the closest hydrant (see Figure 4).

Figure 4. Map of the area, courtesy of FDNY CRIMS.

There were two hydrants at this dead-end block of Avenue N. The first hydrant was on the north side of the street, approximately 80 feet east of East 108th Street. The second hydrant, at the far eastern end of the street (at the dead end), was inaccessible due to the placement of construction barriers. This second hydrant was not used at the incident.

CONSTRUCTION ZONE

The New York City Departments of Environmental Protection (DEP) and Design and Construction had been leading a project to upgrade the storm and sanitary sewer system infrastructure for the Canarsie and East New York neighborhoods. A portion of this project was underway at the dead end stretching from 10832 Avenue N to the front of 10826 Avenue N (Fire Building). This

construction site encompassed the street area from curb to curb and was fenced in by chain link on all sides. A hydrant within this fenced-off area was the closest hydrant to the Fire Building, but it was not readily visible to responding companies (see Figures 5 and 6).

Figure 5. Location of 10826 and 10824 Avenue N and the intersection of East 108th Street. Source: Google Maps.

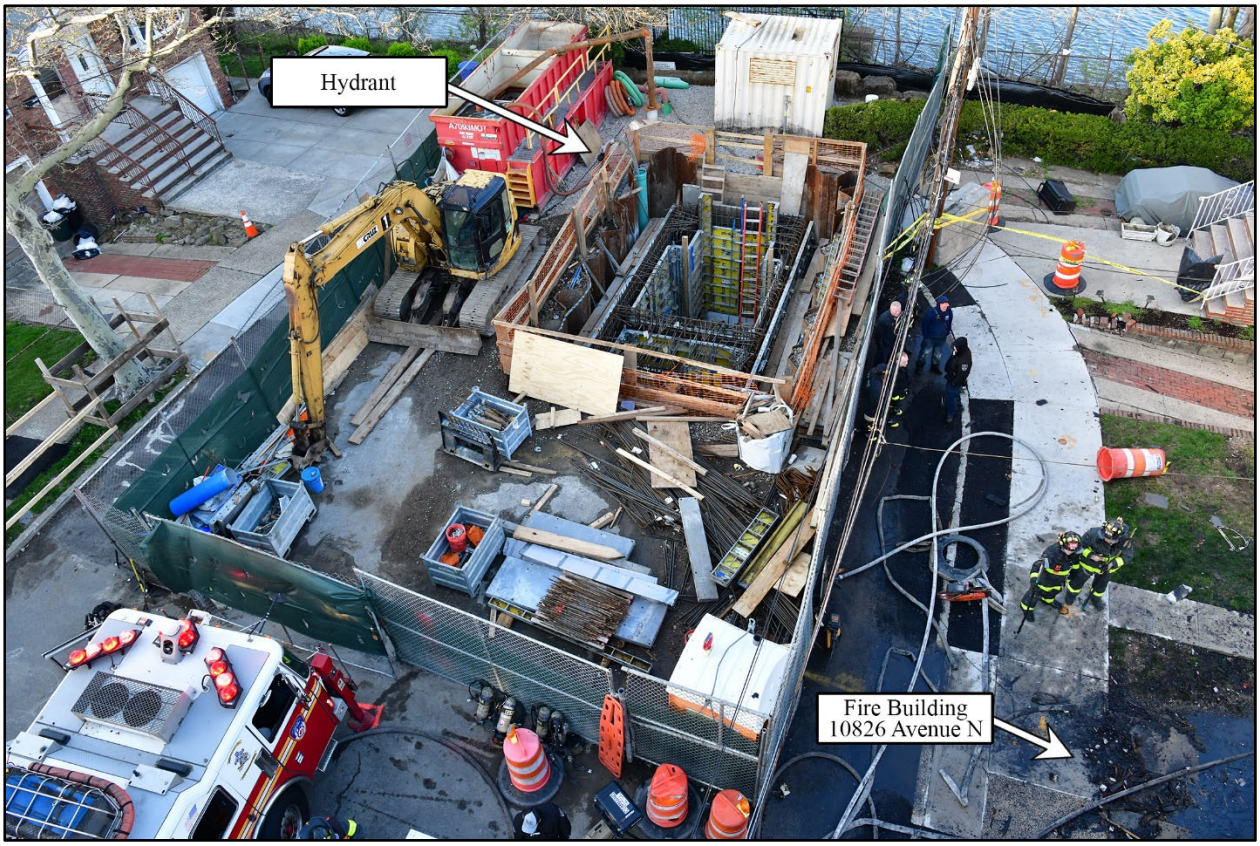


Figure 6. View of the construction zone at the dead end of Avenue N.

WEATHER AND WIND CONDITIONS

On April 24, 2022, temperatures peaked at 59° Fahrenheit at approximately 0900 hours, and the day began with a clear sky and no precipitation. Between 0900 and 1000 hours, the wind intensity increased from approximately 10 miles per hour (mph) east to 24 mph east, and sustained winds lasted until 1600 hours. At the time of the incident, the area saw sustained winds from the east at 23 mph and gusts averaging 30 mph (see Figures 7 and 8).

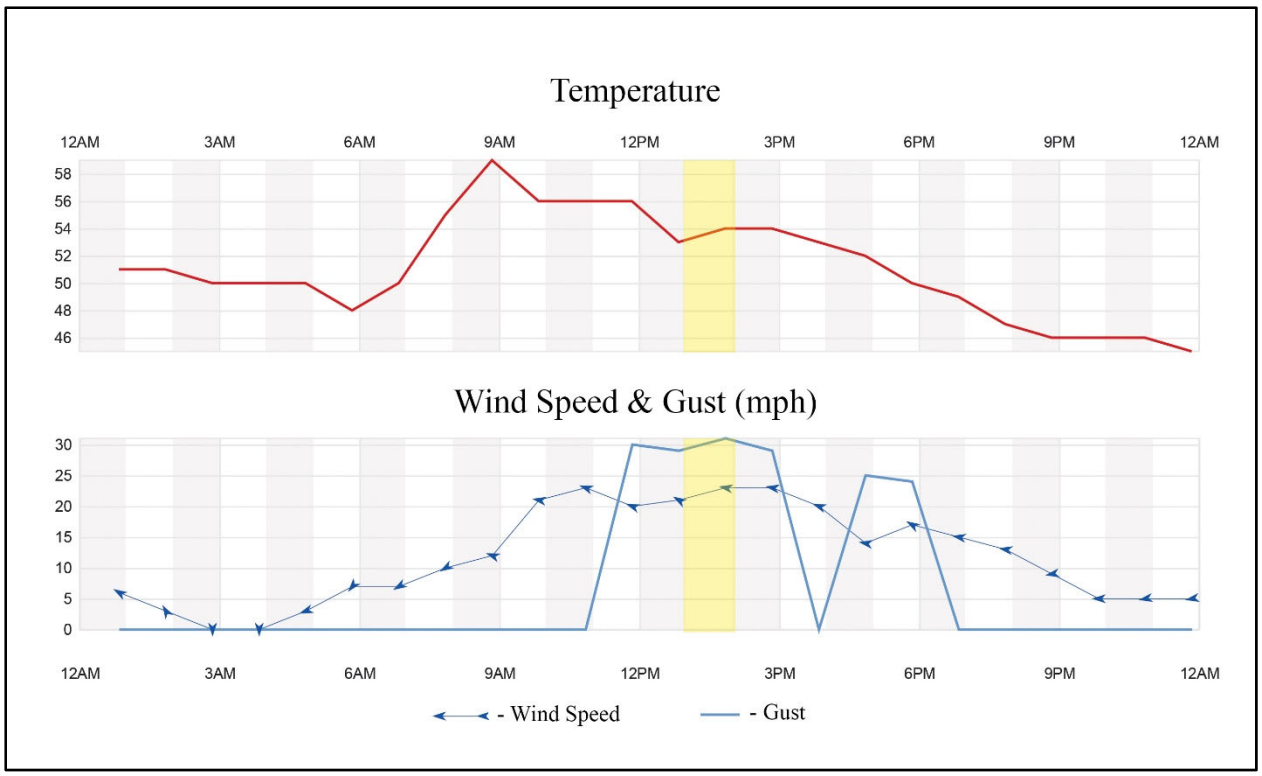


Figure 7. Temperature and wind speed measured at John F. Kennedy International Airport, approximately 5 miles from 10826 Avenue N, Brooklyn. Source: Weather Underground.

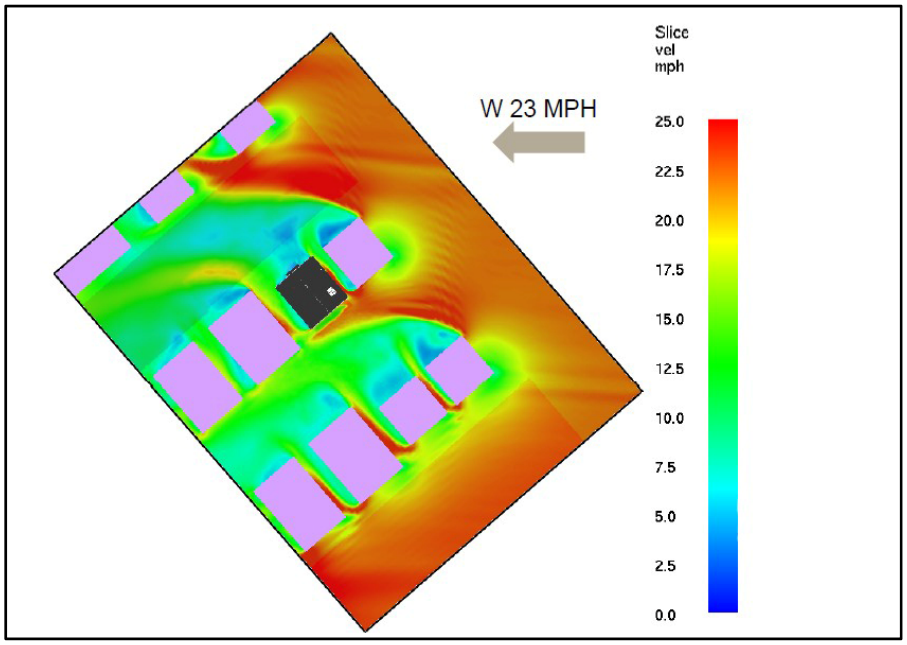


Figure 8. Wind direction and velocities measured 6 feet above the first floor, courtesy of UL Research Institutes' Fire Dynamics Simulator.

CHAPTER 4. PHOTOGRAPHS AND DIAGRAMS

Figure 9. Aftermath of incident at 10826 and 10824 Avenue N, Brooklyn, Box 3-3 2075 (front elevation).

Figure 10. Aftermath of incident at rear of 10826 and 10824 Avenue N.

Figure 11. Drone photo of the scene and surrounding area with apparatus placements, courtesy of the FDNY Robotics Unit.

10824 Avenue N - Exposure #4 Building

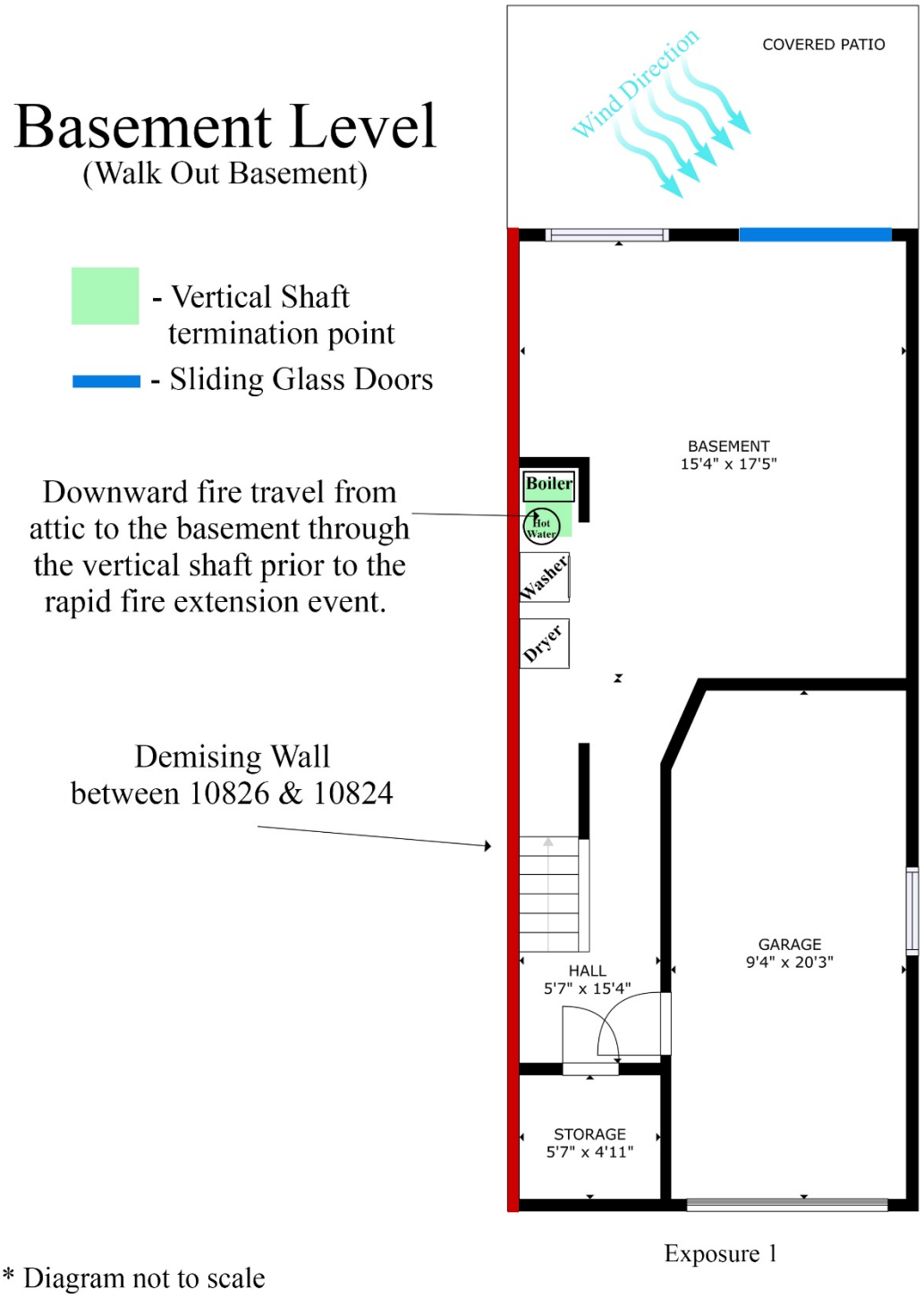


Figure 12. Basement level of 10824 Avenue N, Exposure #4 Building.

Figure 13. Photograph of utility room on the basement level of the Exposure #4 Building, showing vertical shaft and source of low intake (top); view of backyard from inside basement, showing another source of low intake (bottom).

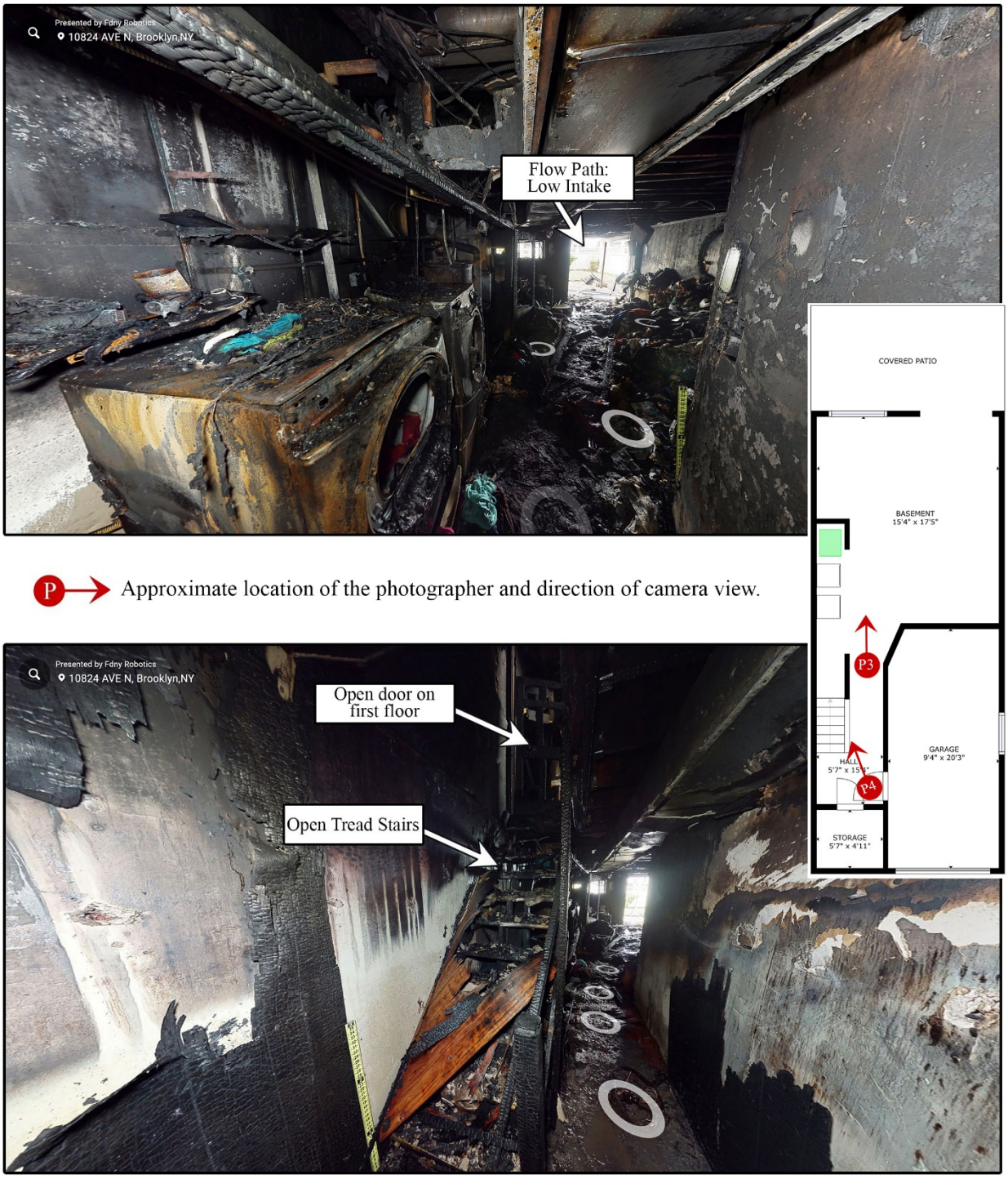


Figure 14. Basement-level hallway from front to rear, view of rear sliding glass door (top); basement-level view facing the rear of the Exposure #4 Building (bottom).

10824 Avenue N - Exposure #4 Building

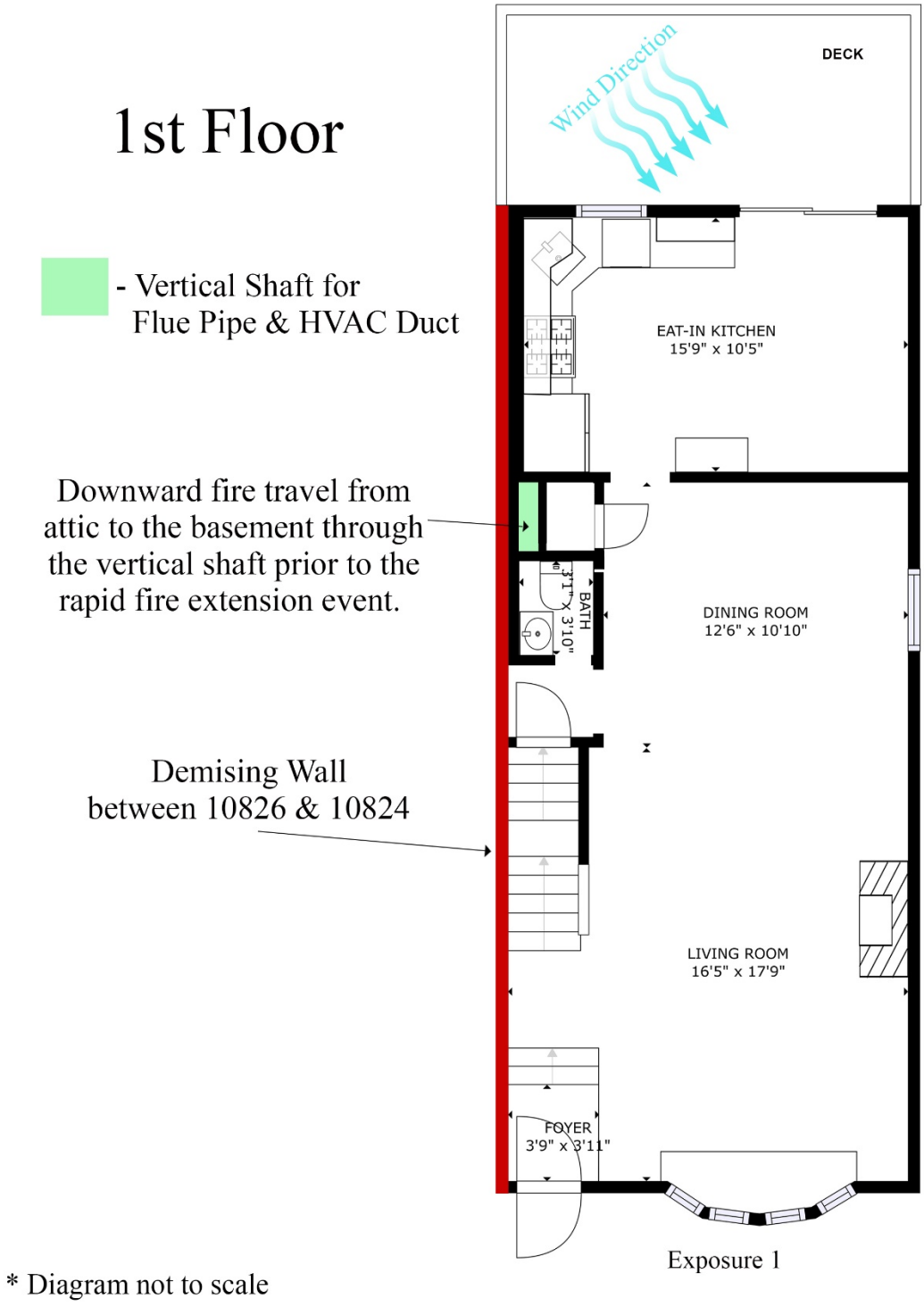


Figure 15. First floor of 10824 Avenue N, Exposure #4 Building.

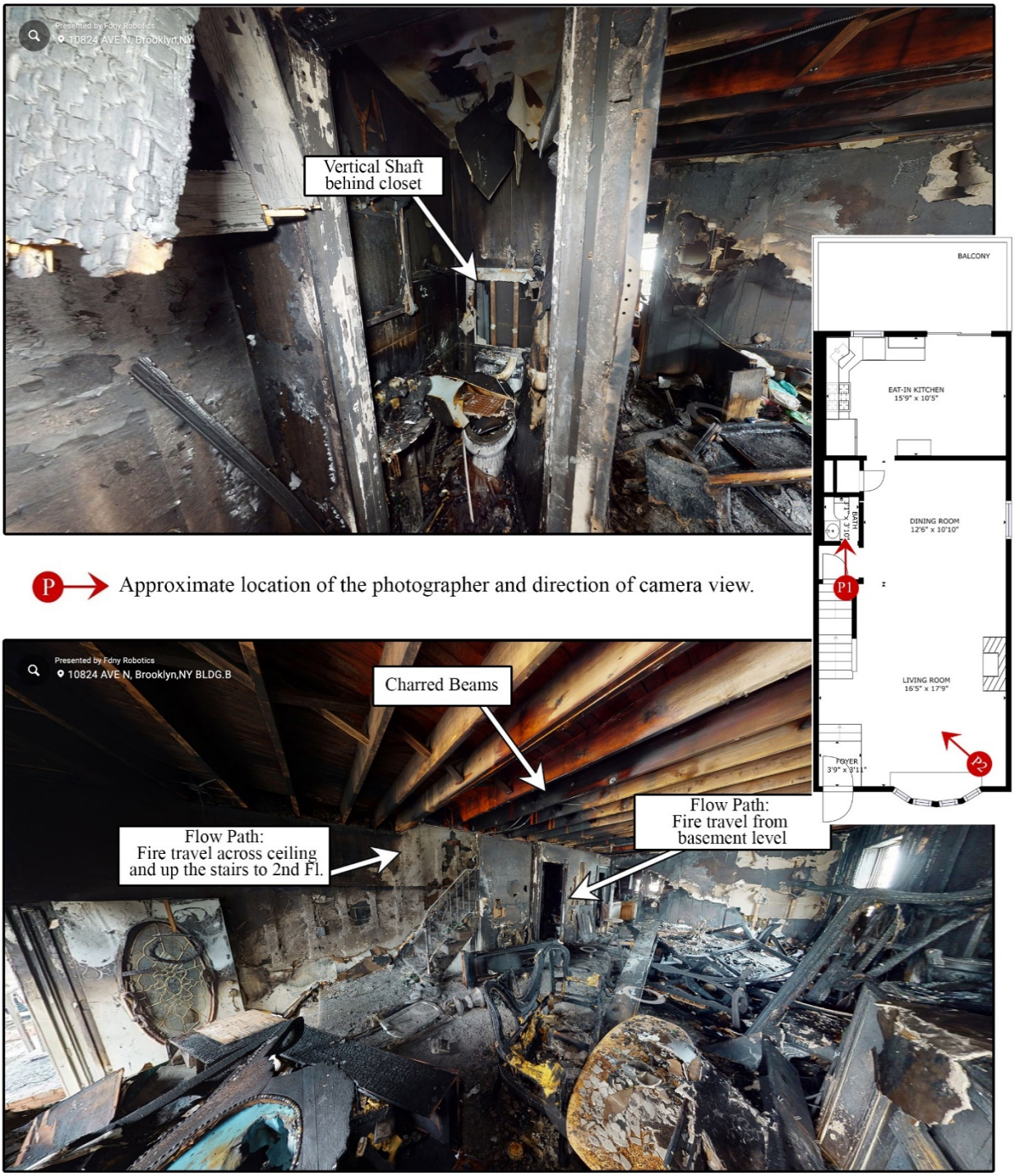


Figure 16. View of the first-floor bathroom and the vertical shaft in the wall (top); view of the first floor from the living room (bottom).

10824 Avenue N - Exposure #4 Building

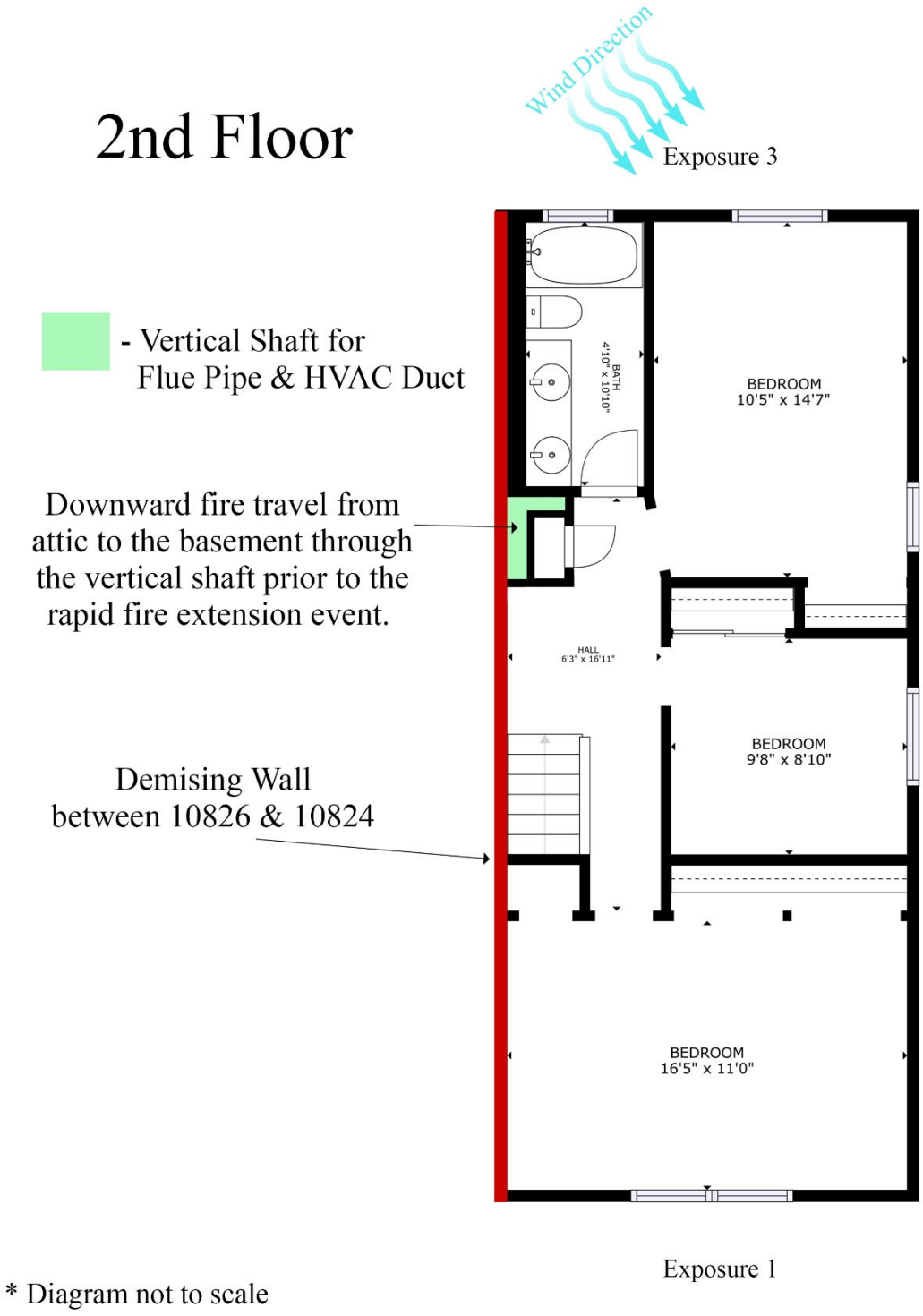


Figure 17. Second floor of 10824 Avenue N, Exposure #4 Building.

Figure 18. View of the second-floor hallway and iron railing (top); view of the second-floor vertical shaft for flue pipe and HVAC vent (bottom).

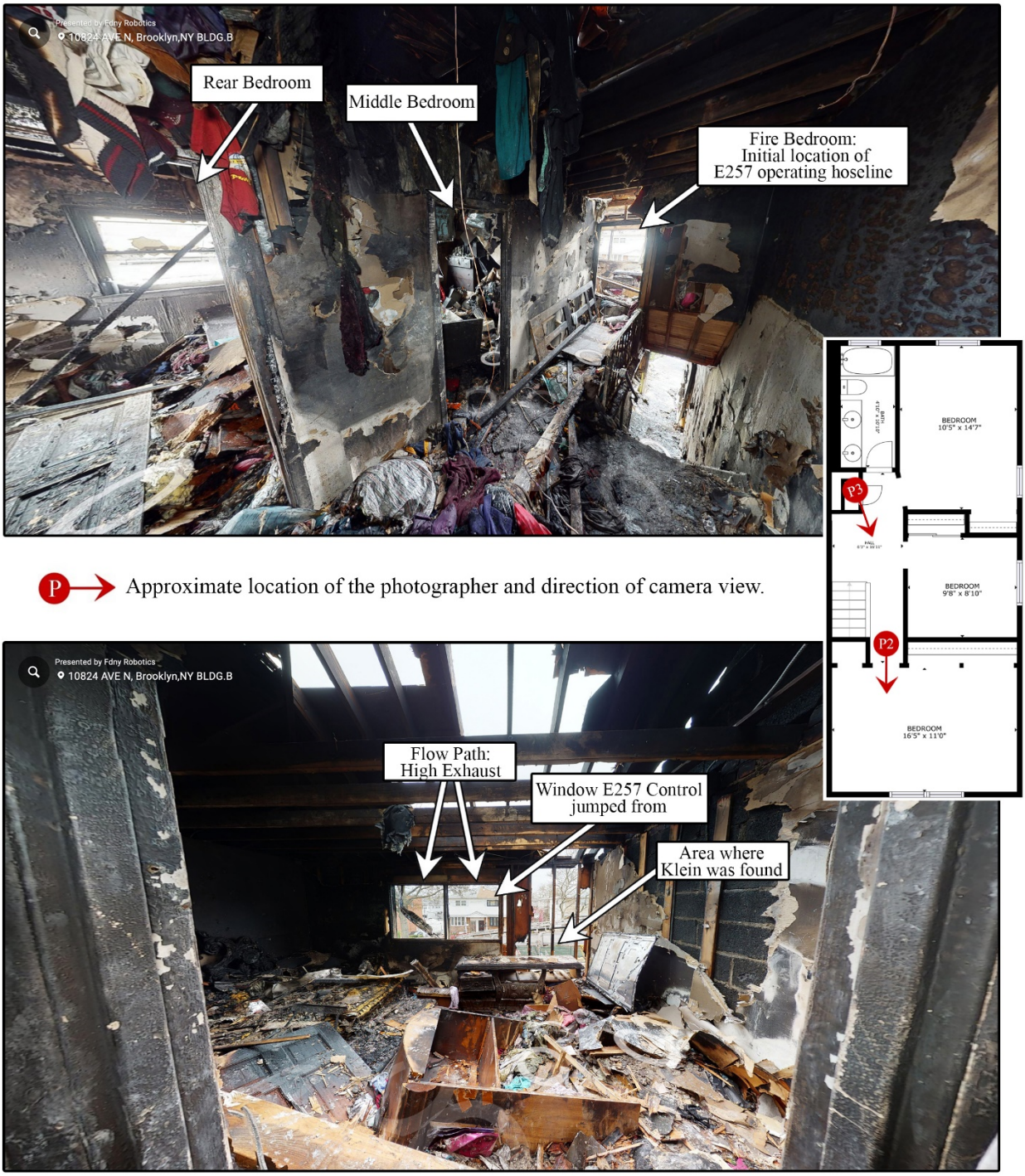
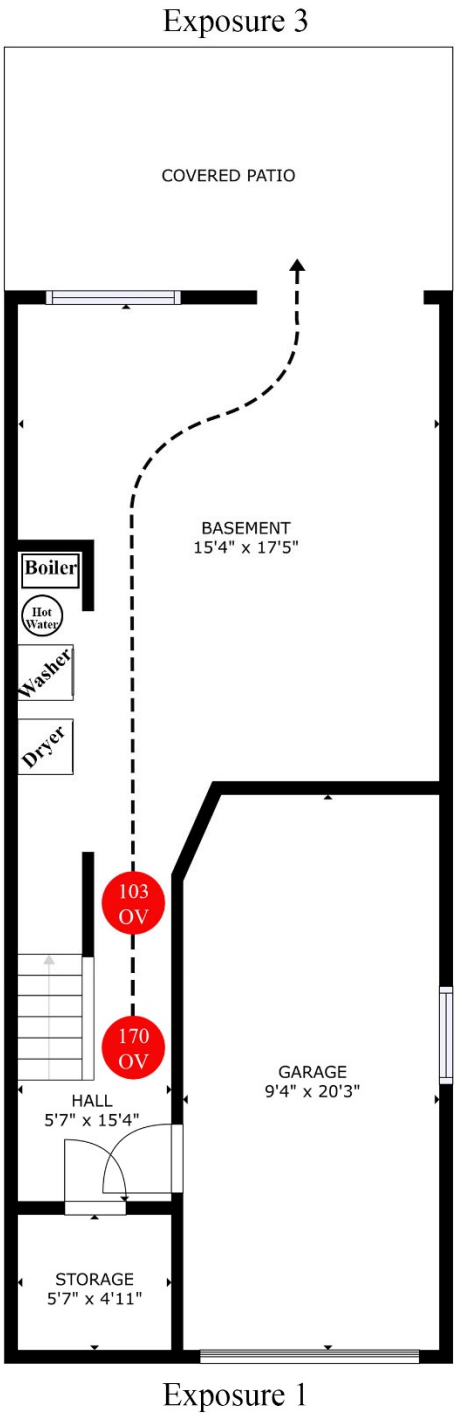


Figure 19. View of the hallway to the front bedroom on the second floor (top); view of front bedroom on the second floor, where Firefighter Timothy Klein was found (bottom).

10824 Avenue N - Exposure #4 Building



Basement Level

*Approximate initial location and movement of members during or immediately after the fire event.

Figure 20. Member movement on basement level of 10824 Avenue N, Exposure #4 Building.

10824 Avenue N - Exposure #4 Building

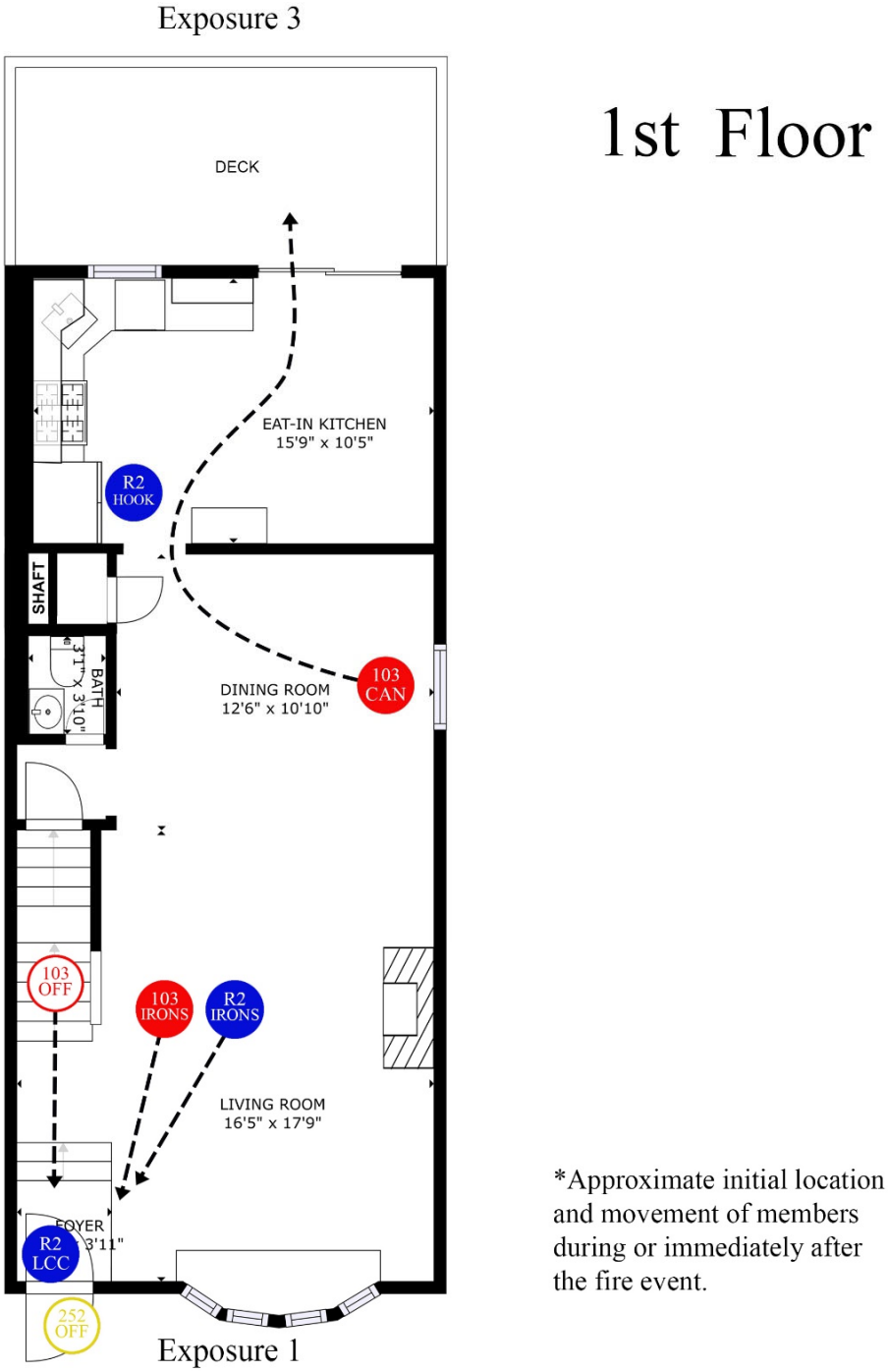


Figure 21. Member movement on first floor of 10824 Avenue N, Exposure #4 Building.

10824 Avenue N - Exposure #4 Building

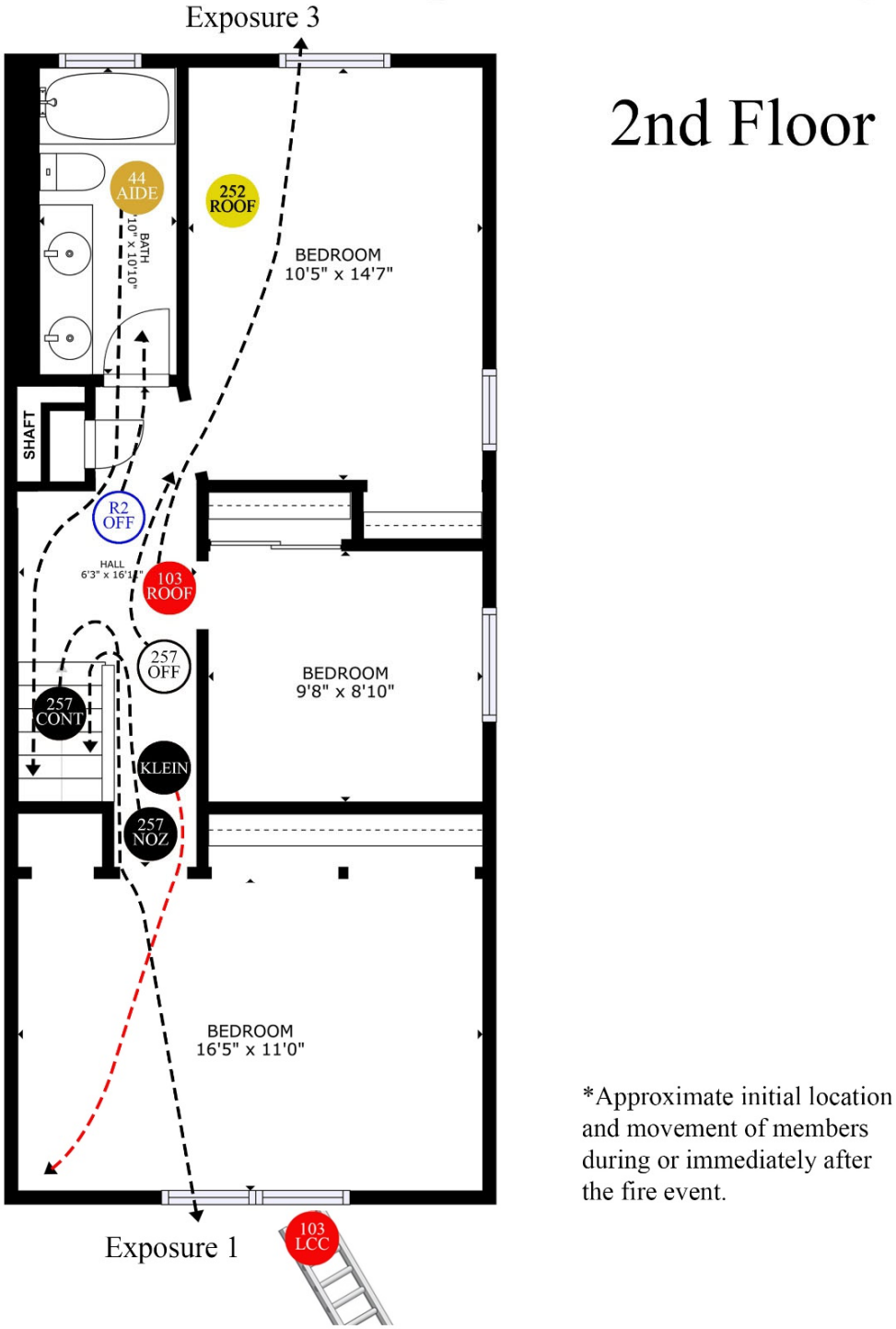


Figure 22. Member movement on second floor of 10824 Avenue N, Exposure #4 Building.

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CHAPTER 5. FIRE DEPARTMENT OPERATIONS

This chapter provides a comprehensive accounting of the operations of the New York City Fire Department (FDNY)'s members at Brooklyn Box 2075 on April 24, 2022. The intent is to fully recount the events leading up to the line-of-duty death of Firefighter Timothy Klein. With some minor variations, information in this chapter is presented chronologically. To communicate the complex and often simultaneous activity on the fireground, the narrative is divided into sub-sections that focus on periods lasting several minutes. The information presented here focuses primarily on the actions taken by operating FDNY members and does not fully recount the chronological behavior of the fire.

INITIAL RESPONSE

On Sunday, April 24, 2022, at 1349 hours, the FDNY's Brooklyn Communication Office received a telephone alarm reporting smoke near Avenue N and East 108th Street. E257, E290, E283, L170, L174, and B58 were assigned to Brooklyn Box 2075.

The wind on April 24, 2022, gusted to nearly 30 mph at the John F. Kennedy (JFK) International Airport's wind station. JFK is approximately 5 miles east of 10826 Avenue N. The time, wind direction, and wind speed during the incident were as follows: at 1251 hours, east-southeast at 21 mph; at 1351 hours, east at 23 mph; and at 1451 hours, east at 23 mph. The temperature was 54° Fahrenheit with a clear sky.

At 1351 hours, L103, the normally assigned second-due ladder company to Brooklyn Box 2075, became available from Brooklyn Box 1719 and was assigned as the second-due ladder company, replacing L174, which was directed to remain in service. E257 and E290 each responded with an officer and four firefighters. E283 responded with an officer and five firefighters. All ladder companies responded with an officer and five firefighters. All units responded in emergency mode.

Although he was assigned to L170, Firefighter Timothy Klein was detailed to E257 for the 9×6 tour and was assigned the back-up position. At 13:52:32, while responding on E257's apparatus, Firefighter Timothy Klein pressurized his SCBA by opening the cylinder valve, thereby arming the Pak-Alert SE 7 personal alert safety system (PASS) device.

ARRIVAL AND INITIAL OPERATIONS OF FIRST-DUE UNITS

At 13:53:34, E257 arrived at the intersection of Avenue N and East 108th Street, and the E257 Officer transmitted via handie-talkie, "We got a lot of smoke, corner of the Avenue."

At 1354 hours, the B58 Chief transmitted via department radio to the Brooklyn dispatcher, "Looks like we got something."

The E257 Chauffeur positioned the apparatus on East 108th Street, approximately 10 feet west of Avenue N, given the positions of the responding ladder companies. The E257 Control Firefighter exited the apparatus and tested the hydrant in front of 10807 Avenue N (DEP hydrant number H331087), which was operational. The E257 Control Firefighter used a 3½-inch supply line to connect the hydrant to the apparatus, establishing a positive water source.

At 13:54:45, the E257 Officer proceeded to the front of the Fire Building and ordered members via handie-talkie to "start a dry line to the front." The E257 Nozzle Firefighter and Firefighter Timothy Klein stretched a 1¾-inch hoseline from E257's apparatus to the front of the Fire Building. Eight total lengths of hose were stretched—six lengths of 1¾-inch and two lengths of 2½-inch hose (see Figure 23 for the initial smoke conditions).

Figure 23. Initial smoke conditions that members encountered on Avenue N (left); view from Ring camera at 10824 Avenue N, the Exposure #4 Building, of E257 and L170 preparing for initial attack (right).

At 13:54:53, L170 arrived and positioned the apparatus in front of the Fire Building. The L170 Officer transmitted to the B58 Chief via handie-talkie, “Give the 10-75.” The members of L170 exited the apparatus and proceeded to their positions as follows: the L170 Officer, FE Firefighter, and Can Firefighter—the Inside Team—proceeded to the front entrance of 10826 Avenue N and prepared to force entry.

At 13:55:46, the L170 Roof Firefighter on the way to the rear of the Fire Building via the alley on the exposure #2 side transmitted via handie-talkie, “Heavy fire coming out the two side, second floor, in the rear” (see Figure 24).

Figure 24. View of exposure #2 and #3 of 10826 Avenue N.

The L170 Outside Vent (OV) Firefighter proceeded to the exposure #2 side of the Fire Building and placed a 24-foot extension ladder against the second-floor window. Heavy fire venting from the first-floor windows prevented the L170 OV Firefighter from ascending this ladder. The L170

OV Firefighter then proceeded to the rear and entered the Fire Building's basement (a walk-out basement) via the rear sliding glass door. Visibility inside the Fire Building was clear. The L170 OV Firefighter found the stairs to the first floor and noticed the door frame at the top was on fire.

The L170 Chauffeur repositioned the apparatus to maximize its coverage of the Fire Building (see Figure 25).

Figure 25. Ladder 170 apparatus placement in front of 10826 Avenue N.

At 1355 hours, the B58 Chief arrived on scene and assumed the role of incident commander (IC). The B58 Firefighter positioned the battalion vehicle on the south side of East 108th Street, east of Avenue N, allowing access for incoming units.

At 13:55:15, the B58 Chief transmitted to the Brooklyn dispatcher via department radio, "10-75 the box. We have a peaked roof private dwelling. We will confirm the address."

At 13:55:19, D15, B44, R2, SQ252, E310, and L174 were assigned to the 10-75 transmission signal. L174 was designated the Firefighter Assist and Search Team (FAST). R2 responded with an officer and six firefighters, SQ252 responded with an officer and five firefighters, E310 responded with an officer and four firefighters, and L174 responded with an officer and five firefighters. The Emergency Medical Service (EMS) Basic Life Support (BLS) Unit 44I2, the Advanced Life Support (ALS) Unit 39W2, and the Conditions Officer C592 were also assigned.

ARRIVAL AND INITIAL OPERATIONS OF SECOND- AND THIRD-DUE UNITS

At 1355 hours, E290 arrived on scene and transmitted a 10-84 via the Mobile Data Terminal (MDT). The E290 Chauffeur positioned the apparatus at the hydrant (H331088) in front of 10573 Avenue N. The E290 Nozzle and Back-up Firefighters assisted the E257 Firefighters with the initial hose stretch. Once it was determined enough hoseline had been stretched, the E290 Control Firefighter disconnected it at the hose bed and connected the first hoseline to an outlet on E257's apparatus.

At 1356 hours, E283 arrived on scene and transmitted a 10-84 via the MDT. The E283 Chauffeur positioned the apparatus near the hydrant (H331090) at the intersection of East 108th Street and Flatlands 9th Street. The E283 Nozzle and Back-up Firefighters stretched a second 1¾-inch hoseline from E257's apparatus and met up with the E283 Officer in front of the Fire Building. This hoseline was connected to an outlet on E257's apparatus.

At 13:56:42, L103 arrived at the intersection of Avenue N and East 108th Street and transmitted a 10-84 via the MDT. The L103 Officer, Inside Team, and OV Firefighter exited the apparatus and walked down the block to the front of the Fire Building. The L103 Roof Firefighter stayed with the L103 Chauffeur to assist with apparatus placement.

At 13:56:43, the hoseline was flaked out, and the E257 Officer made the initial call for water. This hoseline was not immediately charged. The E257 Officer called for the hoseline to be charged four more times over the next 2 minutes.

At 13:57:51, the B58 Firefighter transmitted to the Brooklyn dispatcher via the department radio the confirmed address of 10826 Avenue N and requested an extra engine and truck. E231 and L120 were the extra units assigned.

DELAYED WATER AND WITHDRAWAL FROM THE FIRE BUILDING

At approximately 1358 hours, after reporting to the IC, L103 members proceeded to their positions as follows. The L103 Officer and Inside Team proceeded to the front entrance of 10824 Avenue N (Exposure #4 Building). They donned their SCBA facepieces and entered the Exposure #4 Building via the front door at the top of the stoop. They found no indications of smoke or heat on the first floor. Then, they ascended the interior stairs to the second floor, where the L103 Officer noted that the staircase wall—the demising wall between the Exposure #4 Building and the Fire Building—was extremely hot to the touch (see Figure 26). When they reached the top of the stairs, they found a high-heat condition with limited visibility. The L103 Officer ordered the L103 Can Firefighter to remain at the top of the stairs to act as a beacon. The L103 FE Firefighter began a search of the rear while the L103 Officer searched the front of the second floor, where fire was discovered in the front bedroom. Upon finding fire, the L103 Officer closed the door to the front bedroom, confining the fire to that room.

Figure 26. View of the front door and staircase on first floor of 10824 Avenue N.

The L103 OV Firefighter proceeded to the rear of the Fire Building with a 24-foot extension ladder via the alley on the exposure #2 side of the Fire Building. After surveying the rear, the member

placed a 24-foot extension ladder to a second floor window on the exposure #4 side of 10824 Avenue N. The L103 OV Firefighter climbed the ladder, intending to vent, enter, isolate, and search (VEIS) the room, but the size of the window and the location of furniture inside the room restricted the firefighter's entry. The L103 OV Firefighter left the window intact and descended the ladder.

The L103 Chauffeur positioned L103's apparatus in front of 10820 Avenue N, behind L170's apparatus, to maximize ladder coverage of the Fire Building. Once the apparatus was in position, the L103 Chauffeur raised the aerial ladder to the front second-floor window of the Exposure #4 Building (see Figures 27–29).

Figure 27. L103's apparatus placement in front of 10820 Avenue N.

Figure 28. L103's aerial ladder to the second-floor window of 10824 Avenue N.

Figure 29. Placement of the L103 OV Firefighter's 24-foot portable ladder against the second-floor window on the exposure #4 side of 10824 Avenue N.

The L103 Roof Firefighter proceeded to the rear of the Fire Building with an extension ladder via the alley on the exposure #4 side. Due to the sharp turns and narrow path, the L103 Roof Firefighter was forced to breach a PVC fence in the alley to carry the ladder into position. Upon arrival in the rear, the L103 Roof Firefighter noted fire out all windows and the door of the first floor of the Fire Building and a 20-pound propane cylinder exposed to fire on the rear deck of the Exposure #4 Building. The member climbed the stairs to the rear deck and removed the cylinder, carrying it back toward the front via the exposure #4 side alley.

At 13:58:37, the E257 Chauffeur transmitted via handie-talkie, "We're having issues with the rig." This transmission was followed by another transmission at 13:58:47, stating, "We're having issues getting water intake to the pumps." Engine company chauffeurs on the scene tried unsuccessfully to engage E257's pump.

At approximately 1359 hours, The E290 Chauffeur repositioned E290's apparatus, backing down the block onto Avenue N in front of a hydrant (H331087). The hydrant supply line connected to E257 was disconnected, and E290 connected its 3½-inch supply line to the same hydrant. The two handlines that had been connected to E257's outlets were disconnected and connected to outlets on E290 (see Figures 30 and 31).

Figure 30. E290 in position after E257's apparatus experienced pumping issues.

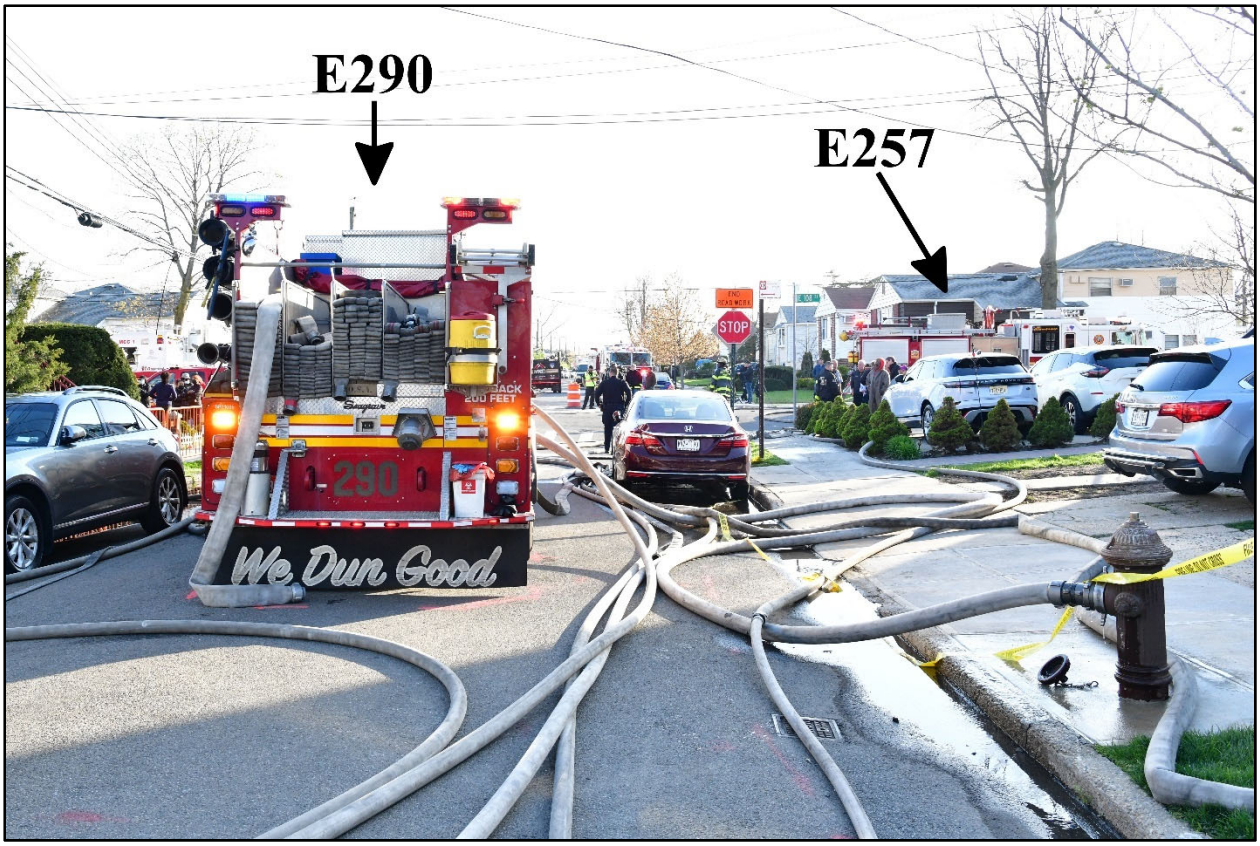

Figure 31. E290 connected to hydrant H331087 in front of 10807 Avenue N.

At 13:59:02, the B58 Chief transmitted "10-70" over the handie-talkie, but the 10-70 signal was never transmitted over the department radio.

While the water supply issues were addressed in the street, the fire continued to vent out the front door of the Fire Building. Due to the lateral impact of the wind condition, the fire blew across the open front door of the Exposure #4 Building. The L170 Officer and Inside Team, positioned on the front stoop of the Fire Building, recognized that the extending fire was threatening the egress of the L103 Officer and Inside Team, who were operating inside the Exposure #4 Building.

At 13:59:37, the L170 Officer transmitted to the L103 Officer via handie-talkie. The captured portion of the message was as follows: "170 to 103, [You have to get out of there. The fire is taking over the] front door. So be careful wherever you are." With this information and the lack of a hoseline in the Exposure #4 Building, the L103 Officer ordered the L103 FE and Can Firefighters to descend the stairs and exit the building.

At 13:59:57, after deciding to evacuate all members from the Fire Building and the exposure, the B58 Chief transmitted via handie-talkie, "Command to all units, everybody out of the building. Command to 103, get out of the building. We have no water on the fire."

At 14:00:20, the B58 Firefighter transmitted to the Brooklyn dispatcher via department radio, "58 to Brooklyn, give a second alarm." E323, E225, E309, L107, B39, B38R, and B41S; Command Tactical 1; Field Communications Unit 1; Rescue Battalion 1; Rehabilitation Manager (RM) 01; Safety Battalion (SB) 01; E284 with Satellite 3; and Tactical Support 1 were assigned to transmission of the second alarm. E284 was designated the transport for Satellite 3, the B39 Chief was designated for firefighting duty, the B38 Chief was designated the Resource Unit leader (RESL), and the B41 Chief was designated the safety officer. All engine companies on the second alarm responded with an officer and four firefighters, and L107 responded with an officer and five firefighters.

At 1401 hours, L175 became available from Brooklyn Box 2027 and was assigned to second alarm Box 2075. L107 was directed to remain in service. EMS Units Haz-Tac 2, Conditions Car 583, Logistical Support Unit 8, Mobile Respiratory Treatment Unit 3, Major Emergency Response Vehicle MV1, and the Haz-Tac Battalion (HTB) were also assigned.

At 14:01:11, all units were confirmed out of the building via handie-talkie transmissions.

INTERIOR ATTACK: FIRST HOSELINE CHARGED

After both hoselines were disconnected from E257's apparatus and reconnected to outlets on E290's apparatus, the E290 Chauffeur supplied water to E283's hoseline.

At 14:02:38, the E283 Chauffeur transmitted via handie-talkie, "There's water in one line."

The E290 Chauffeur noticed that the hoseline stretched by E257 was disconnected a few lengths away from the apparatus. These lines were quickly reconnected, and E257's hoseline was supplied with water.

INTERIOR OPERATIONS RESUME

After extinguishing fire on the exterior of the Fire Building, the E283 Officer and Nozzle and Back-up Firefighters entered the front door of the Fire Building with the first hoseline and initiated

an interior attack, with the assistance of E290. L170's Inside Team also entered the Fire Building behind E283's hoseline.

At 14:03:44, the L170 Officer transmitted via handie-talkie, "170 to Command, we're putting water on the fire now."

ADDITIONAL UNITS ARRIVE

At 1403 hours, B44, SQ252, and L174 arrived on scene, all transmitting a 10-84 via the MDT.

The L174 Chauffeur positioned the apparatus on East 108th Street, just east of Avenue N. The Chauffeur, OV, FE, and Roof Firefighters reported to their officer in front of 10820 Avenue N with their assigned FAST Unit tools. The L174 Can Firefighter, as the designated EFAS firefighter, entered the passenger compartment of B58's vehicle and began monitoring the EFAS.

The SQ252 Officer reported to the B58 Chief in front of the Fire Building. The B58 Chief ordered the SQ252 Officer to check the Exposure #2 Building for fire extension. The SQ252 Officer split his unit into teams. The SQ252 Officer and SQ252 FE Firefighter checked the Exposure #2 Building for fire extension, the SQ252 Can Firefighter was directed to enter the Fire Building, the SQ252 Hook Firefighter proceeded to the rear, and the SQ252 Roof Firefighter was directed to the second floor of the Exposure #4 Building to check for fire extension.

The B58 Firefighter transmitted via department radio to the Brooklyn dispatcher, "Can we get a primary response from Con-Ed on this box?" This request was meant to address the power lines that were arcing in front of the Fire Building.

DIVISION 15 ARRIVES ON SCENE

At 1404 hours, D15 arrived on scene and transmitted a 10-84 via department radio and the MDT. Also, at 1404 hours, the B58 Firefighter transmitted a primarily report via department radio to the Brooklyn dispatcher, "We have fire on the first and second floor of a two-story building, 40 by 60. The address is 10826 Avenue N, an occupied non-fireproof. We have two lines stretched, one in operation. Primary searches are underway. The trucks are opening up, the fire is doubtful. Exposures are as follows: one is the street, two is a driveway, three is unknown, four is a similar attached."

At 1404 hours, the L103 Roof Firefighter returned to the rear yard and climbed the deck stairs to make entry into the first-floor rear of the Exposure #4 Building via a sliding glass door. The L103 Roof Firefighter opened this sliding glass door, and the glass remained intact. This sliding glass door remained open for the remainder of the operation. Upon entry into the Exposure #4 Building, the L103 Roof Firefighter noted no heat condition and clear visibility. While searching this floor, the L103 Roof Firefighter found the door to the interior stairway to the basement and conducted a visual inspection down the stairs. Looking down the stairway from the doorway at the top, the L103 Roof Firefighter observed that conditions in the basement were clear, closed this stairway door, and continued to search the first floor.

THIRD HOSELINE STRETCHED

E310 arrived on scene and positioned the apparatus on the hydrant in front of 10573 Avenue N (H331088), which had previously been the location of E290 before they repositioned their apparatus.

At 14:04:17, the B58 Chief ordered E310 via handie-talkie to stretch a third hoseline to the front of the Fire Building. After conferring with the E290 Chauffeur to ensure the apparatus had the capacity to supply a third hoseline, E310 began to stretch a 1¾-inch hoseline from E290's apparatus.

At approximately 1405 hours, after reporting to the B58 Chief in front of the Fire Building, the B44 Chief assumed the role of fire sector chief. The B44 Chief entered the Fire Building to supervise extinguishment operations.

Around this time, the L103 Officer and Inside Team re-entered the front door of the Exposure #4 Building to resume their search of the second floor. However, the L103 Officer and Inside Team again exited the Exposure #4 Building due to the build-up of heat on the second floor, the lack of a hoseline into the Exposure #4 Building, and the L103 Officer's SCBA entering Vibralert.

Also, at approximately 1405 hours, the L170 OV Firefighter forced open the sliding glass door of the Exposure #4 Building's walk-out basement, made entry on that floor, and began to conduct a search. Upon being forced open, the sliding door's glass shattered. This doorway remained open for the remainder of the operation.

At 1405 hours, E231 arrived on scene and transmitted a 10-84 via the MDT. The E231 Chauffeur positioned the apparatus on East 108th Street at the hydrant (H331086) located at the intersection of Flatlands 10th Street. The members of E231 assisted E310 with positioning the third hoseline.

At 14:05:05, the L170 Officer transmitted via handie-talkie a request that an additional hoseline be stretched to the front door of the Fire Building.

SECOND HOSELINE CHARGED AND ENTERS THE EXPOSURE #4 BUILDING

At 14:05:42, the E290 Chauffeur transmitted via handie-talkie, "290 Chauffeur to Command, both lines, 283 and 257, are charged on hydrant water." At this point, E257 was positioned with a charged hoseline outside the Fire Building near the front door of the Exposure #4 Building.

The L103 Roof Firefighter, while continuing to search the Exposure #4 Building, ascended the interior stairs to the second floor.

The B44 Firefighter entered the front door of the Exposure #4 Building and ascended the interior stairs to the second floor after being ordered by the B44 Chief to check for fire extension. The B44 Chief remained in the Fire Building.

After descending the portable ladder in the exposure #4 side alley, the L103 OV Firefighter proceeded to the rear of the building, climbed the rear deck steps, and entered the first floor of the Exposure #4 Building via the open, rear sliding glass door.

At 1406 hours, L120 arrived on scene and transmitted a 10-84 via the MDT. The L120 Chauffeur positioned the apparatus on East 108th Street, approximately 50 feet east of Avenue N.

At approximately 1406 hours, while searching the Exposure #4 Building, the L103 OV Firefighter found the interior stairs leading down to the basement. The L103 OV Firefighter descended these stairs and joined the L170 OV Firefighter.

At 14:06:28, the E257 Chauffeur transmitted via handie-talkie, "We're back in pumps." From this point, E257's apparatus pump operated properly.

At 14:06:41, the B58 Chief ordered E257 to bring its hoseline into the Exposure #4 Building to extinguish the fire on the second floor previously discovered by the L103 Officer. The B58 Chief initially intended this hoseline to back up E283's hoseline in the Fire Building.

At 1407 hours, E323 and E309 arrived on scene and transmitted a 10-84 via the MDT.

Upon arrival, the E323 Chauffeur stopped the apparatus and allowed the members to exit. The E323 Officer and Nozzle, Back-up, and Control Firefighters exited the apparatus and proceeded to the rear of E257. The E323 Officer ordered the Nozzle, Back-up, and Control Firefighters to remain at the back step of E257 and then proceeded to the front of the Fire Building. The E323 Chauffeur proceeded down the dead end of Flatlands 9th Street and positioned the apparatus at the hydrant (H331093) in front of 10823 Flatlands 9th Street. The E323 Chauffeur tested the hydrant and determined that it was serviceable. To avoid interrupting handie-talkie transmissions, the E323 Chauffeur then ran around the block to inform the IC that E323 had a serviceable hydrant.

Upon arrival, the E309 Chauffeur stopped the apparatus and allowed the members to exit. The E309 Officer and Nozzle, Back-up, and Control Firefighters exited the apparatus and proceeded down Avenue N toward the Fire Building. The E309 Chauffeur then positioned the apparatus in front of 10571 Avenue N.

OPERATIONS IN THE EXPOSURE #4 BUILDING

At 14:07:01, the B58 Chief transmitted via handie-talkie to the L103 Officer, who entered the Exposure #4 Building for the third time after exchanging his SCBA air cylinder, "I got 257 coming in with you." The E257 Officer, the Nozzle Firefighter, Back-up Firefighter Timothy Klein, and Control Firefighter entered the Exposure #4 Building via the front door and joined the L103 Officer and Inside Team. The E257 Officer and L103 Officer had a face-to-face exchange, and the E257 Officer was informed of fire on the second floor in the front room. E257 brought a hoseline up the interior stairs to the second floor.

At approximately 1407 hours, while searching the second floor of the Exposure #4 Building, the L103 Roof Firefighter also discovered fire in the front bedroom and kept the door to this room closed until E257 brought a hoseline to the second floor. While maintaining this position in the

hallway outside the front bedroom, the L103 Roof Firefighter heard glass breaking. At this point, the fire began venting out the front windows of the second floor of the Exposure #4 Building.

Once it was determined that L170's bucket could not access the Fire Building due to the overhead electric wires, the L170 Chauffeur proceeded to the rear of the building by way of the exposure #2 side alley.

At 14:07:41, the L170 Chauffeur transmitted via handie-talkie, "We need a line, straight down the two-side, into the back yard."

As E257 made entry with a hoseline, the SQ252 Roof Firefighter followed and assisted, advancing the hoseline up the interior stairs, and upon reaching the second floor began a search of the rear. Also searching the rear at this time was the B44 Firefighter, who entered a bathroom near the top of the stairway.

At 1408 hours, R2 arrived on scene and positioned the apparatus on East 108th Street, just south of Flatlands 8th Street. The R2 Officer reported to the Command Post and was assigned to the second floor of the Exposure #4 Building. Unable to enter the front door, the R2 Officer, Irons, and Hook Firefighters proceeded to the rear via the exposure #4 side alley. The R2 Roof Firefighter proceeded to L103's apparatus and prepared to climb the aerial ladder (behind the L103 Chauffeur). The R2 Can Firefighter entered the original Fire Building to support the advance of the first hoseline, the R2 OV Firefighter proceeded to the rear via the exposure #2 side alley, and the R2 Chauffeur remained in front of the Fire Building.

At 1408 hours, E225 arrived on scene and transmitted a 10-84 via the MDT. The E225 Chauffeur stopped the apparatus and allowed the members to exit. The E225 Officer and Nozzle, Back-up, and Control Firefighters proceeded to the front of the Fire Building. The E225 Chauffeur then positioned the apparatus on Flatlands 8th Street at the hydrant (H331084) in front of 10551 Flatlands 8th Street.

At 14:08:20, the L103 Chauffeur climbed L103's aerial ladder, positioned at the second floor window of the Exposure #4 Building. Upon arrival at the tip of the aerial ladder, the L103 Chauffeur found that the window had already self-vented and that E257 had begun extinguishment

operations in that room. From this position on the aerial ladder, the L103 Chauffeur prepared to make entry, placed his 6-foot hook inside the window, and began donning his SCBA facepiece.

FIRE EXTINGUISHED IN FRONT BEDROOM OF THE EXPOSURE #4 BUILDING

E257 brought a charged hoseline up the stairs and turned right, around a wrought iron handrail, toward the front on the second floor, where the E257 Officer joined the L103 Roof Firefighter at the doorway to the front bedroom. The E257 Officer and L103 Roof Firefighter had a face-to-face communication confirming the presence of fire in the bedroom. The E257 Officer opened the bedroom door and removed it from its hinges to facilitate the advance of the hoseline, providing an unobstructed path from the interior stairs to the seat of the fire in the front room.

At approximately 14:08:25, the E257 Nozzle Firefighter, backed up by Firefighter Timothy Klein, operated the hoseline and extinguished all visible fire in the front room. The E257 Control Firefighter remained on the stairs to facilitate line advancement. Extinguishment operations lasted for roughly 1 minute.

At 14:08:28, while descending the interior stairs, the L103 OV Firefighter transmitted via handie-talkie, “There’s a glow in the basement.” In the basement of the Exposure #4 Building, the L170 OV and L103 OV Firefighters discovered a small pile of clothes on fire near the bottom of the interior stairs near the front of the building (see Figure 32). The L170 OV Firefighter made several inspection holes in the immediate area to check for fire extension, but no extension was found. There was no noticeable heat condition in the basement, but there was an increasing smoke condition with reduced visibility.

Figure 32. Burning clothes from view of the first floor into the basement of 10824 Avenue N, the Exposure #4 Building.

At 14:08:35, upon arrival at the rear of the building, the R2 Officer noted heavy fire issuing from the rear of the Fire Building, extending to the rear deck. The R2 Officer transmitted via handie-talkie, “Rescue to Command: You need a line to the rear.” Members of R2 then proceeded up the rear deck stairs and entered the first floor of Exposure #4 Building via the rear sliding glass door. As they made their way toward the front, the R2 Officer noticed a pile of burning material on the floor near the top of the interior stairs to the basement. At this point, the stairway door was in the open position. After ordering the R2 Irons Firefighter to address the burning material, the R2 Officer continued toward the front and ascended the interior stairs to the second floor. The R2 Irons Firefighter proceeded toward the front door while the R2 Hook Firefighter remained in the rear kitchen area. Upon reaching the second floor, the R2 Officer noted E257 operating at the front and began a search of the rear.

After completing a search of 10830 Avenue N (Exposure #2 Building), the SQ252 Officer returned to the front of the Fire Building and ordered the SQ252 FE Firefighter to the rear of the Fire Building. The SQ252 Officer had a face-to-face conversation with the B58 Chief and then proceeded toward the front stoop to enter the first floor of the Exposure #4 Building.

OPERATIONS IN ORIGINAL FIRE BUILDING

At 14:08:39, the E290 Chauffeur charged E310's hoseline, redirected to the rear yard via the alley on the exposure #2 side. In the rear yard, E310 extinguished fire that had extended from the Fire Building to the rear deck. E310 operated a hoseline from the ground beneath the deck, just outside the open sliding glass door of 10826 Avenue N (there was no fire inside that door). After this fire was extinguished, the E310 Officer and Nozzle and Back-up Firefighters used a portable ladder to reposition their line to the rear deck. The E310 Control Firefighter remained on the ground to manage the hoseline at the bottom of the ladder. E310 then used the hose stream's reach to vent the Fire Building's rear second-floor window and began operating the hose stream into that window. Although there was no fire in the immediate area, the intention was to improve conditions by cooling the area on the second floor.

After the main body of fire was extinguished on the first floor in the original Fire Building, E283 ascended the interior stairs with a hoseline and began extinguishing fire on the second floor.

At 14:09:08, the E283 Officer transmitted via handie-talkie, "We're on the top floor, we got water on the fire, we got a couple of rooms going, we'll let you know when it's knocked down."

At approximately 1409 hours, the L103 Officer noticed an increased smoke condition on the first floor of the Exposure #4 Building and ordered the L103 Inside Team to vent the area. The L103 FE Firefighter proceeded to the rear and vented the kitchen window next to the open sliding glass door. While passing the interior stairway to the basement level, the L103 FE Firefighter looked down the stairs, saw fire at the bottom, and noted a firefighter walking away from the bottom of the stairway. The L103 FE Firefighter closed the stairway door and reported the findings to the L103 Officer. At 14:09:20, the L103 Officer transmitted via handie-talkie the need for a line in the rear, as there was "possibly fire in the basement as well."

While the L103 FE Firefighter was venting the rear window, the L103 Can Firefighter began venting the side window on the exposure #4 side wall, across from the top of the interior stairs to the basement. This window was fully vented at 14:09:36.

Upon E323's arrival at the IC Post, the B58 Chief ordered the team to stretch a hoseline to the front of the building.

At 14:09:44, the E323 Officer transmitted via handie-talkie, “323 Nozzle, stretch a line to the front of the Fire Building.” The E323 Nozzle, Back-up, and Control Firefighters stretched a 2 ½-inch hoseline from E257’s apparatus to the front of the Fire Building. This was the fourth hoseline stretched at the operation and the first hoseline supplied by E257’s apparatus.

At 14:09:50, conditions in the basement of the Exposure #4 Building rapidly deteriorated and became untenable. The L103 OV Firefighter transmitted via handie-talkie, “OV to 103, you got fire blowing out of the basement.”

RAPID FIRE EXTENSION EVENT

Between 14:09:50 and 14:10:00, a sudden, catastrophic fire extension event occurred, resulting in a rapid, high-intensity fire spread upward from the basement to the second floor of the Exposure #4 Building, primarily by way of the interior stairway. This extension was driven by the wind condition from the rear and the uncontrolled low-intake, high-exhaust flow path inside the Exposure #4 Building.

The following subsections provide an accounting of the approximate location of all members in the Exposure #4 Building at the time of the fire extension event.

Basement

- The L170 OV Firefighter was near the bottom of the stairway.
- The L103 OV Firefighter was near the bottom of the stairway.

First Floor

- The L103 Officer was on the bottom steps of the stairway leading to the second floor.
- The L103 FE Firefighter was in the living room between the stairway door to the basement and the bottom of the stairway to the second floor.
- The L103 Can Firefighter was near the window on the exposure #4 side, across from the stairway to the basement.
- The R2 Irons Firefighter was near the bottom of the stairway to the second floor.
- The R2 Hook Firefighter was in the kitchen area in the rear.

Second Floor

- The E257 Control Firefighter was on the stairway, a few steps from the top of the stairs.
- The B44 Firefighter was in the bathroom, toward the rear.
- The R2 Officer was in the hallway, toward the rear.
- The SQ252 Roof Firefighter was in the rear bedroom.
- The L103 Roof Firefighter was in the hallway, near the top of the stairs.
- The E257 Officer was in the hallway, near the top of the stairs.
- The E257 Nozzle Firefighter was in the hallway, near the front bedroom.
- Firefighter Timothy Klein was toward the front, between the stairway and front windows.

At 1410 hours, B39 arrived on scene and transmitted a 10-84 via the MDT.

UNCONTROLLED FIRE THROUGHOUT THE EXPOSURE #4 BUILDING

In the basement of the Exposure #4 Building, the sudden intensity of the fire forced the L103 OV and L170 OV Firefighters to exit via the rear sliding glass door. The L103 OV Firefighter was forced to crawl past the source of the fire. The L103 OV Firefighter's bunker gear suffered burn damage along the left side during the escape.

At 14:10:02, the L103 FE Firefighter made a handie-talkie transmission: "Heavy fire coming up." At this point, the L103 FE Firefighter was in the living room on the first floor between the basement stairs and the stairway to the second floor. The R2 Irons Firefighter was completing a search of the first floor. The L103 Officer was standing on the bottom steps of the stairway to the second floor. All three members were in the flow path and forced to escape out the front door.

The L103 Can Firefighter vented the window on the exposure #4 side just across from the stairway door to the basement. The member turned and saw the fire rapidly extend from the basement stairway door and travel toward the front of the building, up the interior stairs to the second floor. The L103 Can Firefighter's position outside the flow path was not subject to extreme temperatures, so the member remained standing and left the area by walking out the sliding glass door onto the rear deck.

At 14:10:11, the L103 Officer transmitted via handie-talkie, “Mayday! Mayday! Mayday! 103 with a Mayday,” without activating the EAB. The L103 Officer was on the front steps, just outside the front door of the Exposure #4 Building, while making this transmission.

At 14:10:16, the SQ252 Officer transmitted via handie-talkie, “Brothers upstairs. You got fire, heavy fire on the first floor.” At this point, heavy fire on the first floor was traveling up the interior stairs. Seconds later, at 14:10:21, the B58 Chief transmitted via handie-talkie, “Command to all units, Command to all units. Everybody back out, back out of the building. Everybody back out. Command to all units.” As this message was transmitted at 14:10:22, fire vented out the Exposure #4 Building second-floor side window (see Figure 33).

Figure 33. View of exposure #4 side of 10824 Avenue N, as provided by security camera footage from 10820 Avenue N.

During this time, Firefighter Timothy Klein’s position on the second floor was subject to extreme temperatures and untenable conditions. His SCBA PASS device entered pre-alarm at 14:10:28 and

entered full alarm at 14:10:40. It was unclear whether Firefighter Timothy Klein moved after his PASS alarm entered full alarm. However, the FFIT determined that Klein did not move between 14:10:28 and 14:10:40.

At 14:11:06, the windows failed, and fire vented out the large bay window on the front of the Exposure #4 Building. This fire vented directly below L103's aerial ladder and forced the L103 Chauffeur to retreat from the tip of the aerial. The L103 Chauffeur climbed down the aerial ladder at 1412 hours. The R2 Roof Firefighter, on the bottom rungs of the ladder, climbed down the ladder and proceeded to the rear of the Fire Building.

Fire rapidly extended up the interior stairway to the second floor of the Exposure #4 Building and surged toward the front of the building. The fire vented out the previously self-vented windows in the front bedroom. Quickly after extending up the stairs, fire also vented out the open front door of the Exposure #4 Building from a sunken foyer roughly 2 feet lower than the rest of the main floor.

In the following seconds, conditions on the second floor rapidly deteriorated and became instantly untenable.

- The E257 Control Firefighter, who was forced from the stairway up the stairs and down the hallway to the front bedroom, jumped out the front window to the driveway below.
- The E257 Nozzle Firefighter dove down the interior stairs and escaped out the front door at the bottom of the stairs.
- The B44 Firefighter dove down the interior stairs and escaped out the front door at the bottom of the stairs.
- The E257 Officer was forced down to the floor in the hallway near the top of the stairs.
- The L103 Roof Firefighter was forced down to the floor in the hallway near the top of the stairs.
- The R2 Officer took refuge in the rear bathroom, at the top of the stairs.
- The SQ252 Roof Firefighter, located toward the rear of the building, took refuge in the rear bedroom (see Figures 34 and 35).

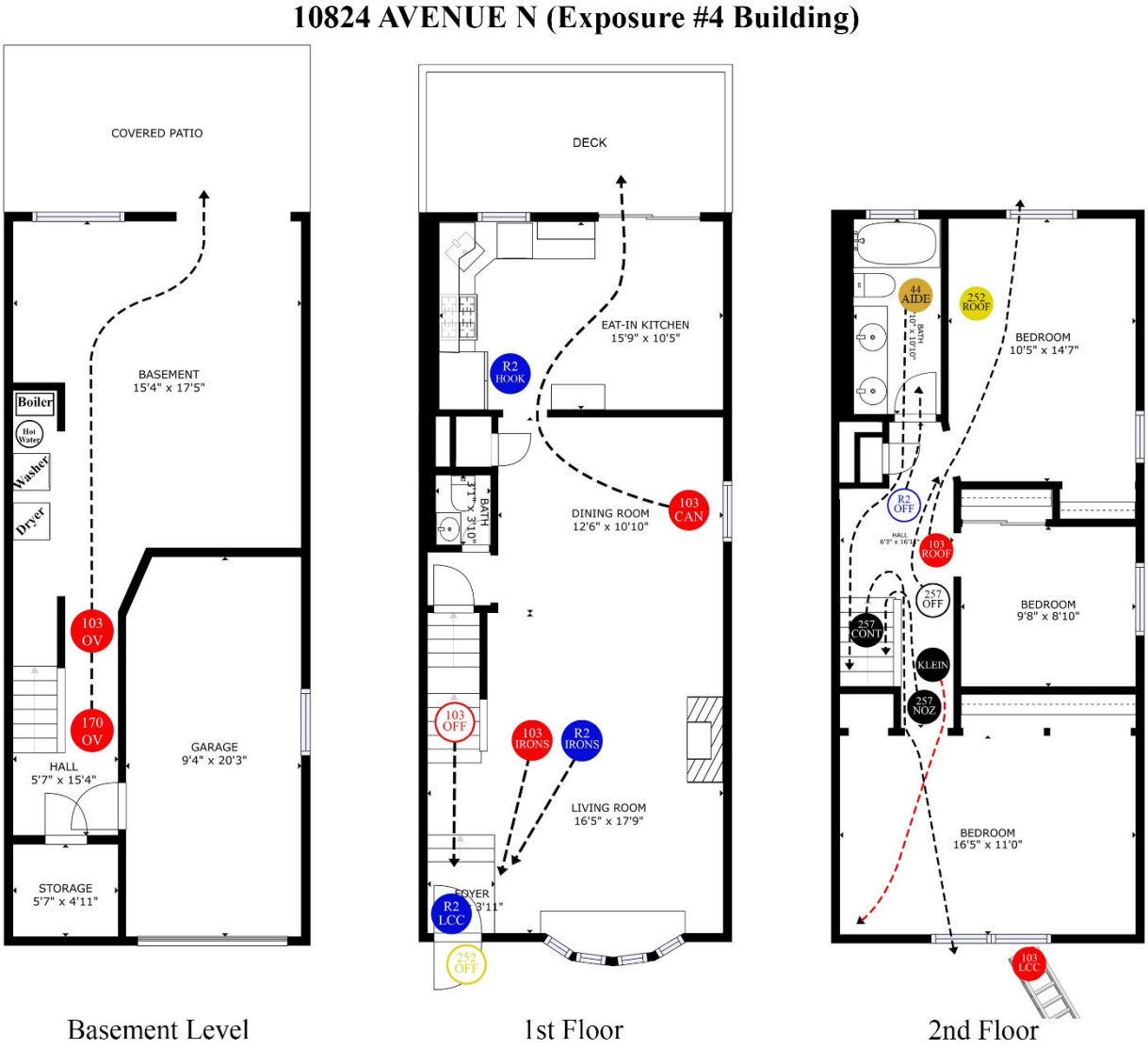

Figure 34. Approximate location and movement of members during or immediately after the event at the Exposure #4 Building. See Chapter 4 for enlarged diagrams of each floor.

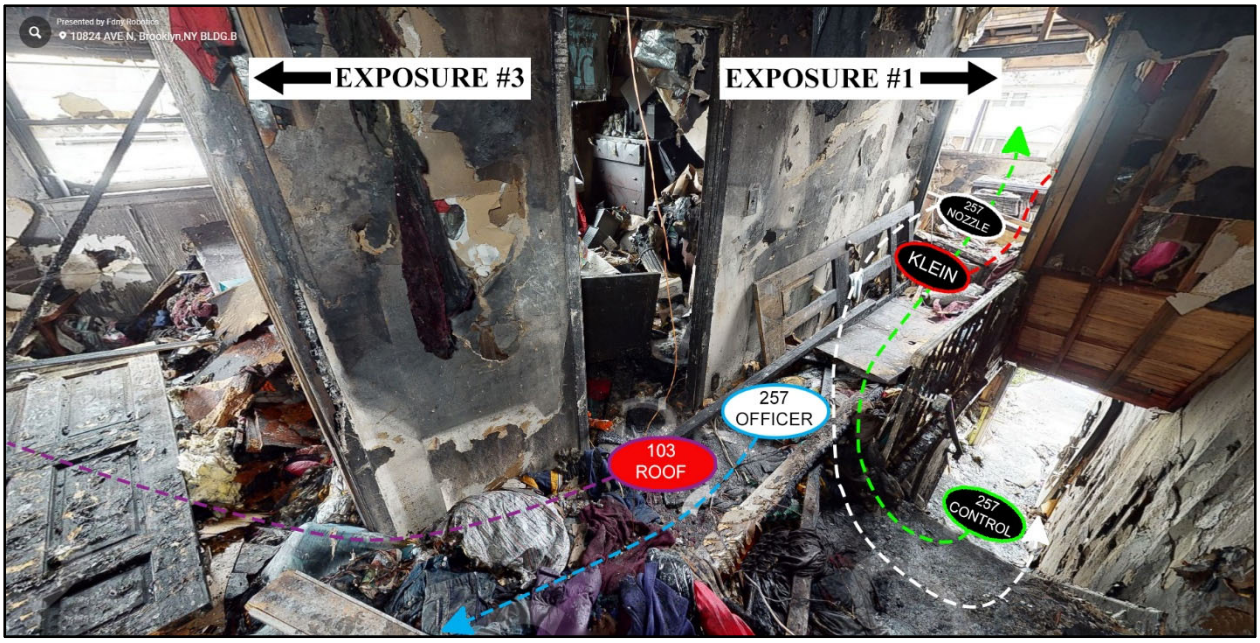

Figure 35. 3D Scan approximating locations of members on the second floor of 10824 Avenue N during the event, courtesy of FDNY Robotic Unit.

At 1411:15, Firefighter Timothy Klein transmitted via handie-talkie, "Mayday! Mayday! Mayday! . . . second floor front." This transmission, which was interrupted by interfering radio activity and not heard on the fireground, was recorded by the battalion vehicle recorders. Firefighter Timothy Klein did not activate his EAB. According to the SCBA data, Firefighter Timothy Klein's PASS device had auto-activated to full alarm 35 seconds before this mayday message was transmitted.

After jumping out the front bedroom window from the second floor, the E257 Control Firefighter fell approximately 20 feet and landed in the driveway below. Members outside the building could not see the E257 Control Firefighter fall through the heavy smoke, but after discovering the firefighter on the ground, those in the area quickly came to the firefighter's aid. These included members of E225, E309, and L174 FAST positioned nearby. While the E257 Control Firefighter received assistance outside the building, the firefighter's EAB was activated at 14:11:48, but no emergency transmission followed. The E257 Control Firefighter was moved away from the driveway to an area behind L170's apparatus. The E309 Officer informed the IC of the E257 Control Firefighter's identity.

The extreme temperature of the environment on the second floor heated the wrought iron railing to such a degree that it caused severe damage to E257's charged hoseline near the top of the stairs.

The hoseline burned through at the point of contact with the wrought iron railing. This burst length critically reduced the water flow available at the nozzle and immediately rendered the hoseline inoperable. Without an operating hoseline on the second floor, members resorted to emergency tactics to escape the extreme heat and untenable conditions enveloping them (see Figure 36).

Figure 36. E257's hoseline with burns that caused a burst length.

APPLICATION OF WATER ON THE FIRE IN EXPOSURE #4 BUILDING VIA ALTERNATIVE ACCESS POINTS

At 14:12:11, the D15 Firefighter transmitted to the Brooklyn dispatcher via department radio, "I need a third alarm. I got members falling out the building, we have fire in two buildings. I need a third alarm." E332; E227; E234; E233; E303; L105, acting L120; B37; B57; MSU1; and RA04 were assigned upon transmission of the third alarm. B57 was assigned as the staging area manager; E303 was assigned as the communications unit. All engine companies assigned on the third alarm

responded with an officer and four firefighters. L105, acting L120, responded with an officer and five firefighters. EMS ALS Rescue Paramedic Unit 48R2 also arrived on scene at 1412 hours.

As the heavy fire continued venting out every front window and door of the Exposure #4 Building, E323 positioned a 2½-inch hoseline in the driveway and prepared to apply water from the exterior of the building (see Figure 37).

Figure 37. E323's hoseline placement and operation at 10826 and 10824 Avenue N.

At 14:12:18, E323's hoseline was charged, and the E323 Nozzle Firefighter was ordered to operate the hose stream into the large bay window, extinguishing a considerable amount of fire. The E323 Officer then ordered members to reposition the hoseline to a 14-foot portable extension ladder previously positioned at the bay window, allowing them to direct the stream deeper into the structure. Several minutes later, after all the visible fire was extinguished from its position at the bay window, E323 repositioned a hoseline to the front door, entered the Exposure #4 Building, and operated on the first floor.

At the same time, in the rear of the building, the E310 Control Firefighter was positioned on the ground, just below the rest of the members of E310, who were operating on the rear deck outside the original Fire Building. When fire appeared at the open sliding glass door in the basement of the Exposure #4 Building, the E310 Control Firefighter called for the E310 Nozzle Firefighter to pass the hoseline down to extinguish the fire that threatened the members on the deck above. The portable ladder by which E310 accessed the deck had been repositioned onto the deck to reach the upper floors and was not readily available for E310's Nozzle Team to descend from the deck. At approximately 1412 hours, the E310 Nozzle Firefighter passed the hoseline down to the E310 Control Firefighter.

The SQ252 FE Firefighter, who had proceeded to the rear yard after checking the Exposure #2 Building for extension, assisted the E310 Control Firefighter with advancing the hoseline, ultimately advancing to the laundry room area and extinguishing the fire.

Unknown to the members operating this hoseline, the laundry room area was adjacent to the bottom of the building's vertical utility shaft, the source of the rapidly extending fire. By extinguishing this fire, E310's hoseline effectively extinguished the main seat of the fire. Once this was accomplished, at approximately 1414 hours, conditions throughout the Exposure #4 Building significantly improved (see Figure 38).

Figure 38. View of the rear basement level of 10824 Avenue N.

BURST LENGTH IN ORIGINAL FIRE BUILDING

At 1412 hours, a burst length occurred in E283's hoseline while extinguishing fire on the second floor of the original Fire Building. The members were unaware of the burst length, which occurred just inside the front entrance to the building, at a point where the back end of the lead length of hose contacted a superheated wrought iron handrail (precisely what occurred to E257's hoseline on the second floor of the Exposure #4 Building). E283 had just experienced a loss of pressure in the hoseline when a transmission from the B58 Chief at 14:12:45 informed the members they had a burst length and ordered them to leave the building. Members of E283 backed their hoseline out as their Vibralerts activated.

At 1413 hours, B38 and FC1 transmitted a 10-84. The B38 Chief assumed the role of RESL.

At 14:14:26, the E290 Chauffeur shut down the water supply to E283's hoseline. Members of E290 removed the burst lead length and attached a new nozzle on the second length. The original

nozzle remained on the burst length, which was moved from the front door. The E290 Chauffeur recharged the hoseline at 14:16:50, and E290 relieved E283 and entered the original Fire Building.

TRAPPED MEMBERS ON THE SECOND FLOOR OF THE EXPOSURE #4 BUILDING

At 14:11:23, while taking refuge in the bathroom, the R2 Officer transmitted via handie-talkie, "We need the line open on the top floor now." Upon hearing members out in the hallway, the R2 Officer exited the bathroom and met the E257 Officer, who had been severely burned from the extreme heat in the hallway near the top of the stairs.

At 1413 hours, the R2 Officer transmitted via handie-talkie, "Yeah, on the top floor, it's uh, we need the line operated up here. I got two or three guys in the two-three corner."

At 14:13:28, the E231 Officer transmitted via handie-talkie, "231 to Rescue 2: We're putting the ladder up on the rear right now. Putting the ladder to that rear window right now. Get to the rear." E231 assisted in moving the 20-foot straight portable ladder from the yard to the rear deck. This ladder was then placed against the rear second-floor bedroom window of the Exposure #4 Building by the R2 Roof and OV Firefighters to allow members a means of egress.

During this time, the SQ252 Roof Firefighter operated in the rear bedroom and continued to search for a means of egress. The SQ252 Roof Firefighter found the rear window and vented it to create an egress point for the trapped members. After venting the window, the SQ252 Roof Firefighter left the rear bedroom and went back into the hallway, where the member met the L103 Roof Firefighter, who had been forced to the floor by the extreme heat. The SQ252 Roof Firefighter informed members on the second floor there was a means of egress and led them to the rear bedroom window.

At 14:14:29, the R2 Officer transmitted, "Top floor with 257. We're going to make our way to that window now."

At 14:14:43, the E231 Officer depressed the EAB on the handie-talkie and transmitted, "Mayday! Mayday! Mayday! 231 to Command with a mayday." After acknowledgment by the IC, the E231 Officer transmitted, "We got guys operating in the top floor. We just got a ladder to them. We need another line back here, in the exposure. Exposure #3, we need another line back here."

At 14:15:28, the R2 Officer transmitted, “Got some guys up here. I’m bringing them to the window.” During this time, the E257 Officer made repeated attempts to account for E257’s members and, despite suffering severe burns, was reluctant to leave without first accounting for his entire unit.

At 14:16:16, the E257 Officer transmitted, “257 to back-up.” This was the first transmission made attempting to contact Firefighter Timothy Klein. The E257 Officer made four additional transmissions trying to contact Firefighter Timothy Klein at 14:17:11, 14:17:17, 14:17:22, and 14:18:39.

At 14:19:24, the B58 Firefighter transmitted, “257 Back-up, where are you, TK?”

TRAPPED MEMBERS LEAVE THE EXPOSURE #4 BUILDING

Once at the window, the trapped members made their way out and down the portable ladder. The SQ252 Roof Firefighter exited first, followed by the L103 Roof Firefighter, the E257 Officer, and the R2 Officer.

At 14:18:20, the R2 Officer asked Command to account for the members of E257. Since the B58 Chief had already confirmed that the E257 Control Firefighter was out of the building, the B58 Chief responded, “I’m looking for the nozzleman and the back-up.”

The R2 Officer answered, “Alright, I’ve got the officer. Just account for those two guys.”

At 14:20:04, the R2 Officer confirmed that the members who had been seeking refuge on the second floor were out of the building and in the backyard.

At 14:20:30, the L170 Chauffeur transmitted, “Second floor, it just . . . into the first floor.” (The rear second-floor bedroom collapsed into the first floor in the original Fire Building.) This message was not directed to anyone nor was it acknowledged.

Command ordered E225 to stretch a hoseline to the rear of the Fire Building, and the members of E225 stretched a 2½-inch hoseline from SQ252’s apparatus via the exposure #4 side to the rear of the Fire Building and connected this hoseline to an outlet on E257’s apparatus. This hoseline, charged at 14:20:34, was the second one supplied by E257.

SEARCH FOR FIREFIGHTER TIMOTHY KLEIN

At 14:20:53, the B58 Chief transmitted via handie-talkie, "Command to Engine 257 Back-up." After receiving no response, the D15 Chief called the R2 Officer and transmitted via handie-talkie, "Tommy, we're looking for the back-up of E257. We can't find him. He's in your building." The R2 Officer then made four attempts to contact Firefighter Timothy Klein directly on the handie-talkie, at 14:21:23, 14:21:24, 14:21:35, and 14:23:27, using his name, company, and riding position.

At 1421 hours, B41 arrived on scene and transmitted a 10-84 via the MDT.

Uncertainty on the fireground about the whereabouts of the E257 Back-up Firefighter caused members to re-enter the Exposure #4 Building to search for Firefighter Timothy Klein. The R2 Roof Firefighter climbed the portable ladder from which members on the second floor had exited. While at the top of the ladder, in the window, the R2 Roof Firefighter informed the B39 Chief that conditions on the second floor had improved and that there was a need to re-enter to search for Firefighter Timothy Klein.

At 14:22:30, the R2 Roof Firefighter informed the B39 Chief that conditions on the second floor were improving. The B39 Chief then transmitted via handie-talkie, "39 to Command, you want everybody out of both sides of the dwelling, or just the one side, the original Fire Building?" This message was never acknowledged by Command.

At 14:23:21, the R2 Irons Firefighter stated, "Alright, we gotta stay in there looking for him, Chief."

At 14:23:53, the R2 Chauffeur transmitted, "Chief, did we find E257's back-up?" The D15 Chief responded, "We have not found him yet."

The R2 Roof Firefighter entered the second-floor window, followed by the SQ252 FE Firefighter. Both members began a search of the second floor. The SQ252 FE Firefighter exited the rear bedroom and searched toward the front of the second floor. The R2 Chauffeur entered the front door of the Exposure #4 Building and ascended the stairs to the second floor. While in the hallway

on the second floor, the SQ252 FE Firefighter heard a PASS device and proceeded to the front bedroom.

At 14:24:33, the B39 Chief called Command asking whether someone could confirm that E257's back-up had been accounted for.

At 14:25:31, the R2 Officer asked members whether they got to the second floor to conduct a search.

At 14:25:39, the R2 Officer informed the members, "They are saying second floor, possibly halfway to the rear."

At 14:25:48, the R2 Roof Firefighter notified the R2 Officer, "Yeah, I'm in the bathroom. I'm in the rear, where the window you came out of. We're gonna take a good look."

The SQ252 Officer asked the D15 Chief to confirm that all members had been accounted for.

At 14:27:12, the D15 Chief informed the SQ252 Officer that Firefighter Timothy Klein was missing and ordered the SQ252 Officer to utilize portable ladders to search the Exposure #4 Building. The SQ252 Officer acknowledged.

At 14:27:35, the B58 Chief transmitted, " . . . the last known location of the, of 257 Back-up is on the second floor at the top of the stairs."

At 1427 hours, the SQ252 FE Firefighter found Firefighter Timothy Klein in the front bedroom of the second floor. The SQ252 FE Firefighter moved back toward the doorway and called to the R2 Chauffeur. When Firefighter Timothy Klein was found, his SCBA facepiece was not donned and his helmet was not on his head but hung by the chinstrap from his forearm. After Firefighter Timothy Klein was removed from the building, it was determined that his SCBA cylinder was empty, his SCBA regulator was in the open position, and his SCBA facepiece was missing the left voicemitter. The condition of this SCBA facepiece is discussed further in Chapter 7.

At 14:27:45, the R2 Chauffeur transmitted via handie-talkie, "Mayday! Mayday! Mayday! Rescue Chauffeur with a Mayday," and notified Command that the missing member had been found on the second floor.

The IC ordered the stairs be cleared to facilitate removal. The SQ252 Officer requested a CFR engine and EMS to the front of the building. Members made several reports that the stairs had been cleared.

At 14:30:41, the SOC Chief asked the IC, "Do we have rescue medics on this?" The EMS Rescue Paramedic Unit 48R2 was standing by in front of the Fire Building. The E283 Officer informed the L170 Roof Firefighter that Firefighter Timothy Klein's bunker gear would need to be removed once he was brought from the building.

REMOVAL AND TRANSPORT OF FIREFIGHTER TIMOTHY KLEIN

By 14:33:27, Firefighter Timothy Klein was moved down the interior stairs to the front of the Fire Building via the front door. Members of L170 removed Firefighter Timothy Klein's bunker gear, so he could be treated on scene by EMS units. He was transported to Brookdale Hospital. According to the autopsy report issued by the OCME, the immediate cause of death was smoke inhalation.

CHAPTER 6. FIRE BEHAVIOR

This chapter accounts for the fire's behavior, growth, and travel in 10826 and 10824 Avenue N throughout the operation. The information is presented chronologically, with slight variations, as it was in Chapter 5. The narrative comprises sections that correspond with periods lasting several minutes and with the concurrent firefighting operations, as recounted in the previous chapter. To explain the fire dynamics in greater detail, this chapter offers in-depth discussions in large framed insets that are distinct from the chronological narrative. Notably, this chapter outlines the cause and origin of the fire, as determined by the FDNY BFI.

FIRE CAUSE AND ORIGIN

As determined by investigating fire marshals, the area of origin of the fire was the kitchen in the rear of 10826 Avenue N on the first floor, where the fire burned undetected for an unknown period. From this point, the fire extended and involved the first floor, second floor, and attic space of the Fire Building and all floors in the Exposure #4 Building. The basement level of the Fire Building was the only area of the dwelling not involved in the fire.

The investigation also found that the fireproof concrete masonry demising wall between the two buildings was completely intact throughout the operation. From the bottom level to just below the roof sheathing, this wall had no penetrations that could have allowed for fire extension. However, the top of this wall did not extend entirely to the roof sheathing, which left a gap between the top of the demising wall and the roof beams. Charring and burn patterns in the attic spaces confirm that this gap at the top of the demising wall was where the fire initially extended from the Fire Building to the Exposure #4 Building.

BEFORE FDNY ARRIVAL: 1330–1355 HOURS

Fire Already in the Exposure #4 Building

Before the first FDNY units arrived, the fire had already extended from its origin in the kitchen on the rear of the first floor of the Fire Building. The fire was present inside the attic spaces of both buildings and inside the vertical shaft in the Exposure #4 Building. The occupant of the Exposure #4 Building reported smelling smoke on the second floor of that building as early as 1330 hours.

Video evidence shows dark black smoke from a vent opening on the side of the Exposure #4 Building as early as 1355 hours (see Figure 39). This vent opening led to a horizontal duct within the ceiling joist bay on the first floor that connected to the vertical shaft at the ceiling level above the bathroom. The presence of smoke at this opening indicates that burning was taking place in the void space and that hot gases and products of combustion were being pushed out of the vertical shaft under pressure. This smoke might also indicate that fire and burning materials had already been present at the bottom of the vertical shaft at the basement level by 1355 hours.

Figure 39. Side of Exposure #4 Building showing smoke from a vent pipe in the ceiling of the first floor.

Vertical Extension in Walls of the Fire Building, First Floor to Second Floor

From the point of origin in the kitchen in the rear of the first floor of the Fire Building, the fire extended to the attic space of the Fire Building through vertical voids between the back of the kitchen wall and the central demising wall. This space was the depth of a two-by-four stud (3.5 inches), plus additional piping clearance, resulting in a space of roughly 6 inches (see Figure 40).

Figure 40. View of kitchen area against the demising wall of the Fire Building on the first floor.

Horizontal Extension at Top of the Demising Wall, Fire Building to Exposure #4 Building

The attic of the Fire Building was a tightly sealed, enclosed space. The soffits were neither vented nor covered in a solid sheathing, which prevented both the inflow of fresh air and the escape of the hot gases and products of combustion from the attic space. As the fire developed, the only available outlet for the pressure in the attic space was the gap between the top of the demising wall and the underside of the roof sheathing. This gap connected the attic space in the Fire Building and the attic space in the Exposure #4 Building. Driven by this pressure, smoke, hot gases, and fire extended through the gap to the attic space of the Exposure #4 Building, where it found a new source of fuel and oxygen to develop and spread further. As the wood boards near the top of the demising wall charred and fell away, the size of this gap increased (see Figures 41–43).

Figure 41. View of the top of the demising wall toward the front of 10826 Avenue N, where fire extended from the Fire Building to the Exposure #4 Building.

Figure 42. View of the top of the demising wall in the Fire Building toward the rear where flue pipe extends through the roofline.

Figure 43. Photos of the top rear section of the Fire Building and Exposure #4 Building with thermal imaging, courtesy of FDNY Robotic Unit Drone. The green line represents the top of the demising wall showing heat and fire on both sides.

Downward Fire Migration within Exposure #4 Building Attic

Once the fire extended to the attic space of the Exposure #4 Building, the pressure in the area began to build just as it had in the attic of the Fire Building. As with the Fire Building, the soffits in the Exposure #4 Building attic were not vented, and the hot gases produced by the fire filled the attic space. The hot, oxygen-deficient gases began to accumulate at the upper levels of the attic, resulting in a growing volume of gases that could not burn. However, the increased availability of oxygen at the lower levels of the attic enabled gases near the floor to burn readily, with flaming combustion occurring between the smoke layer and the available air near the floor of the attic space. This dynamic resulted in downward fire travel in the attic space, a process discussed further in the following section.

The downward migration of flames spread to the contents stored in the attic, eventually involving the structural members. In time, the fire burned at the lower level of the attic but did not involve the upper levels or the roof itself (the roof remained unburned throughout the incident). The depth of the charring patterns discovered on the wooden beams of the floor of this attic space indicates that fire burned undetected in this area for an extended period. The location of these charring patterns was also significant, as they indicated that fire was burning from above, not below. These beams exhibited a "saddle burn" pattern, which shows heavy charring on the beam's upper section, a characteristic of fire burning from the top down (see Figures 44–46).

Figure 44. Lower rear section of the attic of Exposure #4 Building where the roof rafters rest on the rear wall of the second floor (left); attic space over the bathroom and hallway of the second floor of Exposure #4 Building (right).

Figure 45. View of vertical shaft on the second floor looking down (left); view of vertical shaft on the second floor showing the saddle burns on the floor beams (right).

Figure 46. View of vertical shaft on the first floor looking down (left); view of vertical shaft from the basement level looking up (right).

As material continued to burn, the fire involved the area adjacent to the top of the open vertical shaft that extended the entire height of the Exposure #4 Building. Any burning material (or unburned combustible gases) that entered this shaft would have had a source of fuel and oxygen, as well as a path of travel directly to the bottom of the shaft, at the basement level of the Exposure #4 Building.

Discussion of Downward Fire Travel

The upward direction of fire travel is more common than the downward direction, as hot gases and flames are less dense, or more buoyant, than the surrounding air, causing them to rise. However, two distinct conditions can cause downward fire travel:

1. The migration of fire toward an area with available oxygen to support flaming combustion; and
2. The physical dropping-down of burning materials.

The first condition results from a fire not having sufficient oxygen at the upper levels of a space and traveling downward to an area with available oxygen to burn. This principle is demonstrated when a match is lit and held vertically: as the fuel at the match head depletes, the flame spreads downward to consume the fuel of the wooden handle of the match. In a gaseous environment, the same condition is manifest when gases near the top of the area are oxygen deficient—or "too rich to burn"—and active flaming spreads downward to the gases near the bottom of the area, which offers levels of oxygen to support burning. The attic space of the Exposure #4 Building exhibited this condition (as described in the previous section).

The second condition is the physical dropping-down of burning material from an upper level to a lower level of the fire area, where it continues to burn and spread to that level. Burning debris or collapsed structural elements, which can readily spread fire downward to lower levels of a structure, are a common occurrence at many firefighting operations. This phenomenon may occur on the exterior of a building, for example, from flying embers or burning debris falling from a window or in the building's interior from burning debris falling down a vertical shaft or other void. In prolonged fires, the likelihood of burning debris falling and smoldering in unnoticed areas increases over time.

Notably, both conditions can occur at the same time and in the same place. It is possible—often probable—that burning debris drops down to an area also experiencing the downward spread of unburned combustible gases. In such a situation, both conditions contribute to the same result: the downward spread of fire. In the dynamic situation of an intensifying fire, neither one of these conditions is the single cause of fire spread; instead, the combination of both leads to the common result of fire spreading in a downward direction.

Downward Fire Travel in the Exposure #4 Building, Exposure #4 Building Attic to Basement Level

Both downward fire travel conditions, as described in the previous discussion inset, occurred simultaneously in the attic of the Exposure #4 Building and contributed to the same result: fire extended downward inside the vertical shaft from the attic space of the Exposure #4 Building to the bottom of the vertical shaft in the basement. The increasing pressure in the attic space would have contributed to the movement of unburned combustible gases into the vertical shaft. The fire would have continued to migrate downward toward available oxygen. Physical evidence strongly indicates that burning material from the top of the vertical shaft also dropped down the length of the shaft to its end point in the basement, further spreading fire and igniting combustibles.

Considering the time the fire in the attic had burned undetected, the relatively large size of the vertical shaft in the Exposure #4 Building, and the volume of stored material available to burn in the attic of the Exposure #4 Building, it is probable that burning material dropped down the height of the vertical shaft to the bottom of the shaft (see Figures 12, 15, and 17). The homeowner noted a strong odor of smoke in the basement of the Exposure #4 Building at least 20 minutes before calling 9-1-1. She went downstairs to investigate the odor multiple times before leaving the building, a detail consistent with the fire burning undetected inside the shaft at that level.

By 1355 hours, dark black smoke could be seen issuing from the vent opening on the side of Exposure #4 Building, as shown in surveillance video (see Figure 39). This timestamped video, along with the observed charring patterns on the ceiling beams in the attic, is evidence of burning inside the vertical shaft of the Exposure #4 Building before the first FDNY units arrived.

FDNY ARRIVAL: WIND-IMPACTED CONDITIONS, 1353–1355 HOURS

Upon the arrival of the first FDNY units at 1353 hours, the heavy fire condition on the first floor of the Fire Building had self-vented the rear windows and sliding glass door. With these large openings in the rear of the building, the wind acting on the building from that direction began to create wind-impacted fire conditions. This wind blew toward the building on an angle from the east, traveling from the Exposure #2/3 corner of the fire area (rear of Exposure #2) toward the Exposure #1/4 corner (front of Exposure #4). Weather data recorded at the time of the incident indicate wind of up to 23 mph (research has proven that 10 mph wind is sufficient to create wind-

impacted conditions). Wind-impacted conditions on the Fire Building came from two distinct directions:

- Wind-impacted air movement from the rear to the front (exposure #3 side to #1 side); and
- Wind-impacted air movement from the exposure #2 side to the exposure #4 side.

This wind-impacted air movement varied throughout the incident and affected the operation in different ways. The specific effects of these dynamics are discussed fully as a critical factor in Chapter 7.

As units arrived at 1353 hours, video evidence shows the impact of the wind on the self-vented sliding glass door and windows in the rear on the first floor of the Fire Building, the windward (high-pressure) side of the building (see Figure 47). The visible heavy fire exhibited a ventilation profile characteristic of wind-impacted conditions (see also Chapter 7). By 1355 hours, the front door on the first floor of the Fire Building was opened, and wind-impacted fire conditions met units as they attempted to make entry. The front door was on the building's leeward (low-pressure) side.

Figure 47. Still frame photo taken from cellphone video of the rear of 10826 Avenue N, the Fire Building.

Soon after, the large front bay window on the leeward (low-pressure) side of the first floor of the Fire Building self-vented under wind-impacted fire conditions. At this point, the fire issued under pressure from that front door and the self-vented bay window. This fire blew out the front openings and was driven by the wind condition across the front of the Fire Building. This caused fire to spread toward the Exposure #4 Building severely exposing the front door on the first floor and the front portion of the second floor of the Exposure #4 Building.

EXTERIOR FIRE EXTENSION TO THE EXPOSURE #4 BUILDING'S SECOND FLOOR: 1355–1402 HOURS

As the fire vented out the front of the Fire Building, it was driven by the left-to-right (exposure #2 side to exposure #4 side) direction of the wind. This wind condition drove fire toward the Exposure #4 Building, where it severely exposed the front portion of the Exposure #4 Building's second floor and partially blocked the front door to the Exposure #4 Building. Video evidence collected from both the front and rear of the building verified this lateral impact of the wind on fire travel and smoke movement.

As a result, the Exposure #4 Building was severely exposed to extending fire from the Fire Building, which led to fire extension in the front of the Exposure #4 Building, traveling from the first floor of the Fire Building directly to the front bedroom on the second floor of the Exposure #4 Building. Specifically, the fire traveled through voids inside the front wall behind the portico that spanned the entranceway at the top of the front stoop. Photo evidence of the charring patterns inside the front wall, between the front door on the first floor and the front windows on the second floor of the Exposure #4 Building, indicates fire extension at that point.

However, the rear of the building did not experience this kind of fire extension, despite wind-impacted exposure to fire venting from the first floor rear of the Fire Building (as seen in video footage), because the unvented soffits in that area prevented direct fire travel from the Fire Building to the Exposure #4 Building.

FORMATION OF THE LOW-INTAKE, HIGH-EXHAUST FLOW PATH IN EXPOSURE #4 BUILDING: 1402–1410 HOURS

At 1402 hours, the initial attack commenced in the Fire Building, and primary searches began in the Exposure #4 Building. In the Exposure #4 Building, the sliding glass door in the rear basement was forced open, causing the glass to shatter, and would remain open for the duration of the incident. At 1404 hours, the sliding glass door in the rear of the first floor was also opened and remained open during the entire incident. These doors were on the windward (high-pressure) side of the building, forming the uncontrolled inlet of the flow path.

As E257 advanced with their hoseline to extinguish the fire in the front bedroom on the second floor, the front windows self-vented due to the heavy fire conditions. These windows were on the

leeward (low-pressure) side of the building. As E257 advanced with their hoseline to extinguish the fire, the door to the front bedroom was opened, providing an open path from the top of the interior stairway to the open front windows, forming the exhaust portion of the flow path.

While E257 extinguished the fire in the front bedroom on the second floor, it was unaware of the smoke condition worsening on the first floor and the fire in the basement. At this time, L103's Inside Team began ventilation on the first floor. The rear window next to the open sliding glass door was vented, as was the window on the exposure #4 side wall across from the top of the interior stairs to the basement, at 14:09:36. These additional openings also contributed to the flow path formation in the Exposure #4 Building (see Figure 48).

Figure 48. View of the rear exterior wall on the basement level of the Exposure #4 Building where the open sliding door provided the low intake.

At this point,

- The rear (windward side) sliding glass door was open in the basement;
- On the first floor, the rear (windward side) sliding glass door was open;
- The rear window (windward side) was vented;
- The side window (leeward side) was vented;
- The front door (leeward side) was open; and
- On the second floor, the front windows (leeward side) had self-vented.

As a result, a low-intake, high-exhaust flow path had inadvertently been formed, with the windward openings acting as the intakes and the leeward openings acting as the exhausts.

Discussion of Low-Intake, High-Exhaust Flow Path

A low-intake, high-exhaust flow path is an uncontrolled flow path by which fire travels from the high-pressure area at its source to a remote low-pressure exhaust point. Because of the orientation of the ventilation intake and exhaust points relative to the fire, this type of flow path creates a powerful, unidirectional airflow from the fire to the exhaust point. As a result, fire rapidly extends to the remote exhaust point, driven by the inflow of air at the intake point.

For this condition to occur, three critical features must exist:

1. A sufficiently large opening available for air intake at or below the level of the fire;
2. An exhaust point at the same level or above the fire; and
3. An uncontrolled flow path connecting the intake, the fire, and the exhaust.

This low-intake, high-exhaust flow path developed in the Exposure #4 Building; the fire on the bottom floor of the building extended via the open interior stairway from the basement to the top floor. Fresh air continued to feed the fire from the uncontrolled low-intake inlet to the fire and exhausted to an uncontrolled high-exhaust outlet.

At this incident, the hot, buoyant gases from the fire in the basement exhausted up the open interior stairway (flow path) to the uncontrolled high-exhaust outlet. There was an inflow of air toward the fire to replace these exhausting gases. The negative pressure in the fire area "pulled" air from the uncontrolled low-intake inlet toward the fire.

Once the rising gases found an exhaust point on the top floor (high-exhaust), they vented out the front window to the low-pressure area on the leeward side of the structure. These escaping gases introduced more fresh air to the seat of the fire, thus increasing the burn rate and producing more hot gases and flaming combustion. At this point, the uncontrolled fire intensified. Gases rapidly released up the uncontrolled flow path, and more air flowed to the fire, replacing these escaping gases. The convective flow from the fire area to the uncontrolled high exhaust built speed and intensity while the uncontrolled low intake supplied fresh air to feed the fire, allowing it to grow and spread. Members were subject to the convective heat energy transfer in the uncontrolled exhaust of the flow path—the most efficient means of heat transfer—which can overwhelm the thermal protection of fire gear before members have time to react.

The open, uncontrolled flow path, created inadvertently, spread fire and heat from the basement to the high exhaust on the second floor. Convective flows in this unidirectional exhaust of the flow path placed FDNY members at significant risk.

FIRE EXTENSION: WIND-IMPACTED, LOW-INTAKE, HIGH-EXHAUST FLOW PATH, 1410–1412 HOURS

Between 14:09:50 and 14:10:00, fire spread from the base of the vertical shaft in the basement of the Exposure #4 Building, engulfing the basement and rapidly extending upward in the Exposure #4 Building via both the open interior stairway and the enclosed vertical shaft. Unaware of this fire behavior, E257 operated on the second floor of the Exposure #4 Building.

Once fire extended to the basement of the Exposure #4 Building, it was immediately subject to two distinct and powerful air movements: the severe wind condition and the air currents produced by the uncontrolled low-intake, high-exhaust flow path. Each of these movements could have been strong enough to impact the fire condition significantly, but together, in the same direction, they amplified the impact. In the basement of the Exposure #4 Building, the combination had the effect of driving fire from the base of the vertical shaft up the wind-impacted flow path between the low intake from the open sliding glass door in the basement and the high-exhaust of the failed front bedroom window on the second floor. The distinct components of this flow path are discussed in the following subsections.

Flow Path in the Basement of the Exposure #4 Building: From Bottom of Vertical Shaft Up the Interior Stairway to First Floor

In the basement of the Exposure #4 Building, the fire extended in all directions from the base of the vertical shaft, but the primary path of the extension was forward from the shaft area toward the interior stairway, which was of open-tread construction, and provided an unimpeded path to the top of the stairway. Fire also traveled at the ceiling level toward the open sliding glass door in the rear, but the in-rushing air from the sliding glass door drove the fire forward and up the flow path of the interior stairs. The wind condition increased this ventilation and enabled rapid and sustained fire growth (see Figure 49).

Figure 49. View from the basement level of the Exposure #4 Building from the hallway looking at the staircase to the first floor.

Flow Path on the First Floor of the Exposure #4 Building: From the Top of Interior Stairs of the Basement to Second Floor

Seconds later, on the first floor, extending fire erupted from the interior stairway leading from the basement. The door at the top of this stairway had been opened and closed several times by various members conducting searches throughout the operation. Unless the latch of the door had been firmly and completely engaged, the intensity of the wind-impacted fire conditions would have had the effect of blowing this door open. With this door open, the low-intake, high-exhaust flow path was completed.

Once the fire was on the first floor, it extended via the open, uncontrolled flow path. It rushed toward the open interior stairway that led to the second floor, where a high-exhaust point was available at the self-vented front windows in the front bedroom.

On the first floor, the fire extended from the basement stairway, moving forward toward the leeward (low-pressure) openings at the front of the building and away from the windward (high-pressure) openings in the rear of the building. The front door's position in the sunken foyer 2 feet below the main floor initially prevented hot gases from venting out the door and delayed the fire's appearance out the front door, as the fire more readily extended up the stairs to the second floor. During this delay, three members exited the front door.

Fire also vented out the window directly across from the stairway door on the first floor (on the exposure #4 side wall), which had been vented less than a minute earlier. The member who vented this window reported seeing fire rushing from the basement stairway toward the front of the building. Despite being only several feet from the stairway, the member was positioned outside the exhaust portion of the flow path, thus avoiding the extreme conditions that compelled three other members to exit through the front door. Instead, the member remained standing throughout this time and exited via the open sliding glass door in the rear of the first floor.

Fire did not extend to the rear of the first floor, as the in-flowing air from the windward (high-pressure) openings in the rear limited extension in that direction. These openings acted as air inlets and allowed the wind condition at the rear of the building to drive air toward the extending fire, which added to its intensity and quickly overwhelmed the available ventilation outlets on the leeward (low-pressure) side. At 14:11:06, the large bay window in the front of the first floor self-vented under heavy fire conditions, and fire vented out the new vent point (see Figures 50 and 51).

Figure 50. View from the first floor in the Exposure #4 Building of the doorway leading to the basement level.

Figure 51. View from the first-floor living room of the Exposure #4 Building.

Flow Path on the Second Floor of the Exposure #4 Building: From the Top of Interior Stairs of First Floor toward the Front and Out the Self-Vented Front Window

Wind-impacted fire conditions raced up the interior stairs, following the uncontrolled flow path to the high-exhaust point of the self-vented windows in the front bedroom. The door to the bedroom had previously been removed from its hinges (to allow access for the hoseline due to clutter), providing an uncontrolled flow path for the extending fire from the top of the open interior stairs to the front windows on the leeward (low-pressure) side of the building.

Adding to the high heat and fire load on the second floor was the presence of extending fire inside the vertical shaft. This fire had been burning in the shaft before the arrival of FDNY units on scene. The in-rushing air from the open rear sliding glass door in the basement also created a flow path for fire travel up the vertical shaft. Physical evidence supports this observation, as charring patterns inside the shaft indicate sustained burning from both the top down and the bottom up. Additionally, several members forced to exit from near the top of the interior stairway experienced a sudden

surge of heat coming from two different directions: below them and above them. The heat from below was caused by fire extending up the interior stairs while the heat from above was caused by fire extending out from the top of the vertical shaft, which terminated just above the area near the top of the interior stairs on the second floor (see Figure 52).

The combined impact of heavy fire traveling up the uncontrolled flow path of the open interior stairs and the fire traveling up the vertical shaft led to rapid fire development on the second floor, where the situation became immediately untenable.

Figure 52. View from the hallway on the second floor of the Exposure #4 Building looking toward the front.

FIRE EXTINGUISHMENT IN THE BASEMENT AND FIRST FLOOR: 1412–1416 HOURS

At approximately 1412 hours, additional hoselines positioned on the exterior began extinguishing the fire in the Exposure #4 Building via alternate access points in both the front and rear of the

building. E323 was positioned in the front driveway and operated their hoseline into the self-vented front bay window on the first floor. In the rear, E310 repositioned the hoseline and advanced into the basement by way of the open sliding glass door. Operating from the windward side of the flow path, its members had the wind at their backs and quickly applied water to the source of the fire. This use of alternate access points for fire extinguishment is discussed fully as a critical factor in Chapter 7.

Fire Safety Research Institute's Fire Dynamics Simulator

To examine the rapid fire development at 1410 hours in the Exposure #4 Building, the FFIT coordinated with a team of scientific experts at the Fire Safety Research Institute (FSRI), a subcomponent of UL. This group, widely recognized as a leader in its field, has significant experience assisting in investigations of firefighter fatalities.

For this investigation, the FSRI created a computer-generated simulation of the fire development event at 1410 hours using its Fire Dynamics Simulator (FDS), a computational fluid dynamics model developed by a multi-national team led by the National Institute of Standards and Technology (NIST). Companion software called Smokeview was also used to visualize the results. See Appendix D for the full details and model specifications.

Once the details of the fire incident were entered into the FDS system, the simulation was run and output recorded. The simulation results mirrored the observed conditions in the Exposure #4 Building and confirmed that the extreme conditions could be explained by the combined wind condition, ventilation profile, flow path formation, and fuel load in the building.

Specifically, the model found that temperatures on the first and second floors dramatically increased in the minute following the venting of the first floor window across from the basement stairway. At this time, temperatures in the flow path reached over 1000° Fahrenheit on the first floor and over 900° on the second floor. Similarly, the air flow velocity increased dramatically at this point, with speeds of over 15 mph in the stairway and 6 mph in the second floor hallway (see Figure 53). A full accounting of the results of the FDS model is provided in Appendix D.

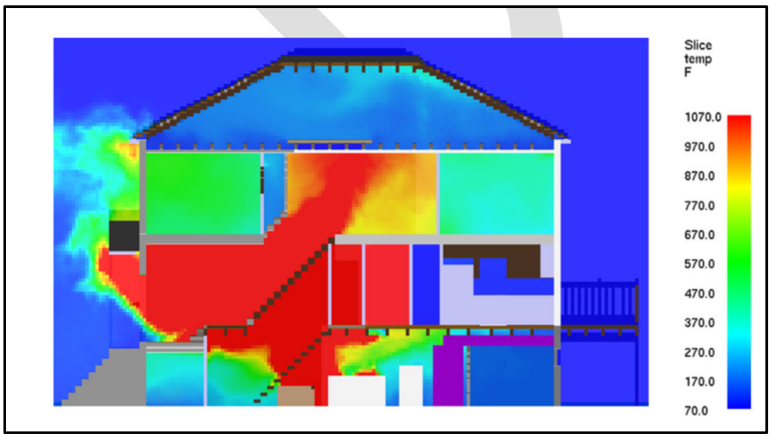

Figure 53. UL Research Institute model of the cross section of Exposure #4 Building.

In addition to the model depicting conditions in the Exposure #4 Building, FSRI analysts ran two more models to investigate scenarios in which there was either no wind or a controlled flow path. In both models, the rapid fire development and extreme conditions resulting from the first model did not occur. The results of these additional models confirmed that the primary contributing factor in the rapid fire growth was the wind condition during the fire, which enabled rapid and sustained fire development. The secondary factor was flow-path control, which provided the ventilation needed to support the fire growth and spread. A full accounting of the results of the FDS models is provided in Appendix D of this report.

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CHAPTER 7. CRITICAL FACTORS

This chapter discusses six critical factors that influenced the outcome of this operation:

- The impact of wind condition on fire behavior;
- The formation of a low-intake, high-exhaust flow path;
- The use of alternative access points for extinguishment;
- The activation of the EAB with mayday transmissions;
- The effect of emotional stress on operational performance; and
- The performance of firefighting equipment.

A further discussion of each factor ensures that the department recognizes the corresponding complexity and addresses it in future operations.

IMPACT OF WIND CONDITION ON FIRE BEHAVIOR

The severe impact of wind on the fire conditions at this incident proved a critical factor throughout the operation. As confirmed by video evidence collected from various perspectives, a powerful, sustained wind condition was present before units arrived and continued until after the fire was under control. As confirmed by analysis and modeling conducted by FSRI, the wind condition increased the oxygen supply to the fire and enabled rapid and sustained fire development.

While members operating at the front of the building might not have immediately noted this extreme wind due to the various structures blocking direct air movement (e.g., buildings, construction barriers, and fences), the unusually heavy smoke condition in the street was a direct result of the wind condition on the opposite side of the building. This smoke condition blanketed the street and had the effect of obscuring the Fire Building from view. A heavy smoke condition outside and in front of the Fire Building would have indicated a strong wind impacting the building.

According to historical weather data (confirmed by video evidence), the wind was blowing toward the fire buildings on an angle from the east, traveling from the exposure #2/3 corner of the fire area (rear of exposure #2 side) toward the exposure #1/4 corner (front of exposure #4 side), with

sustained winds of 23 mph and gusts up to 30 mph. The wind direction affected conditions in the Fire Building from two distinct directions:

- From the rear to the front (exposure #3 side to #1 side); and
- From the exposure #2 side to the exposure #4 side.

This wind-impacted air movement varied throughout the incident and affected the operation differently, depending on the location. The rear and the exposure #2 side of the buildings were on the windward side, which experienced higher pressure. Openings on these sides functioned as air intakes. The front and the exposure #4 side of the buildings were on the leeward side, which experienced lower pressure. Openings on these sides functioned as air exhausts. The specific effects of these dynamics are described in the following subsections.

Wind-Impacted Fire in the Fire Building

Video evidence at 1355 hours showed a ventilation profile at the rear of the first floor of the Fire Building exhibiting characteristics of wind-impacted conditions. Fire from the self-vented rear sliding glass door exhibited the characteristic "burping/pulsing" effect, produced when a wind condition overwhelms an opening and over-pressurizes a fire area. While limited smoke was seen issuing from the rear door, a large volume of smoke was seen blowing out the front of the building and horizontally across the street, a result of the wind condition.

In addition to driving the fire, smoke, and hot gases forward through the building, the wind condition also increased the burning rate in the fire area by providing a steady supply of air. This condition led to heavier fire and increased the volume of combustion products. The steady inflow of air at the rear openings also made it difficult for the products of combustion to exhaust the Fire Building. As a result, the vent openings were overwhelmed, leading to an accumulation of hot gases inside the structure that would have otherwise escaped (see Figure 54).

Figure 54. Rear of 10826 Avenue N, the Fire Building.

Wind-Impacted Low-Intake, High-Exhaust Flow Path in Exposure #4 Building

At the basement level of the Exposure #4 Building, the wind condition had the effect of driving air into the building through the open sliding glass door in the rear. With fire extension to the basement, the wind-impacted conditions compounded the effects of the low-intake, high-exhaust flow path that had formed. The wind condition significantly affected the speed and intensity of the fire traveling in the flow path's exhaust.

Pressurization of Rear of the Exposure #4 Building's First and Second Floors

On the first floor of the Exposure #4 Building, the wind forced into the open sliding glass door on the windward (high-pressure) side in the rear of the building pressurized the rear portion of the first floor and prevented fire travel to that area. Once the windows in the rear of the building were vented on the second floor of the Exposure #4 Building, the inflow of air on the windward (high-pressure) side pressurized the bathroom and rear bedroom. Consequently, conditions in these areas were relatively more tenable than on the rest of the second floor, creating an area of refuge and eventually providing egress.

Fire Extension from the Fire Building's First Floor to the Exposure #4 Building's Second Floor

The lateral component of the wind condition caused fire to extend from the Fire Building to the Exposure #4 Building's front second-floor bedroom by way of existing voids in the front wall (behind the portico). In the rear of the building, a similar extension was prevented by the absence of vent openings in the soffits, which were also exposed to fire.

FORMATION OF A LOW-INTAKE, HIGH-EXHAUST FLOW PATH

While the previous section described the formation of the low-intake, high-exhaust flow path in the Exposure #4 Building, as well as the fire dynamics of this condition, this section defines the danger of this type of flow path to firefighters. It also describes the situations in which a low-intake, high-exhaust flow path might be encountered. A complete discussion of the principles that govern fire growth and travel is beyond the scope of this report (see the FDNY's "Fire Dynamics" training bulletin for further details).

A low-intake, high-exhaust flow path can render conditions untenable for firefighters, even in the absence of wind (see Figure 55). Such a dynamic was not unique to this incident but has been the unfortunate cause of several firefighter fatalities and many near-misses across the country and in the FDNY.

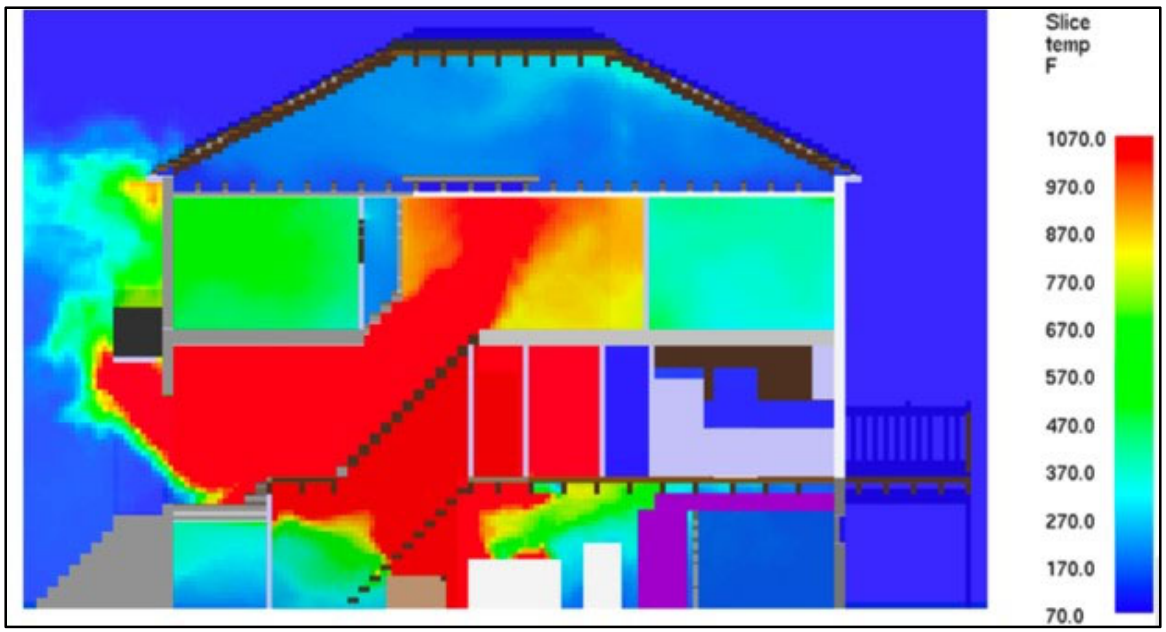

Figure 55. UL Research Institute modeling showing a cross section of 10824 Avenue N with fire travel and temperatures demonstrating the low-intake, high-exhaust flow path.

While private dwellings present a common situation, this flow path can occur in any building, regardless of occupancy or construction type. Meeting the following three criteria increases the potential for a low-intake, high-exhaust flow path:

- A sufficiently large opening for air intake at or below the level of the fire;
- An exhaust point at or above the level of the fire; and
- An uncontrolled flow path connecting the intake, the fire, and the exhaust.

This situation is of particular concern whenever the fire attack involves entering the exhaust portion of the flow path above the low intake. Such a situation may occur in a cellar or basement, a duplex apartment in a multiple dwelling, a structure built on a hill or grade, or any other layout that would result in advancing the attacking hoseline through the exhaust portion of the flow path, above the low intake.

This flow path resembles the fire behavior in the Exposure #4 Building. The airflow between the low-intake opening and the fire could be either bidirectional or unidirectional, which means that air could flow both from the intake opening toward the fire and from the fire toward the opening. Consequently, fire would travel toward the intake but only near the top of the opening. The danger would exist in the exhaust portion of the flow path, between the fire and the high-exhaust opening.

Air movement in this area would be unidirectional, and fire and hot gases would travel in one direction: from the fire to the exhaust opening. Conditions in this exhaust portion of the flow path would be velocity-driven (from the difference in pressure between areas) and would deteriorate without warning when an uncontrolled flow path formed and then became rapidly untenable. This portion of the flow path might be positioned from the fire to the front door, the typical path of the initial fire attack.

Recognizing the potential for a low-intake, high-exhaust flow path should be a priority at all firefighting operations, regardless of occupancy and construction type. If the potential for such a flow path exists, the path of the fire attack should account for the locations of the intake and exhaust.

USE OF ALTERNATE ACCESS POINTS FOR FIRE EXTINGUISHMENT

Using alternate access points to apply water on the fire proved critical to extinguishing the rapidly extending fire in the Exposure #4 Building. After the rapid fire extension at 1410 hours, applying water through alternate access points rapidly improved conditions throughout the building. Although conditions had deteriorated and become untenable in a matter of seconds, the tenability of the environment also quickly improved once hoselines operating from these alternate access points began to extinguish the fire.

The fire was extinguished from two separate access points, each different from the original point of access (the front door of the first floor of the Exposure #4 Building). In the front of the building, exterior fire control was initiated by operating a hoseline from the exterior into the self-vented bay window in the front of the first floor. This hoseline effectively improved conditions in that area without worsening conditions opposite the hoseline, as it minimized air entrainment (caused by the hoseline pushing air) into the fire area. In the rear of the building, a hoseline was advanced into the basement through the open sliding glass door on the windward (high-pressure) side of the building. As a result, the wind-impacted air moved in the same direction as the hoseline advance, which enabled the Nozzle Team to safely and effectively advance the hoseline to the source of the fire.

Extinguishment from both these points began at nearly the same time and improved conditions to such a degree that trapped members on the second floor could leave their refuge and make their way to safety less than three minutes later.

ACTIVATION OF THE EAB WITH MAYDAY TRANSMISSIONS

As with any operation involving a mayday transmission, activating the EAB is paramount. At this incident, there were four mayday transmissions. One of these transmissions originated with Firefighter Timothy Klein while he was trapped in an untenable position on the second floor of the Exposure #4 Building.

Handie-talkie recordings show that Firefighter Timothy Klein repeated "Mayday" three times and provided his location, transmitting "second floor front." During the investigation, the FFIT could only decipher this transmission with great difficulty after repeated analysis, which did not reflect what had been possible on the fireground. His transmission was not received due to multiple simultaneous handie-talkie transmissions. Firefighter Timothy Klein's mayday transmission was not acknowledged, his EAB was not activated on his handie-talkie, and no one at the operation knew he had transmitted a mayday.

In addition to Firefighter Timothy Klein's transmission, three other members transmitted a mayday at this incident. All transmissions are listed in Table 1.

Table 1. Mayday Transmissions

Member	Location	EAB Activation	Interrupted Transmission	Message Acknowledged
L103 Officer	At front door of Exposure #4 Building, after rapid exit	No	No	Yes, by IC
FF Timothy Klein	On second floor of Exposure #4, in flow path of extending fire	No	Yes	No
E231 Officer	Outside, in rear of building	Yes	No	Yes, by IC
R2 Chauffeur	After locating missing member on second floor of Exposure #4 Building	No	No	Yes, by IC

Considering the information illustrated in this table, the following critical points can be made about EAB activation, the circumstances surrounding mayday transmissions, and the response to these transmissions at this fire:

- Of the four transmissions, the only EAB activation was by a member outside the IDLH;
- Two members who transmitted maydays without EAB activation were operating in an IDLH; and
- Firefighter Timothy Klein's transmission was the only one to be interrupted and go unheard, to have no EAB activation, and to receive no mayday acknowledgment.

These findings are consistent with those of previous mayday transmission research conducted by the FDNY Safety Command.

Importance of the EAB

Activating the EAB is critical to increasing the chance that the message is received and generating an effective response. To illustrate the effectiveness of an EAB activation, when two members at this operation depressed their EABs inadvertently, the EFAS firefighter recognized the signals, and the firefighters' identities were transmitted to the IC.

EFFECTS OF EMOTIONAL STRESS ON OPERATIONAL PERFORMANCE

After analyzing interviews, handie-talkie transmissions, and video recordings, the FFIT determined that most of the personnel involved in the incident had operated under conditions of extreme emotional stress. The profound impact of such stress on the actions and decision-making process was observed across all ranks, from the highest level of command to probationary firefighters. The interview process revealed that many members did not realize the high level of stress under which they had been operating.

Emotional stress, which refers to the strain one experiences from emotional or psychological pressures, can significantly affect firefighters working on the fireground. Some of its impacts are as follows:

- Decision-making and judgment: Emotional stress can impair firefighters' ability to make sound decisions and exercise good judgment. High-stress situations can lead to cognitive overload, making it harder to think clearly and make effective choices.
- Reduced situational awareness: Emotional stress can narrow firefighters' focus and limit their ability to perceive the entire fireground environment. Reduced situational awareness can increase the risk of accidents and decrease overall effectiveness.
- Task performance: Emotional stress can hinder firefighters' performance during fireground operations. Stress can affect motor skills, coordination, and cognitive functions, making it more difficult to perform tasks efficiently and safely.
- To mitigate the effects of emotional stress on firefighters, the department has implemented the Mental Performance Initiative, or MPI, program. Appendix E expounds on the effects of emotional stress on operational performance.

PERFORMANCE OF FIREFIGHTING EQUIPMENT

The final critical factor was the performance of firefighting equipment during the operation. While most firefighting equipment performed as expected, three critical issues arose relating to fire hoses, a SCBA facepiece, and the fire apparatus pump.

Fire Hose

In this operation, two different hoselines suffered a burst length during a fire attack. Considering the infrequency of burst lengths in the FDNY, the occurrence of two unrelated burst lengths in separate hoselines at the same operation proved to be a critical factor in the operation.

The first burst length occurred near the top of the stairs in the Exposure #4 Building on the second floor at 1411 hours and rendered the hoseline useless for E257. This burst in the lead length of E257's hoseline severely reduced water flow at the nozzle, making it impossible for E257 to improve the rapidly deteriorating conditions in the exhaust portion of the flow path at their location. This burst length resulted from burn damage to the hose, not from exposure to hot gases or extending fire but from contact with a hot metal railing at the top of the stairs. The prolonged contact with this hot railing compromised the hose and caused the burst length.

The FFIT examined E257's hoseline and determined that it also exhibited burn damage spread evenly over a large area of the hose's surface. This type of damage indicates exposure to high radiant heat and contact with hot gases. Critically, the integrity of the hose was not compromised in the area of this burn damage, so the hose retained its ability to deliver water.

The second burst length occurred just inside the front door on the first floor of the Fire Building at 1412 hours and affected the ability of E283 to operate the hoseline. The burst occurred in the lead length of the hoseline and severely reduced water flow at the nozzle, causing E283 to back the hoseline out of the Fire Building. This burst length resulted from burn damage to the hose, caused by prolonged contact with a hot metal railing near the front door. Members operating in the area specifically recalled this railing appearing "cherry red."

The FFIT examined the hose recovered from E283's hoseline. The damaged hose was charged with hydrant pressure (at roughly 50 pounds per square inch), and the location of the breach was identified by noting the discharging water. The nature of the burn damage surrounding the breached point was also noted.

In both damaged lengths, the examination found the breach occurred at a single point of highly concentrated damage, which is indicative of contact with a hot solid object. This finding has practical implications for future fire operations, as it suggests that a hose in contact with a hot object may be more susceptible to compromise than a hose exposed to hot gases.

SCBA Facepiece

After Firefighter Timothy Klein was removed from the building, members found that the voicemitter on the left side of his SCBA facepiece was missing. The butyl rubber lining surrounding the voicemitter that secured it in place was found intact on the facepiece, but the flat metal surface of the voicemitter itself was not present. As a result, there was no barrier in the facepiece where the voicemitter would have been normally affixed, which left a circular opening with a 15/16-inch diameter, thus compromising the integrity of the facepiece (see Figure 56).

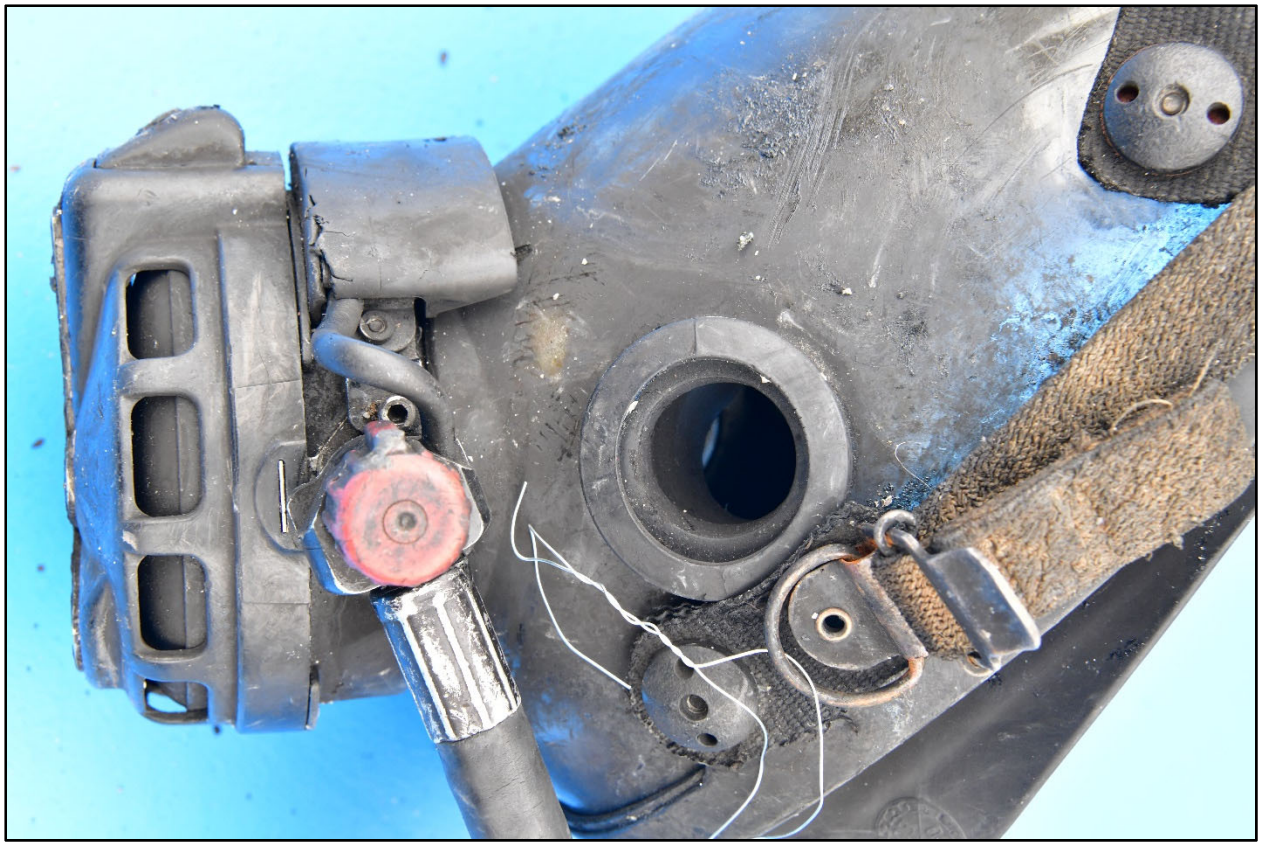

Figure 56. Facepiece attached to the regulator of E257's back-up position SCBA worn by Firefighter Timothy Klein.

Based on the information and evidence available, the FFIT could not determine when this voicemitter became detached from the facepiece.

The FFIT confirmed that the SCBA assigned to Firefighter Timothy Klein for the tour was pressurized at 0754 hours. The FFIT confirmed that the facepiece found on Firefighter Timothy Klein's SCBA was not the personal facepiece that had been assigned to him by the MSU. The facepiece worn by Firefighter Timothy Klein had "L138 - RIT" etched on the lens.

Fire Apparatus Pump

While initially operating at this fire, E257's apparatus (registration number SP20007) could not engage its pumps (the apparatus would not "go into pumps"). The E257 Chauffeur unsuccessfully attempted to engage the pump several times, including following the recommended troubleshooting technique of restarting the sequence of engaging the pump. Additional engine company chauffeurs also attempted to engage E257's apparatus pump but were unsuccessful. At this point, the decision was made to disconnect the hoselines stretched from E257's apparatus and attach them to E290's apparatus, which had been backed down the block and was connected to a serviceable hydrant. E290's apparatus supplied water to these handlines for the duration of the operation.

Several minutes later, at 1406 hours, the E257 Chauffeur engaged the pump on E257's apparatus. The IC was informed, and E257's apparatus supplied two new handlines. When interviewed, the E257 Chauffeur could not recall the exact actions that successfully engaged the pump, including whether the apparatus had been shut down and restarted, an additional step beyond the recommended troubleshooting techniques. However, the E257 Chauffeur recognized the possibility that another member might have shut down and restarted E257's apparatus while he assisted with repositioning the initial handlines to E290's apparatus.

Investigation after the Fire: April 24 and 25, 2022

After the fire, E257's apparatus underwent a series of functional tests by Fleet Services to determine the operability of the apparatus. After performing as expected during these tests, the apparatus was returned to service.

Returned to Service: May 2, 2022

Fleet Services took E257 to a test hydrant, connected a 35-foot soft-suction to the front inlet, and performed an FDNY 2000GPM pump test without any issues or defects. Fleet Services provided E257 with normal preventive maintenance service and placed it back in service.

In the following weeks, two additional incidents involving the apparatus not operating as expected occurred on June 2, 2022, and June 30, 2022.

Second Apparatus Pump Issue: June 2, 2022

On June 2, 2022, E257's officer on duty notified Fleet Services that E257's apparatus pump had failed to engage. Seagrave responded to the quarters of E257 and, upon inspection, discovered that although the apparatus pump had successfully engaged, booster tank water could not enter the pump due to a missing fastener that connected the tank-to-pump valve at the valve-side linkage rod connection. This missing fastener prevented booster tank water from entering the pump, which caused a low-pressure reading on the pro-pressure governor. After Seagrave repaired the connection, the apparatus passed an operational test and performed as expected.

Third Apparatus Pump Issue: June 30, 2022

On June 30, 2022, E257 responded to Brooklyn Box 75-2383. During initial operations, the E257 Chauffeur had difficulty engaging the apparatus pump. After positioning at a hydrant and setting the parking brake, the Chauffeur could not shift the transmission into neutral (or any other gear).

To troubleshoot the apparatus pump's inability to engage, the Chauffeur turned the apparatus completely off, including the ignition switch and battery switch. When the Chauffeur restored power to the apparatus, the transmission defaulted to the neutral position, making it possible for the apparatus pump to engage. Once the pump was engaged, E257's apparatus could supply water at the operation without incident.

Immediately following the operation, the officer on duty placed the apparatus out of service and notified Fleet Services. When questioned about the issue, the Chauffeur also reported that while driving the apparatus during the response to the incident, the apparatus seemed to be "stuck in gear," and the transmission selector read "2" throughout the response. These observations indicate that the apparatus had remained in second gear while responding to the incident.

Results of Advanced Testing: Faulty Ground Crimp Connection

Fleet Services and Allison Transmission conducted advance testing and discovered a fault in the electric system that controls the transmission of the apparatus. Specifically, a fault was located at the "ground crimp connection" on the chassis above the transmission. The purpose of this

connection is to connect to the “grounding block” at that location, which effectively completes the electrical circuit that supplies the electronic control unit, which controls the transmission. A fault at this connection could result in the transmission’s inability to shift out of second gear. This condition, known as “limp mode,” allows the engine to function in second gear upon transmission failure, but the engine cannot shift to a higher gear. Critically, the apparatus must function in fourth gear to operate the pump. Upon discovering this condition, Seagrave was notified, and the faulty connection was repaired.

CHAPTER 8. FINDINGS AND RECOMMENDATIONS

This chapter outlines specific recommendations from the FFIT, as informed by the various findings made throughout the investigation. For each finding observed, a recommendation has been provided. If any modifications to the FDNY manuals are proposed, such changes are suggested for the Bureau of Operations. The recommendations focus primarily on the following areas and are grouped in this chapter as follows:

- Managing incidents involving members in distress: Recommendations 1–2
- Fire behavior: Recommendations 3–5
- Hoseline operations: Recommendations 6–8
- Mayday transmissions: Recommendation 9
- Response resources: Recommendations 10–12
- Tools and equipment: Recommendations 13–21
- Water supply: Recommendations 22–25
- Change-in-grade floor identification: Recommendations 26–28
- Incident investigation: Recommendations 29–31
- EMS operations: Recommendations 32–37

MANAGING INCIDENTS INVOLVING MEMBERS IN DISTRESS

Recommendation 1. Require that every time a mayday is transmitted, the IC must announce the mayday on the handie-talkie and on the appropriate department radio borough frequency.

> **R1A.** The designation of the chief officer who will be addressing the mayday and the chief officer who will manage the fire must also be transmitted when the mayday is given to the borough dispatcher.
>
> **R1B.** The borough dispatcher will prompt the IC if the designations of these chiefs are not identified.

Findings That Led to Recommendation

- A mayday transmission was not given for a missing member over the handie-talkie or over the department radio borough frequency.
- Previous fires with maydays in which the IC delegated the tasks of managing the fire and the mayday to specific chief officers demonstrated a level of success that suggests it should be deemed a best practice.
- Chief officers on scene as well as chief officers still responding to the incident were either unaware a member was missing or under the impression the missing member had been located.

FDNY Manuals Affected

- *Communications Manual*
- Firefighting Procedures—*Managing Incidents Involving Members in Distress*, Chapter 4: "Incident Commander"

Recommendation 2. Institute a training guide to help identify members in distress and organize a clear plan of action to be taken by the IC and the FAST Group supervisor.

> **R2A.** Members with knowledge of members in distress shall convene to exchange information away from the fire building about the last known location, direction of travel, status of air, physical condition, and any other pertinent information that could aid in a coordinated rescue effort. This vital information must be relayed to the IC and the FAST Group supervisor.

R2B. Develop search procedures for members in distress. These search procedures should define how and what areas to search and be understood by all units operating.

Findings That Led to Recommendation

- The IC did not designate a firefighter locator officer or a FAST Group supervisor.
- There was confusion about whether all members were accounted for and which ones were receiving treatment from EMS.
- Current FDNY procedures do not adequately address searching tactics for lost or missing members.

FDNY Manuals Affected

- *Communications Manual*
- Firefighting Procedures—*Managing Incident Involving Members in Distress*
- Training Bulletin: "Search"

FIRE BEHAVIOR

Recommendation 3. Issue a new chapter for the "Fire Dynamics" training bulletin that comprehensively explains how fire travels in all structures and occupancy types. This document, Chapter 5, "Fire Travel," in the training bulletin on "Fire Dynamics" will provide critical information regarding the dynamics of fire travel in all structures and occupancy types. Specifically, the following recommendations will inform this document:

R3A. Make clear the potential impact of a wind condition at fires in structures of all sizes, all heights, and all occupancy types.

R3B. Identify the various potential warning signs of a wind-impacted condition, including a heavy smoke condition present outside the structure at the street level.

R3C. Provide a detailed explanation of the formation of a flow path and its impact on fire travel in various structures and occupancies.

R3D. Provide a detailed explanation of a low-intake, high-exhaust flow path and discuss specific hazards and potential solutions.

R3E. Provide a detailed explanation of the effects of an operating hoseline on airflow and its potential impact on fire travel.

R3F. Provide standard definitions for describing fire conditions, smoke conditions, wind impact, and ventilation profile. These terms will be used in fireground communications to effectively communicate conditions uniformly.

R3G. Include all relevant information in current department manuals (listed below).

Findings That Led to Recommendation

- The wind significantly impacted this operation, as evidenced by video captured from several angles that recorded the severity of fire conditions. These findings were corroborated by fire modeling conducted by UL.
- During the debriefing process, many members stated that they did not notice the severity of the wind at this fire, despite multiple indications of a wind-impacted fire condition.

FDNY Manuals Affected

- Training Bulletin: "Fire Dynamics," Chapter 2: "Fire Development," Section 4: Flow Path and Fire Travel
- Training Bulletin: "Fire Dynamics," Chapter 4: "Stack Effect and Wind," Section 2: Wind
- Training Bulletin: "Fire Dynamics," Addendum 2: Fire Dynamics Research Air Entrainment and Handline or Exterior Stream Operation
- Firefighting Procedures—*Multiple Dwelling Fires*, Chapter 5: "Wind Impacted Fires in Fireproof Multiple Dwellings"

Recommendation 4. Amend all firefighting procedure bulletins to state that wind can impact fires in all structures and occupancy types. A section shall be added to each bulletin to describe the potential impact of a wind condition and the importance of its consideration when conducting ventilation of any type. This section should be unique to each bulletin and address the relevant operational characteristics involving the occupancy type described therein.

Findings That Led to Recommendation

- Department policies related to wind-impacted fires are described only in Chapter 5 of *Multiple Dwelling Fires*. Although this section states that the tactical guidance outlined therein may apply to other building and occupancy types, the specific location of this information may give the false impression that wind-impacted fires in other structures are less likely.
- Regarding Firefighting Procedures, there are ventilation sections for non-fireproof multiple dwellings, high-rise fireproof multiple dwellings, and low-rise fireproof multiple dwellings but not for any of the other types of occupancies.

FDNY Manuals Affected

- Firefighting Procedures—*Private Dwellings*
- Firefighting Procedures—*Brownstones and Rowframes*
- Firefighting Procedures—*Taxpayers*
- Firefighting Procedures—*High Rise Office Buildings*
- Firefighting Procedures—*Places of Worship*
- Firefighting Procedures—*Lofts*
- Firefighting Procedures—*Ventilation*

- Firefighting Procedures—*Ladder Company Operations*, "Tenements"

Recommendation 5. Develop and institute a training program to provide a better understanding of the impact of wind conditions and how to identify potential threats.

R5A. Develop standardized terminology describing wind conditions to be added to training programs and firefighting procedure manuals.

R5B. Utilize the results of the computerized modeling research conducted by UL's FSRI and acquire and develop additional examples for this training.

Findings That Led to Recommendation

- The results of the computerized modeling research by the FSRI demonstrate that wind speeds in front of the building were less dynamic than wind speeds impacting the fire from the rear.
- Many members reported not thinking there was significant wind concern at this fire.
- Members subject to the higher wind speeds in the rear did not report that information to the IC.
- Currently, the Roof Firefighter section of the *High-Rise Multiple Dwellings* Firefighting Procedures is the only one of its kind among the FDNY's manuals to direct members on how to report wind conditions to the Inside Team or the IC.

FDNY Manuals Affected

- Firefighting Procedures—*Private Dwellings*
- Firefighting Procedures—*Brownstones and Rowframes*
- Firefighting Procedures—*Taxpayers*
- Firefighting Procedures—*High Rise Office Buildings*
- Firefighting Procedures—*Places of Worship*
- Firefighting Procedures—*Lofts*
- Firefighting Procedures—*Ventilation*
- Firefighting Procedures—*Ladder Company Operations*, "Tenements"

HOSELINE OPERATIONS

Recommendation 6. Revise FDNY manuals to ensure the engine officer considers the direction and impact of the wind condition when determining the location and path of the hoseline. The first hoseline at an operation should be stretched via the access that would provide the quickest and most effective attack on the fire. The quickest access may be an alternative entry point (such as a back door). In situations involving a wind condition, the engine officer must consider the direction and impact of the wind condition in determining the location and path of the hoseline. Stretching and operating the hoseline with the wind behind the stream will facilitate rapid fire extinguishment and provide greater protection for operating members.

Findings That Led to Recommendation

- Results of the research conducted by the FSRI on Governor's Island in 2008 related to wind-impacted fires support the benefits of introducing water into the fire area with the wind behind the stream.

FDNY Manuals Affected

- Firefighting Procedures—*Engine Company Operations*, Chapter 4: "Engine Company Officer," Section 3: Line Placement

Recommendation 7. Reinforce the danger of a burst length of hose resulting from prolonged contact with extremely hot objects, such as metal railings. Members should remain aware of this danger and be familiar with best practices to avoid it, including using the hoseline to cool the surface or ensuring the charged hoseline is not left in contact with the surface.

Findings That Led to Recommendation

- Two separate hoselines at this operation suffered burst lengths after contacting hot wrought iron railings inside both buildings. In one instance, numerous members specifically recalled the railings appearing red hot.

FDNY Manuals Affected

- Firefighting Procedures—*Engine Company Operations*, Chapter 6: "The Backstep," Section 2.7.11

Recommendation 8. Develop a training program to standardize and improve fireground communications when describing fire and smoke conditions, wind impact, and ventilation profiles. Incorporate this training program into the Fire Academy's curriculum and on the Learning Management System.

Standardized communication terminology would provide the IC and other operating members with more accurate information, enabling them to make informed decisions regarding the positioning of hoselines or the need to consider a change of tactics. Often, more precise and consistent terminology can lead to an accurate understanding of conditions observed remotely from the Incident Command Post.

> **R8A.** Develop a library of photographs and videos demonstrating different types of smoke and fire conditions and standardized terminology to describe them. These can be used across multiple training platforms as well as an initial training program rollout.

Findings That Led to Recommendation

- Currently, there is no common terminology to describe smoke and fire conditions.
- Several members reported over the handie-talkie that they needed a line in the rear without providing additional critical information, such as the conditions found that required a hoseline or the location where the hoseline was needed.

FDNY Manuals Affected

- *Communications Manual*
- Firefighting Procedures—*Private Dwellings*
- Firefighting Procedures—*Brownstones and Rowframes*
- Firefighting Procedures—*Taxpayers*
- Firefighting Procedures—*High Rise Office Buildings*
- Firefighting Procedures—*Places of Worship*
- Firefighting Procedures—*Lofts*
- Firefighting Procedures—*Ventilation*
- Firefighting Procedures—*Ladder Company Operations*, "Tenements"
- Firefighting Procedures—*Engine Company Operations*
- *Probationary Firefighter Manual*

MAYDAY TRANSMISSIONS

Recommendation 9. Develop a new chapter for the *Communications Manual* dedicated to emergency handie-talkie transmissions. Chapter 15, "Emergency Handie-Talkie Communications," will provide the policies and procedures governing mayday and urgent handie-talkie transmissions and the use of the EAB. In particular, this document will draw from the following recommendations:

R9A. Introduce the term "self-mayday" to describe a situation in which a mayday is transmitted by a member who is in a life-threatening situation. This is different from a situation in which a member transmits a mayday when someone else is in a life-threatening situation (such as a missing member) or in which an announcement is made to inform all members of a dangerous condition (such as a collapse).

R9B. Reinforce the importance of depressing the EAB before transmitting a mayday message. This is especially critical in the situation of a self-mayday because a member is less likely to execute multiple steps when transmitting a mayday under stress (e.g., transmitting "Mayday! Mayday! Mayday!" in addition to activating the EAB).

R9C. Discontinue the use of the EAB in conjunction with urgent handie-talkie transmissions. EAB activation shall be reserved exclusively for a mayday transmission or by the IC to gain control of the handie-talkie communications on the fireground.

R9D. Reinforce that the IC may also use the post radio to gain control of the handie-talkie communications; EAB activation should remain the primary option.

R9E. Reinforce the importance of a mayday transmission any time a structural collapse occurs. This mayday should be transmitted by any member who becomes aware of a collapse.

R9F. Include all information in the *Communications Manual*, Chapter 9, Section 9.4, titled "Emergency Handie-Talkie Communications." This section would be moved from its current location.

R9G. Reinforce the importance of a mayday transmission any time a member cannot extricate oneself from a hazardous condition. Notifying the IC of one's location and conditions will provide the IC the opportunity to change tactics and reassign resources to affect the rescue of members.

R9H. Amend the *Communications Manual* to describe that after three unsuccessful attempts to contact a member on a handie-talkie, the member must be considered a missing member, and a mayday must be transmitted.

R9I. Amend the *Communications Manual* to describe that an immediate roll call must be conducted any time a unit or member is subjected to a dangerous fire event.

Findings That Led to Recommendation

- As discussed in Chapter 7 of this report, the FFIT determined that Firefighter Timothy Klein transmitted a mayday message, but his EAB was not activated. His assigned handie-talkie was tested and found to be operating correctly.
- Although handie-talkie recorders captured Firefighter Timothy Klein's mayday message, the FFIT has concluded that no one operating heard his mayday transmission.
- Research conducted by the Safety Command of all mayday transmissions from 2012 to 2022 found that 38% were interrupted by another transmission.
- Research conducted by the Safety Command of all mayday transmissions from 2012 to 2022 found that a member transmitting a self-mayday was three times more likely to take only a single action while transmitting the mayday. In 76% of cases, the member giving a self-mayday either activated the EAB or verbally transmitted "Mayday! Mayday! Mayday!" In only 24% of self-maydays did the member take both actions.
- When the self-mayday member did not activate the EAB, the member was more likely to have one's message interrupted or, in some cases, not have one's mayday received. In addition to Firefighter Timothy Klein, this situation occurred in the line-of-duty deaths of Lieutenant Gordon Ambelas in 2014 and Firefighter Michael Davidson in 2018.
- During this operation, members operating in the rear of the Fire Building were aware of a collapse of the second floor into the first floor. No member transmitted a mayday for a floor collapse over the handie-talkie.
- The procedures governing maydays and urgent handie-talkie transmissions are presented as subsections in Chapter 9 of the *Communications Manual*.
- Several members were in an extremely hazardous location. They should have notified the IC that they could not leave the location due to the intense and rapid expansion of fire conditions.

- A member operating in a unit subject to a dangerous fire event was not answering repeated attempts to contact the member via handie-talkie.

FDNY Manuals Affected

- *Communications Manual*, Chapter 9, Section 9.4, "Emergency Handie-Talkie Communications"

RESPONSE RESOURCES

Recommendation 10. Create a multi-unit FAST Group to be dispatched, in accordance with *Managing Incident Involving Members in Distress*, Chapter 2, instead of a single-unit FAST Truck. This group will consist of the following: one battalion chief, one ladder company, one engine company, one rescue paramedic unit, and one Haz-Tac EMS officer.

R10A. The FAST battalion chief will be designated the FAST Group supervisor and will supervise all units of the FAST Group in the search, rescue, and removal of a member in a life-threatening situation. The FAST battalion chief will also supervise the emergency medical treatment of any injured members.

R10B. The engine officer of the FAST Engine will be designated the "member tracking coordinator" and will coordinate with the Medical Branch director to track the identity of any injured FDNY members.

R10C. Develop and describe a systematic search guideline to be used when a member is lost, trapped, or missing. This procedure should involve implementing a multi-sided approach and coordinating multiple search teams, including the cooperation between the FAST Truck responding from outside the building and SOC units already operating inside the building. This search procedure should also involve the use of the thermal imaging camera and Pak-Tracker to their fullest capability and a search rope when necessary.

R10D. A member of the FAST Group must be assigned to monitor the EFAS system for EAB activations continually. Additionally, a member of the FAST Group must be assigned to monitor a Pak-Tracker for PASS alarm activations.

R10E. A member of the FAST Group should be assigned to assist in street management and work to ensure access and egress of EMS personnel to the fire scene.

R10F. The Haz-Tac EMS officer will be designated the "FAST Medical Group supervisor" and will coordinate with the FAST Group supervisor regarding the medical care of injured members.

R10G. Develop a new chapter of the *Firefighting Procedures Manual* dedicated to FAST Group operations.

Findings That Led to Recommendation

- Multiple injured members evacuated the Exposure #4 Building simultaneously. The FAST Truck, an engine company, and additional members in front of the building were available to assist the injured members before transferring their care to EMS.
- The current FAST Unit policy does not address providing patient care to an injured firefighter after removal. The existing tool assignment for the FAST Unit does not include CFR equipment.
- A CFR-D engine is assigned not to a 10-75 signal but to 10-76 and 10-77 signals.
- Current procedures for *Managing Incidents Involving Members in Distress* state that a chief officer shall be assigned whenever possible to supervise the rescue effort.
- Fire departments in other cities, such as Boston, Chicago, Los Angeles, and Phoenix, have much more robust multiple-unit rapid intervention teams or crews (FAST) than the FDNY's current FAST assignment of only one ladder company (see Appendix C for details).
- While trying to account for all members, there was confusion about the identity of the injured members being treated by EMS.

FDNY Manuals Affected

- *Communications Manual*, Chapter 5: "Alarm Assignments," Section 5.6
- Firefighting Procedures—*Managing Incidents Involving Members in Distress*, Chapter 2: "Firefighter Assist and Search—FAST Unit"

Recommendation 11. Create a modified signal 10-66 to be transmitted upon receipt of any mayday transmission for a lost, missing, or trapped member.

R11A. The transmission of signal "10-66 No Code" shall cause the response of the following:

- One deputy chief
- Two battalion chiefs
- One rescue company
- One squad company
- One additional FAST unit
- One CFR engine
- One safety battalion
- One rescue battalion
- One SOC support ladder
- One conditions officer
- One Haz-Tac officer
- One EMS deputy chief
- One EMS division chief
- One OMA response physician
- One EMS ALS ambulance
- One EMS BLS ambulance
- One rescue ALS ambulance

R11B. The transmission of signal "10-66 Code 1" shall cause the response of the "10-66 No Code" matrix, as outlined in R11A, and the remainder of the current 10-66 assignment.

R11C. Require that the IC transmit a mandatory signal 10-66 (either No Code or Code 1) to the dispatcher on the borough frequency upon receiving any mayday transmission for a lost, missing, or trapped member.

R11D. Require that upon transmission of a signal 10-66 for a lost, missing, or trapped member, the IC transmit to all members on the scene, over all handie-talkie channels in use, the nature of the situation. This transmission will serve to increase situational awareness for all operating units.

R11E. Require that every time a signal 10-66 is transmitted on the borough frequency, the designation of the chief officer addressing the mayday and the chief officer managing the fire must also be transmitted when given to the borough dispatcher. The borough dispatcher shall prompt the IC if the designations of these chiefs are not identified.

Findings That Led to Recommendation

- A signal 10-66 was not transmitted for Firefighter Timothy Klein because adequate resources were on scene, as determined by the IC. This is consistent with the existing policy described in *Managing Incidents Involving Members in Distress.*

- Chief officers on scene as well as chief officers still responding to the incident were either unaware a member was missing or under the impression the missing member had been located.

FDNY Manuals Affected

- *Communications Manual*, Chapter 8: "Radio Communications," Section 8.5: Radio Code Signals 10-66
- Firefighting Procedures—*Managing Incidents Involving Members in Distress*, Chapter 4: "Incident Commander," Section 5.4

Recommendation 12. Assign an additional battalion chief to be designated the incident safety officer on the transmission of every signal 10-75. In addition to the current responsibilities of the incident safety officer assigned on the transmission of a second alarm, this officer shall be tasked with assisting the IC in evaluating visible smoke, the ventilation profile, and fire conditions and advising the IC on the potential for flashover, backdraft conditions, unsafe structural conditions, or other fire events that could pose a threat to operational teams.

Findings That Led to Recommendation

- At this incident, maydays were transmitted before the safety officer and safety battalion arrived. The current FDNY response matrix assigns only a safety officer once a second alarm is transmitted. Research conducted by the FDNY Safety Command and the Fire Department Safety Officers Association indicates that mayday transmissions and relative dangers to firefighters often occur early in fire operations.
- The National Fire Protection Association's *Standard on Emergency Services Incident Management System and Command Safety* (NFPA 1561), Chapter 8, Section 8.13.2 (1) states that the incident safety officer must be assigned as early in the incident as possible. Additionally, Annex G, Section 4, "Fire Suppression," in the same NFPA standard suggests that the safety officer should evaluate visible smoke and fire conditions and advise the IC and tactical level supervisors on the potential for flashover, backdraft conditions, unsafe structural conditions, or other fire events that could pose a threat to operational teams.
- The *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (NFPA 1710), Chapter 5, Section 5.2.2.3, states that an incident safety officer

shall be deployed upon confirmation of a structural fire, at special incidents, or when significant risk is present to the member due to the nature of the incident.

- The FDNY is not in compliance with NFPA 1561 or 1710.

FDNY Manuals Affected

- *Communications Manual*, Chapter 5: "Alarm Assignments"

TOOLS AND EQUIPMENT

Recommendation 13. Revise FDNY manuals to require that a specific member be assigned to monitor the Pak-Tracker. This designation will be made at roll call at the beginning of each tour and will be similar in function to the EFAS-designated member of the FAST Truck.

Findings That Led to Recommendation

- The FDNY's current FAST Unit policy requires that two assignments be given at roll call: the EFAS firefighter and the FAST Pak firefighter. It does not assign a Pak-Tracker firefighter designation.
- At this fire, the Pak-Tracker was not monitored before the first mayday, and the tool was not utilized to its full capacity throughout the incident.

FDNY Manuals Affected

- Firefighting Procedures—*Managing Incidents Involving Members in Distress*, Chapter 2: "Firefighter Assist and Search—FAST Unit," Section 5

Recommendation 14. Enforce the existing policy of rescue and squad companies' bringing their assigned Pak-Trackers to the Command Post when assigned to an incident. In addition to the designated Pak-Tracker member, the IC may assign any available unit standing fast near the Incident Command Post to monitor these additional Pak-Trackers.

Findings That Led to Recommendation

- The FAST Unit Pak-Tracker was the only Pak-Tracker utilized. No other Pak-Trackers were brought to the Command Post.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 15. Reinstitute the initial training program to ensure all firefighters develop competency in the use and capabilities of the Pak-Tracker. The Bureau of Training should reevaluate and implement this program. Each division shall adhere to the training requirements of the SCBA Training Bulletin, Addendum 8.

Findings That Led to Recommendation

- A Pak-Tracker was not utilized in the search for Firefighter Timothy Klein.
- Firefighter Timothy Klein's PASS device was in full alarm for 17 minutes and 8 seconds before being deactivated upon his removal by members.
- The member operating the Pak-Tracker reported that it had not displayed a signal from Firefighter Timothy Klein's PASS device.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 16. Include "Use the Pak-Tracker to identify members in distress" on the Mayday Operational Checklist used by chief officers.

Findings That Led to Recommendation

- All Unit Circular 337, *Chief Officer Operational Checklist 10: Mayday Checklist* (OCL-10), does not list utilizing the Pak-Tracker to verify the identity or to assist in locating the member in distress.

FDNY Manuals Affected

- All Unit Circular 337, *Chief Officer Operational Checklist: Mayday Checklist* (OCL-10)

Recommendation 17. Conduct research into the impact of proximity of the handie-talkie antenna on the PASS device. There should be an investigation into interference with the signal transmitted by the PASS device when the handie-talkie antenna is within 6 inches of the PASS device transmitter.

Findings That Led to Recommendation

- The signal from a PASS device to the Pak-Tracker is subject to interference if the transmitter is within 6 inches of the handie-talkie's antenna.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 18. Identify and obtain existing technology that enables members to monitor PASS alarm activations. Such technology should be similar in function to the present EFAS monitoring system and should have the following operational capabilities:

- Remote identification and graphical display of all PASS activations,
- The ability to monitor multiple PASS activations simultaneously,
- Prioritization of PASS activations, and
- Data storage functionality to assist in future investigations and research.

Findings That Led to Recommendation

- The monitoring capability of the Pak-Tracker has the advantage of not depending on any human intervention (except the initial opening of the SCBA cylinder valve to "turn on" the PASS alarm). Should a member become incapacitated and unable to depress the EAB, transmit a mayday, or manually depress one's PASS alarm, the Pak-Tracker will be the only indication a member is in distress.
- The most immediate value of the Pak-Tracker is as a monitoring device to identify the activation of a PASS alarm remotely. The Pak-Tracker's functionality as a tracking device is secondary to this primary value, and the design of the equipment should reflect this distinction.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 19. Identify and obtain technology that enables EFAS firefighters to remotely activate a missing member's EAB. Such technology should be a function of the EFAS monitoring system and should have the following operational capabilities:

- The ability to activate an EAB beacon tone of a missing member's handie-talkie and
- Remote activation and graphical display of mayday activations.

Findings That Led to Recommendation

- Multiple unanswered calls were made over the handie-talkie to reach Firefighter Timothy Klein.

- Members searching for Firefighter Timothy Klein heard a PASS device, which helped them locate him. An EAB beacon tone would provide an additional sound to home in on a member in distress.
- This recommendation is similar to one from an investigation of an incident involving a member lost in a commercial basement on March 4, 2003.

FDNY Manuals Affected

- *Communications Manual*
- Firefighting Procedures—*Managing Incidents Involving Members in Distress*

Recommendation 20. Members shall wear their personal-issued facepieces. Six facepieces are provided as company-assigned facepieces for all positions. They are etched with the company designation and affiliated SCBA number. If it is necessary for the member to use the company-assigned SCBA facepiece, the member must ensure that the facepiece designation coincides with the SCBA riding position.

All members are fit-tested as part of the FDNY's respiratory protection policy and must wear the correct facepiece size for which they were fit-tested. Members issued a personal facepiece shall wear that facepiece. When a member's facepiece is placed out of service, it must be returned to the MSU with an RT-2 attached. When this occurs, the company-assigned SCBA facepiece should be used.

Findings That Led to Recommendation

- During the investigation, it was discovered that Firefighter Timothy Klein was not using his personal-issued facepiece. The FFIT inspected the facepiece and discovered that it was not an assigned E257 facepiece.

Recommendation 21. Institute a policy and procedure that ensures a training program is implemented any time a new piece of equipment is issued to the field units. In addition to initial training programs, develop and maintain the corresponding curriculum on the Learning Management System. Mandate completion reports up through the chain of command.

Develop a workflow for the implementation of new equipment and/or procedures. Training on equipment and procedures should be documented and recorded to ensure completion by all

members. A system should be developed requiring a mandatory report be completed by the company commander and be forwarded through the chain of command ensuring proper documentation and accountability. The report should include details such as the date of completion, the equipment or procedure trained upon, and the names of the members who have undergone the training. By implementing this, we aim to ensure that all members receive the necessary training on new equipment and procedures, thereby enhancing operational safety.

Findings That Led to Recommendation

- Historically, new pieces of equipment have been delivered to field units by division messenger vans with associated documentation without a formal department-developed training program.
- New firefighting procedures have been issued and existing procedures rewritten without a consistent formal department-wide training program to cover the new material.
- Currently, there is no department-wide mechanism to ensure that members develop competency with newly issued equipment or written procedures.
- Probationary firefighters currently utilize the Diamond Plate platform to comply with reading assignments and testing required by AUC 323. Similar applications could be used for all members.

FDNY Manuals Affected

- All materials that refer to new policy, procedures, and equipment

WATER SUPPLY

Recommendation 22. Revise FDNY manuals to update the definition of a signal 10-70 to any situation in which the first arriving engine company cannot supply and maintain the initial hoselines with sufficient water flow and pressure. Ensure there is consistency in department manuals regarding the transmission of a signal 10-70.

Findings That Led to Recommendation

- Existing manuals are inconsistent in defining situations that warrant a signal 10-70 transmission.
- No explicit instruction addresses a situation in which the first arriving engine company successfully obtains a water source but, due to a mechanical issue with the apparatus pump, cannot supply a hoseline.

FDNY Manuals Affected

- Firefighting Procedures—*Engine Company Operations*, Chapter 5: "Engine Company Chauffeur," Section 3.6
- *Communications Manual*, Chapter 8: "Radio Communications," Section 8.5: Radio Code Signals
- *Communications Manual*, Chapter 9: "Company Unit Communications," Section 9.4.2 B and 9.4.2 F

Recommendation 23. Revise FDNY manuals such that when transmitting a signal 10-70, the nature of the problem and the actions or resources required to address the problem must be included. The member transmitting the signal 10-70 shall state the reason for the signal, along with the resources or actions needed to rectify the problem.

Findings That Led to Recommendation

- The first-due engine had a mechanical problem and could not go into pumps. The IC transmitted the signal 10-70 over the handie-talkie, met the second-due engine officer face to face, and ordered the officer to perform water resource officer duties.

FDNY Manuals Affected

- Firefighting Procedures—*Engine Company Operations*, Chapter 5: "Engine Company Chauffeur," Section 3.6
- *Communications Manual*, Chapter 8: "Radio Communications," Section 8.5: Radio Code Signals
- *Communications Manual*, Chapter 9: "Company Unit Communications," Section 9.4.2 B and 9.4.2 F

Recommendation 24. Develop and implement a water resource officer training curriculum for newly promoted officers and as annual refresher training. This training shall be incorporated into the First Line Supervisor Training Program and the Captains Development Course to troubleshoot pump panel operations. Additionally, annual refresher training in pump operations shall be provided for all officers to maintain familiarization and keep members abreast of updated information.

Findings That Led to Recommendation

- Current department policy designates the second-due engine officer as the water resource officer.
- Many company officers have been promoted without attending Engine Chauffeur School and may need to be more familiar with pump operations.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 25. Reinforce the importance of the FDNY communicating with other city agencies to ensure access to hydrants at all times. Uninterrupted and unimpeded access to all hydrants is critical for the safety of the area's citizens and for operating FDNY members.

Findings That Led to Recommendation

- The contractor working under a city contract blocked and fenced off the hydrant (H331092) at the dead end of Avenue N.

- The FDNY Bureau of Fire Prevention, Special Investigations Unit, issued a criminal summons to the contractor for the "obstruction of a public fire hydrant preventing access and use of said hydrant at all times" and a violation order "to maintain the public fire hydrant clear of obstructions, clearly visible, and ready for use at all times."

FDNY Manuals Affected

No change to existing manuals is required.

CHANGE-IN-GRADE FLOOR IDENTIFICATION

Recommendation 26. Introduce the term "walk-out basement" in all relevant department manuals. A walk-out basement describes a situation in which the bottom floor of a building has a horizontal egress point at the ground level in the rear of the building. This term is not specific to any particular occupancy type and should be used in fireground communication whenever applicable. This term is commonly used in the real estate industry. This construction feature can contribute to creating a low-intake, high-exhaust flow path.

Findings That Led to Recommendation

- Several handie-talkie transmissions showed inconsistencies when communicating floor designations.
- Many structures are built on grades that differ in the front and rear of the structure, commonly referred to as "Canarsie tenements." This is especially common for private dwellings. The basement level may be below grade in the front and ground level in the rear, making more floors visible in the rear than in the front.
- This construction feature can also be present in areas that appear to be relatively flat. A structure does not need to be built on a grade to have a walk-out basement.
- Depending on the situation, a walk-out basement may provide the safest and quickest approach to the fire area for search and suppression efforts in a wind-impacted fire.

FDNY Manuals Affected

- Firefighting Procedures—*Private Dwellings*, Chapter 1: "Introduction/Description," Section 3: Specific Descriptions
- Firefighting Procedures—*Private Dwellings*, Chapter 4: "Ladder Company Operations," Section 5.4: Tower Ladder Operations A
- *Communications Manual*, Chapter 9: "Company Unit Communications," Section 8.5

Recommendation 27. Revise FDNY manuals to require that any difference in the number of floors in the fire building shall be communicated to the IC by any member aware of the situation. This may be a difference in the number of floors from front to rear or from side to side. Once recognized, any member aware of the situation should communicate this critical information.

Findings That Led to Recommendation

- The difference in perspective from front to rear can lead to confusion when communicating information regarding a floor based on the perspective of the member transmitting information or requests for help.

FDNY Manuals Affected

- *Communications Manual*, Chapter 9: "Company Unit Communications"

Recommendation 28. Whenever there is a difference in the number of floors in the fire building, from front to rear or from side to side, the IC must announce over the handie-talkie and include this information in preliminary and additional reports to the dispatcher over the borough frequency.

R28A. The IC must ensure all units (including later arriving units) are aware of the specific floor designations being used.

Findings That Led to Recommendation

- The difference in perspective from front to rear can lead to confusion when communicating information regarding a floor based on the perspective of the member transmitting information or requests for help.

FDNY Manuals Affected

- *Communications Manual*, Chapter 9: "Company Unit Communications," Section 9.3: Inter-Unit Communications

INCIDENT INVESTIGATION

Recommendation 29. Establish an Engineer Group of qualified FDNY members to provide subject-matter expertise to assist in investigating fatal fires or unusual incidents. A survey of uniformed department members should be conducted to identify qualified engineers to form this group.

Findings That Led to Recommendation

- Two FDNY fire officers with expertise as qualified engineers were called to the scene by a staff chief to evaluate the structure for stability and to document evidence of how the fire attacked and moved throughout the structure. Their analysis proved beneficial in assisting the FFIT.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 30. Fund and staff a Tactical Intelligence Unit under the Safety Command to collect and analyze various operational data not exclusive to line-of-duty deaths. The mission of this unit will be to conduct proactive research to identify dangerous operational gaps and best practices in FDNY operations. This analytical research can be used in the development of the FDNY Risk Management Plan.

Findings That Led to Recommendation

- The FFIT utilized analytical data gathered by the Safety Command regarding mayday transmissions during the investigation of this incident.
- Research regarding other critical facets of firefighting operations would be valuable in informing future tactical policy recommendations.
- Currently, all such research is being conducted independently and not formally coordinated between bureaus.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 31. Institute a committee to review the recommendations from previous fatal fire reports that still need to be implemented. This committee would consist of two members from each of the following: the Bureau of Safety Command, Bureau of Operations, Bureau of Training, and Bureau of EMS. This group would have mandatory semi-annual meetings and be chaired by the Safety Command.

Findings That Led to Recommendation

- Numerous findings and recommendations discovered in previous reports have yet to be implemented. Some of these would have directly impacted the operations at this fire.

FDNY Manuals Affected

No change to existing manuals is required.

EMS OPERATIONS

Recommendation 32. Modify the EMS response to every signal 10-75/MCI 21 to include the necessary resources to provide medical care to injured members and civilian casualties. The EMS response to every 10-75/MCI 21 shall include the following:

- Two EMS BLS ambulances,
- Two EMS ALS ambulances,
- One EMS rescue medic ambulance,
- Two EMS conditions cars, and
- One EMS deputy chief.

Findings That Led to Recommendation

- The first arriving EMS resources were overwhelmed with multiple patients on arrival. The current dispatch policy does not provide enough resources to treat members and any civilians injured at the scene, which leaves the need to request additional resources.
- Rescue paramedics have extensive training in the medical management of members in distress and additional training on advanced airway management (e.g., surgical airway) and additional procedures. Rescue paramedics are trained in using SCBA and firefighting bunker gear, which allows for care in austere environments.
- Currently, the first arriving EMS officer is responsible for 10 distinct response roles, which regularly exceed the operational capacity of a single member and require delegation to additional responding resources.

FDNY Manuals Affected

- *Communications Manual*, Chapter 7, Addendum 2: "Bureau of EMS Response to Multiple Casualty Incidents," EMS Operating Guide Procedure 109-12 (Reference Material)

Recommendation 33. Create the role of a FAST Medical Group supervisor to be filled by a responding EMS officer. The responsibilities of a FAST Medical Group supervisor should include but are not limited to:

- Coordinating with the FAST Group supervisor,
- Ensuring crew access to injured members,

- Ensuring egress from the scene to the transporting ambulance, and
- Preparing hydroxocobalamin and assisting with other necessary care.

Findings That Led to Recommendation

- Upon the arrival of EMS members on scene, firefighters attempted to redirect them to care for non-critically injured members.
- EMS members did not know who had called the mayday, as this information had not been relayed to them in person or via handie-talkie.
- Several firefighters and EMS personnel were in the back of the ambulance, causing a crowded condition.

FDNY Manuals Affected

- *Communications Manual*, Chapter 7, Addendum 2: "Bureau of EMS Response to Multiple Casualty Incidents," EMS Operating Guide Procedure 109-12 (Reference Material)

Recommendation 34. Amend department policy for FDNY Bureau of Fire Communications' fire alarm dispatchers to announce the transmission of a mayday on the EMS citywide frequency.

Findings That Led to Recommendation

- Multiple mayday messages were transmitted during this incident but were never relayed to the EMS dispatcher.
- If Recommendation 1 in this chapter were implemented, fire dispatchers would know about handie-talkie maydays such that they could pass this information to the EMS dispatcher.

FDNY Manuals Affected

- *Communications Manual*, Chapter 7, Addendum 2: "Bureau of EMS Response to Multiple Casualty Incidents," EMS Operating Guide Procedure 109-12 (Reference Material)

Recommendation 35. Upon confirmation of a lost, trapped, or missing member, the Medical Branch director must transmit a signal 10-66 to EMS dispatch. The transmission of a signal 10-66 will ensure the response of the Rescue Medical Task Force comprising specialty resources, including an EMS field response physician.

Findings That Led to Recommendation

- Multiple mayday messages were transmitted during this incident but were never relayed to EMS dispatch.

FDNY Manuals Affected

- *Communications Manual*, Chapter 7, Addendum 2: "Bureau of EMS Response to Multiple Casualty Incidents," EMS Operating Guide Procedure 109-12 (Reference Material)

Recommendation 36. Institute additional training for EMS personnel to reinforce fireground operations, mayday operations, and tactical communications. This training should include proper radio communications and bureau interoperability and incorporate joint training between fire and EMS operations.

Findings That Led to Recommendation

- EMTs and paramedics receive only mass-casualty incident and fire scene operations training during their probationary training programs. EMS does not have sustainment or refresher training on mass-casualty incidents and fire scene operations.

FDNY Manuals Affected

No change to existing manuals is required.

Recommendation 37. Institute a training program for street management planning to provide EMS ambulances with closer access at fire operations. Such a training program should involve units from both fire and EMS operations. Additionally, Chauffeur Training School should contribute to and participate in the development and delivery of this training program, as the positioning of fire apparatus will be a critical concern.

Findings That Led to Recommendation

- After the EMS crews placed Firefighter Timothy Klein onto the ambulance stretcher, the crews had to transport him over a distance of 1.5 city blocks to the EMS staging area.

FDNY Manuals Affected

No change to existing manuals is required.

APPENDIX A. CHRONOLOGICAL FDNY OPERATIONS

BROOKLYN BOX 3-3 2075

(P) = Time taken from the Incident History Printout

(HT) = Handie-Talkie Recorder

(AV) = Time taken from Audio Visual Tapes

(E) = Estimated time of events and debriefings

(A) = Audio recordings other than HT recorders

(S) = SCBA PASS Alarm Electronic Record

(F) = Electronic Fireground Accountability System (EFAS)

(M) = EMSCAD #2176

1349 Hours

1349:41 (P) (A) The Brooklyn Communications Office of the New York City Fire Department received a telephone call reporting smoke in the area of Avenue N and East 108th Street.

1349:47 (P) The Brooklyn Communications Office transmitted Box 2075. The following units were dispatched: E257, E290, E283, L170, L174, and B58. E283 acknowledged via Personal Computer/Alarm Teleprinter/Selector (PC/ATS).

1350 Hours

1350 (P) E257, E290, L174, L170 and B58 acknowledged via (PC/ATS).

1351 Hours

1351:30 (P) (A) L103 was assigned and acknowledged via Department radio.

1351:37 (P) L174 was placed back in service.

1352 Hours

1352:32 (E) (S) E257 Back-up Firefighter, Timothy Klein pressurized his Self-Contained Breathing Apparatus (SCBA) by opening the cylinder valve, thereby arming the Pak-Alert SE7 Personal Alert Safety System (PASS) Device.

1352:57 (P) (A) The Brooklyn Communications Office received a telephone call reporting the address of the fire location, 10820 Avenue N.

1353 Hours

1353:34 (HT) E257 Officer transmitted, **"257 to Battalion. We got a lot of smoke, corner of the Avenue."**

1354 Hours

1354 (AV) Smoke can be seen coming from the vent above the first floor window on exposure #4 side, 10824 Avenue N.

1354:23 (P) L170 transmitted a 10-84 via Mobile Data Terminal (MDT).

1354:27 (E) E257 Chauffeur positioned apparatus on E 108th Street, ten feet west of Avenue N.

1354:35 (HT) B58 Chief transmitted, **"58 to 170. Let me know when you know if it's a confirmed structural."**

1354:45 (HT) E257 Officer transmitted, **"257, start a dry line to the front."** to the members of E257.

1354:53 (HT) L103 Officer transmitted, **"Yeah, 170, give the 10-75."** to B58 Chief.

1354 (E) (AV) E257 Nozzle and Firefighter Timothy Klein stretched a 1¾" hoseline to the front of the Fire Building, 10826 Avenue N.

1354 (E) (AV) L170 Chauffeur positioned the apparatus in front of the Fire Building.

1354:50 (E) (AV) L170 Officer, Can and FE Firefighters proceeded to the front of the Fire Building.

1355 Hours

1355:02 (E) (AV) E257 Control checked the hydrant in front of 10807 Avenue N and stretched a 3 ½" supply line.

1355 (P) B58 Chief transmitted signal 10-75 via Department radio.

1355:15 (HT) (F) E257 Officer communicated **"Make sure you stretch enough line. It's the last house on the right."**

1355:18 (E) L170 Roof Firefighter went to the rear of the Fire Building via the alley on the exposure #2 side with a portable ladder.

1355:19 (P) E310, L174(F), B44, DC15, RS02, SQ252, RA02, and AM03 were assigned.

1355 (P) E310, L170, RS02, B44 acknowledged via (PC/ATS).

1355:28 (HT) (F) E257 Control Firefighter transmitted **"Yeah, we got a good hydrant here."**

1355:30 (E) L170 OV Firefighter went to the exposure #2 side and placed a 24-foot portable ladder to a second floor window. Heavy fire prevented L170 OV

	Firefighter from ascending the ladder. L170 OV Firefighter then went to the rear and entered the basement of the Fire Building through a sliding glass door. Conditions in the basement were clear.
1355:34 (AV)	E257 stretched the first handline to the fire building.
1355:35 (P)	E290 Officer transmitted a 10-84 via MDT.
1355 (E)	E290 Chauffeur positioned apparatus at hydrant located in front of 10573 Avenue N.
13:55 (E)	E290 Nozzle and Back-up Firefighters assisted E257 Firefighters with the initial hoseline stretch.
1355:40 (P)	Incident update: Fire in a peaked roof private dwelling.
1355 (AV)	Heavy fire showing on the first floor in the rear of Fire Building.
1355:46 (HT) (F)	**"Roof to 170. Heavy fire coming out the uh, two side, second floor, in the rear."**
1355:46 (P)	SQ252 acknowledged via MDT.
1355 (E)	E290 Control disconnected the hoseline at the second 2 ½" length and attached it to an outlet on E257's apparatus.
1355 (E)	L170 Chauffeur repositioned the apparatus.
1355 (M)	EMS Citywide Dispatcher notified of 10-75 in Brooklyn at 10820 Avenue N.

1356 Hours

1356:19 (P)	EMS Conditions Officer C592 and EMS ALS 39W2 were assigned to MCI21.
1356:24 (P)	E283 and L103 transmitted a 10-84 via MDT.
1356:40 (HT)	E290 Control Firefighter asked E257 Nozzle Firefighter if enough hoseline was stretched.
1356 (E)	E283 Nozzle and Back-up Firefighters stretched a second hoseline from 257's apparatus and met up with E283 Officer in front of the fire building.
1356:42 (E)	L103 transmitted a 10-84 via MDT and arrived at E 108 St and Avenue N. The L103 Officer, Can, FE, and OV Firefighters walked down to the fire building. The L103 Roof Firefighter remained with the L103 Chauffeur to assist with apparatus placement.
1356:43 (HT)	E257 Officer confirmed there was enough line and ordered, **"Start water."**
1356 (M)	EMS BLS 44I2, EMS ALS 39W2, and Conditions Officer C592 assigned to MCI 21.

1357 Hours

1357:10 (P) DC15 acknowledged via (PC/ATS).

1357:11 (P) EMS BLS 44I2 assigned.

1357:51 (P) B58 Chief transmitted signal 7-5: All Hands.

1357:57 (P) E231 and L120 assigned.

1357:13 (HT) B58 Chief communicated the with the B58 Firefighter, **"Confirmed address: 10826. Avenue N. Extra engine, extra truck."**

1357:04 (HT) E257 Officer made three requests for water.

1357:50 (AV) E283 stretched the second hoseline to the fire building.

1357:59 (AV) The first firefighter proceeded down the exposure #4 side to the rear.

1358 Hours

1358:17 (P) E231 and L120 acknowledged via MDT.

1358:23 (P) Status of fire: Doubtful.

1358:13 (HT) E257 Officer asked again for water.

1358:25 (HT) E290 Officer told E290 Chauffeur to, **"give him [E257 Chauffeur] a hand at the pumps."**

1358:37 (HT) E257 Chauffeur notified E257 Officer, **"we're having issues with the rig"** and again, that there were issues getting the apparatus into pumps.

1358:57 (HT) E283 Officer communicated with E283 Chauffeur about which apparatus their line was stretched off of.

1358 (E) L103 Officer, Can and FE Firefighters entered 10824 Avenue N. They did not find any indications of smoke or heat on the first floor and ascended to the second floor. They found high heat conditions and limited visibility on the second floor. L103 Can Firefighter remained at the top of the stairs to act as a beacon as L103 FE Firefighter searched the rear and L103 Officer searched the front.

1359 Hours

1359:15 (AV) The third portable ladder is brought to the exposure #4 side. L103 Roof Firefighter breaks through fence on exposure #4 side to gain access to the rear.

1359:17 (HT) E290 Officer and Chauffeur communicated about options to supply hoselines.

1359:42 (AV) The fourth portable ladder is brought to the Fire Building.

1359 (E)	E290 Chauffeur started backing down Avenue N to the hydrant E257 was connected to.
1359:45 (HT)	L170 Officer warned L103 Officer about the fire conditions exposing the front door of 10824 Avenue N.
1359 (HT)	B58 Chief transmits, **"Command to all units, everybody out of the building. Command to 103 get out of the building, we have no water on the fire."**

1400 Hours

1400 (P)	FC01, TS02, B41S, B38R, B39, E225, L107, E309, CT01, RB01, E284, E323 and RM01 acknowledged via (PC/ATS).
1400 (P)	CT01 acknowledged via MDT.
1400:08 (HT)	E290 Officer directs E290 Chauffeur to continue to back up to the hydrant.
1400:12 (HT)	E283 Chauffeur notifies E283 Officer that they are working on solving the problem and that E257's apparatus was unable to operate the pumps.
1400:18 (HT)	B58 Chief ordered everyone out of the building. L170 Officer confirms they are out of the building.
1400:36 (HT)	E257 Officer called E257 Chauffeur requesting water.
1400:20 (P)	B58 Chief transmitted a 2nd Alarm.
1400:27 (P)	E323, E225, E309, L107, B39, B38R, B41S, CT01, FC01, RB01, RM01, SB01, ST03, E284, and TS02 were assigned.
1400:42 (HT)	E290 Officer replied, **"We're gonna get you water in a second."**
1400 (E)	E290 Chauffeur connected to the hydrant that E257 had been connected to and the hoselines were disconnected from E257's apparatus and connected to E290's apparatus.
1400 (M)	MCI21 upgraded to MCI22.

1401 Hours

1401:01 (P)	Signal 7-5 notification made to Bureau of Fire Investigation.
1401:03 (HT)	B58 Chief ordered everyone out of the building.
1401:05 (P)(M)	EMS BLS 44I2 on scene, and establishes initial staging at E 107th Street and Avenue N.
1401:08 (HT)	L170 Roof and OV Firefighters and L103 Roof and OV Firefighters confirm they are out of the building.

1401 (P) EMS HazTac Officer HT22, EMS DC 583, Logistical Support LS82, Mobile Respiratory Treatment MR32, and Major Emergency Response Vehicle MV12 assigned.

1401 (M) HazTac Lt, HT22 acknowledged.

1401 (M) EMS DC 583 acknowledged.

1401:13 (HT) E257 Officer requested water.

1401:14 (HT) E290 Officer replied, **"Yo guys, relax. We're gonna get you water in a minute."**

1401:16 (P) SB01 acknowledged via MDT.

1401:25 (HT) L170 Roof Firefighter called Command, **"L170 Roof to Command. Check exposure #4."**

1401:27 (AV) First firefighter proceeds up the rear deck stairs on Exposure #4 Building.

1401:46 (P) L175 assigned.

1401:48 (HT) L103 Officer and L170 Officer confirm they are each out of the building.

1401:54 (P) (A) L175 acknowledged via radio.

1401:55 (AV) First visual of smoke coming from the vent below the first floor window on exposure #4 side.

1402 Hours

1402:01 (HT) E290 Officer notified B58 Chief, **"Yeah, we're on a good hydrant Chief. We're gonna be giving that first line water in a minute."**

1402:10 (HT) E257 Officer asked E257 Chauffeur for booster water.

1402:12 (P) L107 placed back in service.

1402:12 (AV) L103 Chauffeur raises and extends aerial to second floor window of Exposure #4 Building.

1402:17 (HT) E290 Officer announced they had a hydrant and were about to charge the first hoseline.

1402:21(AV) E283's hoseline was charged.

1402:22 (HT) B58 Chief asked for booster water.

1402:37 (P) EMS HazTac Battalion HTB assigned.

1402:38 (HT) E283 Chauffeur notified E283 Officer, **"There's water in one line. We don't know which one it is. There's a burst length out here."**

1402:38 (HT) E283 Officer asked if the charged hoseline was the one with a burst length.

1402:50 (HT) E283 Chauffeur replied **"Negative. There's one good line right now. There's another burst length we're trying to rectify."** E283 Officer acknowledged.

1402 (E) E283 Nozzle Team started extinguishing fire on the exterior of the Fire Building.

1402 (E) E290 Chauffeur noticed the hoseline stretched by E257 was disconnected a few lengths away from the apparatus.

1403 Hours

1403:00 (HT) L103 Officer assisted L103 Chauffeur in placing the aerial due to limited visibility. **"Move a little higher on that stick."**

1403:05 (P) Signal 2-2 notification made to Bureau of Fire Investigation.

1403:15 (P) L175 acknowledged via MDT.

1403:17 (HT) E290 Officer called for E290 Nozzle and Back-up Firefighters.

1403:22 (HT) E290 Control Firefighter replied, **"290, we're coming back."**

1403:23 (HT) E290 Officer replied I'm going in the front stoop, and they'd be backing up E283.

1403:25 (P) EMS call type MCI22.

1403:29 (P) ST03 acknowledged.

1403:30 (AV) L103 Roof Firefighter descended the deck stairs on exposure #4 side with a propane cylinder and placed it on the other side of the fence away from Exposure #4 Building. The firefighter returned to the rear deck.

1403:35 (HT) E290 Control Firefighter, **"That's line is 283's line off red."**

1403:37 (P) SQ252, B44, and L174 transmitted 10-84 via MDT.

1403:40 (HT) E290 Chauffeur replied, **"Yeah 10-4. I'm waiting for them to give me 257's line to charge it."**

1403:44 (HT) L170 Officer notified B58, **"170 to Command. We're putting water on the fire now."** B58 acknowledged.

1403:45 (AV) L103 OV Firefighter proceeded from the rear with a portable ladder and set it up to a second floor window on the exposure #4 side.

1403:56 (P)(M) EMS ALS 39W2 10-84.

1403:59 (HT) L103 Chauffeur asked for L103 Officer for help guiding the aerial due to limited visibility. **"Cap, you got eyes on the stick?"**

1403 (E) E283 Officer, Nozzle and Back-up Firefighters entered the Fire Building and began extinguishing fire.

1404 Hours

1404 (AV) L103's aerial ladder is placed at the second floor window of exposure #4.

1404:03 (HT) L103 Officer replied, yes, and advised L103 Chauffeur to raise the tip of the aerial two or three feet.

1404:11 (P) Rescue Paramedics 48R2 10-63 were assigned and responded.

1404:17 (P) DC15 10-84 via radio.

1404:17 (HT) B58 Chief ordered E310 to stretch a hoseline to the front of the building.

1404:19 (HT) E310 Officer replied it was on its way.

1404:24 (P) EMS Rescue Medics 48R2, EMS BLS 41D2, EMS B57, EMS HazTac 37H2, and EMS ALS 43V2 assigned.

1404:28 (HT) L170 Officer called E283 Officer, **"Hey E283, come back near the front door."**

1404:44 (HT) E257 Officer asked E257 Chauffeur for water.

1404:48 (HT) E257 Chauffeur replied, **"Yeah, 10-4. It's coming from 290."**

1404 (E) E257's hoseline was reconnected and charged.

1404 (E) L103 Roof Firefighter enters Exposure #4 Building from rear deck.

1405 Hours

1405:04 (AV) L103 OV Firefighter picked up tools and climbed ladder to the second floor window but does not enter the window.

1405 (AV) E257's hoseline was charged.

1405:05 (HT) L170 Officer notified B58 Chief they needed another hoseline in the front door.

1405:08 (HT) B58 Chief transmitted that a hoseline would be sent as soon as it was available.

1405:10 (P) Signal 2-2 notification made to NYPD Operations.

1405:16 (HT) E283 Chauffeur notified B58 Chief, **"You're getting a second line off 90's rig right now."** B58 Chief acknowledged.

1405:26 (HT) B58 Chief warned L103, **"I only have one line right now."**

1405:34 (HT) E231 Officer asked B58 Chief, **"We're your extra engine, do you want us to grab a line?"**

1405:35 (HT) B58 Chief replied, **"No 231, your gonna back up E310."** E231 Officer acknowledged.

1405:38 (AV) Unknown Officer checked exposure #4 side with thermal imaging camera.

1405:39 (P) E231 transmitted 10-84 via MDT.

1405:42 (HT) E290 Chauffeur notified B58 Chief, **"Both lines, 283, 257 are charged on hydrant water."**

1405:49 (HT) B58 Chief acknowledged and informed E283 Officer, **"I got 257 with a line behind you if you need a second line inside that building."**

1405:58 (AV) A firefighter broke and removed more of the fence between exposure #4 and #4A.

1405 (M) EMS BLS 41D2 10-63(Responded).

1405 (E) B44 Chief reported into the Command Post, assumed the role of Fire Sector Chief and entered the fire building. The B44 Firefighter entered Exposure #4 Building and went to the second floor.

1405 (E) E231 Chauffeur positioned apparatus at the hydrant at E 108th Street and Flatlands 10th Street.

1405 (E) L170 OV Firefighter forced the sliding glass door in the rear at the basement level of Exposure #4 Building.

1406 Hours

1406:03 (P) Signal 2-2 notification made to Department of Environmental Protection (DEP).

1406:08 (P) L120 transmitted 10-84 via MDT.

1406:14 (P) B58 Firefighter reported first and second floors, two lines stretched, one in operation, primary searched underway, trucks opening up, fire doubtful will hold.

1406:23 (HT) E310 Officer ordered E310 Chauffeur to **"Stay right on that corner. I need another line off you."**

1406:28 (HT) E257 Chauffeur notified command, **"We have, we're back in pumps."**

1406:39 (HT) B58 Chief asked SQ252 Officer if there was extension in exposure #2.

1406 (E) L103 Roof Firefighter entered Exposure #4 Building through the rear sliding glass door from the deck and proceeded to search the first and second floor.

1406:41 (P) CT01 acknowledged via MDT.

1406:42 (AV) L174, the FAST truck, arrived with stokes basket in front of exposure #4A.

1406:43 (AV) The firefighter climbed down the portable ladder on exposure #4 side and proceeded up the deck stairs on exposure #4 side.

1406:49 (P) EMS BLS 83D2 assigned.

1407 Hours

1407:01 (HT) B58 Chief notified L103, **"I got 257 coming in with you."**

1407:03 (P) Notification to ConEd, no ETA given.

1407:05 (AV) The third hoseline was stretched to the front of the Fire Building and brought to the rear.

1407:06 (P) Incident update two story, 40 feet by 80 feet, fire on first and second floor, exposure #1 is the street, exposure #2 is a driveway, exposure #3 is unknown, exposure #4 is a similar attached.

1407:13 (HT) L170 notified Command, **"We need another line to the second floor."** B58 Chief acknowledged.

1407:34 (HT) E310 Officer ordered E310 members to **"stretch that line when you can."**

1407:36 (P) E323 and E309 transmitted 10-84 via MDT.

1407:41 (HT) L170 Chauffeur notified Command, **"We need a line, straight down the two side, into the backyard."** B58 Chief acknowledged.

1407:50 (P)(M) EMS Conditions Officer C592 on scene.

1407:57 (HT) E231 Officer ordered E231 Chauffeur by name, **"…, 290's got three lines off that. Rig, make sure you'd have enough water."**

1407 (E) The second hoseline was stretched into Exposure #4 Building to the second floor.

1407 (E) Members entered the rear of Exposure #4 Building through basement level sliding glass door.

1407 (E) Fire began venting out the second floor front window.

1408 Hours

1408:06 (AV) L103 Chauffeur climbed aerial to the second floor window of Exposure #4 Building.

1408 (AV) Fire showed out the second floor windows of Exposure #4 Building.

1408:07 (HT) B58 Chief notified L170 Officer, **"I got 120 coming in to operate on the top floor."**

1408:10 (HT) L170 Officer acknowledged and notified B58 Chief, **"I got 283 going up now."**

14:08 (E) E257 operated the hoseline on the second floor, in the front bedroom, knocking down fire.

1408:27 (HT) E283 Chauffeur notified E310 Officer, **"here comes your water."**

1408:28 (HT) L103 OV Firefighter reported, **"there's a glow in the basement."**

1408:35 (HT) R2 Officer notified Command, **"You need a line in the rear."**

1408:39 (HT) E290 Chauffeur notified E310 Officer, **"here comes your water."**

1408:42 (HT) E310 Officer acknowledged, **"10-4, give us the water."**

1408:52 (P) E225 transmitted 10-84 via MDT.

1408 (E) E310's hoseline was charged and brought to the rear.

1408 (E) Additional members entered Exposure #4 Building rear from the deck.

1408 (E) R2 Officer noticed fire on the floor near the basement stairway door.

14:08 (E) L103 OV and L170 OV Firefighters both find fire in the basement near the front.

1408 (E) L170 OV Firefighter made inspection holes near the bottom of the stairs.

1408 (E) The fire was extinguished in the second floor front bedroom of Exposure #4 Building.

1409 Hours

1409:06 (HT) B58 Chief asked E283 Officer, **"Alright, are you good in there? Or do you need another line?"**

1409:08 (HT) E283 Officer replied, **We're on the top floor. We got water on the fire. We got a couple rooms going. We'll let you know when it's knocked down."**

1409:19 (M) EMS BLS 41D2, 10-84.

1409:20 (HT) L103 Officer notified Command, **"need a line to the rear of exposure #4."** B58 Chief acknowledged. L103 Officer continued, "**and now possibly in the basement as well."**

1409:31 (P) EMS BLS 41D2 on scene.

1409 (E) L103 Officer noticed an increased smoke condition on the first floor and ordered the inside team to vent the area.

1409:36 (AV) L103 Can vented the window on the first floor exposure #4 side from the interior.

1409:44 (HT) E323 Officer ordered, **"E323 Nozzle, stretch a line to the front of the fire building."** E323 Nozzle acknowledged.

1409:50 (HT) L103 OV Firefighter transmitted, **"OV to 103, you got fire blowing out of the basement."**

1409:50 (E) A sudden hostile fire event occurred resulting in rapid extension of fire from the basement to the second floor in Exposure #4 Building.

1409:51 (HT) B58 Chief transmitted, **"58 to L170 OV. Your line is coming to the rear."**

1409:53 (HT) SQ252 Officer transmitted, "**The line upstairs has to come down."**

1409 (M) EMS BLS 83D2, 10-63 (Responded).

1410 Hours

1410:00 (P) HazTac HT22, 10-84.

1410:00 (HT) SQ252 Officer repeated, **"The line upstairs in 4 has to come down."**

1410:02 (HT) L103 FE Firefighter reported, **"Heavy fire coming up."**

1410:03 (AV) Smoke from the first floor Exposure #4 Building window appeared darker.

1410:04 (AV) The fifth portable ladder was brought to the building.

1410:08 (AV) The smoke got darker, and conditions change drastically.

1410:11 (HT) L103 Officer transmitted, **"MAYDAY, MAYDAY, MAYDAY, 103 with a MAYDAY."** (No EAB)

1410:14 (HT) DC15 replied, **"Command, go with your MAYDAY.**

1410:15 (AV) Heavy dark smoke appeared from the first floor exposure #1 side bay window.

1410:16 (HT) SQ252 Officer transmitted, **"Brothers upstairs you got fire, heavy fire on the first floor."**

1410 (E) L170 OV and L103 OV Firefighters were forced by fire to exit the basement.

1410 (E) L103 Officer, L103 FE Firefighter, B44 Firefighter, R2 Chauffeur and R2 Irons Firefighter were forced to exit through the front door. L103 Can was able to walk out the first floor rear door.

1410:20 (AV) Fire and smoke vented from the first floor exposure #4 side window.

1410:21 (HT) B58 Chief ordered, **"Command to all units. Command to all units. Everybody back out, back out of the building. Everybody back out. Command to all units."**

1410:21 (P) MR06, MB01, and L123 assigned.

1410:26 (P) EMS Conditions Officer C582 assigned.

1410:26 (P) EMS B57 removed and then reassigned.

1410:27 (AV) The second portable ladder was carried to the rear down the exposure #4 side.

1410:28 (S) Firefighter Timothy Klein's SCBA PASS device entered pre-alarm.

1410:40 (S) Firefighter Timothy Klein's SCBA PASS device entered full alarm.

1410:42 (HT) DC15 ordered, **"Command to all units. Back out, back out, back out."**

1410:47 (HT) B44 Chief ordered, **"44 to 283 and 170, back out of that top floor."**

1410:47 (P) B39 Chief transmitted 10-84 via MDT.

1410:48 (AV) Heavy fire from the first floor exposure #4 window.

1409:50 (HT) L103 OV Firefighter transmitted, **"OV to 103, you got fire blowing out of the basement."**

1410:50 (AV) E310's hoseline was charged.

1410:52 (HT) B58 Chief ordered, **"I want everyone to back out of the building now. Everybody to back out of the building now."** (with EAB activation)

1410:57 (HT) R2 Officer transmitted, **"Rescue to Command."**

1410:58 (AV) E323's handline was stretched to the front of the Fire Building.

1411 Hours

1411 (E) E257 Nozzle Firefighter dove down the stairs to exit the front door of Exposure #4 Building.

1411 (E) B44 Firefighter dove down the stairs to exit the front door of Exposure #4 Building.

1411 (E) E257 Officer was pinned to the floor by heat.

1411 (E) L103 Roof Firefighter was pinned to the floor by heat.

1411 (E) R2 Officer sought refuge in the rear bathroom on the second floor.

1411 (E) E257 Control Firefighter forced to bail out of the second floor, front bedroom window, landing in the driveway.

1411 (E) SQ252 Roof Firefighter took refuge in the rear bedroom on the second floor.

1411:08 (AV) Heavy fire appeared from the first floor exposure #1 bay window.

1411(AV) E257 Control was cared for by firefighters outside of Exposure #4 Building.

1411:10 (HT) R2 Officer called Command again.

1411:15 (HT) E257 Back-up, Firefighter Timothy Klein, transmitted, **"MAYDAY, MAYDAY, MAYDAY… second floor front."** (no EAB)

1411:21 (HT) E290 Officer transmitted, **"Open up that line."**

1411:23 (HT) R2 Officer transmitted, **"We need a line open on the top floor now."**

1411:29 (HT) E290 Chauffeur transmitted, **"Shut that other gate."**

1411:32 (HT) R2 Hook Firefighter, called R2 Irons by name.

1411:34 (HT) E290 Chauffeur transmitted, **"257, shut all your gates."**

1411:38 (HT) R2 Irons Firefighter called R2 Officer by name, **"…, I'm out. Where are you?"**

1411:40 (HT) R2 Officer replied to R2 Irons Firefighter by name, **"On the top floor ...."**

1411:42 (HT) L174 Can transmitted, **"EFAS to Battalion 58."**

1411:42 (HT) L174 Can transmitted, "**EFAS to Command. Battalion 58 Chief, EAB alert."**

1411:48 (F) E257 Control Firefighter EAB activation.

1411:51 (HT) R2 Roof Firefighter transmitted, "**Rescue roof to Rescue."**

1411:52 (HT) R2 Roof Firefighter transmitted calling R2 Officer by name, **"Come to the rear. Come to the rear ...."**

1411:54 (P) C04C assigned.

1411:56 (P) L123 acknowledged via (PC/ATS).

1411:59 (HT) L174 Can transmitted, "**EFAS to Command, E257 Control EAB."**

1411 (E) E310 Nozzle Firefighter passed the hoseline down from the deck to E310 Control Firefighter, SQ252 FE Firefighter assisted E310 Control Firefighter in advancing the hoseline into the basement of Exposure #4 Building.

1412 Hours

1412:06 (HT) R2 OV Firefighter asked R2 Irons Firefighter by first name, **"you out?"**

1412:08 (HT) R2 Hook Firefighter called for R2 Officer by first name.

1412:08 (AV) The sixth portable ladder was carried to the fire buildings.

1412:10 (HT) B58 Firefighter reported, **"E257 Control is out of the building."**

1412:11 (P) DC15 transmitted a 3rd Alarm.

1412:12 (AV) The seventh portable ladder was carried to the fire buildings.

1412:13 (HT) R2 OV Firefighter called for R2 Officer by first name.

1412:16 (HT) R2 Chauffeur asked, **"anybody from 257 is still in the building?"**

1412:17 (AV) E323's hoseline was charged.

1412:18 (HT) E283 Officer called, **"Hey Chief.."**

1412:20 (HT) E323 Officer transmitted, **"323 to Nozzle.."**

1412:20 (P) E332, E227, E234, E233, E303(S), L105/L120, B37, B57 (P), MK01, and RA04 were assigned. EMS BLS 38C2 assigned.

1412:22 (HT) R2 Officer called to R2 Irons Firefighter by name, R2 Irons Firefighter replied.

1412:24 (HT) R2 Officer called again to R2 Irons Firefighter by name, R2 Irons Firefighter replied.

1412:25 (AV) L103 Chauffeur climbed down the aerial.

1412:30 (P) ConEd notification made.

1412:31 (HT) R2 Officer requested, **"Get that line on the top floor landing and towards the rear. We need it knocked down."**

1412:34 (HT) SQ252 Officer transmitted, **"…top of the stairs into 4…"**

1412:39 (HT) R2 Hook Firefighter transmitted, **"Get a ladder to the rear."**

1412:40 (P) DC15 reported fire extended to Exposure #2 Building and reported a MAYDAY.

1412:42 (HT) L103 Officer transmitted, **"I got a line operating now we're coming up."**

1412:43 (P) EMS changed type MCI23. E233, B57, L105/L120, B37, E227, RA04, B37, and B57 acknowledged via (PC/ATS).

1412:45 (HT) B58 Chief ordered, **"Command to 283, get out…you have burst length."**

1412:51 (HT) B44 Chief called Command.

1412:53 (HT) R2 Officer called Command. DC15 replied, "**Command, go Rescue."**

1412:57 (HT) R2 Officer transmitted, **"Rescue to Command."** again.

1412:58 (HT) DC15 responded, **"Rescue, go."**

1412 (E) E323 operated a 2 ½" hoseline into the bay window of the first floor of Exposure #4 Building.

1413 Hours

1413:00 (HT) R2 Officer transmitted, **"Yeah, on the top floor, it's uh, we need the line operated. up here. I got two or three guys in the two, three corner."**

1413:00 (P) B38 and FC01 transmitted 10-84 via MDT.

1413:09 (HT) An unidentified member transmitted, **"…is operating if you can make your way to those rear bedrooms."**

1413:11 (HT) B58 Chief transmitted, **"No we can't we want everyone out of the building."**

1413:13 (HT) B58 Chief, captured on an open microphone, **"Who's trapped?"**

1413:16 (HT) DC15 Chief transmitted, **"Command to Rescue. Get out of the building."**

1413:19 (HT) B44 Chief transmitted, **"44 to Command."**

1413:21 (P) 3-3 Alarm Staging Area-E108 ST/Seaview Ave.

1413:23 (HT) B58 Chief ordered, **"58 to Rescue 2. Get to the rear. Get to the rear."**

1413:28 (HT) E231 Officer transmitted, **"231 to Rescue 2. We're putting a ladder up on the rear right now. Putting the ladder to the rear window right now. Get to the rear."**

1413:34 (HT) R2 Hook Firefighter asked R2 Officer by name, **"…, what side of the building you on, two or 4?"**

1413:38 (HT) B58 Chief called, **"Command to 257. Command to 257."** Unanswered.

1413:54 (AV) The eighth portable ladder was carried to the buildings.

1413:54 (HT) E290 Officer ordered E290 Chauffeur, **"We got the line that 83 has. Just. Shut. It down for a minute. Make sure it's the right…"**

1413:55 (P) EMS BLS 44J2 assigned.

1413:59 (HT) Command called L170.

14:14 Hours

1414:04 (AV) The third portable ladder was carried to the rear down the exposure #4 side.

1414:07 (P) MK01, E332, and E234 acknowledged.

1414:07 (HT) E231 Officer called Command.

1414:08 (HT) L170 responded, **"170."**

1414:10 (P) (M) EMS DC 583

1414:14 (M) EMS BLS 83D2 on scene.

1414:16 (HT) B58 Chief transmitted, **"…257. Command to Rescue."**

1414:20 (HT) B58 Chief called, **"Command to Rescue."**

1414:21 (P) EMS ALS 41W2 assigned.

1414:23 (HT) SQ252 asked the R2 Officer by name, **"…are you guys out?"**

1414:26 (HT) E290 Officer called E290 Chauffeur by name, **"…shut it down."**

1414:29 (HT) R2 Officer replied, **"…top floor with 257. We're gonna make our way to that window now, but uh, maybe you can keep continue to hit fire."**

1414:32 (AV) Fire coming from the rear of Exposure #4 Building.

1414:43 (HT) E231 Officer transmitted, **"MAYDAY, MAYDAY, MAYDAY, 231 with a MAYDAY."** (with EAB activation)

1414:47 (HT) DC15 answered, **"Command, go ahead with your MAYDAY."**

1414:49 (HT) E231 Officer transmitted, **"We got guys operating on the top floor. We just got a ladder to them. We need another line back here, in the exposure. Exposure #3, we need another line back here."**

1414:56 (HT) B58 Chief responded, **"Alright, they gotta get out. Get them out of the building."**

1414:59 (HT) E231 Officer replied, **"231 to Command. We're trying Chief. We, we got a ladder to them. They took, they took the window, but they're not, they didn't show themselves again."**

1414 (M) EMS BLS 44J2, 10-63 (Responded).

1414 (M) Conditions Officer Lt C593 relocated staging to 105 St and Avenue N.

1415 Hours

1415:07 (P) S3-3 notification made to NYPD Operations and NYPD Aviation.

1415:10 (HT) B58 Chief called E257 Officer. This went unanswered.

1415:12 (HT) R2 Irons Firefighter called R2 Officer by name.

1415:13 (HT) E231 Officer transmitted, **"…portable to the three side. 120's bringing that. I need another line in the rear. K. I need another line in the rear."**

1415:19 (HT) DC15 replied, **"It's coming but it's gonna take time 231."**

1415:24 (HT) R2 Irons Firefighter asked R2 Officer by name, "**…did you make it out?"**

1415:26 (HT) B58 Chief transmitted, **"Command to Engine 257."**

1415:28 (HT) R2 Officer transmitted, **"…got some guys up here. I'm bringing them to the window."**

1415:32 (HT) R2 OV Firefighter transmitted, **"Get a ladder to the two side also."**

1415:35 (HT) B58 Chief transmitted, **"Command to 257."**

1415:39 (HT) E257 Officer answered, **"257."**

1415:42 (HT) R2 Chauffeur called R2 Officer by name, **"…, did you get out, ...?"**

1415:50 (AV) The fifth hoseline was stretched to the fire building.

1415:51 (HT) L120 Officer called L120 Can Firefighter.

1415:52 (HT) B44 Chief called Command.

1415:54 (HT) E257 Officer replied again, **"257."**

1415:56 (HT) R2 Officer called E257 Officer, **"Rescue to 257."**

1416 Hours

1416:00 (P) EMS Conditions Officer C312 assigned.

1416:21 (P) C04C Operations 10-84.

1416:00 (AV) EMS arrived in front of Exposure #4 Building with a stretcher.

1416:00 (AV) Hoseline was stretched down the exposure #4 side to the rear.

1416:02 (HT) B58 Chief responded to R2 Officer, **"257, go."**

1416:03 (HT) R2 Officer asked E257 Officer, **"Do you have all of your guys."**

1416:05 (HT) B58 Chief transmitted, **"No, I'm looking for 257 Officer."**

1416:08 (HT) R2 Roof Firefighter reported, **"Yeah, we have 257's Officer at the rear window on the top floor."**

1416:11 (HT) B58 Chief responded, **"Alright, where's the rest of the guys?"**

1416:16 (HT) E257 Officer transmitted, **"257 to Back up."**

1416:18 (HT) BC58 transmitted, **"Go ahead 257. Are you out?"**

1416:20 (HT) L120 Officer asked by name for the location of L120 OV Firefighter.

1416:23 (AV) Chief ran down Avenue N to the front of Exposure #4 Building with a backboard.

1416:26 (HT) L120 OV Firefighter responded, **"I'm up here helping the uh downed fireman."**

1416:29 (HT) B58 Chief transmitted, **"Command, go ahead…",** to the B44 Chief by name.

1416:33 (HT) R2 Irons Firefighter called R2 Officer.

1416:35 (HT) B44 Chief called to B58 Chief by name, **"…Fire duty…"**

1416:37 (HT) B58 Chief responded, **"Right, I gotta get you a line, I'm getting you a line, …"** by name.

1416:40 (HT) R2 Officer transmitted, **"No, I'm good. I'm just helping them out."**

1416:46 (HT) R2 Officer transmitted, **"Keep those lines moving…"**

1416:48 (HT) E290 Officer transmitted, **"…that line again."**

1416:50 (HT) E290 Chauffeur responded to E290 Officer, **"10-4, charging 283's line now."**

1416:52 (HT) B58 Chief transmitted, **"Command, Command to Fire Sector."**

1416:56 (HT) B58 Chief transmitted, **"Command to Fire Sector 44."**

1416:58 (P) EMS Conditions Officer C212 assigned.

1417 Hours

1417:00 (HT) B44 Chief responded, **"Yeah, Battalion 44."**

1417:01 (HT) B58 Chief called B44 Chief by name and warned, **"…We got holes in the floor at the, at the top of the steps to the second floor. Do not go up there unless we have to."**

1417:06 (HT) B58 Chief continued, **"Hold up, I'm getting you a line right now."**

1417:11 (HT) E257 Officer transmitted, **"257 to Back-up."**

1417:17 (HT) E257 Officer repeated, **"257 to Back-up."**

1417:18 (HT) R2 Officer called Command.

1417:20 (HT) E257 Chauffeur transmitted, **"Chauffeur…"**

1417:22 (HT) E257 Officer transmitted, **"257 Back-up, where are you?"**

1417:24 (HT) E225 Officer transmitted, **"Squad Chauffeur you can charge that line."**

1417:27 (HT) L120 Officer asked L120 OV Firefighter for the OV's location.

1417:29 (HT) L120 OV Firefighter responded, **"I'm in the street. I'm giving them a hand packaging this guy up."**

1417:31 (HT) B58 Chief transmitted, **"Command to 257."**

1417:35 (HT) R2 Officer called Command.

1417:37 (HT) B58 Chief responded, **"Command, go."**

1417:40 (HT) R2 Officer transmitted, **"Alright, Guys at the rear window. That line being opened, conditions are improving."**

1417:45 (HT) B58 Chief responded, **"Alright good. Are you guys out of the building or what?"**

1417:49 (HT) R2 Officer replied, **"Not. Yet, we're at a rear window going down a portable."**

1417:50 (AV) The ninth portable ladder was carried to the fire buildings.

1417:52 (HT) B58 Chief replied, **"Alright, get out of the building."**

1417:55 (HT) E225 Officer transmitted, **"…to 252 Chauffeur, charge that line."**

1417:59 (HT) B58 Chief called Battalion 44.

1418 Hours

1418:01 (P) C024 assigned.

1418:01 (HT) SQ252 Chauffeur transmitted, **"I'm operating."**

1418:02 (HT) B58 Chief called B44 Chief.

1418:06 (HT) B44 Chief responded.

1418:08 (HT) B58 Chief notified B44 Chief by name, **"I got E323 coming in with you."**

1418:08 (P) Incident update: FC01 confirms MAYDAY given.

1418:12 (HT) B44 Chief responded, **"Alright, 10-4. They're gonna be operating with uh, 174. I got the officer from 174 here."**

1418:16 (HT) B58 Chief replied, **"Alright, do you got a truck in there?"**

1418:20 (HT) R2 Officer called Command.

1418:21 (P) EMS Conditions Officer C312 removed.

1418:21 (P) EMS B35 assigned.

1418:24 (HT) B58 Chief responded, **"Rescue, go."**

1418:25 (HT) R2 Officer transmitted, **"Chief, can you account for Engine 257? I have the Officer, we're gonna go out a portable in the rear."**

1418:26 (AV) E257 Control Firefighter was placed on stretcher.

1418:30 (HT) B58 Chief responded, **"Yes, I'm looking for the Nozzleman and the Back-up."**

1418:34 (HT) R2 Officer replied, **"Alright, I've got the Officer. Just account for those two guys."**

1418:37 (HT) B58 Chief replied, **"10-4."**

1418:39 (HT) E257 Officer transmitted, **"257 to Back-up."**

1418:45 (HT) SQ252 Officer asked R2 Officer by name, **"…, You have everyone from the uh, the line at the top of the stairs?"**

1418:49 (HT) R2 Officer responded, **"Yeah, I got them at the rear window. Who's this?"**

1418:50 (P) EMS HazTac BLS 37H2 on scene.

1418:51 (HT) E231 Officer transmitted, **"231 to Command, K."**

1418:53 (HT) R2 Roof Firefighter called R2 Officer, R2 Officer replied.

1418:58 (HT) R2 Roof Firefighter notified R2 Officer by name, **"…, They're knocking fire down in the rear."** Then asked, **"Is anybody left upstairs?"**

1419 Hours

1419:02 (P) 10-44 request EMS transmitted.

1419:03 (HT) R2 Officer responded, **"Negative, they're at the rear window now, going down a portable."**

1419:07 (HT) L175 Officer requested portable ladders to the rear.

1419:09 (HT) E231 Officer called Command.

1419:15 (HT) E231 Officer transmitted, **"Chief, we got two lines operating in the rear. We need a third one. We need uh, another line down here, in the rear, K."**

1419:20 (HT) DC15 responded, **"It's coming, it's gonna take some time."**

1419:24 (HT) B58 Firefighter transmitted, **"257 Back-up, where are you TK?"**

1419:23 (AV) E257 Control Firefighter removed from scene by firefighters and EMS members.

1419:25 (AV) Hoseline stream coming out of the first floor exposure #4 side window.

1419:26 (HT) E231 Back-up transmitted, **"…we're in the backyard. We'll be there in a minute."**

1419:29 (HT) E231 Officer transmitted, **"231 to Command, we got a line coming right now to the rear."**

1419:34 (HT) B44 Chief transmitted, **"Yeah, 44 to Command."**

1419:35 (P) E332 transmitted 10-84 via MDT.

1419:39 (HT) B44 Chief transmitted, **"44 to the 58."**

1419:42 (HT) B58 Chief responded, **"58, go."**

1419:43 (HT) B44 Chief responded to B58 Chief, by name, **"Yeah, …, we got that line going up…floor, in the original fire building. They're knocking down some fire. We just need somebody to drop…"**

1419:50 (P) Incident update FC01 reported Nozzle Firefighter from E257 removed/notify EMS this is a mass casualty incident.

1419:54 (AV) The tenth portable ladder is brought to the fire buildings.

1419:56 (P) EMS BLS 38C2 on scene.

1419:59 (HT) E225 Officer transmitted, **"225 to 252 Chauffeur, please charge that line."**

1419:59 (P) SB01 transmitted 10-84 via MDT.

14:20 Hours

1420:00 (HT) R2 Officer called Command.

1420:03 (HT) B58 Chief replied, **"Command."**

1420:04 (HT) R2 Officer transmitted, **"Yeah, everyone that was sheltering on the top floor is out now, in the backyard…"**

1420:09 (HT) An unidentified member transmitted, **"10-4."**

1420:11 (HT) Field Com transmitted, **"Field Com to 257 Officer, you out?"**

1420:15 (HT) R2 Officer responded to Field Com by name, **"…, yeah, he's with me. Just account for Nozzle and Back-up."**

1420:18 (HT) Field Com reported, **"Nozzle is already in with EMS, so is Control. Do you have the Back-up?"**

1420:23 (P) Car 1C Commissioner's Liaison assigned.

1420:24 (HT) R2 Officer responded, **"No, just 257 back here."**

1420:26 (HT) E225 Officer called SQ252 Chauffeur.

1420:30 (AV) The hoseline that was stretched down the exposure #4 side was charged.

1420:30 (HT) L170 Chauffeur transmitted, **"Second floor, it's just…first floor."**

1420:34 (HT) E225 Chauffeur transmitted, **"Two and a quarter, here comes your water."**

1420:39 (AV) The hoseline stretched into the rear yard off E323 from Flatlands 9th Street was charged.

1420:40 (HT) E323 Nozzle transmitted, **"323, I need more line. 323 I need more line."**

1420:44 (HT) E231 Officer transmitted, **"231 to 232 Chauffeur, …323 Chauffeur go to your rig. We're pumping off your rig."**

1420:53 (HT) B58 Chief transmitted, **"Command to E257 Back-up."**

1420:56 (P) Incident update FC01 reported the E257 Control Firefighter removed from building.

1421 Hours

1421:01 (HT) DC15 transmitted, **"Command to Rescue 2."**

1421:02 (HT) R2 Officer responded.

1421:03 (HT) DC15 communicated to R2 Officer by name, **"…, we're looking for the Back-up of 257. We can't find him. He's in your building."**

1421:08 (AV) The fifth hoseline was charged.

1421:09 (HT) R2 Officer acknowledged, **"10-4."**

1421:09 (P) B41 and L105/L120 transmitted 10-84 via MDT.

1421:11 (HT) R2 Officer called to R2 Irons and Chauffeur Firefighters.

1421:13 (HT) R2 Irons Firefighter responded to R2 Officer by name, "**Yeah, …we're making a push up the stairs. What do you need?"**

1421:17 (HT) R2 Officer responded, **"He was on the second floor when your…"**

1421:21 (HT) E231 Control transmitted, **"…get water to 231's line…"**

1421:23 (HT) R2 Officer transmitted, **"Rescue 2 to Timmy Klein."**

1421:24 (HT) R2 Officer transmitted, **"Rescue 2 to 257 Back-up Timmy Klein."**

1421:26 (AV) The eleventh portable ladder was carried to the fire buildings.

1421:30 (HT) E231 Nozzle transmitted, **"323 Chauffeur, charge that line you just…off."**

1421:34(AV) The fourth ladder was carried down the exposure #4 side to the rear.

1421:35 (HT) R2 Officer transmitted, **"Rescue to Timmy Klein, you on the air?"**

1421:43 (HT) E323 Chauffeur transmitted, **"Here comes your water."**

1421:46 (HT) SQ252 Can transmitted, **"Timmy, you on the air?"**

1421:51 (HT) An unidentified member transmitted, **"Anybody got eyes on Timmy Klein?"**

1421:53 (HT) R2 Officer communicated to R2 Chauffeur by name, **"Hey…, check the landing. We were all trapped on the landing."**

1421:58 (HT) R2 Chauffeur responded, **"We checked the landing already…. been down the second floor."**

1422 Hours

1422:02 (HT) L170 Officer called E257 Officer.

1422:04 (AV) L174's stokes basket was carried to the front of Exposure #4 Building.

1422:07 (P) E234, L123, and E227, transmitted 10-84 via MDT.

1422:09 (HT) B58 Chief communicated with B44 Chief by name, **"Command, Command to the 44, …, I want everybody out of the building. Everybody out now."**

1422:17 (HT) B39 Chief called Command.

1422:19 (HT) B44 Chief responded, **"44, K."**

1422:20 (HT) B58 Chief communicated to B44 Chief by name, **"I want everybody out of the building now, … I want everybody out of the building now. Command to Rescue.**"

1422:30 (HT) B39 Chief transmitted, **"39 to Command. You want everybody out of both sides of this, of this uh, dwelling or just the one side, the original fire building?"**

1422:31 (P) Incident update: FC01 reported Command Channel has been established.

1422:36 (P) C11A Chief of Rescue Services assigned and 10-84 via radio. C22C assigned.

1422:38 (HT) R2 Officer transmitted, **"Alright, they're backing out now."**

1422:46 (HT) SQ252 Officer called R2 Officer.

1422:48 (HT) An unidentified member transmitted, **"Have we found 257's Back-up?"**

1422:51 (HT) An unidentified member transmitted, **"Rescue, do you have 257's Back-up..."**

1422:55 (HT) An unidentified member transmitted, **"No…"**

1422:55 (HT) B58 Chief called, **"Command to 44."**

1422:56 (HT) B58 Chief transmitted, **"…44. All units in the fire building get out. Back out of that building. We're gonna put water in from the outside."**

1422 (M) Conditions Officer Lt C592 provided progress report. Fire operations ongoing, potential high to Public Safety Personnel (PSP). Patient count 2 Yellow Tag FFs being treated by 44I2 and 39W2.

1423 Hours

1423:04 (HT) B58 Chief communicated to B44 Chief by name, **"Command to the 44. …, get everybody out."**

1423:07 (HT) B44 Chief acknowledged B58 Chief by name, **"Yeah, …, we're backing them out right now."**

1423:12 (HT) R2 Irons Firefighter called the B58 Chief by name, **"Hey Chief …"**

1423:14 (HT) B58 Chief replied, **"Go ahead."**

1423:16 (HT) R2 Irons Firefighter asked, identifying by name, **"Have you found 257 Back-up? This is …"**

1423:18 (HT) An unidentified member transmitted, **"…guys, top floor…"**

1423:21 (HT) R2 Irons Firefighter transmitted, **"Alright, we gotta stay in there looking for him Chief."**

1423:24 (HT) B58 Chief transmitted, **"Everybody out, everybody out."**

1423:27 (HT) R2 Officer transmitted, **"Rescue 2 to E257 Back-up."**

1423:36 (P) E233 transmitted 10-84 via MDT.

1423:41 (HT) L103 Chauffeur transmitted, **"Chauffeur to 103, Cap, where are you?"**

1423:44 (HT) L103 Officer responded, **"We're in front of exposure #2."**

1423:48 (HT) R2 Chauffeur transmitted, **"Rescue Chauffeur to Command."**

1423:51 (HT) DC15 replied, **"Command. Go Rescue Chauffeur."**

1423:53 (HT) R2 Chauffeur asked, **"Chief, did we find 257's Back-up?"**

1423:56 (HT) DC15 responded, **"We have not found him yet."**

1423:58 (HT) R2 Chauffeur replied, **"10-4."**

1424 Hours

1424 (E) R2 Roof Firefighter entered the top floor rear bedroom window, followed by SQ252 FE Firefighter. Both members began a search of the second floor. SQ252 FE Firefighter exited the rear bedroom and began to search towards the front of the second floor.

1424 (E) R2 Chauffeur entered the front door of Exposure #4 Building and ascended the stairs to the second floor and began to search.

1424:02 (HT) An unidentified member transmitted, **"…to Nozzle, did. You back out of the building?"**

1424:05 (HT) R2 Officer called, **"Rescue to Command."**

1424:07 (HT) B58 Chief replied, **"Command, go."**

1424:09 (HT) R2 Officer transmitted, **"There was a member who was carried out, being treated by EMS. Confirm his ID for us?"**

1424:15 (HT) B58 Chief responded, **"Alright, listen, I want you out of the building. I want everybody out of the building."**

1424:19 (HT) R2 Officer replied, **"Alright we're backing out. Just confirm that for us. We're making our way to the front door."**

1424:33 (HT) B39 Chief transmitted, **"39, 39 to Command. Can someone confirm 257 Back-up has been accounted for?"**

1424:41 (HT) E323 Nozzle called E323 Officer.

1424:43 (HT) R2 Irons Firefighter transmitted, **"…out the front window with a broken arm."**

1424:49 (HT) E231 Officer transmitted, **"231 to Fire Sector."**

1424:52 (HT) B58 Chief replied, **"231…"**

1424:54 (HT) E231 Officer transmitted, **"Chief, I'm in the rear, in the basement. I have a little pocket of fire. Do I have permission to put it out?"**

1424:50 (P)(M) EMS BLS 44J2, 10-84.

1424:50 (P) EMS MR32 on scene.

1424:52 (P) C23D assigned.

1425 Hours

1425:03 (HT) R2 Officer transmitted, **"Hey guys, he's still missing. Let's try the top floor."**

1425:06 (HT) R2 Hook Firefighter called Command.

1425:13 (HT) SQ252 Can notified SQ252 Officer by name, **"…, I'm switching bottles."**

1425:13 (P) Incident update: **"As per Car 4C have a staff Chief report to FDOC and to Brookdale Hospital."**

1425:16 (HT) R2 Hook Firefighter transmitted, **"You have members operating on the second floor, four side. You want them out of the building?"**

1425:23 (P) B37 transmitted 10-84 via MDT.

1425:31 (HT) R2 Officer ordered R2 Irons Firefighter and R2 Chauffeur to get to the second floor.

1425:39 (HT) R2 Officer notified R2 Chauffeur, **"…they're saying second floor possibly the rear."**

1425:44 (HT) R2 Roof Firefighter called R2 Officer by name.

1425:46 (HT) R2 Officer relied.

1425:48 (HT) R2 Roof Firefighter notified R2 Officer, **"Yeah, I'm in the bathroom. I'm in the rear, where the window you came out of. We're gonna take a good look."**

1425:53 (HT) R2 Officer acknowledged.

1425:59 (HT) R2 Chauffeur asked R2 Hook Firefighter by name, **"…, You're talking about the fire building, correct?"**

1426 Hours

1426:00 (AV) L170's bucket was in operation.

1426:02 (HT) R2 Hook Firefighter answered R2 Chauffeur by name, **"…, I'm talking about the exposure #4 side. Is everybody accounted for from the top floor."**

1426:05 (HT) R2 Chauffeur responded, **"Not at this time. If we have the Back-up, the Back-up guy from 257 at the ambulance we should have everybody."**

1426:17 (HT) Field Com member communicated with the other Field Com member by name, **"Hey, hey ... Move the Command Post right next to 170. I'll give you a hand. Four Charlie wants it moved. We have no members missing at this time?"**

1426:17 (P) C16C assigned.

1426:22 (HT) An unidentified member said, **"10-4."**

1426:30 (HT) Field Com member asked, **"Just to confirm no one is missing, correct?**

Just to confirm?

1426:40 (HT) SQ252 transmitted, **"Squad to Command, can you confirm that? Everybody's accounted for?"**

1426:45 (HT) B39 Chief called Command.

1426:47 (HT) DC15 replied, **"Command, 39 go."**

1426:49 (HT) B39 Chief reported conditions improving in the rear.

1426:53 (HT) R2 Hook Firefighter asked R2 Irons Firefighter location.

1427 Hours

1427:03 (HT) R2 Irons Firefighter replied, **"I'm on two."**

1427:05 (HT) SQ252 Officer called Command.

1427:06 (HT) DC15 replied, **"Command, go Squad."**

1427:08 (HT) SQ252 Officer transmitted, "**Please confirm whether all members are accounted for or not? There still seems to be con, uh some confusion."**

1427:12 (HT) DC15 replied to SQ252 Officer by name, **"Negative .... We're still missing 257 Back-up. If you can get up on a portable ladder and go in off that and do a search of the exposure #4 side."**

1427:11 (P) Incident update: FC01 reported as per Car 11A special call additional Rescue and Squad. Rescue 4 (R4) and Squad 1 (SQ1) assigned.

1427:25 (P) SQ1 acknowledged via (PC/ATS).

1427:26 (HT) SQ252 Hook Firefighter reported, **"We got Rescue on that floor doing a search."**

1427:30 (HT) B58 Chief called, **"...41, Command to the 41."**

1427:31 (HT) Battalion 41 acknowledged.

1428:33 (P) EMS ALS 43V2 on scene.

1427:35 (HT) B58 Chief transmitted, **"… the last known location of the, of 257 Back-up is on the second floor at the top of the steps."**

1427:41 (HT) An unidentified member transmitted, **"Alright, 10-4, Command. 10-4."**

1427:45 (HT) R2 Chauffeur transmitted, **"MAYDAY, MAYDAY, MAYDAY. Rescue Chauffeur with a MAYDAY."**

1427:48 (E)(S) SQ252 FE Firefighter reset Firefighter Timothy Klein's PASS device as R2 Chauffeur transmitted the MAYDAY.

1427:53 (HT) D15 Chief responded, **"Rescue Chauffeur go with your MAYDAY."**

1427:55 (HT) R2 Chauffeur transmitted, **"We got the missing member on the top floor, near the front, exposure #4."**

1427 (M) EMS DC 583 provided progress report. Fire operations continue, patient count 3 Yellow Tag FFs. Potential high to PSP, will hold with current compliment.

1428 Hours

1428:00 (HT) DC15 transmitted, **"You have the missing member?"**

1428:02 (HT) R2 Chauffeur confirmed, **"10-4."**

1428:04 (HT) An unidentified member asked, **"…can you get him down the stairs?"**

1428:06 (HT) An unidentified member transmitted, **"Alright, bring him out of there now."**

1428:11 (P) E303 transmitted 10-84 via MDT.

1428:12 (HT) An unidentified member transmitted, **"Clear the front of the building, clear the front of the building. We're going to bring him down."**

1428:14 (HT) An unidentified member transmitted, **"Squad Hook and Irons meet me in the rear on four."**

1428:18 (HT) An unidentified member transmitted, **"You gotta shut this burst length down on these stairs going up first."**

1428:18 (P) R4 acknowledged via radio.

1428:24 (HT) B58 Chief called, **"Command to Rescue."**

1428:26 (HT) R2 Officer responded, **"Rescue."**

1428:28 (HT) B58 Chief transmitted, "**We got the missing member?"**

1428:30 (HT) R2 Officer responded, **"They're bringing him out."**

1428:32 (HT) R2 Chauffeur transmitted, **"Rescue Chauffeur."**

1428:33 (HT) B58 Chief transmitted, **"Alright, 10-4."**

1428:35 (HT) R2 Chauffeur transmitted, **"Around the corner, under the window, we're trying to get him now."**

1428:37 (HT) L103 Officer called the R2 Officer by name, **"…, where are you? Top of the stairs of the fire building?"**

1428:40 (HT) B58 Chief called, **"Command to the 41."**

1428:49 (HT) E332 Officer transmitted, **"332 to 227. They can start that water."**

1428:52 (HT) E227 Officer replied, **"Alright, 10-4. Water's coming."**

1428:55 (HT) B44 Chief called B58 Chief.

1428:57 (HT) B58 Chief replied, **"58, go."**

1428:59 (HT) B44 Chief communicated with B58 Chief by name, **"…, they're not in the fire building, right? 257 missing member?"**

1429 Hours

1429:02 (HT) B58 Chief responded, **"No, we've got the missing member, so pull everybody out, ok?"**

1429:06 (HT) B44 Chief replied, **"Alright, 10-4."**

1429:10 (HT) SQ252 Hook Firefighter transmitted, **"Top floor by the aerial brothers. Top floor by the aerial."**

1429:14 (HT) R2 Chauffeur transmitted, **"Anyway to get a bucket to the top floor windows where the aerial is?"**

1429:18 (HT) B58 Chief replied, **"Yeah, we're gonna try."**

1429:32 (HT) B58 Chief called, **"Command to Rescue."**

1429:34 (HT) R2 Chauffeur transmitted, **"…Chauffeur…"**

1429:37 (HT) B58 Chief transmitted, **"Command to Rescue."**

1429:40 (HT) R2 Officer replied, **"Rescue."**

1429:42 (HT) B58 Chief asked, **"How are we doing moving that member?"**

1429:45 (HT) R2 Officer replied, **"One second."**

1429:48 (HT) An unidentified member transmitted, **"Hey brothers, listen, we need…"**

1429:50 (HT) An unidentified member transmitted, **"Whoever's supplying 170, stop water."**

1429:52 (HT) E332 Officer transmitted, **"332 to 227, have them shut that hydrant."**

1429:57 (HT) R2 Officer notified the R2 Chauffeur by name, **"…, the stairs are clear."**

1429:59 (HT) B41 Chief called, **"Battalion 41 to Command."**

1430 Hours

1430:01 (HT) R2 Officer notified R2 Irons the stairs were clear.

1430:04 (HT) B41 Chief called Command.

1430:13 (P) Incident update FC01 reported another member located on the second floor, in the process of bringing him out.

1430:14 (HT) E332 Officer transmitted, **"332 to 227, have them shut that hydrant."**

1430:17 (HT) E227 Officer transmitted, **"227, shutting down now."**

1430:26 (HT) SQ252 Officer called, **"Squad to Command."**

1430:29 (HT) B58 Chief replied, **"Command."**

1430:31 (HT) SQ252 Officer requested, **"We need a CFR Engine and EMS to the front of the building of uh, four."**

1430:37 (HT) Car 11A transmitted, **"Rescue Operations to Command."**

1430:39 (HT) B58 Chief replied, **"Command, go ahead."**

1430:41 (HT) Car 11A asked, **"Do we have Rescue Medics on this?"**

1430:44 (HT) B41 Chief transmitted, **"Battalion 41 to Command with an URGENT."**

1430:44 (AV) Another stretcher arrived in front of the building.

1430:47 (P) E284 transmitted 10-84 via MDT.

1430:47 (HT) R2 Officer transmitted, **"Rescue to Command, we're moving the downed member. Clear the front of the building."**

1430:51 (HT) B41 Chief transmitted, **"Battalion 41 to Command."**

1430:53 (HT) B58 Chief replied, **"Command, go."**

1430:54 (HT) An unidentified member transmitted, **"Have the members…"**

1430:55 (HT) An unidentified member transmitted, **"Alright…"**

1430:56 (HT) DC15 ordered, **"Command to all units, Command to all units. Get out of the building, get out of the building."**

1431 Hours

1431:01 (HT) B41 Chief transmitted, **"Have EMS right at the staircase outside."**

1431:06 (HT) DC15 transmitted, **"Command to all units, get out of the building. We have the missing member."**

1431:16 (HT) R2 Officer notified R2 Irons Firefighter by name, **"…, the stairs are clear."**

1431:19 (HT) B41 Chief transmitted, **"41 to Command. We have another member we're taking out unconscious."**

1431:23 (P) B57 and RB01 transmitted 10-84 via MDT.

1431:24 (HT) Command replied, **"Command to 41. Who is that member?"**

1431:25 (HT) An unidentified member transmitted, **"We don't know…"**

1431:30 (HT) B58 Chief transmitted, **"…41. Command to the 41. When we get this member out, I want everybody out of that building. Everyone out."**

1431:37 (HT) B41 Chief responded to B58 Chief by name, **"No, …, we're good. We're taking the member down the staircase."**

1431:40 (HT) B58 Chief replied, **"Alright, good. But he gets out, I want everybody out of the building. You hear me?"**

1431:44 (HT) B41 Chief replied, **"Alright, 10-4. It's gonna take some time, he's on the second floor. We're at the top of the staircase, coming down."**

1431:52 (HT) DC15 transmitted, **"Command to the 41, clear the stairway."**

1431:54 (P) Notification to NAT GRID/ 30 minutes estimated time of arrival.

1431:55 (HT) B41 Chief replied, **"It's clear, we're gonna take him out."**

1431 (E) E283 Officer told L170 Roof they would need to remove Firefighter Timothy Klein's bunker gear when he was removed from the building.

1432 Hours

1432:10 (HT) B41 Chief transmitted, **"Keep that staircase clear out there."**

1432:12 (HT) E332 Nozzle transmitted, **"Nozzle to 332, we're hooked up."**

1432:15 (HT) B41 Chief transmitted, **"They're bringing him down the stairs now guys."**

1432:21 (HT) DC15 transmitted, **"Command…I need the name…of the second member we're bringing out."**

1432:23 (M) EMS BLS 44I2 10-82 enroute to Staten Island University Hospital (Hospital 62) with E257 Nozzle Firefighter with burns.

1432:27 (HT) E332 Nozzle transmitted, **"332 Nozzle, 332. We're hooked up, ready for water one second."**

1432:30 (HT) E332 Officer transmitted, **"10-4. 332 to 310 Chauffeur, supply our line."**

1432:35 (P) CT01 transmitted 10-84 via MDT.

1432:42 (HT) SQ252 Officer transmitted, **"We're coming down the stairs. Clear the stairs in front of the building in 4. Clear the stairs in front of the building in 4, he's coming out."**

1432:50 (HT) B41 Chief transmitted, **"Alright, 41 to Command. We have a member coming out the front door right now."**

1432:54 (HT) DC15 transmitted, **"…in 4. I want you to be the last man out. Everybody gets out. Do you understand?"**

1432 (M) EMS DC 583 provided progress report. Requested a Rescue Medic Unit. Patient count 3 Yellow Tag FFs. Potential high to PSP, will hold current compliment.

1433 Hours

1433:00 (HT) B41 Chief transmitted, **"Yeah 10-4. I'm getting everybody together."**

1433:04 (P) C16C transmitted 10-84 via radio.

1433:05 (HT) E332 Officer transmitted, **"332, 310 Chauffeur. You can start that line."**

1433:11 (HT) B58 Chief transmitted, **"Command to Rescue."**

1433:17 (HT) B44 Chief transmitted, **"Yeah, we got the Medics in front of the building."**

1433:25 (HT) B58 Chief transmitted, **"Command to Rescue."**

1433 (M) E257 Back-up is removed from the building and treatment was turned over to Rescue Medics 48R2 and HazTac Lieutenant. His bunker coat and SCBA were removed. Member was placed on stretcher and brought to EMS BLS 44J2 ambulance.

1433:27 (HT) R2 Officer transmitted, **"Rescue, he's removed. Uh, Rescue Medics got him."**

1433:28 (P) EMS 39R2 assigned.

1433:32 (HT) E227 Officer asked for water.

1433:43 (P) EMS HT32 assigned.

1433:43 (HT) B38 Chief Resource Unit Leader began a Roll Call.

1434 Hours

1434:20 (AV) Firefighter Timothy Klein was removed by firefighters and EMS from the scene on a stretcher.

1434:47 (P) EMS Rescue Medics 07R2 were assigned.

1435 Hours

1435 (P) EMS B35 and B57 on scene.

1436 Hours

1436 (P) C22C transmitted 10-84 via radio.

1436 (M) EMS DC 583 provided progress report. Patient count 4. 3Yellow Tag FFs, 1 Red Tag Firefighter being treated by Rescue Medics 48R2. Potential high to PSP.

1437 Hours

1437 (P) TS02 transmitted 10-84 via MDT.

1438 Hours

1438 (P) EMS LS82 on scene.

1438 (P) Car 12 Chief of Safety assigned.

1439 Hours

1440 Hours

1440 (P) EMS MV12 on scene.

1440 (P) RAC Units RA04 and RA02 transmitted 10-84 via MDT.

1446 Hours

1446 (M) Rescue Medics 48R2 with EMS BLS 44I2 and an EMT from EMS BLS 41D2 10-82 to Brookdale Hospital (Hospital 41), with Firefighter Timothy Klein.

1451 Hours

1451 (M) EMS BLS 83D2 and a medic from EMS ALS 39W2 10-82 to Staten Island University Hospital (Hospital 62) with E257 Officer.

1451 (M) Rescue Medics 48R2 with EMS BLS 44J2 and an EMT from EMS BLS 41D2 arrived at Brookdale Hospital (Hospital 41) 10-81 with Firefighter Timothy Klein.

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APPENDIX B. HANDIE-TALKIE RECORDER TRANSCRIPT

BROOKLYN BOX 3-3 2075

04/24/2022

FATAL INJURY

THIS TRANSCRIPT IS A COMBINATION

FROM THE HANDIE-TALKIE RECORDERS

OF BATTALION'S 58, 44, 39

BATTLION 58 IS THE PRIMARY RECORDER

The Battalion 58 audio recorder is the baseline audio for this transcription. The transmissions with the phrase merge with B44 or B39 represent audio compiled from the B58 recorder as well as the other Battalion Recorder. The transmissions with B44 or B39 represent audio that was not recorded on the B58 recorder. This audio was only recorded on the battalion listed. In order to complete the transcript, "…" was used when the transmission could not be interpreted or a name was being used.

13:53:34 "257 to Battalion. We got a lot of smoke, the corner of the avenue."

13:54:35 "58 to 170. Let me know when you know it's a confirmed structural."

13:54:45 "257, start a dry line to the front."

13:54:49 "257 Nozzle, 10-4."

13:54:53 "Yeah, 170, give the 10-75."

13:54:56 "10-4."

13:55:15 "Make sure you stretch enough line. It's the last house on the right."

13:55:21 "10-4, Cap."

13:55:25 “It’s the second to last house on the right.”

13:55:28 “Yeah, we got a good hydrant here.”

13:55:30 “Alright, 10-4.”

13:55:46 “Roof to 170. Heavy fire coming out the uh, two side. Second floor, in the rear.”

13:56:17 “Kevin.”

13:56:19 “Standby, Cap…water.”

13:56:22 “10-4.”

13:56:33 “Here’s your water.”

13:56:40 “257 Nozzle, do you have enough line?”

13:56:43 “10-4. I got enough line, start water.”

13:56:46 “58 to Alpha.”

13:56:56 “58 Alpha.”

13:57:04 “Kevin…booster.”

13:57:06 “Yeah, water’s coming Cap.”

13:57:09 “58 to Alpha.”

13:57:11 “Alpha.”

13:57:13 “Confirmed address: 10826 Avenue N. Extra engine, extra truck.”

13:57:23 “10-4.”

13:57:25 “Kevin, I gotta have booster.”

13:57:29 “257 Chauffeur, you can start water on your blue discharge.”

13:57:33 “10-4, it’s coming.”

13:57:48 “58 to 283.”

13:57:51 “Yeah, Chief, I got a line on the way.”

13:57:55 “10-4.”

13:57:57 “You gotta give me that water now.”

13:58:07 “…did you get to the rear?”

13:58:11 “…”

13:58:13 “Chauffeur, give me the water.”

13:58:17 “10-4. Water’s coming.”

13:58:25 “Hey Anthony, give him a hand at the pumps, Anthony.”

13:58:37 “Chauffeur to 257, we’re having issues with the rig.”

13:58:41 “290 to Chauffeur.”

13:58:43 “Chauffeur.”

13:58:44 “…3 Chauffeur.”

13:58:46 “Chauffeur.”

13:58:47 “Chauffeur to 257, we’re having issues getting water into the pumps.”

13:58:51 “283 to 283 Chauffeur.”

13:58:55 “283 Chauffeur.”

13:58:57 “Hey George, is that line off our rig?”

13:59:00 “Negative, we’re gonna get help 90’s, uh, rig.”

13:59:02 “10-70.”

13:59:05 “290 to Chauffeur.”

13:59:07 “Kevin, I don’t care about the hydrant. Give me the booster.”

13:59:13 “290 to Chauffeur.”

13:59:15 “Chauffeur.”

13:59:17 “Anthony, let’s see if we just get water in our rig if we have to, alright? You got a good water source?”

13:59:21 “I’m gonna use my hydrant, I’m gonna give them booster.”

13:59:23 “Alright, give them what you can. Let’s see if we can get some water here.”

13:59:28 “Kevin, give me booster.”

13:59:37 “170 to 103.”

13:59:40 “103.”

13:59:42 “Dan…”

13:59:44 “58 to Alpha.”

13:59:45 “…at this front door. So just be careful wherever you are.”

13:59:49 “58 to Alpha.”

13:59:51 “…to Chauffeur.”

13:59:52 “Chauffeur, go ahead.”

13:59:55 “…”

13:59:57 “Command to all units, everybody out of the building. Command to 103, get out of the building. We have no water on the fire.”

14:00:08 “Anthony keep backing up, we got a good hydrant right here.”

14:00:10 “283 to 283 Chauffeur.”

14:00:12 “283 Chauffeur. Lieu, we’re backing up to the hydrant right now. 257 can’t go in to pumps.”

14:00:16 “We’re on our way out now, Chief.”

14:00:18 “Get out, get out of the building. Command to 170.”

14:00:23 “Yeah, 170’s out. 170 to 103.”

14:00:36 “257 to Chauffeur. Give us water.”

14:00:42 “Hey Mark, give me a second. We’re gonna get you water in a second.”

14:00:45 “Velazquez.”

14:00:46 “290.”

14:00:47 “10-4.”

14:00:48 “170 to 170 OV.”

14:00:52 “Command to 290 Officer.”

14:00:57 “170 to 170 OV.”

14:00:59 “OV.”

14:01:03 “Everybody out of the building. Everyone out of the building.”

14:01:07 “Account for..”

14:01:08 “Roof and OV, we’re out of the building.”

14:01:11 “103 Roof and OV are out of the building.”

14:01:03 “…water…”

14:01:14 “Yo guys, relax. We’re gonna get you water in a minute. 290 to 58.”

14:01:25 “170 Roof to Command. Check the exposure four.”

14:01:28 “103 to 170.”

14:01:32 “Hey Dan, what’s up?”

14:01:34 “Mark…”

14:01:36 “290 to the 58.”

14:01:38 “58, go ahead.”

14:01:44 “290 to the 58.”

14:01:44 “Put your rig in…”

14:01:48 “Mark, I’m out. Where are you?”

14:01:49 “We’re in the front.”

14:01:57 “290 to 58.”

14:01:59 “58, go.”

14:02:01 “Yeah, we’re on a good hydrant Chief. We’re gonna be giving that first line water in a minute.”

14:02:05 “I needed it yesterday.”

14:02:06 “Yeah, don’t I know.”

14:02:10 “Kevin, just give us the booster.”

14:02:16 “Mark.”

14:02:17 “290’s got the uh, the hydrant. Alright? 290’s got that first line. We’re gonna charge it now.”

14:02:22 “Alright, do we got booster water? 58 to 290, do we got booster water?”

14:02:38 “283 Chauffeur to 283. There’s water in one line. We don’t know which line it is. There’s a burst length out here.”

14:02:44 “Alright, 10-4.”

14:02:46 “Hey, the line that’s charged, is it still burst? You still got a burst length?”

14:02:50 “Negative. There’s one good line right now. There’s another burst length we’re trying to rectify.”

14:02:55 “10-4.”

14:03:00 “…move up a little higher on that stick.”

14:03:05 “10-4.”

14:03:17 “290 to 290 Nozzle and Back-up.”

14:03:22 “290, we’re coming back.”

14:03:23 “Alright, I’m going in the front stoop, stoop here. We’re gonna back up 283.”

14:03:35 “290 Chauffeur to 290 Control. That line is 283’s line off the red.”

14:03:40 “Yeah, 10-4. I’m waiting for them to give me 257’s line to charge it.”

14:03:44 “170 to Command. We’re putting water on the fire now.”

14:03:48 “Alright, 10-4. Alright, 10-4.”

14:03:59 “103 Chauffeur to 103. Cap, you got eyes on the stick?”

14:04:03 “Uh, yes. You gotta go up just a little bit more… of the stick. A little more maybe two, three feet.”

14:04:14 “58 to 310.”

14:04:16 “310.”

14:04:17 “310, start a line to the front of the building.”

14:04:19 “310, 10-4. It’s on the way.”

14:04:21 “58 to 231.”

14:04:28 “Hey 283, come back near the first door.”

14:04:44 “257 to Chauffeur. Are we ever getting water?”

14:04:48 “Yeah, 10-4. It’s coming from 290.”

14:04:53 “170 to Command.”

14:04:57 “310 to Chauffeur come back, back up.”

14:05:01 “170 to Command.”

14:05:03 “Command, go ahead.”

14:05:05 “We need another line in the front door.”

14:05:08 “Alright, 10-4. When I have a line I’m gonna send it in. You guys hold your positions.”

14:05:12 “58 to 103.”

14:05:16 “283 Chauffeur to Command. You’re getting a second line operational off 90’s rig right now.”

14:05:21 “Alright, good.”

14:05:23 “58 to 103.”

14:05:25 “103.”

14:05:26 “Danny, I only have one line right now.”

14:05:31 “231 to Command.”

14:05:32 “Command. Go.”

14:05:34 “We’re your extra engine, do you want us to grab a line?”

14:05:35 “No. 231, you’re gonna back up 310.”

14:05:40 “231, 10-4.”

14:05:42 “290 Chauffeur to Command. Both lines: 283, 257 are charged on hydrant water.”

14:05:49 “10-4. 58 to 283. I got 257 with a line behind you if you need a second line inside that building.”

14:06:03 “Squad Hook to Command.”

14:06:08 “Yo Kev.”

14:06:15 “310, 310 Chauffeur.”

14:06:19 “310 Chauffeur.”

14:06:21 “Command to Squad.”

14:06:23 “Stay right on that corner. I need another line off you.”

14:06:26 “Command to Squad.”

14:06:28 “Engine 257 is to uh, Command. We have, we’re back in pumps.”

14:06:37 “Squad to Command.”

14:06:39 “How does it look in exposure two?”

14:06:41 “Yeah, so far uh, we’re good, Chief. We’re just opening up a little bit along that uh, exterior wall.”

14:06:44 “Alright, do we have any, any, anything in the attic?” (B44)

14:06:48 “We’re in the process of checking that as well.” (Merge with B44)

14:06:51 “10-4. Command to 103.”

14:06:54 “...”

14:06:56 “Command to 103.”

14:07:00 “103.”

14:07:01 “I got 257 coming in with you.”

14:07:05 "…"

14:07:06 "170 Chauffeur to Command."

14:07:10 "170 to Command."

14:07:11 "Command, go."

14:07:13 "We need another line to the second floor."

14:07:15 "Alright, 10-4."

14:07:22 "…to 58"

14:07:26 "Yeah, 44 to 1, to 283."

14:07:31 "310 to..."

14:07:32 "Command to 170."

14:07:34 "…stretch that line when you can."

14:07:37 "170 Chauffeur to Command."

14:07:39 "Command, go."

14:07:41 "We need a line, straight down the two side, into the back yard."

14:07:43 "Alright, 10-4."

14:07:53 "231 to 231 Chauffeur."

14:07:55 "Go ahead."

14:07:57 "Sal, check with 290, we got three lines off that rig. Make sure you'd have enough water." (Merge with B44)

14:08:00 "Command, Command to 170."

14:08:04 "170."

14:08:07 “I got 120 coming in to operate on the top floor.”

14:08:10 “Alright, I got 283 going up now.”

14:08:13 “103 to Can.” (Merge with B44)

14:08:21 “…to 103.”

14:08:27 “...3 Chauffeur to 310, here comes your water” (Merge with B44)

14:08:28 “…there’s a glow in the basement.”

14:08:31 “231 Chauffeur to 231.”

14:08:35 “Rescue to Command. You need a line in the rear.”

14:08:39 “290 Chauffeur to 310, here comes your water.”

14:08:42 “310, 10-4. Give us the water.”

14:08:52 “5, Command to 283.”

14:08:55 “Command to 283.”

14:09:01 “Command to 283.”

14:09:04 “283, go...”

14:09:06 “Alright, are you good in there? Or do you need another line?”

14:09:08 “We’re on the top floor. We got water on the fire. We got a couple rooms going. We’ll let you know when it’s knocked down.”

14:09:14 “103 to 58.”

14:09:17 “58, go ahead.”

14:09:20 “Need a line to the rear of exposure four…” (Merge with B44)

14:09:24 “Alright, 10-4.”

14:09:25 "…and now possibly in the basement as well."

14:09:44 "323 Nozzle, stretch a line to the front of the fire building."

14:09:48 "Roger that."

14:09:50 "OV to 103, you got fire blowing out of the basement…"

(Background audio in B58 with next line.)

14:09:51 "58, 58 to 170 OV. Your line is coming to the rear."

14:09:53 "The line upstairs has to come down." (B44)

14:09:55 "Roof to 103."

14:09:58 "Chief."

14:10:00 "The line upstairs in 4 has to come down."

14:10:02 "Heavy fire coming up."

14:10:11 "MAYDAY, MAYDAY, MAYDAY, 103 with a MAYDAY."

14:10:14 "Command, go with your MAYDAY."

14:10:16 "Brother's upstairs, you got fire, heavy fire on the first floor."

14:10:21 "Command to all units. Command to all units. Everybody back out, back out of the building. Everybody back out. Command to all units."

14:10:32 "Mark… Tom."

14:10:34 "103 to Can."

14:10:40 "Command."

14:10:42 "Command to all units. Back out, back out, back out."

14:10:46 "Hey Mark."

14:10:47 “44 to 283 and 170, back out of that top floor.”

14:10:49 “…” (B44)

14:10:52 “I want everyone to back out of the building now. Everybody to back out of the building now.”

14:10:57 “Rescue to Command.”

14:11:05 “Shut that, shut that down 257.”

14:11:10 “Rescue 2 to Command.”

14:11:13 “Engine 323 Officer to 257. Charge that second line please.” (Merge with B39)

14:11:15 “MAYDAY, MAYDAY, MAYDAY…”

14:11:20 “Second floor front.”

14:11:21 “Open up that line.”

14:11:23 “We need the line open on the top floor now.”

14:11:29 “Shut that other gate.”

14:11:32 “Mark Hershey.”

14:11:34 “257, shut all your gates.”

14:11:38 “Tommy, I’m out. Where are you?”

14:11:40 “On the top floor Mark.”

14:11:42 “EFAS to Command. Battalion 58 Chief, EAB alert.”

14:11:51 “Rescue Roof to Rescue.”

14:11:52 “Come to the rear. Come to the rear, Tommy.”

14:11:59 “EFAS to Command. 257 Control EAB.”

14:12:03 “Mark.”

14:12:05 “Yeah.”

14:12:06 “You out?”

14:12:08 “Tommy.”

14:12:10 “257 Control is out of the building.”

14:12:13 “Tommy.”

14:12:16 “…anybody from 257 is still in the building?” (Merge with B44)

14:12:18 “Hey Chief.”

14:12:20 “… back out.” (Merge with B39)

14:12:22 “Hey, Mark Hershey.”

14:12:23 “Yeah, Tom go.”

14:12:24 “Mark.”

14:12:25 “Tom go. Tommy go.”

14:12:31 “Get that line on the top floor landing and towards the rear. We need it knocked down.”

14:12:34 “…top of the stairs into 4.” (Merge with B44)

14:12:39 “Get a ladder to the rear.”

14:12:42 “I got a line operating now were coming up to you.”

14:12:43 “…. you have a burst….”

14:12:48 “Tommy, we got the line …” (B39)

14:12:49 “Command to 283, get out.” (Merge with B44)

14:12:51 “44 to Command.”

14:12:53 “Rescue to Command.”

14:12:55 “Command, go Rescue.”

14:12:57 “Rescue to Command.”

14:12:58 “Rescue, go.”

14:13:00 “Yeah, we’re on the top floor, it’s uh, we need the line operated up here. I got two or three guys in the two, three corner.”

14:13:09 “…is operating if you can make your way into those rear bedrooms.”

14:13:11 “No we can’t…”

14:13:12 “…we want everyone out of the building…” (B44)

14:13:13 “…who’s trapped?”

14:13:16 “Command to Rescue. Get out of the building.”

14:13:19 “44 to Command.”

14:13:23 “58 to Rescue 2. Get to the rear. Get to the rear. Get to the rear.”

14:13:28 “231 to Rescue 2. We are putting the ladder up on the rear right now. Putting the ladder to that rear window right now. Get to the rear.”

14:13:34 “Tommy, what side of the building you on, two or four?”

14:13:40 “Command to 257, Command to 257.” (Merge with B44)

14:13:44 “I got a line to…”

14:13:48 “290 to Chauffeur.”

14:13:52 “Chauffeur.”

14:13:53 “Command to…”

14:13:54 “We got that line that 83 has. Just shut it down for a minute. Just make sure it’s the right…”

14:13:59 “Command to 170.”

14:14:06 “Command to 170.”

14:14:07 “231 to Command.”

14:14:08 “170.”

14:14:13 “Mark.”

14:14:16 “…257. Command to Rescue.”

14:14:20 “Command to Rescue.”

14:14:23 “Riches, are you guys out?”

14:14:26 “Anthony, shut it down.”

14:14:29 “…top floor with 257. We’re gonna make our way to that window now. But uh, maybe you can keep continue to hit fire.”

14:14:39 “…, where are you?”

14:14:43 “MAYDAY, MAYDAY, MAYDAY, 231 to Command with a MAYDAY.”

14:14:47 “Command, go ahead MAYDAY.”

14:14:49 “We got guys operating in the top floor. We just got a ladder to them. We need another line back here, in the exposure. Exposure #3, we need another line back here.”

14:14:56 “Alright, they gotta get out. Get them out of the building.” (Merge with B44)

14:14:59 “231 to Command. We’re trying Chief. We, we got a ladder to them. They took, they took the window, but they’re not, they didn’t show themselves again.”

14:15:10 “Command to 257.”

14:15:11 "…the portable."

14:15:12 "Tommy Riches." (B44)

14:15:13 "…portable to the three side. 120's bringing that. I need another line in the rear, K. I need another line in the rear."

14:15:19 "It's coming but its gonna take some time 231."

14:15:24 "Tommy, did you make it out?"

14:15:26 "Command to 257."

14:15:28 "…got some guys up here. I'm bringing them to the window." (Merge with B39)

14:15:32 "Get a ladder to the two side also."

14:15:35 "Command to 257."

14:15:37 "Mark."

14:15:39 "257."

14:15:42 "Tommy, did you get out Tommy?"

14:15:51 "…120 to Can."

14:15:52 "44 to Command." (B44)

14:15:54 "257."

14:15:56 "…Rescue to 257."

14:16:02 "257, go." (Merge with B39)

14:16:03 "Do you have all your guys?"

14:16:05 "No, I'm looking for 257 Officer."

14:16:08 "Yeah, we have 257's Officer at the rear window on the top floor."

14:16:11 “Alright, where’s the rest of the guys?”

14:16:13 “Alright, we’re gonna take a look for them now.”

14:16:16 “257 to Back-up.”

14:16:18 “Go ahead 257. Are you out?”

14:16:20 “Perticone, where are you?”

14:16:26 “I’m up here helping the uh, the downed fireman.” (Merge with B39)

14:16:29 “Command, go ahead Jeff.” (Merge with B39)

14:16:33 “Irons to Rescue.” (Merge with B39)

14:16:35 “…fire duty…”

14:16:37 “Right, I gotta get you a line. I’m getting you a line Jeff.”

14:16:40 “No, I’m good. I’m just helping get them out.”

14:16:43 “Mark Hersey.” (Merge with B44)

14:16:46 “....”

14:16:46 “Just keep, keep those lines moving…”

14:16:48 “Charge that line again.”

14:16:50 “10-4, charging 283’s line now.”

14:16:52 “Command, Command to Fire Sector.”

14:16:56 “Command to Fire Sector 44.”

14:17:00 “Yeah, Battalion 44.”

14:17:01 “Jeff, we got holes in the floor at the, at the top of the steps to the second floor. Do not go up there unless we have to.” (Merge with B44)

14:17:06 “Hold up, I’m getting a line right now.”

14:17:11 “257 to Back-up.”

14:17:17 “257 to Back-up.”

14:17:18 “Rescue to Command.” (B44)

14:17:20 “Chauffeur.”

14:17:22 “257 Back-up, where are you?” (B44)

14:17:24 “Squad Chauffeur you can charge that line.”

14:17:27 “Perticone, where are you?”

14:17:29 “I’m in the street. I’m giving them a hand packaging this guy up.”

14:17:31 “Command to 257.” (Merge with B44)

14:17:35 “Rescue to Command.”

14:17:37 “Command, go.”

14:17:40 “Alright. We got guys at the rear window. That line being opened, conditions are improving on the top floor.”

14:17:45 “Alright, good. Are you guys out of the building or what?” (Merge with B44)

14:17:49 “Not yet. We’re at a rear window going down a portable.”

14:17:52 “Alright, get out of the building.” (Merge with B44)

14:17:55 “…to 252 Chauffeur, charge that line.”

14:17:59 “Command to the 44.”

14:18:01 “I’m operating.”

14:18:02 “Command to the 44.”

14:18:06 “44.”

14:18:08 “Jeff, I got 323 coming in with you.”

14:18:12 “Alright, 10-4. They’re gonna be operating with uh, 174. I got the Officer from 174 here.” (Merge with B44)

14:18:16 “Alright, do you got a truck in there?”

14:18:20 “Rescue to Command.”

14:18:24 “Rescue, go.”

14:18:25 “Chief, can you account for Engine 257? I have the Officer, we’re gonna go out a portable in the rear.”

14:18:30 “Yes, I’m looking for the Nozzleman and the Back-up.”

14:18:34 “Alright, I’ve got the Officer. Just account for those two guys.”

14:18:37 “10-4.”

14:18:39 “257 to Back-up.”

14:18:45 “Tommy Riches, you have everyone from uh, the line at the top of the stairs?”

14:18:49 “Yeah, I got them at a rear window. Who’s this?”

14:18:51 “231 to Command, K.”

14:18:52 “Jay…” (B44)

14:18:53 “Rescue Roof to Rescue.”

14:18:56 “Rescue.”

14:18:58 “Tommy, they’re knocking fire down in the rear. Is anybody left upstairs?”

14:19:03 “Negative. They’re at the rear window now, going down a portable.”

14:19:07 “We need portables to the rear pronto.”

14:19:09 “231 to Command, K.”

14:19:13 “Command, go 231.”

14:19:15 “Chief, we got two lines operating in the rear. We need a third one. We need uh, another line down here, in the rear, K.”

14:19:20 “It’s coming, it’s gonna take some time.”

14:19:24 “257 Back-up, where are you TK?”

14:19:26 “…we’re in the backyard. We’ll be there in a minute.”

14:19:29 “231 to Command, we got a line coming right now to the rear.”

14:19:34 “Yeah, 44 to Command.”

14:19:39 “44 to the 58.”

14:19:40 “…floor below.”

14:19:42 “58, go.”

14:19:43 “Yeah, Andy, we got that line going up…floor, in the original fire building. They’re knocking down some fire. We just need somebody to drop...”

14:19:59 “225 to 252 Chauffeur, please charge that line.” (Merge with B44)

14:20:00 “Rescue to Command.”

14:20:03 “Command.”

14:20:04 “Yeah, everyone that was uh, sheltering on the top floor is out now, in the backyard…”

14:20:09 “…10-4.” (B44)

14:20:11 “Field Com to 257 Officer, you out?”

14:20:15 “Pat, yeah, he’s with me. Just account for his Nozzle and Back-up.”

14:20:18 “Nozzle is already in with EMS, so is the Control. Do you have the Back-up?”

14:20:24 “No, just 257 back here.”

14:20:26 “225 to 252 Chauffeur.”

14:20:30 “Second floor it’s jumped to the first floor.”

14:20:32 “…five...”

14:20:34 “Two and a quarter here comes your water.”

14:20:36 “Chauffeur.”

14:20:39 “Did that collapse?” (Merge with B44)

14:20:40 “323 I need more line. 323 I need more line.”

14:20:44 “231 to 232 Chauffeur.”

14:20:50 “…323 Chauffeur go to your rig. We’re pumping off your rig.”

14:20:53 “Command to Engine 257 Back-up.”

14:21:01 “Command to Rescue 2.”

14:21:02 “Rescue.”

14:21:03 “Tommy, we’re looking for the Back-up of 257. We can’t find him. He’s in your building.”

14:21:09 “10-4.”

14:21:11 “Hey Mark, Woody.”

14:21:13 “Yeah, Tom, we’re making a push up the stairs. What do ya need?”

14:21:17 “He was on the second floor when your...”

14:21:21 “…get water to 231’s line…”

14:21:22 “Rescue 2 to Timmy Klein. Rescue 2 to 257 Back-up Timmy Klein.”

(Merge with B44)

14:21:30 “323 Chauffeur, charge that line that you just broke off.”

14:21:35 “Rescue to Timmy Klein, you on the air?”

14:21:41 “Hey, Pete.”

14:21:43 “Here comes your water.”

14:21:45 “Pete.”

14:21:46 “Timmy, you on the air?”

14:21:48 “…”

14:21:51 “Anybody got eyes on Timmy Klein?”

14:21:53 “Hey Woody, check the landing. We were all trapped on the landing.”

14:21:58 “We checked out the landing already.”

14:22:00 “…been down the second floor.”

14:22:02 “170 to 257.”

14:22:09 “Command, Command to the 44. Jeff, I want everybody out of the building. Everybody out now.”

14:22:17 “39 to Command.”

14:22:19 “44, K.”

14:22:20 “I want everybody out of the building now, Jeff. I want everybody out of the building now. Command to Rescue.”

14:22:28 “Rescue.”

14:22:30 “39 to Command. You want everybody out of both sides of this, of this uh, dwelling or just the one side, the original fire building?”

14:22:38 “Alright, their backing out now.”

14:22:40 “Rescue…to Rescue.”

14:22:42 “Alright, 10-4.” (B44)

14:22:46 “Squad to Rescue.”

14:22:48 “Rescue.”

14:22:51 “Have we found 257’s Back-up?”

14:22:55 “No...”

14:22:55 “Command to 44.”

14:22:56 “All units in the fire building get out. Back out of that building. We’re gonna put water in from the outside.”

14:23:02 “…”

14:23:04 “Command to the 44. Jeff, get everybody out.”

14:23:07 “Yeah Andy, we’re backing them out right now.”

14:23:12 “Hey Chief Morawek.”

14:23:14 “Go ahead.”

14:23:15 “…”

14:23:16 “Have you’ve found 257 Back-up? This is Hershey.”

14:23:18 “…guys, top floor.”

14:23:21 “Alright, were gonna stay in there looking for him Chief.”

14:23:24 “Everybody out, everybody out.”

14:23:27 “Rescue 2 to 257 Back up.”

14:23:41 “Chauffeur to 103. Cap where are you?”

14:23:44 “We’re in the front of exposure two.”

14:23:48 “Rescue Chauffeur to Command.”

14:23:51 “Command, go Rescue Chauffeur.”

14:23:53 “Chief, did we find 257’s Back-up?”

14:2356 “We have not found him yet.”

14:23:58 “10-4.”

14:24:01 “Rescue Battalion to Command.”

14:24:02 “…to Nozzle, are you outside the building?”

14:24:05 “Rescue to Command.”

14:24:07 “Command, go.”

14:24:09 “There was a member who was carried out, being treated by EMS. Confirm his ID for us?”

14:24:15 “Alright. Listen, I want you out of the building. I want everybody out of the building.”

14:24:19 “Alright, we’re backing out. Just confirm that for us. We’re making our way to the front door.”

14:24:24 “Hey, Pete.”

14:24:30 “…to Command.”

14:24:31 “Hey…”

14:24:33 “39, 39 to Command. Can someone confirm 257 Back-up has been accounted for?”

14:24:41 “323 Nozzle to 323.”

14:24:43 “…out the front window with a broken arm.”

14:24:49 “231 to Fire Sector.”

14:24:52 “231…”

14:24:54 “Chief, I’m in the rear, in the basement. I have a little pocket of fire. Do I have permission to put it out?”

14:25:03 “Hey guys, he’s still missing. Let’s try the top floor.”

14:25:06 “Rescue Hook to Command.”

14:25:13 “Jay, I’m switching bottles…”

14:25:16 “…Nozzle, Can…”

14:25:19 “Pete.”

14:25:22 “Yeah, go ahead Jimmy.” (Merge with B44)

14:25:25 “You have members operating on the second floor, four side. You want them all out of the building?”

14:25:31 “Woody and Mark, you guys get to the top floor?”

14:25:39 “Woody, they’re saying second floor possibly half way to the rear.”

14:25:44 “Hey, Tommy.”

14:25:46 “Yeah.”

14:25:48 “Yeah, I’m in the bathroom. I’m in the rear, where the window you came out of. We’re gonna take a good look.”

14:25:53 “Alright.”

14:25:59 “Jimmy, you’re talking about the fire building, correct?”

14:26:02 “Woody, I’m talking about the exposure four side. Is everybody accounted for from the top floor?”

14:26:05 “Not at this time. Yes, if that’s the Back-up guy from 257 at the ambulance we should have everybody.” (Merge with B39)

14:26:14 “…up there.”

14:26:17 “Hey, hey Billy. Move the Command Post right next to 170. I’ll give you a hand. Four Charlie wants it moved. We have no members missing at this time?”

14:26:22 “10-4.”

14:26:30 “Just to confirm no one is missing, correct? Just to confirm?”

14:26:35 “Squad to Command.”

14:26:40 “…can you confirm that? Everybody’s accounted for?”

14:26:45 “39 to Command.”

14:26:47 “Command, 39 go.” (Merge with B44)

14:26:49 “Alright, conditions in the rear are improving.”

14:26:53 “Mark Hershey.”

14:26:55 “Yeah.”

14:26:58 “Where are you, second floor?”

14:27:00 “What do you need?”

14:27:01 “Just checking where you’re at.”

14:27:03 “I’m on two.”

14:27:04 “Go with it, Mark.”

14:27:05 “Squad to Command.” (B39)

14:27:06 “Command, go Squad.” (B39)

14:27:07 “Hey George.” (B44)

14:27:08 “Please confirm whether all members are accounted for or not? There still seems to be con, uh some confusion.”

14:27:12 “Negative Jason. We’re still missing 257 Back-up. If you can get up on a portable ladder and go in off that and do a search of the exposure four side.”

14:27:21 “Guarasco, get out of the building Guarasco.”

14:27:26 “We got Rescue on that floor doing a search.”

14:27:28 “I’m out, Cap.”

14:27:30 “41, Command to the 41.”

14:27:31 “Battalion 41.”

14:27:33 “No, no.”

14:27:35 “…the last known location of the, of 257 Back-up is on the second floor at the top of the steps.”

14:27:41 “Alright, 10-4, Command. 10-4.”

14:27:45 “MAYDAY, MAYDAY, MAYDAY Rescue Chauffeur with a MAYDAY.” (Merge with B44)

14:27:53 “Rescue Chauffeur go with your MAYDAY.”

14:27:55 “We got the missing member on the top floor, in the front, exposure four.”

14:28:00 “You have the missing member?”

14:28:02 “10-4.”

14:28:04 “10-4. Bring him, can you get him down the stairs? (B44)

14:28:06 “How we gonna get him down?”

14:28:12 “Clear the front of the building, clear the front of the building. We’re gonna bring him down.”

14:28:14 “Squad Hook and Irons meet me in the rear on four.”

14:28:18 “You gotta shut this burst length down on these stairs going up first.”

14:28:24 “Command to Rescue.”

14:28:26 “Rescue.”

14:28:28 “We got the missing member?”

14:28:30 “They’re bringing him out.”

14:28:32 “Rescue Chauffeur” (Merge with B44)

14:28:33 “Alright, 10-4.”

14:28:35 “Around the corner, under the window, we’re trying to get him now.”

(Merge with B44)

14:28:37 “Tommy, where are you? Top of the stairs of the fire building?”

14:28:40 “Command to the 41.”

14:28:49 “332 to 227. They can start that water.”

14:28:52 “Alright, 10-4. Water’s coming.”

14:28:55 “44 to 58.”

14:28:57 “58, go.”

14:28:59 “Andy, they’re not in the fire building, right? 257 missing member?”

14:29:02 “No. We’ve got the missing member, so pull everybody out, ok?”

14:29:06 “Alright, 10-4.”

14:29:10 “Top floor by the aerial brothers. Top floor by the aerial.”

14:29:14 “Anyway to get a bucket up to the top floor windows where the aerial is?”

14:29:18 “Yeah, 10-4. We’re gonna try.”

14:29:32 “Command to Rescue.”

14:29:34 “…Chauffeur…”

14:29:37 “Command to Rescue.” (B44)

14:29:40 “Rescue.”

14:29:42 “How are we doing moving that member?”

14:29:43 “One second.” (B44)

14:29:48 “Hey brothers, listen, we need…”

14:29:50 “Whoever’s supplying 170, stop water.”

14:29:52 “332 to 227, have them shut down that hydrant.” (Merge with B39)

14:29:57 “Woody, the stairs are clear.”

14:29:59 “Battalion 41 to Command.” (B44)

14:30:01 “Hey, Mark. The stairs are clear.”

14:30:06 “Stairs are clear, come down.” (B44)

14:30:04 “Battalion 41 to Command.”

14:30:14 “332 to 227, have them shut that hydrant.”

14:30:17 “227, shutting it down now.”

14:30:19 “…’s clear.”

14:30:26 “Squad to Command.”

14:30:29 “Command.”

14:30:31 “Need a CFR Engine and EMS to the front of the building of uh, four.”

14:30:37 “Rescue Operations to Command.”

14:30:39 “Command, go ahead.”

14:30:41 “Do we have Rescue Medics on this?”

14:30:44 “Battalion 41 to Command with an URGENT.”

14:30:47 “Rescue to Command. We’re removing the downed member. Clear the front of the building.”

14:30:51 “Battalion 41 to Command.”

14:30:53 “Command, go.”

14:30:54 “Command to all units, Command to all units. Get out of the building, get out of the building.” (Merge with B39)

14:30:56 “Alright, I need all … Have EMS right at the staircase outside.” (Merge with B44)

14:31:06 “Command to all units, get out of the building. We have the missing member.”

14:31:16 “Mark, the stairs are clear.”

14:31:19 “41 to Command. We have another member we’re taking out unconscious.”

14:31:24 “10-4, 10-4 41.”

14:31:24 “Command to 41. Who is that member?” (B44)

14:31:25 “We don’t know.”

14:31:30 “41. Command to the 41. When we get this member out, I want everybody out of that building. Everyone out.”

14:31:37 “No, Andy, we’re good. We’re taking the member down the staircase.”

14:31:40 “Alright, good. But he gets out, I want everybody out of the building. You hear me?”

14:31:44 “Alright, 10-4. It’s gonna take some time, he’s on the second floor. We’re at the top of the staircase, coming down.”

14:31:52 “Command to the 41, clear that stairway.”

14:31:55 “It’s clear, we’re gonna take him out.”

14:32:10 “Keep that staircase clear out there.”

14:32:12 “Nozzle to 332, we’re hooked up.”

14:32:15 “They’re bringing him down the stairs now guys.”

14:32:21 “Command…I need the name of the second member we’re bringing out.”

14:32:27 “332 Nozzle, 332. We’re hooked up, ready for water one second.”

14:32:30 “10-4. 332 to 310 Chauffeur, supply our line.”

14:32:42 “We’re coming down the stairs. Clear the stairs in the front of the building in 4. Clear the stairs in the front of the building in 4, he’s coming out.”

14:32:50 “Alright, 41 to Command. We have a member coming out the front door right now.”

14:32:54 “…in 4. I want you to be the last man out. Everybody gets out. Do you understand?”

14:33:00 “Yeah, 10-4. I’m getting everybody together.”

14:33:05 “332, 310 Chauffeur. You can start that line.”

14:33:11 “Command to Rescue.”

14:33:17 “Yeah, we got the Medics in front of the building.”

14:33:25 “Command to Rescue.”

14:33:27 “Rescue, he’s removed. Uh, Rescue Medics got him.”

14:33:32 “Dave, water.”

14:33:43 “Resource to 290.”

14:33:49 “Hey all units, get, uh, prepare for a Roll Call, all units.”

14:33:57 “Rescue Operations to 41.”

14:34:03 “Resource to 290.”

14:34:11 “Resource to 283.”

14:34:31 “Command to the 39.”

14:34:33 “39.” (B44)

14:34:36 “Command to the 41.”

14:34:38 “39, go ahead.” (Merge with B39)

14:34:38 “41, Go.”

14:34:40 “John, I want everybody out of the building now.”

14:34:43 “10-4.”

14:34:44 “Squad to the Command Post, Squad to the Command Post.” (Merge with B39)

14:34:47 “Command, go Squad.”

14:34:53 “Command to the Squad.”

14:35:00 “All units prepare for a Roll Call; all units prepare for a Roll Call. Resource to 290.”

APPENDIX C. FAST GROUP OF OTHER DEPARTMENTS

A comparison of the assets assigned to Rapid Intervention Crews or Teams by other departments shows a significant difference to the FDNY's current FAST assignment.

	Chicago FD	Boston FD	LAFD*	Phoenix FD	FDNY
Truck	1	1	1	1	1
Engine	1	1	1	2	
EMS Chief/Supv	1	1			
Battalion Chief	1	1	1	1	
BLS Ambulance		1			
ALS Ambulance	1	1		1	
ALS Engine	1*				

*High Rise fires only

The following is an excerpt of Communications Manual Chapter 8, Signal 10-66 Response assignment for Missing, Lost, or Seriously Injured Member and Additional Resources Required. Many of the resources required to address a missing, lost or seriously injured member(s) may be delayed due to reflex time while responding to an incident.

10-66 MISSING, LOST, TRAPPED, OR SERIOUSLY INJURED MEMBER, AND ADDITIONAL RESOURCES ARE REQUIRED

Transmission of signal 10-66 will automatically cause the response of the following:

- The next higher full alarm assignment, and response of all of its associated Resources.
- Two Battalion Chiefs in addition to those assigned as part of the extra alarm:
- The first Battalion Chief shall be designated as the FAST Group Supervisor
- The second Battalion Chief shall be designated as the Firefighter Locator Officer

Note: These positions may already be filled by on-scene Chief Officers, in which case the IC may re-designate these additional BCs. Acting Battalion Chiefs shall not be assigned to respond as a FAST Group Supervisor or Firefighter Locator Officer.

- 1 - Rescue Task Force:
- 1 - Rescue Company
- 1 - Collapse Rescue
- 1 - Squad Company with 2nd Piece
- 1 - SOC Support Ladder (When a Collapse Rescue is transported by a SSL, no additional SSL is required)
- 1 - Haz Tac Officer
- 1 - Rescue Paramedic Unit
- 1 - Additional FAST Unit
- 1 - CFR Engine Company (additional, if one was previously assigned, i.e., 10-76 or 10-77)
- 1 - Communications Unit
- Public Information Officer, if not previously assigned

Additional EMS resources assigned on signal 10-66 include:

- EMS Division Chief
- EMS Deputy Chiefs
- EMS Haz-Tac Officer
- EMS BLS Ambulance
- EMS ALS Ambulance
- Response Physician

If the next higher alarm transmitted is a 2nd Alarm, an additional Battalion Chief shall be assigned and designated as the Staging Area Manager and a Staging Area shall be established.

Note: If there are indications that members are missing/lost/trapped/or seriously injured as a result of a collapse, signal 10-60 must also be transmitted in addition to signal 10-66.

COMMAND CONSIDERATIONS

The following is an excerpt from Firefighting Procedures - *Managing Incidents Involving Members in Distress, Chapter 5, section 2*. It demonstrates the need for additional resources at a time when the Incident Commander could become overwhelmed and need to delegate some tasks to manage an incident with greater success.

2.1. The IC or FAST Group Supervisor shall maintain communications with the distressed member, and obtain updates as to their condition and surroundings. Updates should be made anytime there is anything that may affect the rescue, such as if the member's SCBA vibralert activates, air supply is depleted, physical surroundings improving or deteriorating, or the member gathers additional information about their location or the location of others near them.

2.2 The FAST Group: The IC shall assign specific units, including a FAST Unit, Rescue and/or Squad Company, to a group whose sole task shall be searching for and/or removing the missing/lost/trapped/seriously injured member(s). This group shall be designated the FAST Group. Consider using units already in the area or sector where the member(s) is/are reported missing, and immediately provide replacement units for those given this searching assignment. The IC must consider the location, severity and likely spread of the fire when assigning units to the FAST Group. Units directly involved in the extinguishment of the fire should not normally be assigned to this duty, including a Rescue or Squad Company.

2.2.1 It is extremely important to emphasize to other operating units that they must continue to fight the fire when a "Mayday" is transmitted for a distressed member. The abandonment of engine or ladder company operations to assist in a rescue when resources have already been deployed to manage the situation places both the trapped member and the rescuers in severe danger. It is expected that Rescue and Squad Companies on the scene will report to the IC for assignment to the rescue effort. This will require either face-to-face or handie-talkie communication between these units and the IC in order to receive approval, and report any previously assigned tasks that are not yet completed. This will allow the IC to assign units to complete these tasks.

2.2.2 On transmission of the signal 10-66, an additional FAST Unit will be assigned to the incident. Announce to the dispatcher via Department radio the identity of the temporary

FAST Unit pending the arrival of the additional FAST Unit. This newly assigned FAST Unit is responsible for the remainder of the operation, and is not to be assigned to the on-going rescue effort, except at the specific direction of the IC.

2.2.3 The FAST Group should be under the direct supervision of a Chief Officer who has no other duties, designated as the FAST Group Supervisor. Any available chief on the scene may be assigned this position. The FAST Group Supervisor shall coordinate and control all search, rescue, removal and medical treatment of the affected member. The FAST Group Supervisor should be advised of all units under their command. Only units that have been assigned to the FAST Group shall operate in this function. All other units shall maintain their positions and continue their assigned duties, especially fire control functions that may be critical to the ongoing rescue effort. If a Chief Officer is not available initially, a SOC Unit Officer may temporarily be designated the FAST Group Supervisor. If sectors have been established, the immediate Sector Supervisor of the member(s) reported missing is a logical choice for this assignment. Another Chief Officer should replace the Sector Supervisor. If a Sector Supervisor is not used, one of the additional chiefs assigned on the transmission of signal 10-66 shall be used as the FAST Group Supervisor. The FAST Group Supervisor shall report directly to the IC.

2.2.4 The FAST Group Supervisor must recognize that members already operating at an incident for a period of time may have a diminished air supply and need relief sooner than units waiting to be assigned. The IC must ensure that firefighters working in the same unit as the missing/lost/trapped/seriously-injured member don’t overextend themselves. This may hinder the rescue effort and potentially create additional victims. Relief shall be provided if this appears likely, or as additional units become available.

2.2.5 It is imperative that the FAST Group Supervisor maintains control of the rescue area. All members not involved in the actual rescue must remain clear of the area and its access and egress routes.

2.2.6 The FAST Group Supervisor shall report the progress of the search and removal, and provide continual updates on the affected member’s medical status and any medical

treatment being implemented. All requests for specialized equipment and/or relief of FAST Group Units shall be directed to the IC.

2.2.7 Upon arrival, the Rescue Operations Battalion will assume the duties of Firefighter Removal Officer, supervising all extrication efforts. The Firefighter Removal Officer shall work in conjunction with the FAST Group Supervisor.

2.2.8 The IC shall consider having members assigned to the FAST Group operate on a different HT channel from the rest of the operation (Emergency Channel 16). The FAST Group Supervisor, Firefighter Removal Officer, Firefighter Locator Officer and units under their command shall operate on this channel, while designating two members to monitor the Primary Tactical Channel, (Channel 1) and the Command Channel (Channel 2), if established, for any other developing situations or emergency transmissions.

2.3 The IC shall announce on all handie-talkie channels in use that a rescue plan has been implemented, and the identity of the units assigned to the FAST Group. This action will reassure the affected member that assistance is on the way and will also help to discourage freelancing of members not assigned to the FAST Group.

2.4 In addition to the signal 10-66, transmit signal 10-60 or 10-60 Code 1 if there are any indications that members are missing/lost/trapped/seriously injured as a result of a collapse.

2.4.1 Assignments for additional units responding on signal 10-66 will depend on the situation at the particular incident, but should follow the guidelines below:

- Provide relief or replacements for units that are directly affected by the injury or event, and for those on-scene units that have been committed to the rescue efforts, such as the FAST Unit.
- A Battalion Chief shall be designated as the Firefighter Locator Officer, who shall coordinate all efforts to establish the victim's last seen point and assist the Resource Unit Leader (RESL) in conducting a roll call of units. The Firefighter Locator Officer shall also coordinate with the Medical Branch Director or Medical Group Supervisor as to the descriptions, identity, and location of all members who have been removed from the scene by EMS or other resources. Most of the time, one of the Chiefs already on-scene will be designated as the Firefighter Locator Officer, with their prior assignment designated to one of the additional Chiefs. If no

on-scene Chiefs are available for this assignment, one of the additional Chiefs shall immediately be assigned this duty.

APPENDIX D. UL RESEARCH INSTITUTES FIRE DYNAMICS SIMULATOR ANALYSIS

Fire Dynamics Simulator Analysis of The April 24, 2022 Fire at 10824 Avenue N, Brooklyn, New York

Jason Floyd
Daniel Madrzykowski

Fire Safety Research Institute
UL Research Institutes
Columbia, MD 21045

April 19, 2023

Abstract

At the request of the Fire Department City of New York (FDNY), UL's Fire Safety Research Institute (FSRI) developed three different computer simulations to examine the fire which occurred on April 24, 2022, in the duplex at 10824/10826 Avenue N, Brooklyn, NY. The simulations, or models, were created using the Fire Dynamics Simulator (FDS).

The simulations focused on the fire conditions in 10824 Avenue N. The three simulations were: 1) a timeline based on the wind conditions and events as they occurred on April 24th, 2) a timeline assuming there was no wind that day, and 3) a timeline assuming that the upwind intake vents were controlled

Each simulation used the same geometry model which consisted of a detailed model of the duplex plus a notional model of surrounding structures (to support development of the wind field). The 10824 half of the duplex was defined with surface boundary conditions representing the materials of construction and fuel loads present in the basement and on the first floor. While fuels were present on the second floor, fire spread to the second floor did not occur until after untenable conditions for firefighters developed.

The simulation of the fire, flow path conditions and wind provide insight into the rapid fire spread in the actual fire event. The other simulations demonstrate how the lack of wind or the use of flow path control would have slowed the speed of the fire spread through the structure.

3 Computer Model Development

A computer model of the Avenue N fire was created using the Fire Dynamics Simulator (FDS). This model was used to investigate the fire conditions during the event. Three versions of the model were run: the actual event, a version of the event with no wind, and a version of the event with no upwind ventilation openings in Exposure #4 Building.

3.1.1. Fire Dynamics Simulator

The Fire Dynamics Simulator (FDS) is a computational fluid dynamics (CFD) model developed by a multi-national team led by the National Institute of Standards and Technology (NIST). FDS was created to model fires in the built environment. FDS has a companion tool called Smokeview. Smokeview is software that visualizes and animates FDS results.

3.1.2. Model Inputs

3.2.1 Geometric Domain

The geometric domain is the volume in which the CFD calculation takes place. This domain should satisfy two requirements.

First, the domain should be large enough to encompass the fire being modeled and the region in which predictions of fire effects are needed. In this case, since fire effects predictions are desired throughout Exposure #4 Building, the domain must be large enough to include all of Exposure #4 Building.

Second, the domain should be large enough such that effects at boundaries do not overly impact the calculation inside the domain. In this event, high winds existed during the fire. Exposure #4 Building is in the interior of a neighborhood; therefore, upwind and downwind structures will have an effect on the development of the wind field which will have an effect on the wind pressure loading on Exposure #4 Building. The domain should be large enough to encompass surrounding structures. Figure 15 shows a view of the overall FDS domain, and Figure 16 shows a close up view of Exposure #4 Building. The overall FDS domain measured 288 ft × 372 ft × 90 ft. The domain was divided into 63 subdivisions (in FDS parallel computation is done by dividing the domain into subdivision) with grid sizes ranging from 4 in. near Exposures #2 and #4 to 3 ft at the edges of the domain. A total of 9.1 million grid cells were used.

The exterior boundaries at the sides and top of the domain were set as open boundaries. In FDS an open boundary allows for inflow or outflow and outside the boundary is assumed to be air at ambient conditions. A wind from due East was specified at 23 mph. In the left side of Figure 15 it can be seen that the domain is rotated to line up with the structures and a due West wind in the FDS domain is a wind from 135° where North is 0° and East is 90°. The resulting wind field is shown in Figure 17. The figure demonstrates the importance of including a portion of the neighborhood in the model as the impact of other buildings on the wind field can be clearly seen.

The wind speed determines the relative pressure seen on different sides of the building. The windward corner of the Fire Building sees the full 23 mph wind pressure whereas the leeward corner of Exposure #4 Building sees the negative pressure of the 8 to 10 mph wind flowing away from the house.

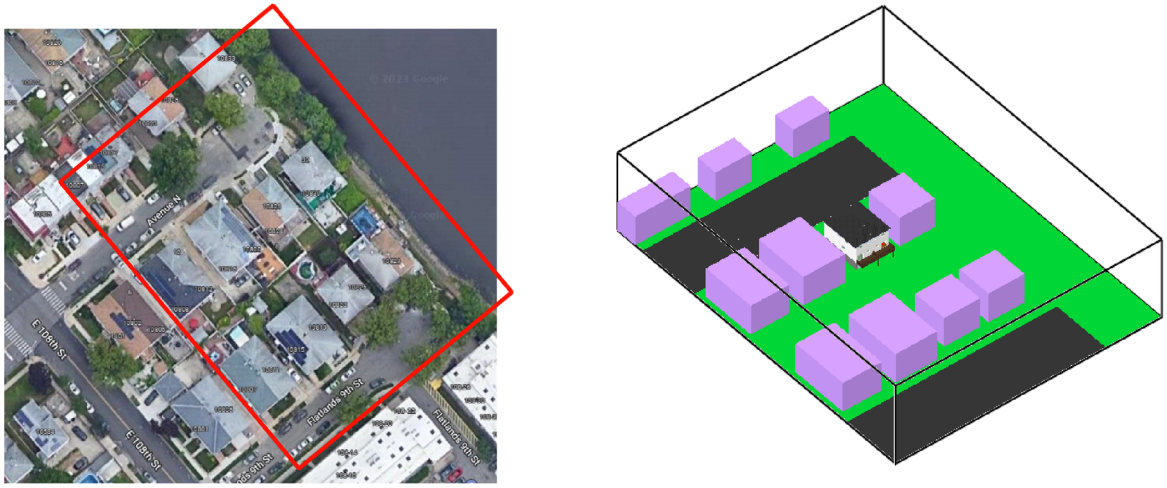
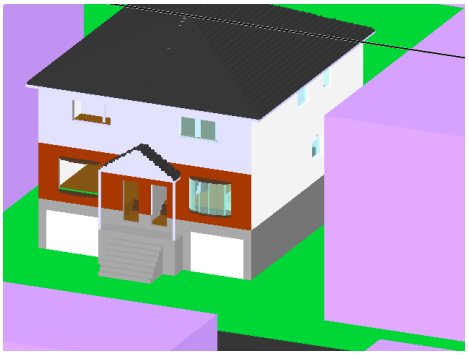
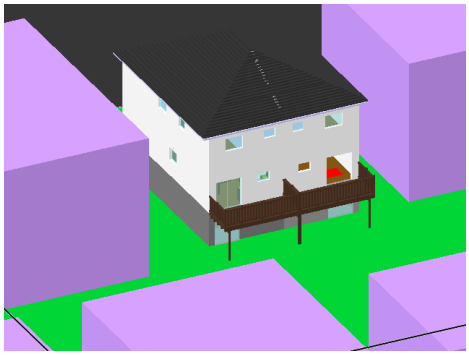


Figure 15: View of computational domain. Left – Aerial view with domain outlined (Imagery ©2023 Bluesky, Maxar Technologies, Map data ©2023 Google). Right -Smokeview rendering of domain.





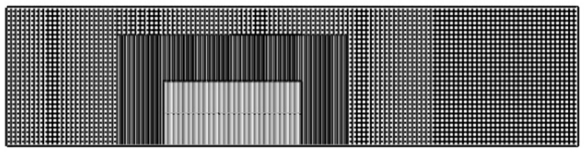


Figure 16: Additional views of computational domain. Top Left – Street view photo (Image capture June 2018 ©2023 Google). Top Right -Smokeview rendering looking at front corner of Exposure #4 Building. Bottom Left – Smokeview rendering looking at rear corner of Exposure #4 Building. Bottom Right – View of computational grids through the demising wall with buildings removed.

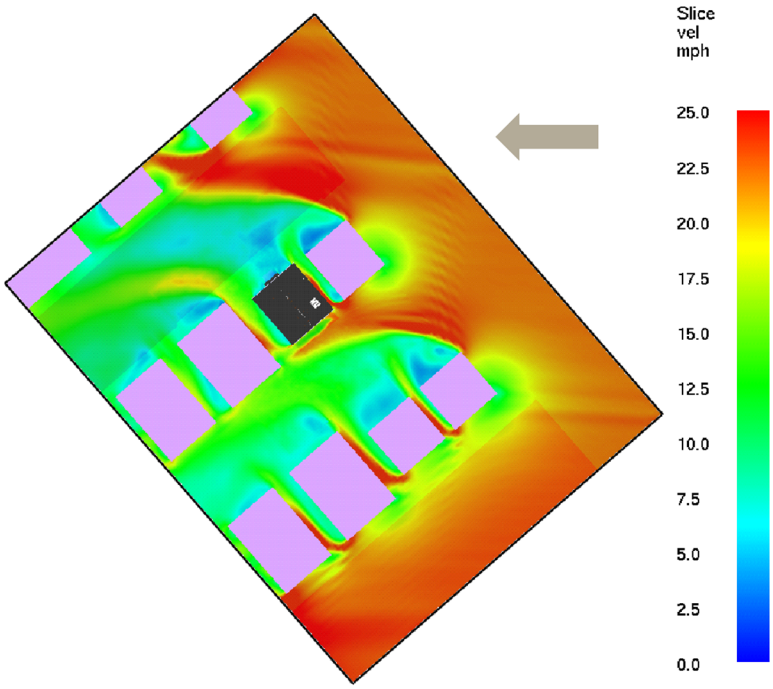


Figure 17: Wind field imposed in the FDS input file; velocities taken at 6 ft above the first floor.

3.2.2. Fire Building and Exposure #4 Building

Figure 18 shows views of the interior of the Fire Building and Exposure #4 Building with rooms and other items labeled for Exposure #4 Building. As discussed in more detail in Section 3.2.4, no fire was modeled in the Fire Building as that fire had been brought under control during the time of interest for the rapid fire growth that occurred in Exposure #4 Building. Red surfaces in Exposure #4 Building represent locations with predefined fires. The fuel loads represented are discussed in Section 3.2.3. The various surfaces seen in the models were defined as one or more layers of various materials. The materials used in the model are steel, wood, cardboard, fiberglass, glass, roofing shingle, cotton, gypsum, polyurethane foam, cinderblock, and a ground material. The carboard, cotton, and foam materials were defined with pyrolysis reactions so they could be ignited and burn during the simulation. The wood material had two variants: with and without a pyrolysis reaction. Per the discussion on fuel loads in Section 3.2.3. the non-pyrolysis version was used in the Fire Building, in the attic space, and on the second floor of Exposure #4 Building.

The following surfaces were defined in the model:

- Ground surface – this surface using typical concrete properties was used for the ground and street surfaces.
- Inert building – this fixed temperature (ambient) surface was used for other structures in the neighborhood where it was not necessary to compute heat transfer.

- Appliance and ducting – a 2 mm steel surface used for kitchen appliances, the washer, the dryer, and the base HVAC ducting and air handler.
- Counter – a 1/2 in. surface using the ground material used for the kitchen counters.
- Stairs – a 3/4 in. wood surface used for the stair steps.
- Third floor ceiling – a surface consisting of 5/8 in. of gypsum used for the ceiling between the second floor and the attic space.
- Second floor and garage ceiling – a surface consisting of 5/8 in. of gypsum, an 8 in. air gap, and 3/4 in. of wood used for the ceiling between the first and second floor.
- Basement ceiling – a surface consisting of 3/4 in. of wood used for the ceiling between the basement and the first floor.
- CMU – an 8 in. thick layer of CMU block used for the demising wall in the attic space.
- CMU basement exterior – a 1/4 in. layer of wood over an 8 in. layer of CMU block used for the exterior walls of the basement.
- Garage wall interior – a 1/4 in. layer of wood with a small air gap to wall assembly consisting of two 5/8 in. layers of gypsum with a 3.5 in. air gap.
- Basement stair wall - a 1/4 in. layer of wood with a small air gap to an 8 in. layer of CMU block used for the basement stair wall between units.
- Boxed commodity – a 2 mm layer of cardboard around a 1 ft layer of cotton used to represent boxed items in the basement and garage.
- Front wall – a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 3 in. layer of CMU used for the bricked portion of the front wall.
- Exterior door – a 1 in. layer of wood used for the front exterior door
- Interior door – a 1/2 in layer of wood (interior doors approximated as the combination of two 1/4 in. layers of wood)
- Shingled wall – a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 2 cm layer of wood used for the upper front wall with shingles.
- Siding wall no wood – a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 1/4 in. layer of wood used for exterior walls with siding (the siding thickness was not included).
- Siding wall with wood – a 1/4 in. layer of wood, a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 1/4 in. layer of wood used for exterior walls with siding (the siding thickness was not included) where the interior finished surface was wood paneling (Exposure #4 Building dining room and living area shared wall).
- Interior wall – a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 5/8 in. layer of gypsum used for interior walls.
- Interior wall with wood – a 1/4 in. layer of wood, a 5/8 in. layer of gypsum, a 3 in. layer of fiberglass, and a 5/8 in. layer of gypsum used for interior wall between the Exposure #4 Building dining area and the kitchen.
- Lumber – a 1.5 in. layer of wood used for exposed joists, the deck, and other exposed wood structure in the basement.
- Roof – a 3/4-inch layer of wood topped with 1 cm of shingle material used for the roof.
- Window – two 3 mm layers of glass with a 3 mm air gap.
- Wood single – a 3/4 layer of wood used for wooden furniture components, built-ins, and other miscellaneous wood items.

- Foam cushion – a 4 in. layer of polyurethane foam used for upholstered furniture.

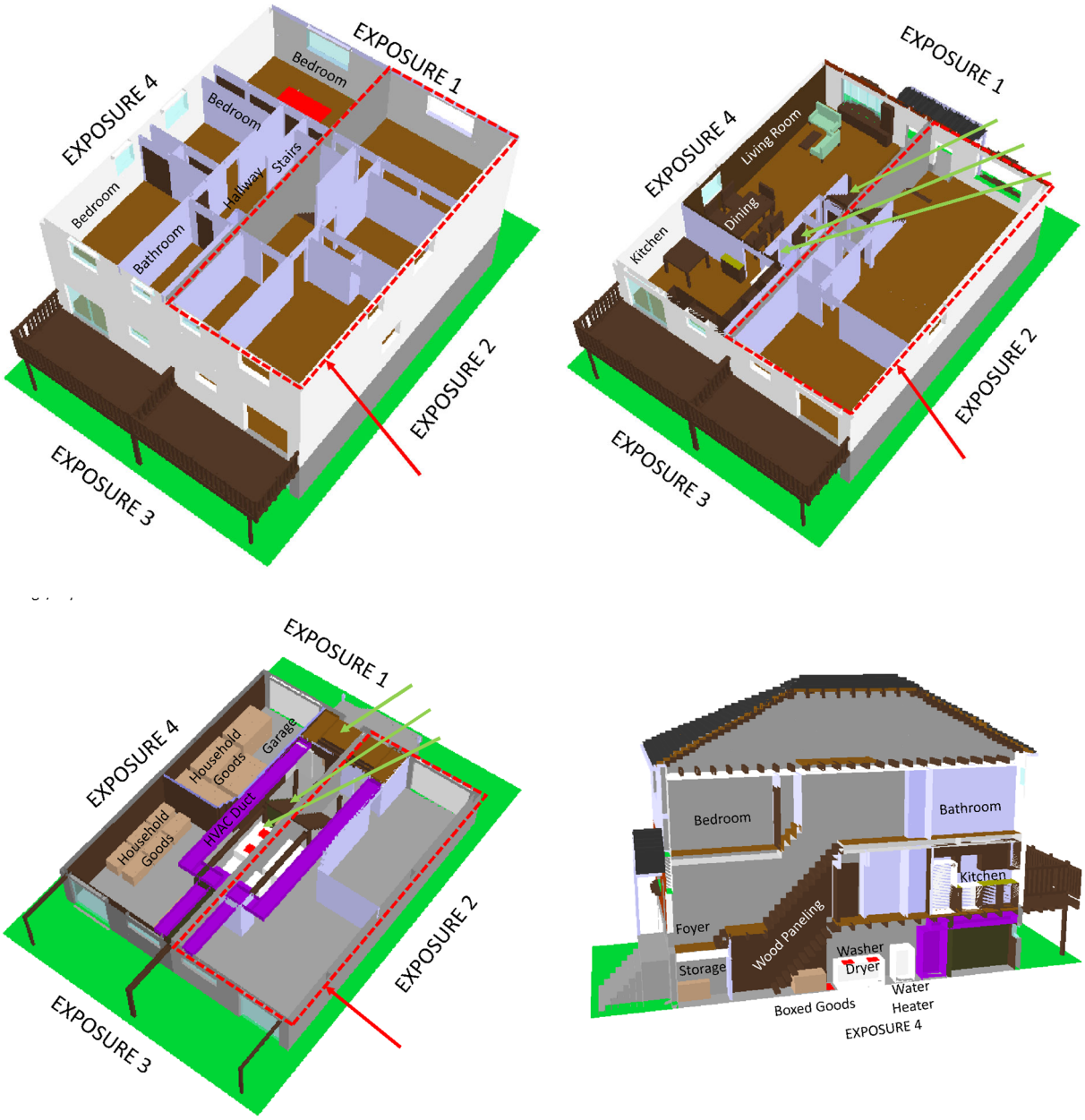


Figure 18: Interior isometric views of Fire Building and Exposure #4 Building. Top Left – second floor, Top Right first floor. Bottom right – basement. Bottom left – Exposure #4 Building clipped to edge of staircase.

The Fire Building was modeled with no fires. All the interior doors were opened in the model, and all the exterior doors and windows were opened in the model. This reflects the state of the structure as search was occurring in Exposure #4 Building where the windows and sliding glass doors had failed and interior doors were fully or partially consumed by the fire.

Exposure #4 Building was modeled with the front door and the middle upper bedroom door initially open. All other doors and windows were closed at the start of simulation and opened according to the timeline in Section 3.2.4.

3.2.3. Fuel Loads

Fuel loads for fire growth and spread were only modeled in the basement and on the first floor of Exposure #4 Building. While combustible materials did exist on the second floor and in the attic, those fuel loads did not play a role in driving the rapid fire growth out of the basement. On the second floor, the only pre-mayday report of fire was in the front bedroom which was suppressed prior to the period of rapid fire growth. Ignition of materials on the second floor outside of the front bedroom was therefore beyond the time of interest for this modeling effort. Fire moved from the Fire Building to Exposure #4 Building through the attic space, and there was burning occurring in the attic space during the time of interest. However, there are no reports that the second floor ceiling was penetrated by any fire in the attic prior to the period of rapid fire growth. The role the attic fire played was as a source of embers or debris falling through the void space and starting fires in the basement.

Fuel loads for the basement and first floor were based upon the post-fire photographs. Since the predominant fuels in Exposure #4 Building during the period of rapid growth were cellulosic materials, a combustion reaction representing cellulosic materials was defined. The reaction was $C_1H_{1.7}O_{0.8}$ (representative of a cellulose chain normalized to one carbon atom) with a 15 MJ/kg heat of combustion, a soot yield of 0.015 kg soot/kg of fuel and a CO yield of 0.005 kg CO/per kg of fuel.

Fuel loads in the basement were defined such that:

- The exposed wooden joists were given the lumber surface type with pyrolysis properties.
- The walls in the basement room with the slider were lined with 1/4 in. of wood paneling with pyrolysis properties.
- The staircase wall, the wall to the storage area, and the hallway wall between the stairwell and the garage was lined with 1/4 in. of wood paneling with pyrolysis properties.
- The open tread stairs and supporting structure were modeled as wood with pyrolysis properties.
- A box of commodity (the boxed commodity surface type with pyrolysis properties) was placed below the stairs near the washing machine.
- Boxes of commodity (the boxed commodity surface type with pyrolysis properties) were placed stacked in the garage and on the floor in the basement room with the slider.

- Predefined fires representing material on shelving above or items on top of the washer and dryer ignited by embers / debris falling down the open shaft were placed on top of the washer and dryer. Each was a 90 kW fire. These are the red squares seen in the lower left image of Figure 18.
- Predefined fire representing the first ignition of items stored below the stairs by embers / debris falling down the open shaft or by embers / debris from the fires started on or over the washer and dryer. This fire was 140 kW and was located on the floor between the washing machine and the items stored below the basement stairs. This fire is the red rectangle visible in the lower right image of Figure 18.

Fuel loads on the first floor consisted of:

- The wood floor was defined using the basement ceiling surface with pyrolysis properties on the top surface.
- Two pieces of upholstered furniture in the living room. The seat back, seat, and arm was defined using the foam surface with pyrolysis properties and the legs defined using the wood single surface with pyrolysis properties.
- The wall between the dining room and the kitchen and the wall shared between the dining room and living room was lined with 1/4 wood with pyrolysis properties.
- The doors to the basement stair, half bathroom, and coat closet were defined with the interior door surface with pyrolysis properties.
- A coffee table in the living room, dining table with six chairs in the dining room, and built in storage at the bay window were modeled with the wood single surface with pyrolysis properties.
- The kitchen cabinets were modeled with the wood single surface with pyrolysis properties.

While no materials were defined with pyrolysis properties on the second floor, a predefined fire was placed in the front bedroom. This fire peaked at 1.5 MW and was decayed towards zero once suppression started in the bedroom.

3.2.4. Model Timeline

Key events in the model are summarized in Table 1 below. All events relate to Exposure #4 Building. Events with a * in the Clock Time column do not result in a change to the FDS model but are there for information.

Table 1: Key events in the FDS model

FDS Time (s)	Clock Time (hh:mm:ss)	Event
-30	13:34:00	Simulations starts with front door open and wind
0	14:04:00	Open kitchen slider
60	14:05:00	Open basement slider, start fire in front bedroom
190	14:07:10	Front bedroom window fails
185	14:07:05	Start fires on washer and dryer
215	14:07:35	Basement stair door opened (report of burning debris)
238	14:07:58	Start fire under stairs
240	14:08:00	Interior door to garage opened
260	14:08:20	Open door to front bedroom and start suppression
268	14:08:28*	Report of glow in basement
300	14:09:00	Basement stair door closed
320	14:09:20*	Report of possible fire in basement
336	14:09:36	Dining window vented
362	14:10:02	Basement door opened (report of heavy fire coming up stairs)
426	14:10:22	Fire seen venting from dining window
435	14:11:06	Bay window opened (fails open). Close second floor bathroom and rear bedroom door.
444	14:11:15*	Mayday called on second floor
480	14:12:00	Simulation ends

3.2.5. Alternate Models

Two alternate models were created to assess the impact of wind and flow path control on the event.

The first alternate model was a no wind model. In this model, all the events from Section 3.2.4 were included except for the breaking of the bay window. The purpose of this model was to investigate the impact on fire growth if there was no external wind causing additional interior flow from the rear to the front of the structure.

The second alternate model was a flow path control model. This model maintained the wind but assumed that the kitchen and basement sliders were not left open during search. As with the no wind model, all the events from Section 3.2.4 were included except for the breaking of the bay window. The purpose of this model was to assess the impact on fire growth of limiting the flow path through the structure to only that provided by leakage.

Table 2 and Table 3 contain changes to events for the alternate models. In both cases the total simulation time was extended to 960 s from 480 s.

Table 2: Changed events in the no wind FDS model

FDS Time (s)	Clock Time (hh:mm:ss)	Event
-30	13:34:00	Simulations starts with front door open and no wind
435	14:11:06	Bay window remains closed. Close second floor bathroom and rear bedroom door.
960	15:32:00	Simulation ends

Table 3: Changed events in the flow path control FDS model

FDS Time (s)	Clock Time (hh:mm:ss)	Event
0	14:04:00	Kitchen slider remains closed
60	14:05:00	Basement slider remains closed, start fire in front bedroom
435	14:11:06	Bay window remains closed. Close second floor bathroom and rear bedroom door.
960	15:32:00	Simulation ends

4. Simulation Results

4.1.Heat Release Rate

Figure 19 shows the FDS predicted heat release rates for each of the three scenarios. These are the heat release rate values in excess of the prescribed fires. All three scenarios show spikes above the prescribed fire size when the front bedroom window fails and when the front bedroom door is opened for suppression. This is a result of increased mixing due the new flow path enabling more rapid combustion and combustion of any accumulated unburned fuel. Shortly after fires start in the basement there is a sustained increase in heat release rate above the prescribed fires of 200 to 300 kW in all scenarios. There is some spreading of the fire in the basement, but it is not experiencing sustained, rapid growth.

In the actual scenario, just before the dining window is vented, the fire in the basement briefly spikes up to 1.6 MW indicating that in this scenario the conditions in the basement are ripe for rapid growth. After the window is vented, the fire grows to 5 MW over the next half a minute. Venting the window created a drop in pressure on the first floor allowing for more leakage flow through the basement door. An increase in 5 MW would only require a few hundred cubic feet per minute (CFM) more airflow in through the basement sliding glass door. This rapid growth would act to increase pressure in the basement compared to the first floor. If the basement door had not been securely latched this pressure or with the addition of pressure from a wind gust could have pushed open the door. Once the basement door is open, a wind driven flow path exists from the basement slider, up the stairs to the first floor and then out the first floor dining window and front door. The flow path continued up into the second floor and out the front bedroom window. As a result of the additional oxygen supply plus wind driven flame spread, the fire in the basement stairs undergoes rapid intensification. At the time of the bay window failure and mayday call, the fire size is ranging between 40 and 60 MW.

In the no wind scenario, the fire in the basement sees brief periods of modest growth followed by decay. The fire never exceeds 1 MW in size. While there is significant uncertainty in predicting fire spread with FDS, these results indicate that wind was a significant factor in the events that day.

In the flow path control scenario, results are similar to the no wind scenario. Near 600 s, the fire in the basement does undergo a period of rapid growth bringing the fire size up to 4 MW before decaying back down. A 4 MW fire requires only a couple of hundred CFM of air to be sustained. This is not an unreasonable amount of air to be forced in under the pressure of sustained 20+ mph winds, given the building's age and construction. The spike in fire size, while large, is only 10 % of the peak for the actual scenario. This again indicates that wind was a primary factor in the events of the day; however, maintaining control of the upwind flow paths would have reduced fire growth and provided a significant increase in safety for firefighters performing search and suppression activities inside the home.

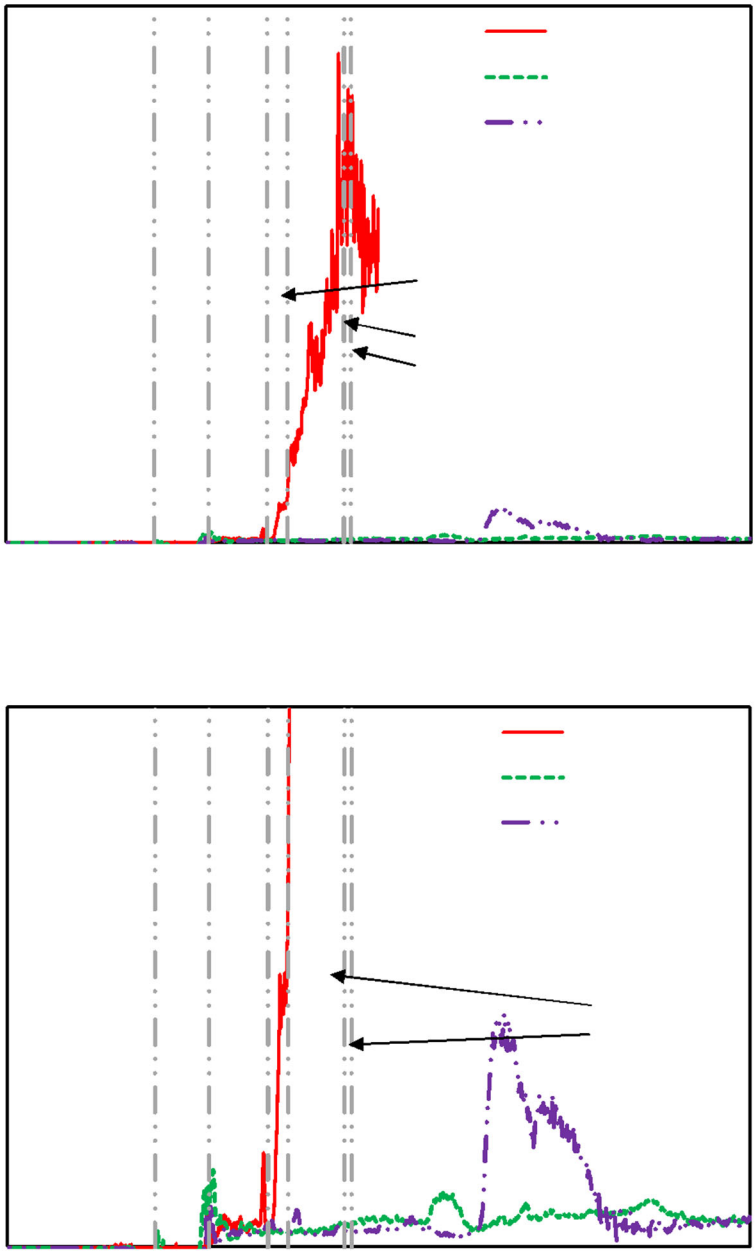


Figure 19: Heat release rates of the three FDS models. Top – full view of all scenarios. Bottom – zoomed view to visualize peak HRR for no wind and flow path control scenarios.

4.2. Actual Event Timeline

4.2.1. Basement Conditions

Figure 20 through Figure 23 show temperature and velocity at 6 ft above the floor of the basement as the dining window is being vented (14:09:36), as the basement stair door opens (14:10:02), as fire is seen venting out the dining window (14:10:22), and as the mayday is being called (14:11:15).

As the dining window is being vented conditions in the basement are not very severe (Figure 20). Heat is rising up the stairwell and venting into the first floor via the unlatched basement door. Temperatures in the garage and in the back room of the basement are below 300 °F. At those temperatures little to no thermal damage would be expected. The flow field shows a significant amount of air is entering the basement from the open slider. Wind is impinging at an angle (at the upper right corner of the Fire Building), and this can be seen as the flow entering the basement is pushed towards the downwind walls.

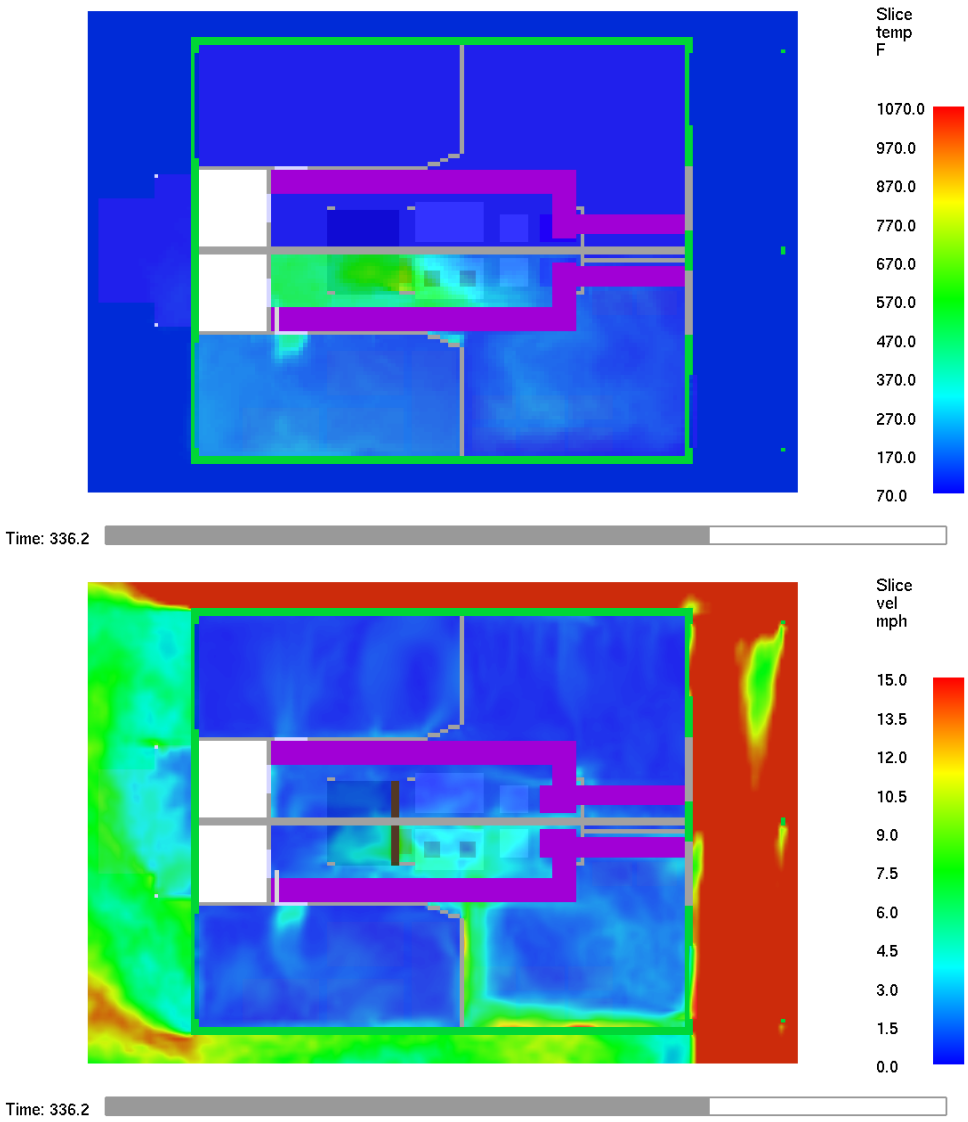


Figure 20: Temperature (top) and velocity (bottom) at 6 ft above the basement floor at 14:09:36 (as the dining window is being vented).

After the dining window is vented, the fire starts growing. As the basement door opens shows that the stairwell is filling with hot gasses in excess of 1000 °F (Figure 21). Temperatures in the garage are reaching 300 to 330 °F along the back wall of the garage. At these temperatures, softening of plastics would be expected but not active combustion. The front half of the back room is reaching temperatures of 400 to 525 °F at 6 ft. These temperatures are in the range where pyrolysis of wood begins to occur in earnest. Temperatures at the ceiling will be hotter than at 6 ft. This is consistent with the observations of charred joists. Velocities entering the basement show a similar pattern to

the prior image. Higher velocities are seen in the stairwell reflecting the increased flow up the stairs resulting from opening door.

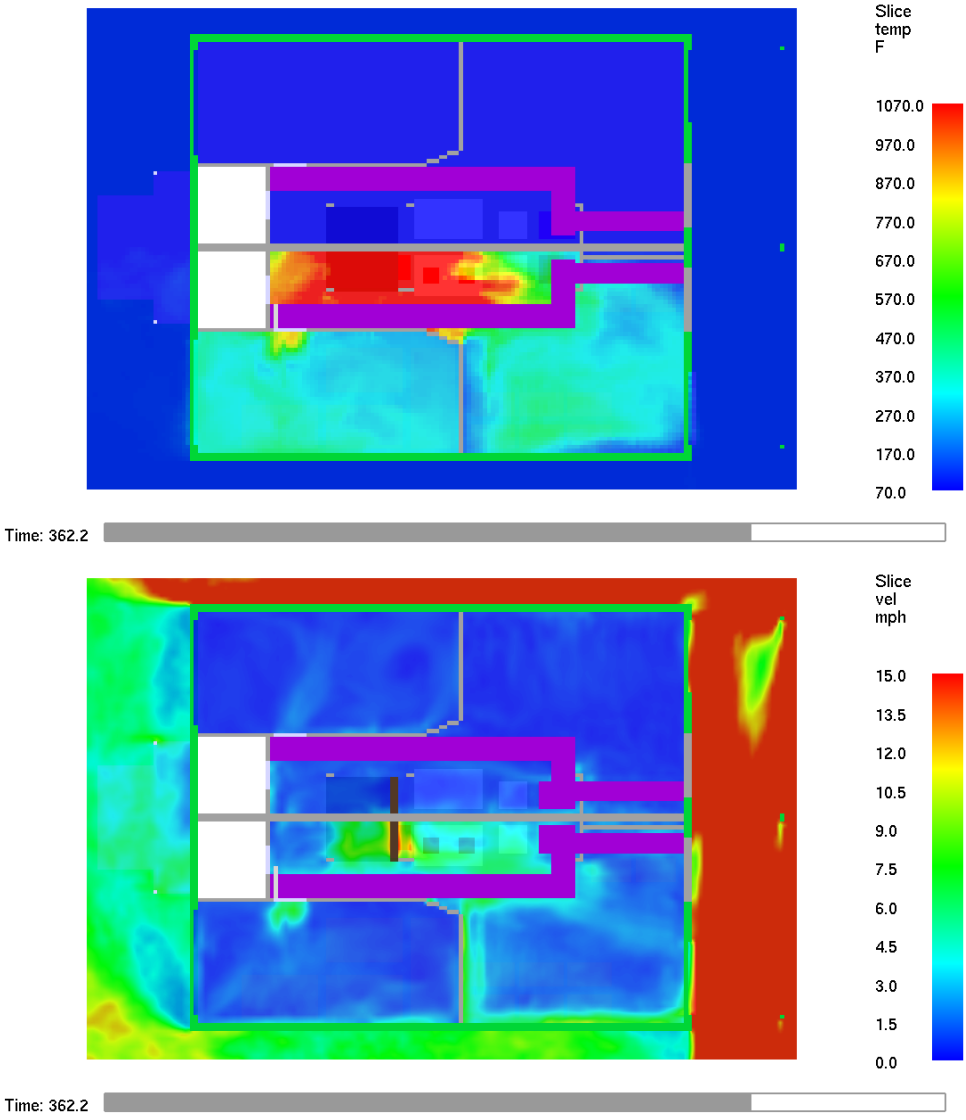


Figure 21: Temperature (top) and velocity (bottom) at 6 ft above the basement floor at 14:10:22 (as the basement stair door opens).

As the basement fire continues its rapid growth through the mayday call conditions in the basement do not significantly change (Figure 22 and Figure 23). The garage temperatures increase slightly; however, most of the heat is venting upwards into the first floor with the basement temperatures being moderated by cool air flowing in through the slider.

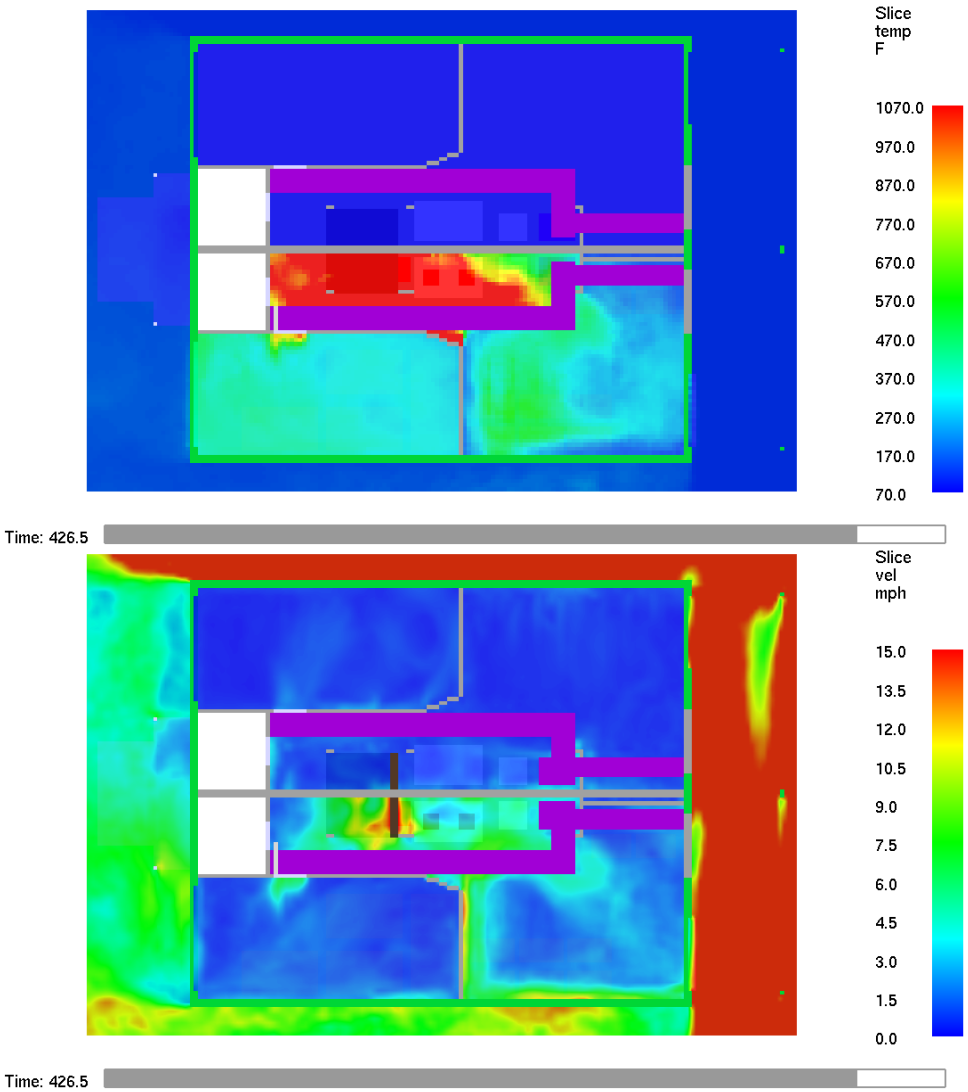


Figure 22: Temperature (top) and velocity (bottom) at 6 ft above the basement floor at 14:10:22 (as fire was seen venting from the dining window).

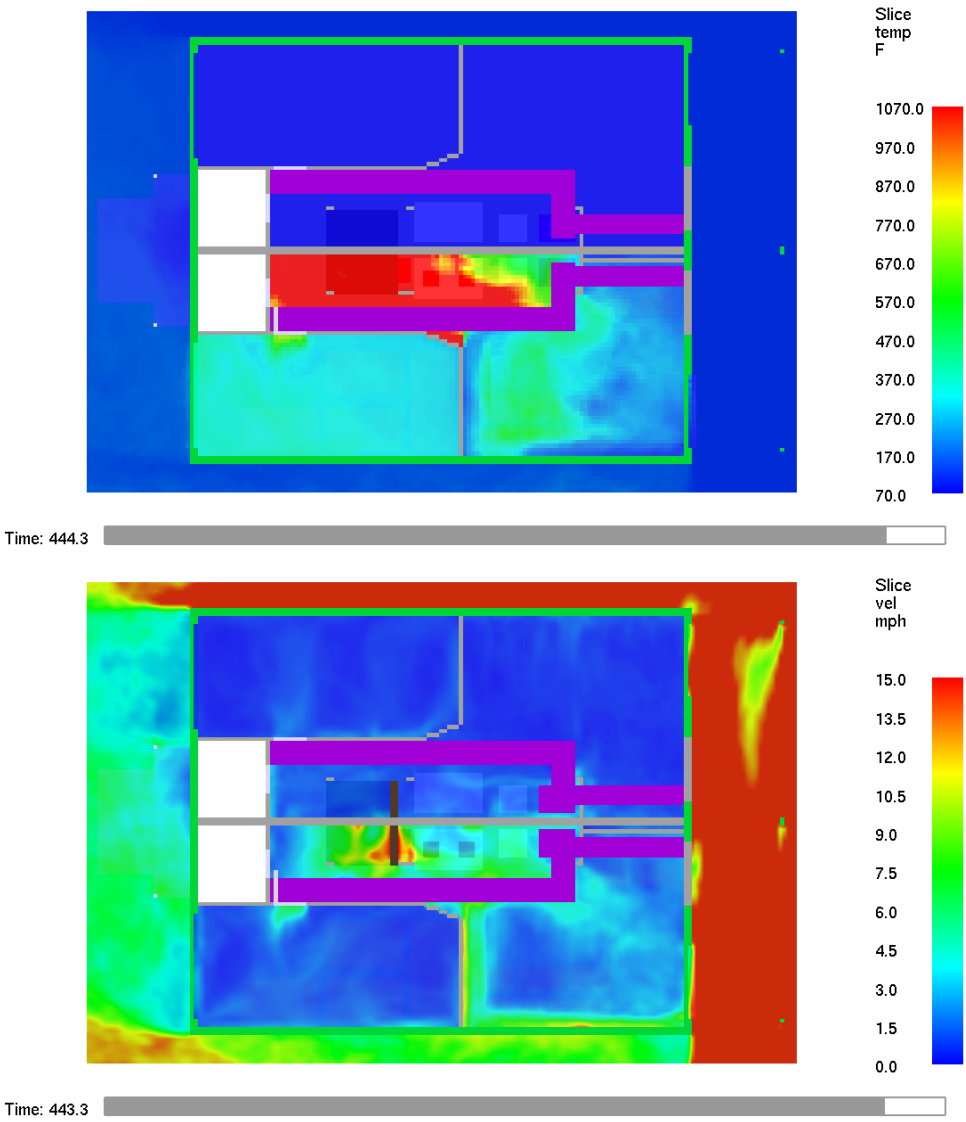


Figure 23: Temperature (top) and velocity (bottom) at 6 ft above the basement floor at 14:11:15 (as the mayday is called).

4.2.2. First Floor Conditions

Figure 24 through Figure 27 show temperature and velocity at 6 ft above the first floor as the dining window is being vented, as the basement stair door opens, as fire is seen venting out the dining window, and as the mayday is being called.

At the time the dining window is being vented, temperatures are over 500 °F in the landing for the staircase and in the half bathroom. Heat venting up from the basement is trapped by the archway leading from the dining area to the stairs. While some heat is spilling into the first floor, temperatures in most of the first floor are below 200 °F. A similar flow field is seen in the kitchen

with air moving along the downwind walls and then through the archway into the dining area. At this point conditions in the kitchen are still at ambient.

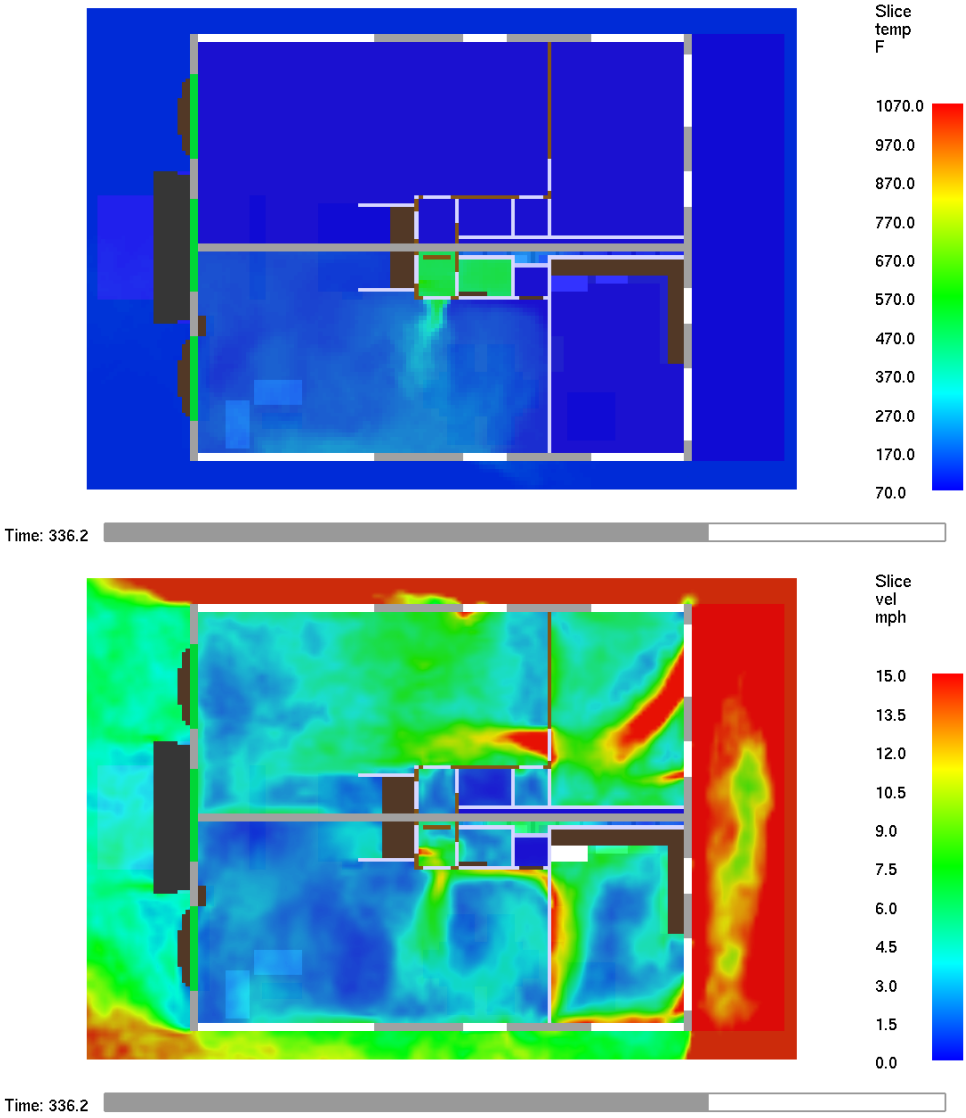


Figure 24: Temperature (top) and velocity (bottom) at 6 ft above the first floor at 14:09:36 (as the dining window is being vented).

As the fire grows post venting of the dining window, high temperature outflow increases into the first floor. As the door is opened to the basement, there is a region of the first floor with temperatures in excess of 1000 °F with the entire floor (except for the kitchen) reaching temperature over 500 °F at 6 ft. The velocity image shows the large increase in outflow as the fire begins its period of rapid growth. Kitchen flows are similar, however, there is now an increase in

the recirculating flow in the kitchen as the increased pressure on the dining side from the basement fire acts to limit flow in from the kitchen. Kitchen conditions are still near ambient but some flow into the kitchen is beginning to occur. Flows of 6 to 9 mph are seen in the stairs to the second floor.

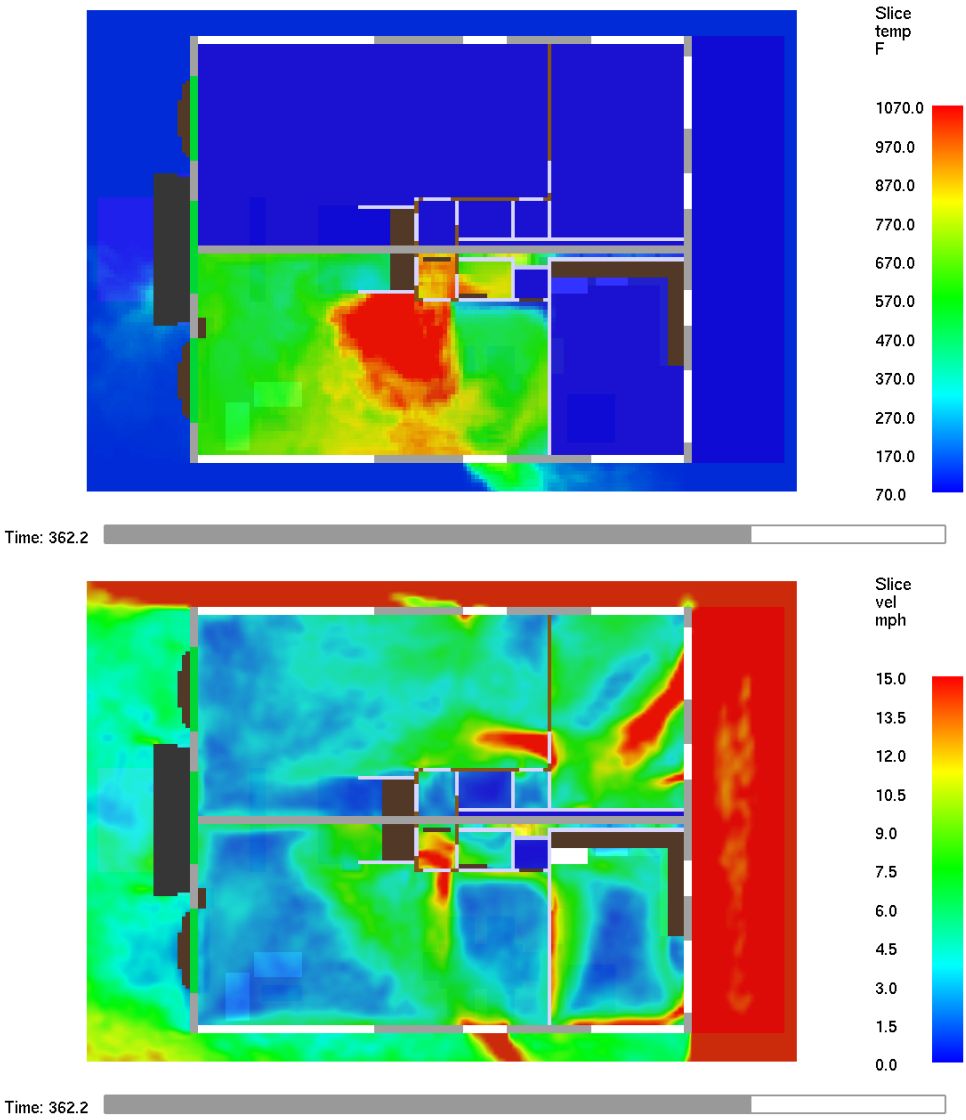


Figure 25: Temperature (top) and velocity (bottom) at 6 ft above the first floor at 14:10:02 (as the basement stair door opens).

One minute later, the entire first floor outside of the kitchen is seeing temperature over 1000 °F with 1000 °F outflow from the front door and dining window (Figure 26). These temperatures are hot enough to support ignition of any unburned fuel leaving the structure and ignition of many materials in the first floor. Flows up into the second floor now exceed 15 mph, and a strong jet

stretches from the basement doors to the dining window. Once the bay window breaks, strong outflow of high temperature gas occurs in the bay window (Figure 27). During this time conditions at the kitchen archway are over 400 °F with 200 °F temperatures near the refrigerator and freezer. The remainder of the kitchen is below 100 °F. This region of high temperature at the archway is consistent with the damage.

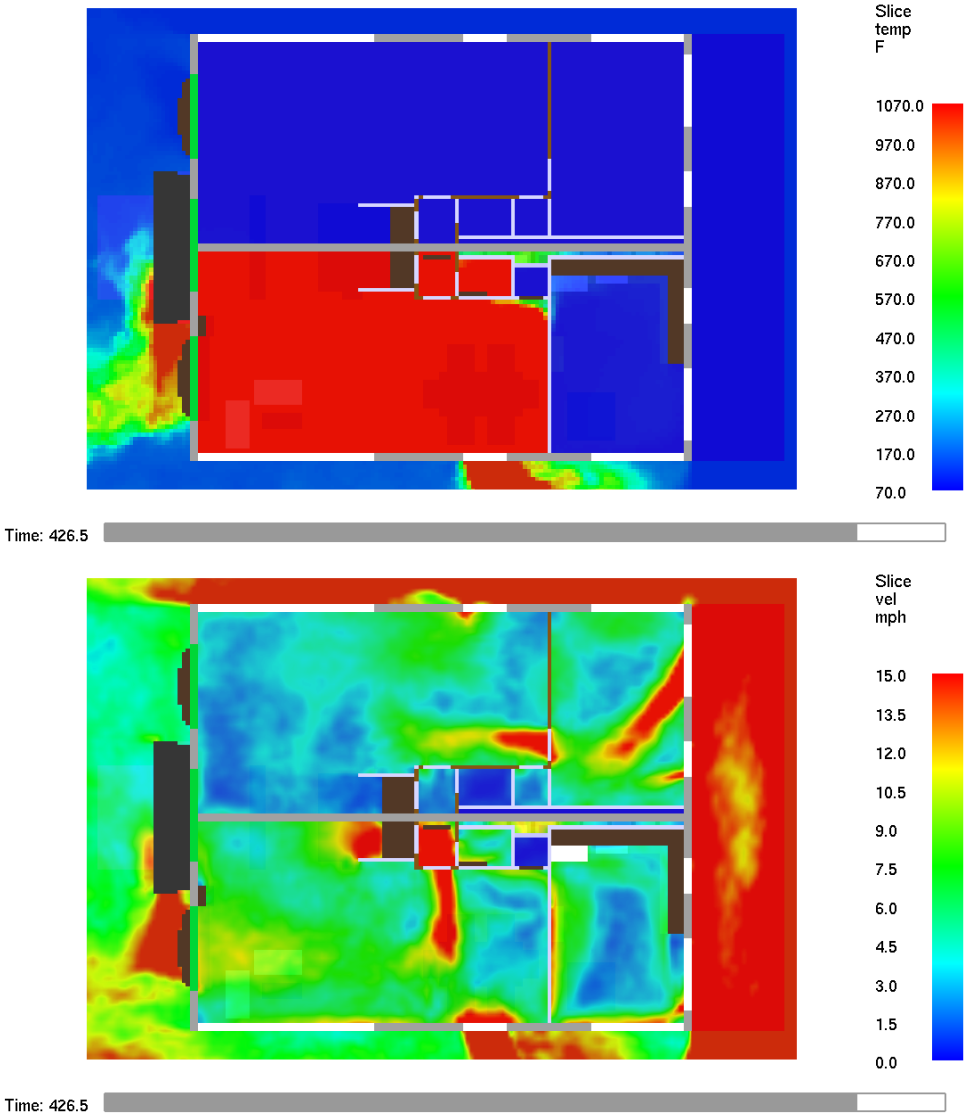


Figure 26: Temperature (top) and velocity (bottom) at 6 ft above the first floor at 14:10:22 (as fire was seen venting from the dining window).

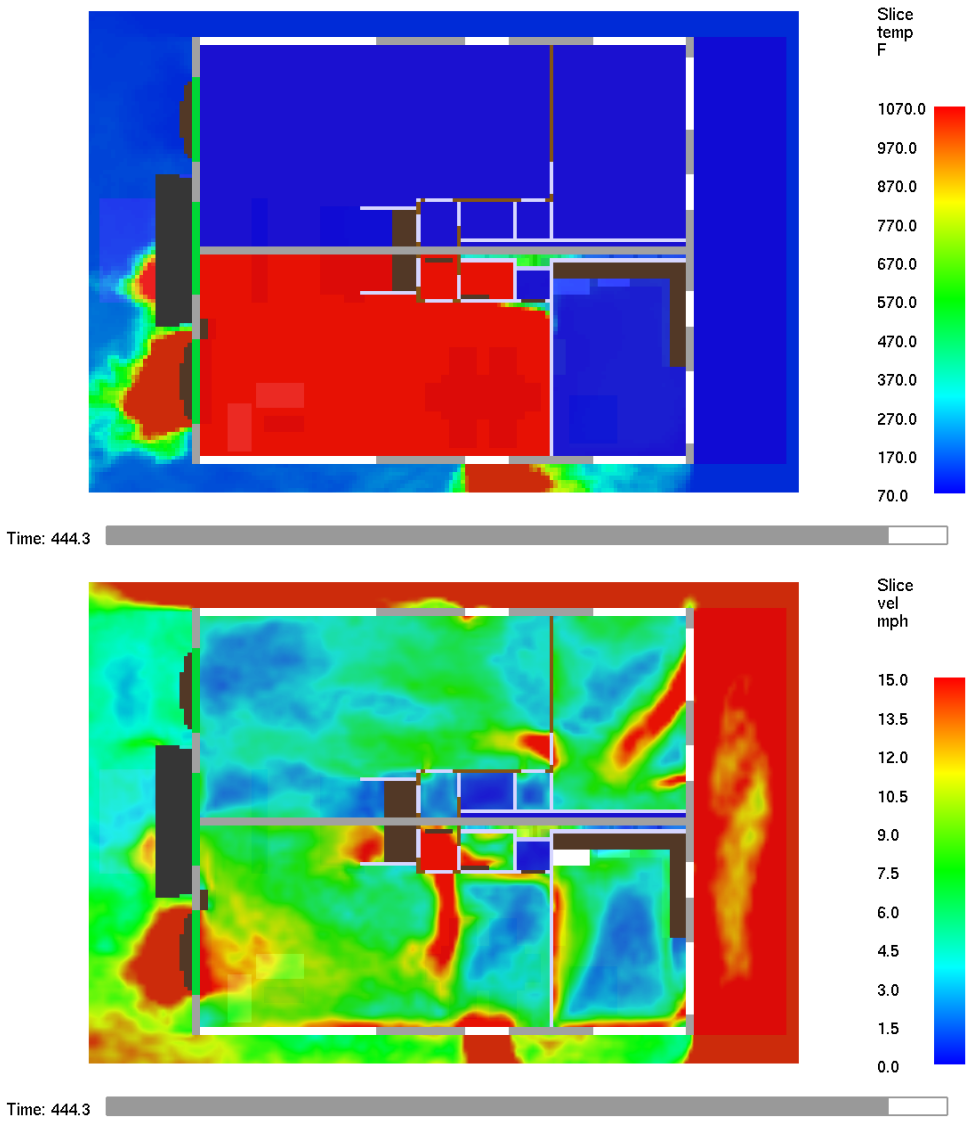


Figure 27: Temperature (top) and velocity (bottom) at 6 ft above the first floor at 14:11:15 (as the mayday is called).

4.2.3. Second Floor Conditions

Figure 28 through Figure 32 show temperature and velocity at 6 ft above the first floor as the front bedroom is entered for suppression, as the dining window is being vented, as the basement stair door opens, as fire is seen venting out the dining window, and as the mayday is being called.

As the door is opened to fight the fire in the front bedroom, the front bedroom shows post-flashover temperatures with the remainder of the second floor at ambient (Figure 28). The velocity image shows only slight flows on the second floor, largely a result of leakage from the rear to the front

due to the pressure loading of the wind. Up flow can be seen in the void space leading from the basement.

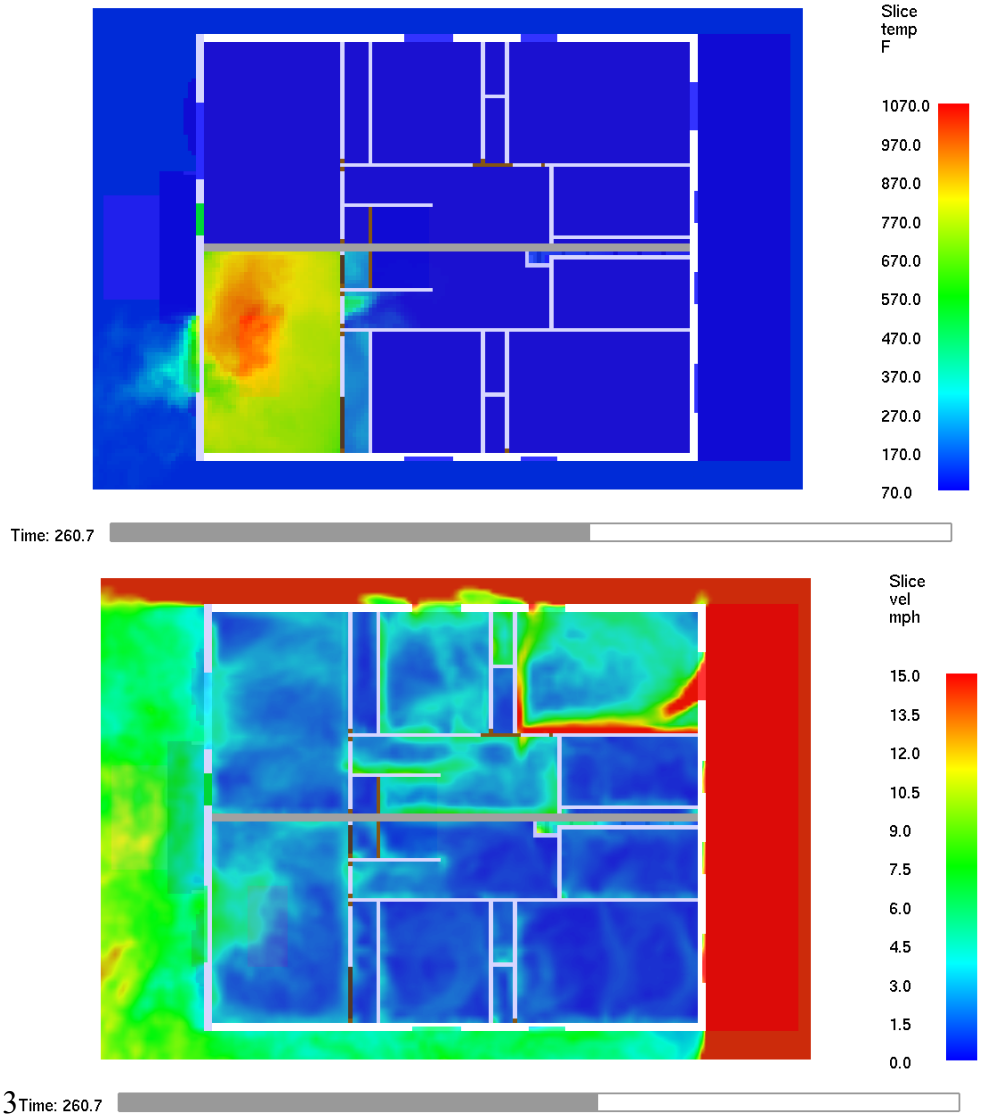


Figure 28: Temperature (top) and velocity (bottom) at 6 ft above the second floor at 14:08:20 (as the front bedroom door is opened for suppression).

As the dining room window is vented and the fire in the basement has begun growth, conditions are still near ambient on the second floor (Figure 29); however, stronger up flow is beginning in the staircase. Up flow in the void space is also increasing. Up flow and temperatures continue increasing as the basement stair door opens.

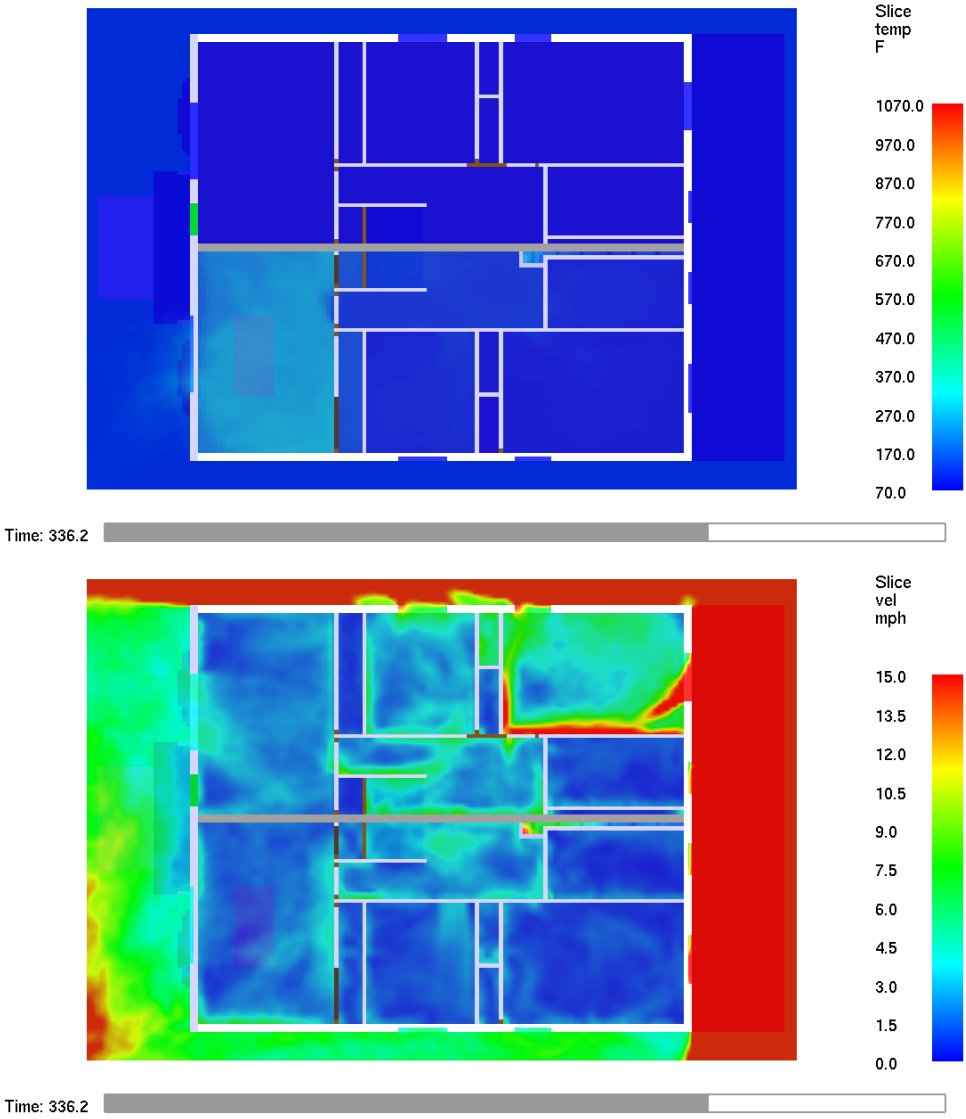


Figure 29: Temperature (top) and velocity (bottom) at 6 ft above the second floor at 14:09:36 (as the dining window is being vented).

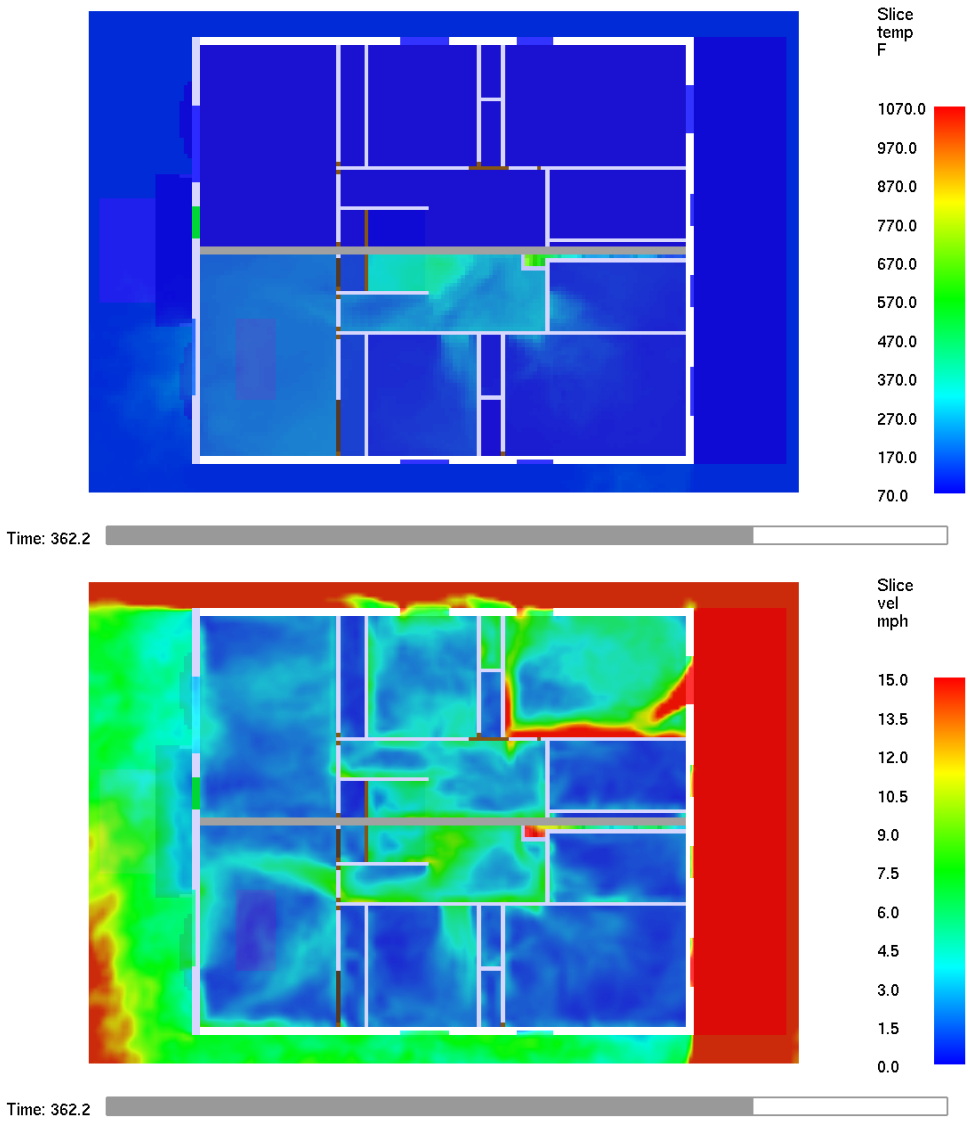


Figure 30: Temperature (top) and velocity (bottom) at 6 ft above the second floor at 14:10:02 (as the basement stair door opens).

By the time flames are seen in the dining window, temperatures at the second floor landing and in the hallway have exceeded 800 °F. Flow up the staircase exceeds 15 mph and flows in excess of 6 to mph move down the hallway towards the front bedroom. The combination of high temperature and the flow rate would result in high rates of heat transfer to turnout gear. At the mayday call, temperatures in much of the landing and hallway are over 900 °F with high rates of outflow still occurring through the hallway.

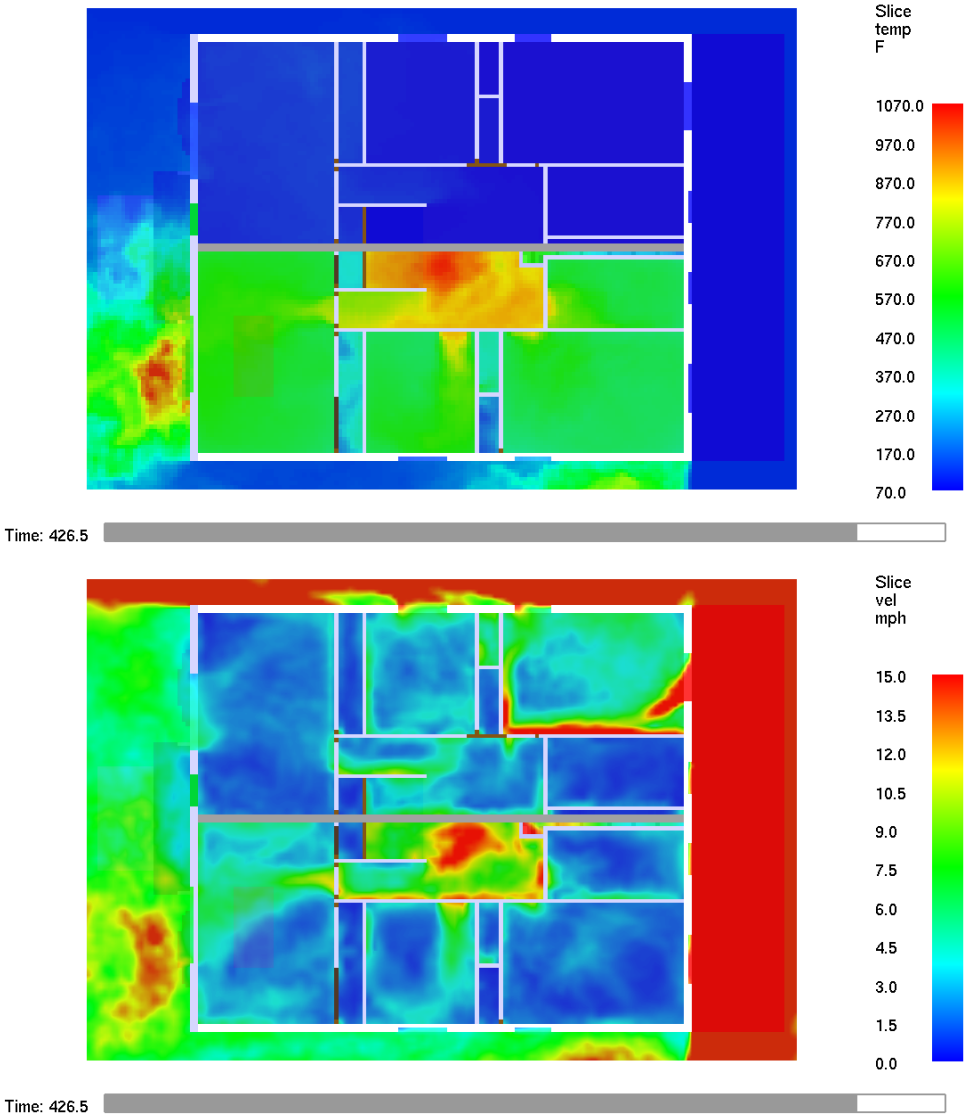


Figure 31: Temperature (top) and velocity (bottom) at 6 ft above the second floor at 14:10:22 (as fire was seen venting from the dining window).

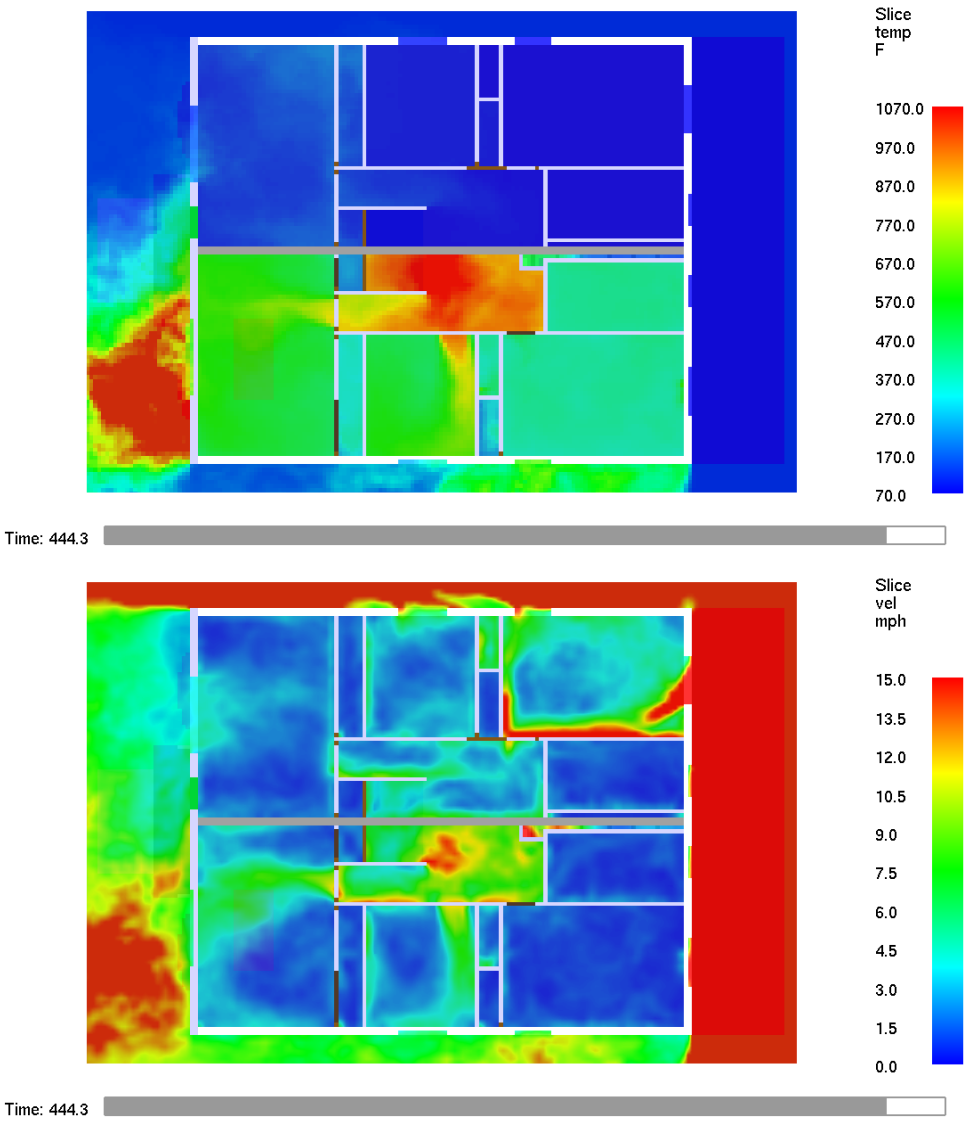


Figure 32: Temperature (top) and velocity (bottom) at 6 ft above the second floor at 14:11:15 (as the mayday is called).

4.2.4. Staircase Conditions

Figure 33 through Figure 36 show temperature and velocity at the staircase centerline as the dining window is being vented, as the basement stair door opens, as fire is seen venting out the dining window, and as the mayday is being called.

As the dining room window is vented and the fire in the basement has begun to grow gases at temperatures of 800 °F and higher begin collecting in the upper portion of the staircase, heating the wood walls and staircase door (Figure 33). Conditions are still near ambient on the second

floor; however, there is up flow in the staircase resulting from venting from the first floor out the open front bedroom door and window.

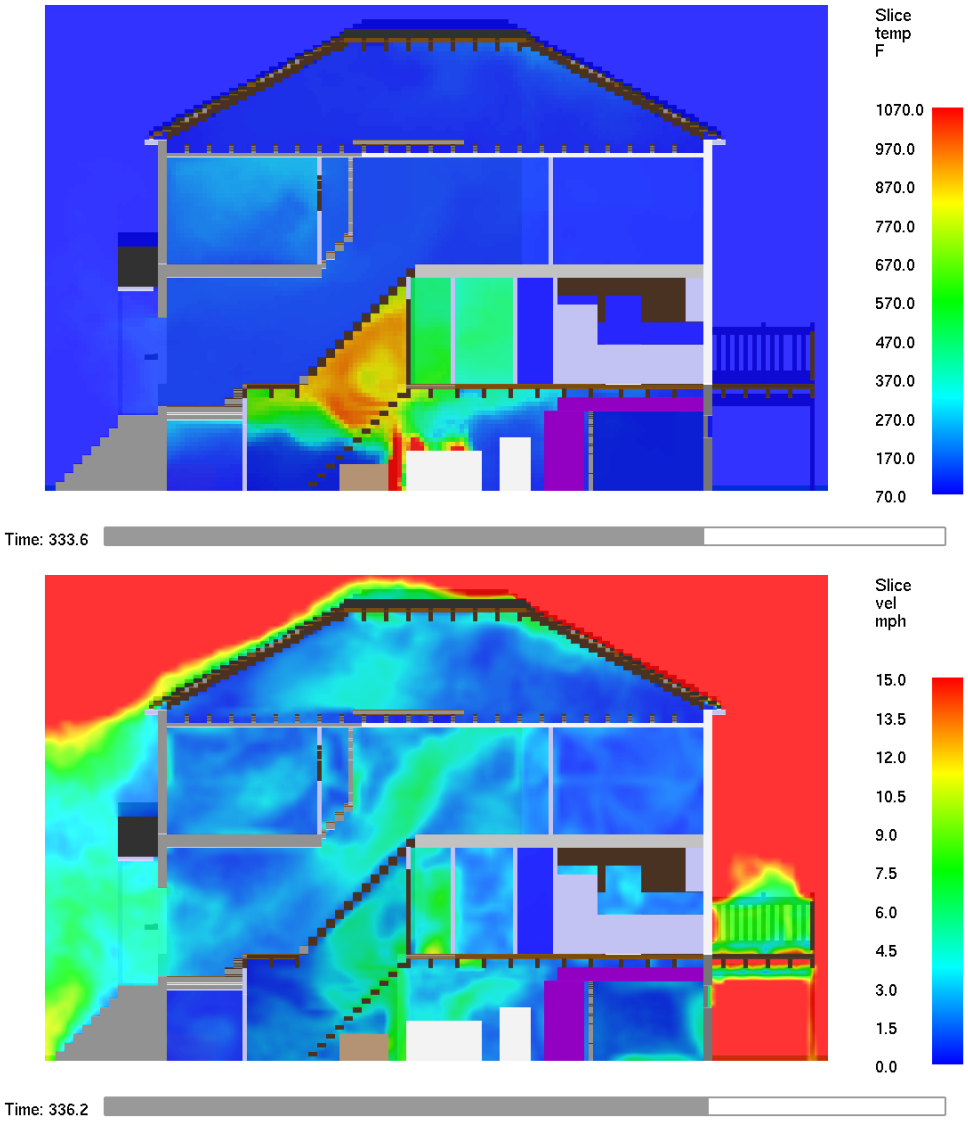


Figure 33: Temperature (top) and velocity (bottom) at the staircase at 14:09:36 (as the dining window is being vented).

As the basement stair is opening, flame temperatures fill the basement staircase and first floor landing and extend along the ceiling towards the back room of the basement (Figure 34). High temperature gasses are beginning to collect on the first floor ceiling. Flows up to the second floor have doubled in speed. The effect of the deep soffit for the front door can be seen in the deep layer forming between the door and the stairs.

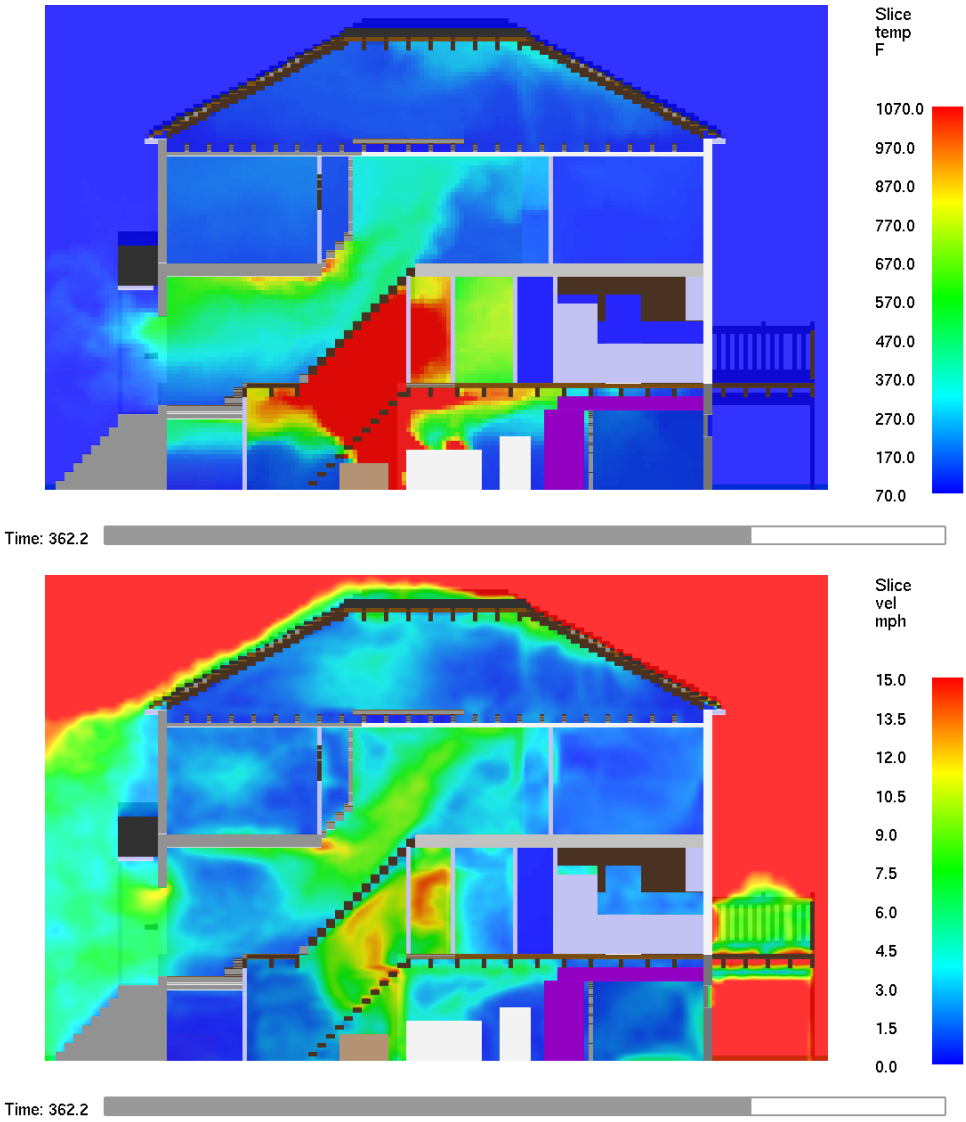


Figure 34: Temperature (top) and velocity (bottom) at the staircase at 14:10:02 (as the basement stair door opens).

As fire is seen venting out the dining window, the first floor is filled from floor to ceiling with temperatures in excess of 900 °F (Figure 35). Flow up the stairs has nearly doubled again. A very high temperature layer is forming on the second floor with over 900 °F temperatures at the ceiling and over 600 °F temperatures at the floor. By the time the mayday is called, temperatures near 900 °F exist down to the floor of the second floor with strong outflow continuing.

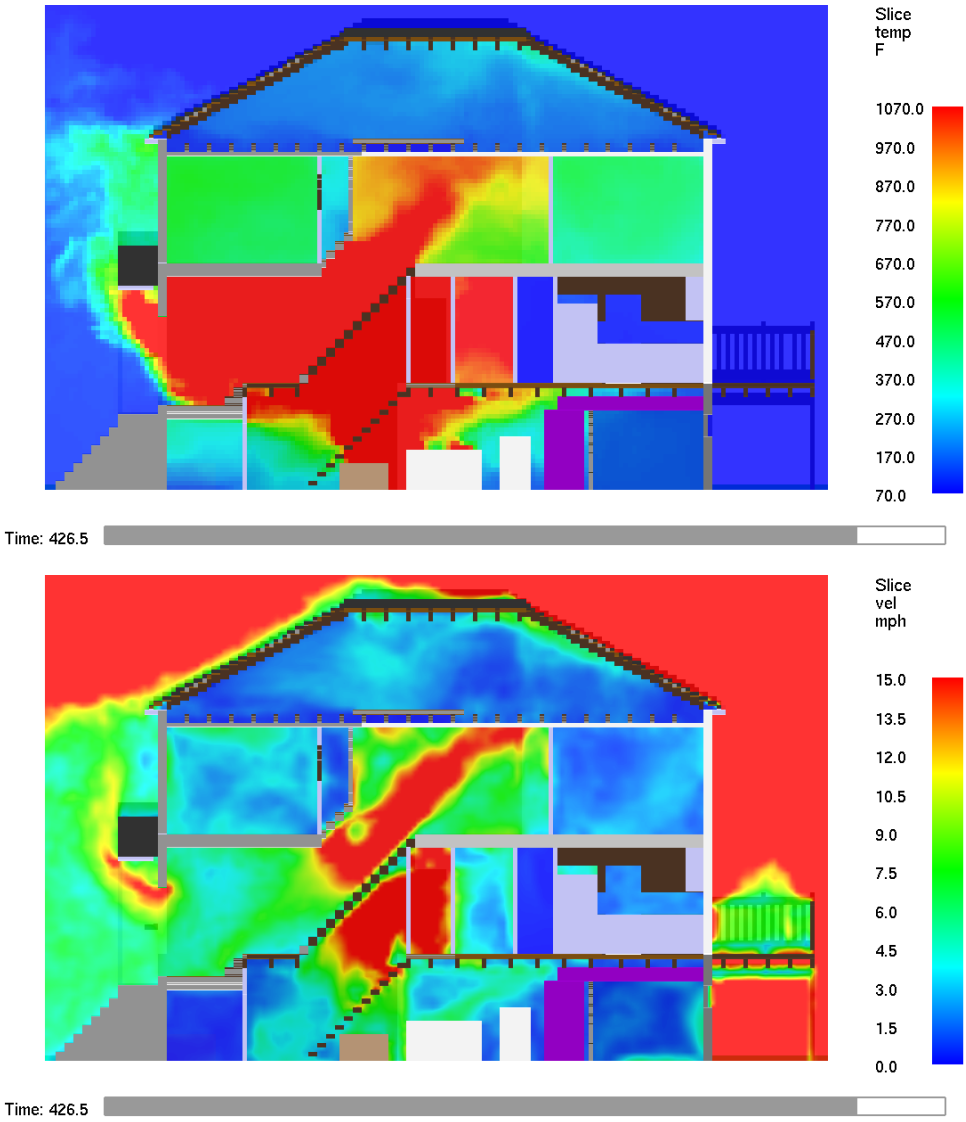


Figure 35: Temperature (top) and velocity (bottom) at the staircase at 14:10:22 (as fire was seen venting from the dining window).

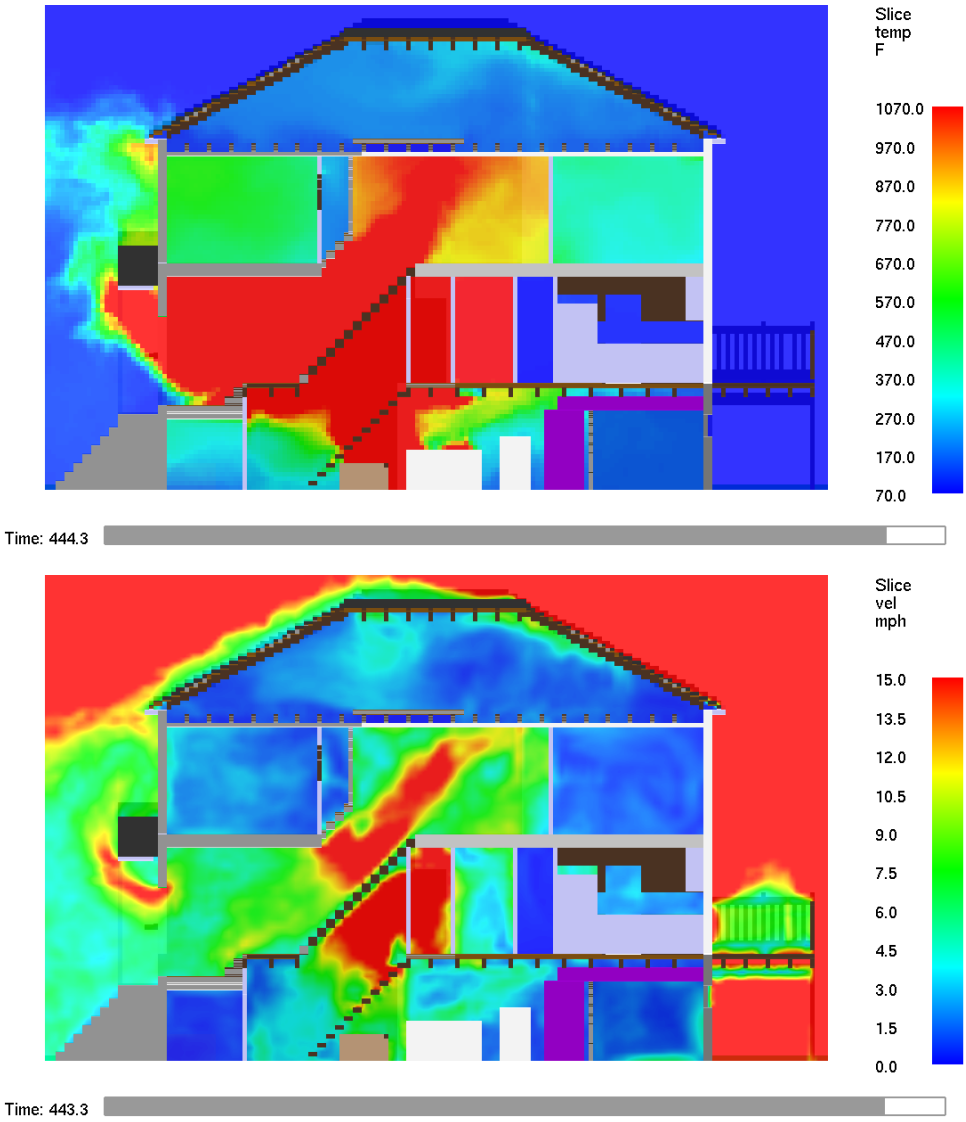


Figure 36: Temperature (top) and velocity (bottom) at the staircase at 14:11:15 (as the mayday is called).

4.2.5. Second Floor Late Scenario Conditions

Figure 37 through Figure 40 show conditions at 3 ft and 6 ft above the second floor and in vertical cross sections through the center of the stairs and the center of the second floor hallway. Times shown are as the basement stair door opens, as the fire is seen venting out the dining window, as members seek refuge in the second floor rear bedroom and bathroom, and as the mayday is called.

Figure 37 shows conditions as fire is coming up the basement stairs into the dining area. Flow up the stairs is just beginning to show extreme temperatures entering the stairs at the first floor landing. Conditions upstairs are near 200 °F in the hallway and in the front bedroom. The latter is

mostly due to residual heat from the recently suppressed fire in the front bedroom. The rear bedroom and bathroom are near ambient except for 200 °F temperatures near the doors.

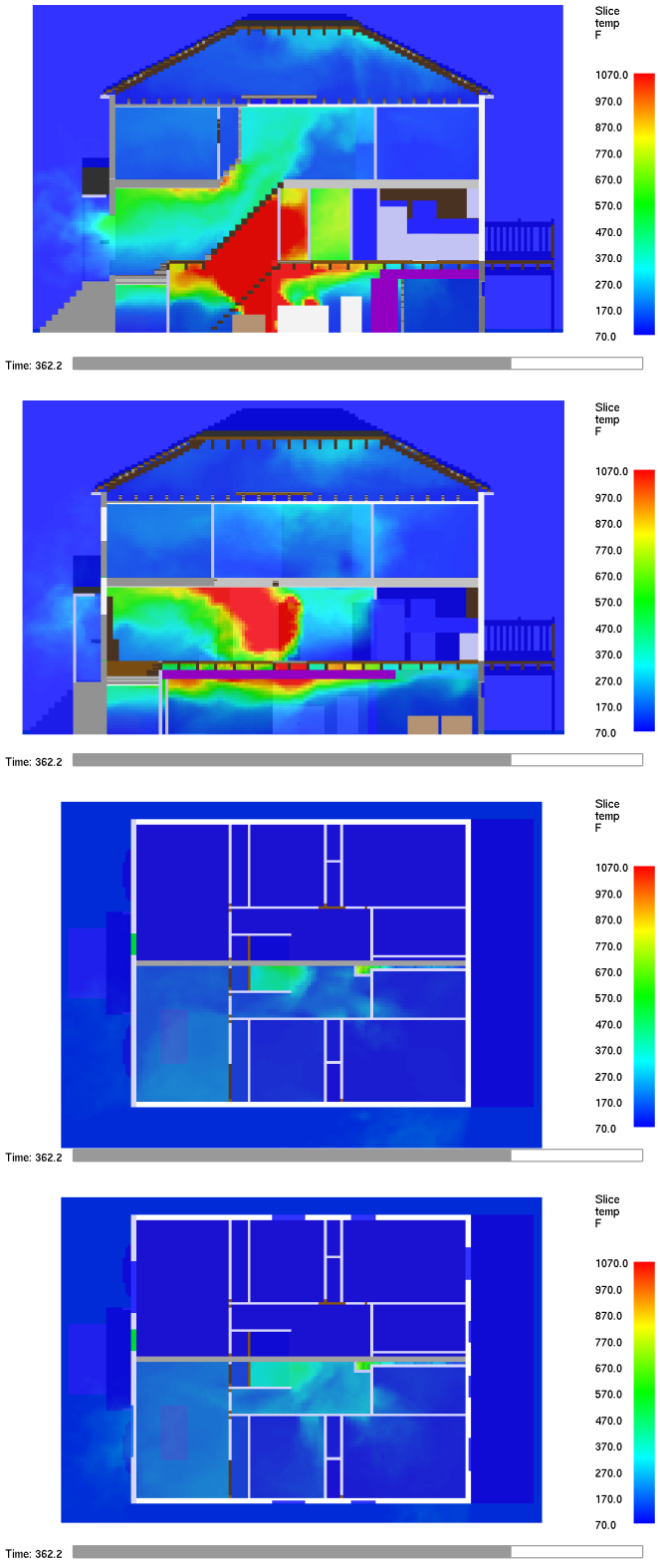


Figure 37: Temperature at the staircase at 14:10:02 (as the basement stair door opens). Top – side view through stairs. Top/Middle – side view through hallway. Bottom/Middle – 3 ft above the second floor. Bottom – 6 ft above the second floor.

Figure 38 shows conditions one minute later as fire begins to vent out the dining window. Extreme temperatures fill the staircase to the second floor. Temperatures at the stair landing and in the hallway near the bathroom door are 800 °F to 900 °F at 6 ft. Temperatures at the same height in the front bedroom are 500 °F to 600 °F. In the rear bedroom and bathroom, they are 50 °F lower. At 3 ft above the floor hall temperatures are 100 °F lower than 6 ft, and in the rear bedroom and bathroom they are 50 °F lower than at 6 ft. Conditions do not change significantly s members seek refuge in the rear rooms (Figure 39).

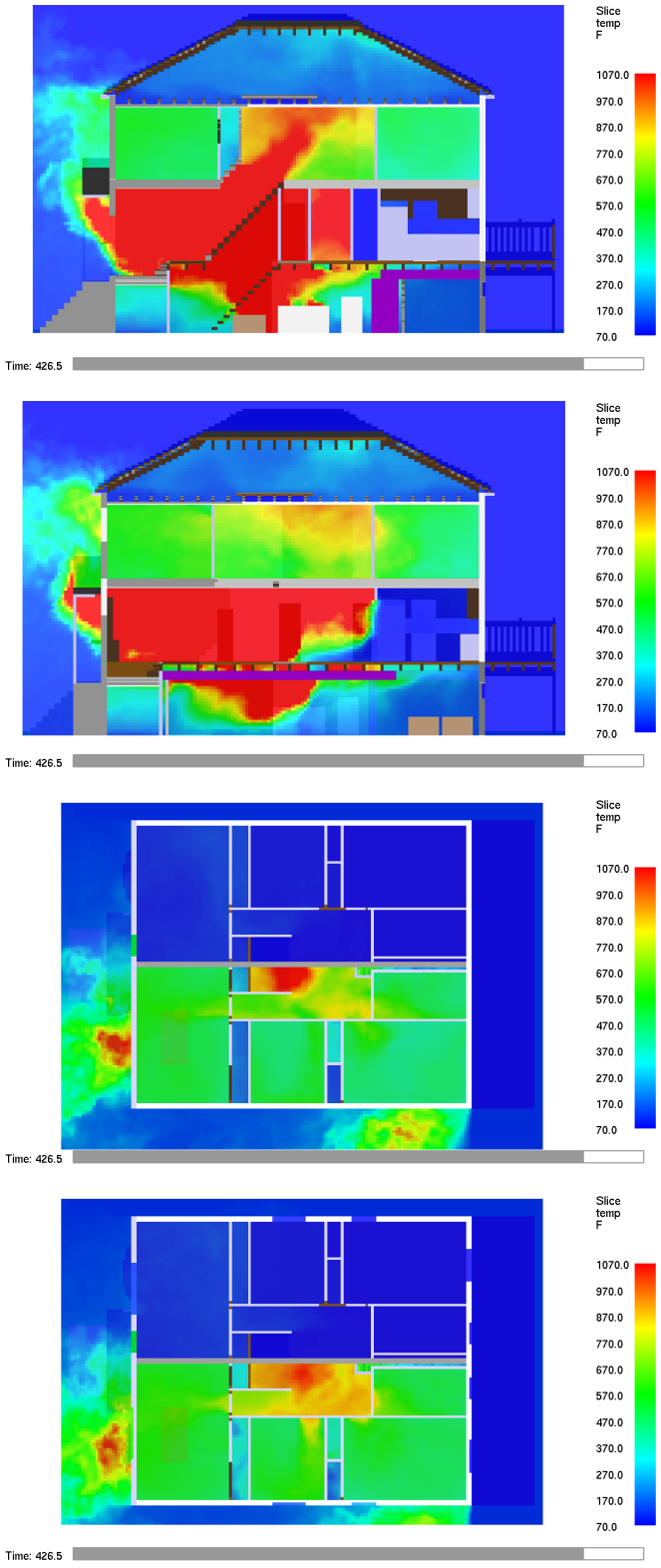


Figure 38: Temperature at 14:10:22 (as fire was seen venting from the dining window). Top – side view through stairs. Top/Middle – side view through hallway. Bottom/Middle – 3 ft above the second floor. Bottom – 6 ft above the second floor.

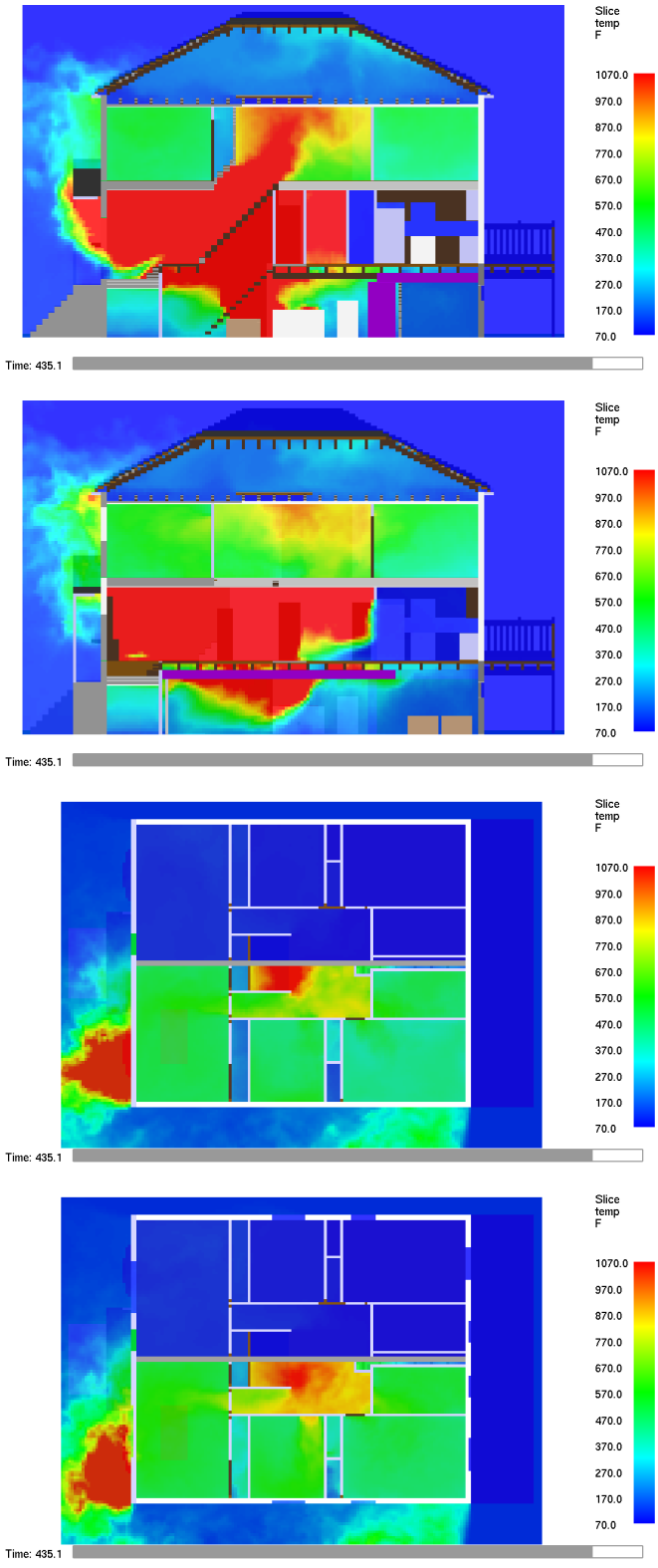


Figure 39: Temperature at 14:11:06 (as members seek refuge). Top – side view through stairs. Top/Middle – side view through hallway. Bottom/Middle – 3 ft above the second floor. Bottom – 6 ft above the second floor.

As the mayday is being called, conditions have worsened one the second floor outside the bathroom and rear bedroom where members are taken refuge (Figure 40). In the rear bedroom and bathroom temperatures have dropped over this 10 s period to 300 to 400 °F. The walls and ceiling in the room have not had time to heat up. With the doors closed and no more heat entering, the gas is quickly cooling as heat is lost to cooler surfaces. Within 30 s of taking refuge temperatures drop further to 250 °F to 300 °F. The mass of air in the bedroom at 400 °F is near 50 lbs. equivalent in weight to a single sheet of drywall. The much larger mass of cooler drywall, plus additional cooling due to cooler air being forced into the room from leakage at the rear windows, was able to remove approximately 15 °F of gas heat for every 1 °F in temperature rise.

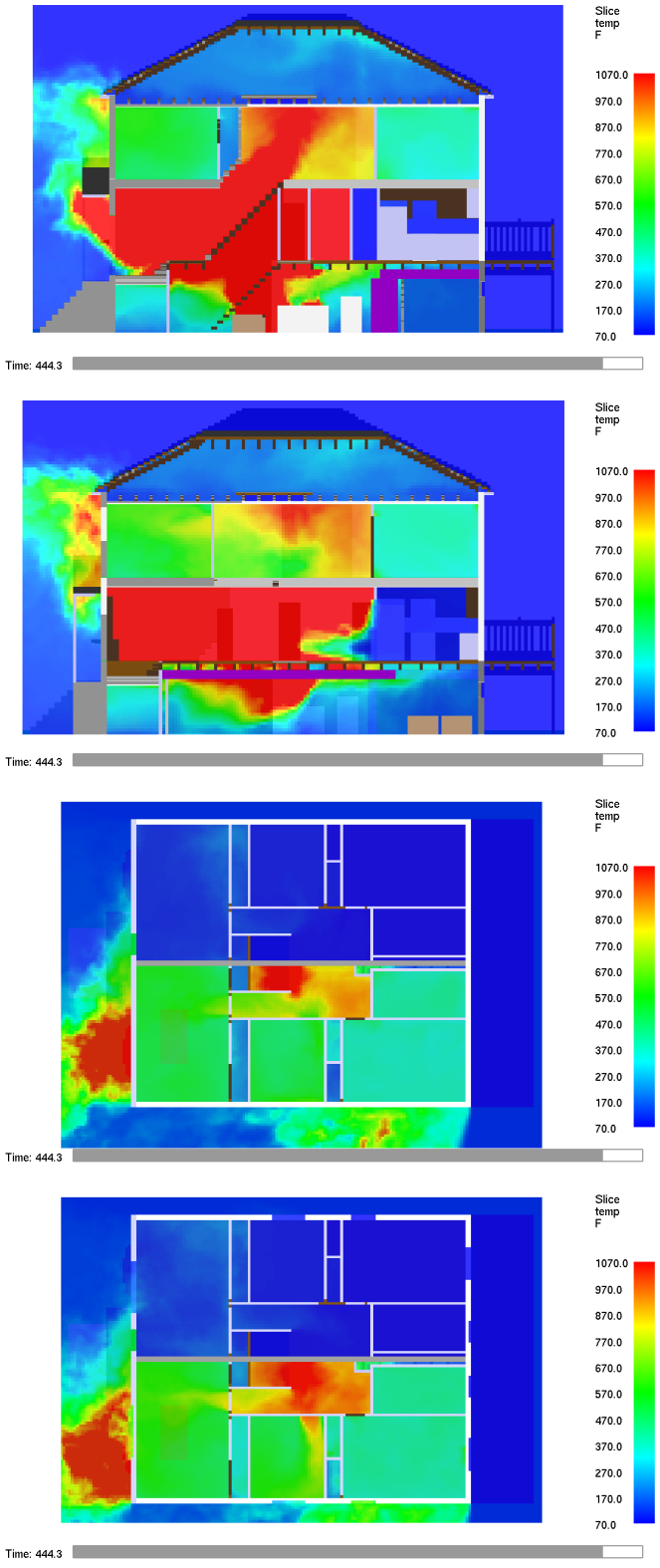


Figure 40: Temperature at the staircase as the mayday is called. Top – side view through stairs. Top/Middle – side view through hallway. Bottom/Middle – 3 ft above the second floor. Bottom – 6 ft above the second floor.

4.3. No Wind Alternate Scenario

Figure 41 through Figure 45 show temperature and velocity at the staircase as the dining window was being vented, as the basement stair door opened, as fire was seen venting out the dining window, as the mayday was being called, and at simulation end for the alternate scenario with no wind. The simulation results show steady slow growth of the fire in the basement, but the fire never enters a period of rapid growth. While predicting fire growth and spread has large uncertainties, these results do show that with no wind conditions for fire spread were far less favorable than during the actual event. With no wind, flow in through the basement is limited to buoyant flow rather than the flow imposed by the pressure of 20+ mph winds. Without the higher flow from the wind, the small fires in the basement are not fanned by the wind enhancing the potential for rapid fire growth.

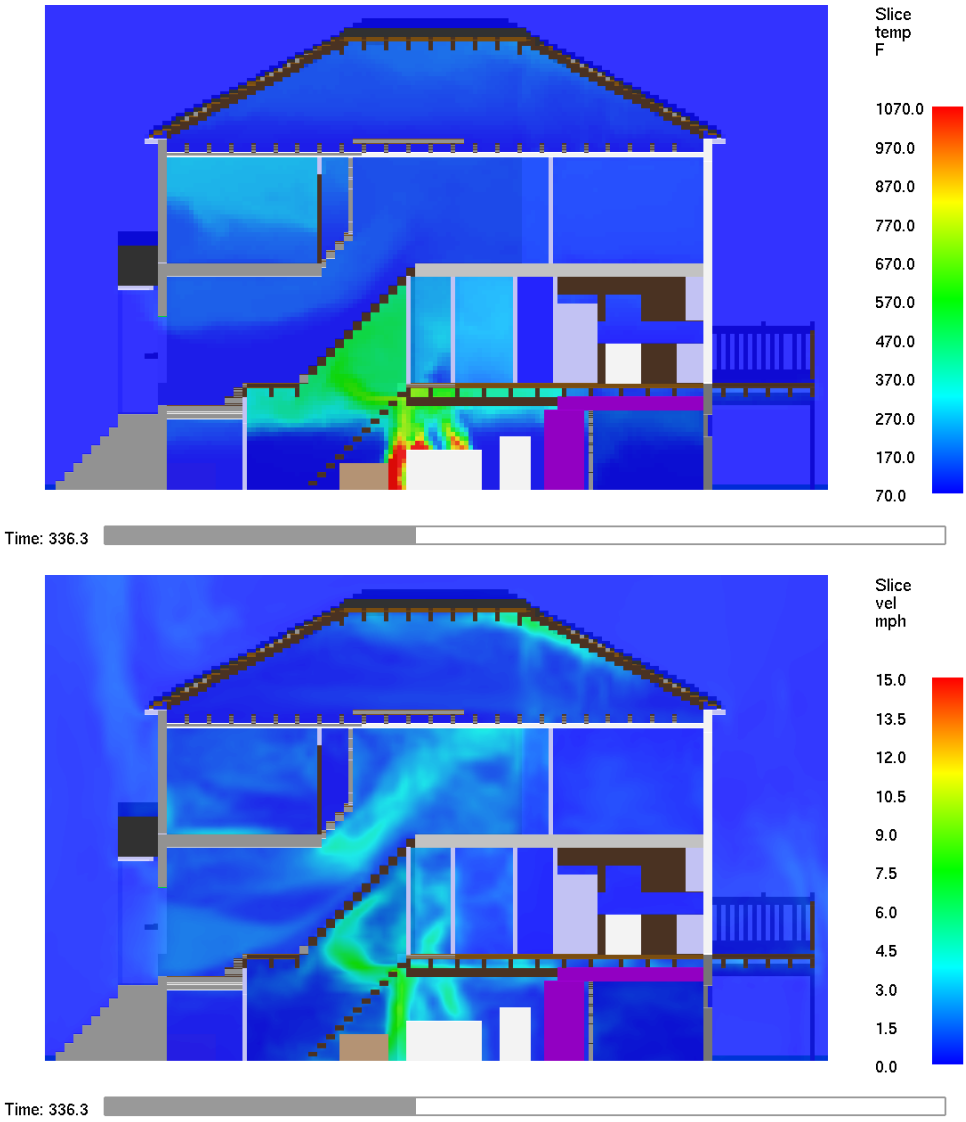


Figure 41: Temperature (top) and velocity (bottom) at the staircase at 14:09:36 (as the dining window is being vented).

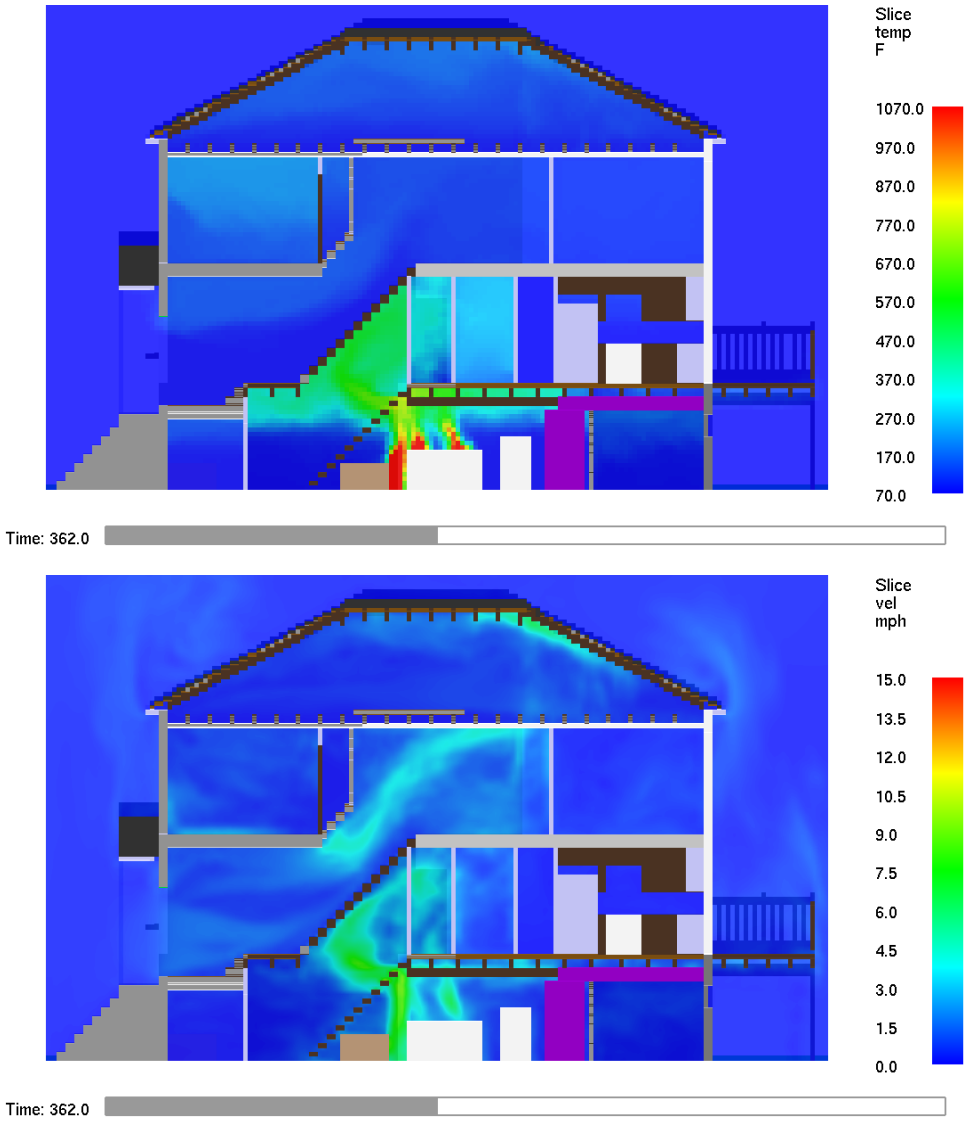


Figure 42: Temperature (top) and velocity (bottom) at the staircase at 14:10:20 (as the basement stair door opens).

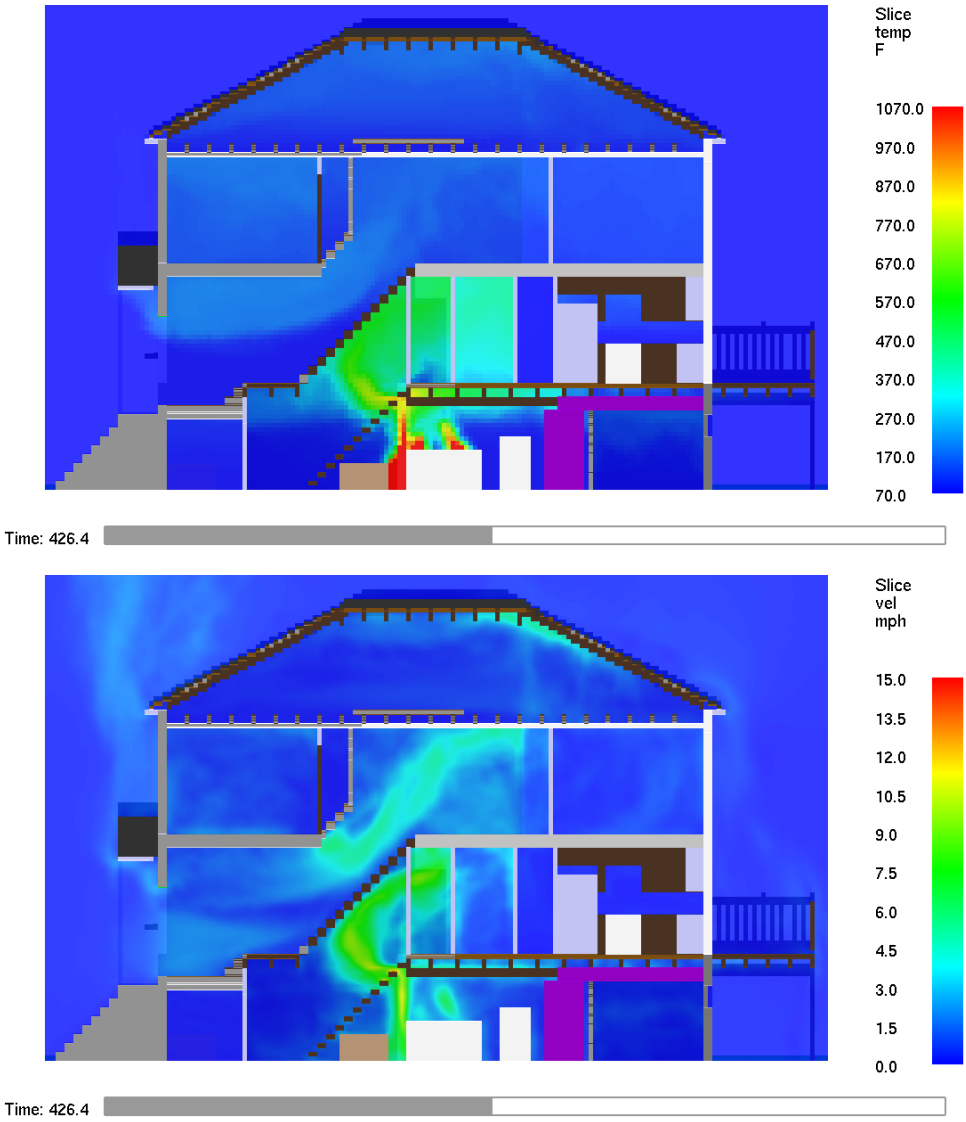


Figure 43: Temperature (top) and velocity (bottom)at 14:10:22 (as fire was seen venting from the dining window).

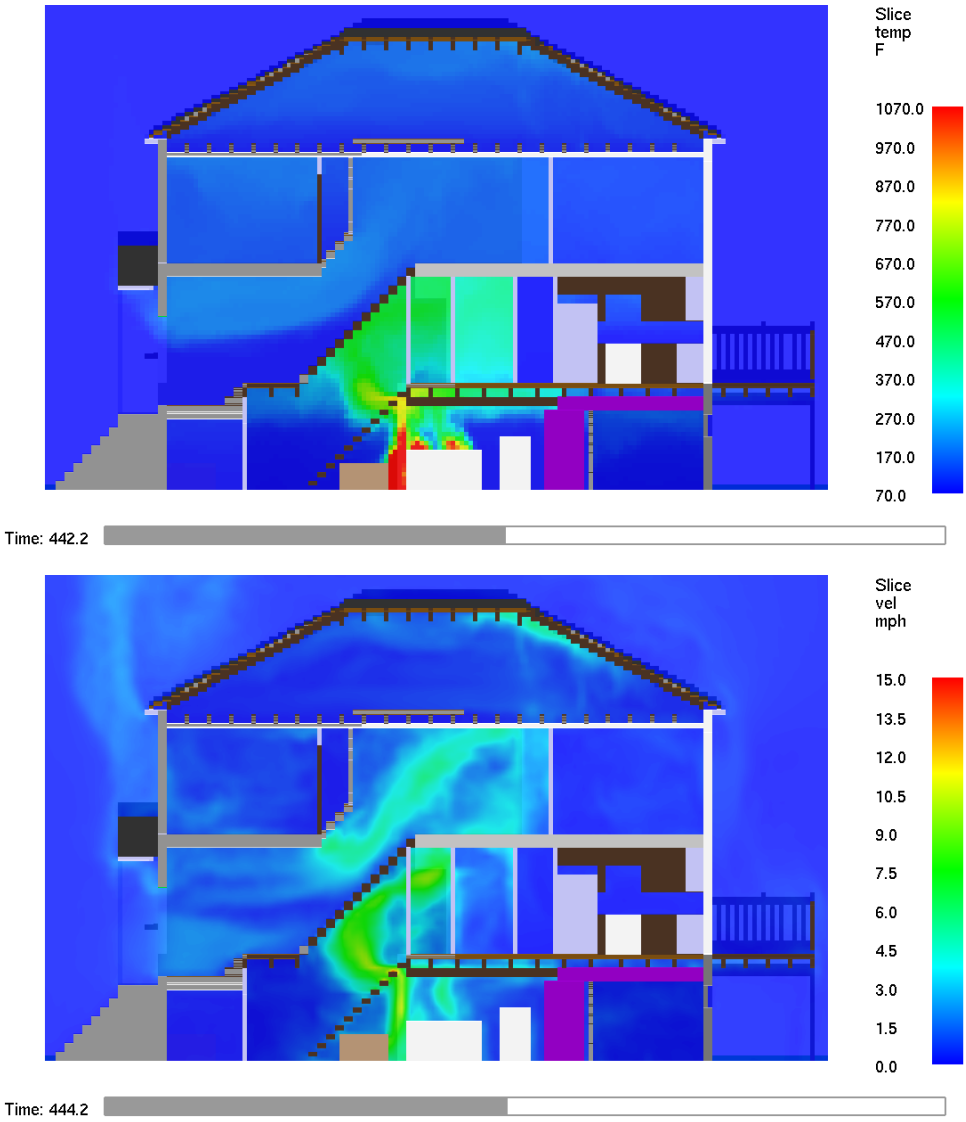


Figure 44: Temperature (top) and velocity (bottom) at 14:11:15 (as the mayday is called).

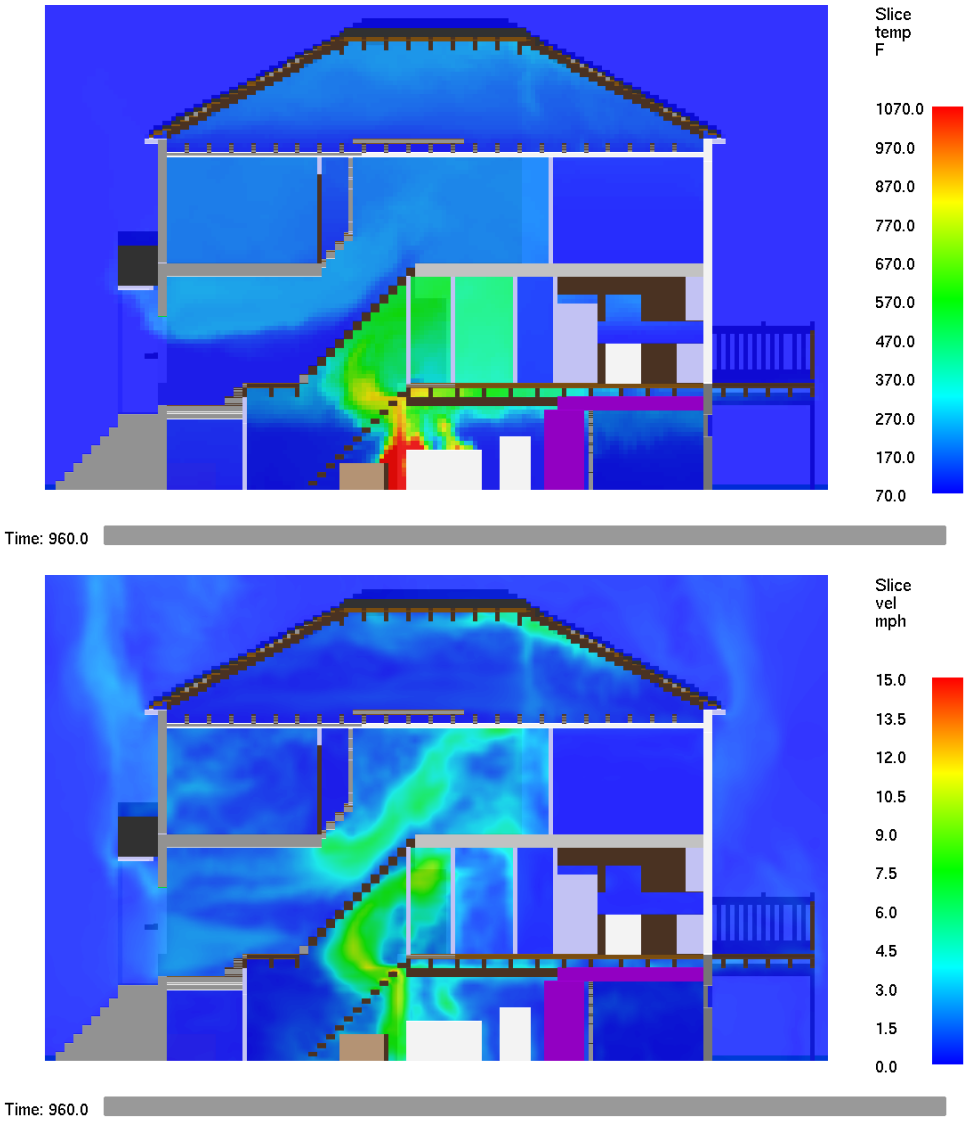


Figure 45: Temperature (top) and velocity (bottom) at simulation end.

Figure 46 shows temperatures and velocities in the basement at the end of the simulation. The temperature slices are at 6 ft and 7 ft and the velocity at 3 ft and 6 ft. The temperature slices show that burning has started in the joists and on the bottom of the subfloor. Over time this would continue to spread and grow. Temperatures at 6 ft have reached 400 °F and further increase in temperature would lead to ignition of wood paneling on the walls. The velocity slices show bi-directional flow in the sliding glass door. At 3 ft air is entering at less than 5 mph. At 6 ft air is leaving at a similar speed. These low flow speeds are in contrast with the much higher flow speeds seen in the actual event with wind.

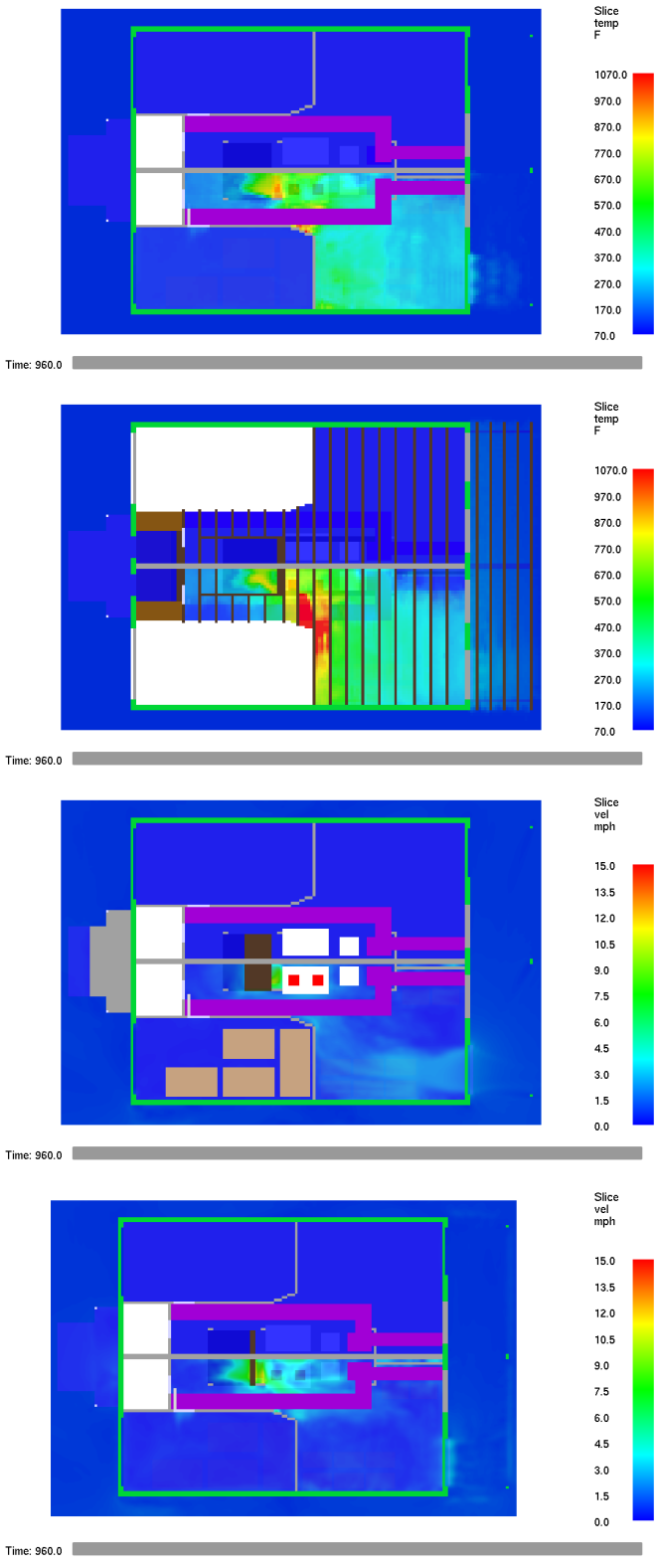


Figure 46: Basement temperature (Top – 6 ft, Top/Middle – 7 ft.) and velocity (Bottom/Middle – 3 ft, Bottom – 6 ft.) at simulation end.

4.4. Flow Path Control Alternate Scenario

Figure 47 through Figure 50 show temperature and velocity at the staircase as the dining window was being vented, as the basement stair door opened, as fire was seen venting out the dining window, and at the peak of the fire for the alternate scenario with flow path control.

Comparing Figure 41 to Figure 47 and Figure 42 to Figure 48, the flow path control scenario shows that early in the scenario the closed basement slider results in somewhat warmer temperatures in the basement plus a deeper hot layer. The velocity image shows that with the door closed there is little flow from the first floor to the second floor. With only the front door open, in the flow path control scenario, there is a limited ability for air to be pulled through the lower floors of the house into the second floor and out the open front bedroom.

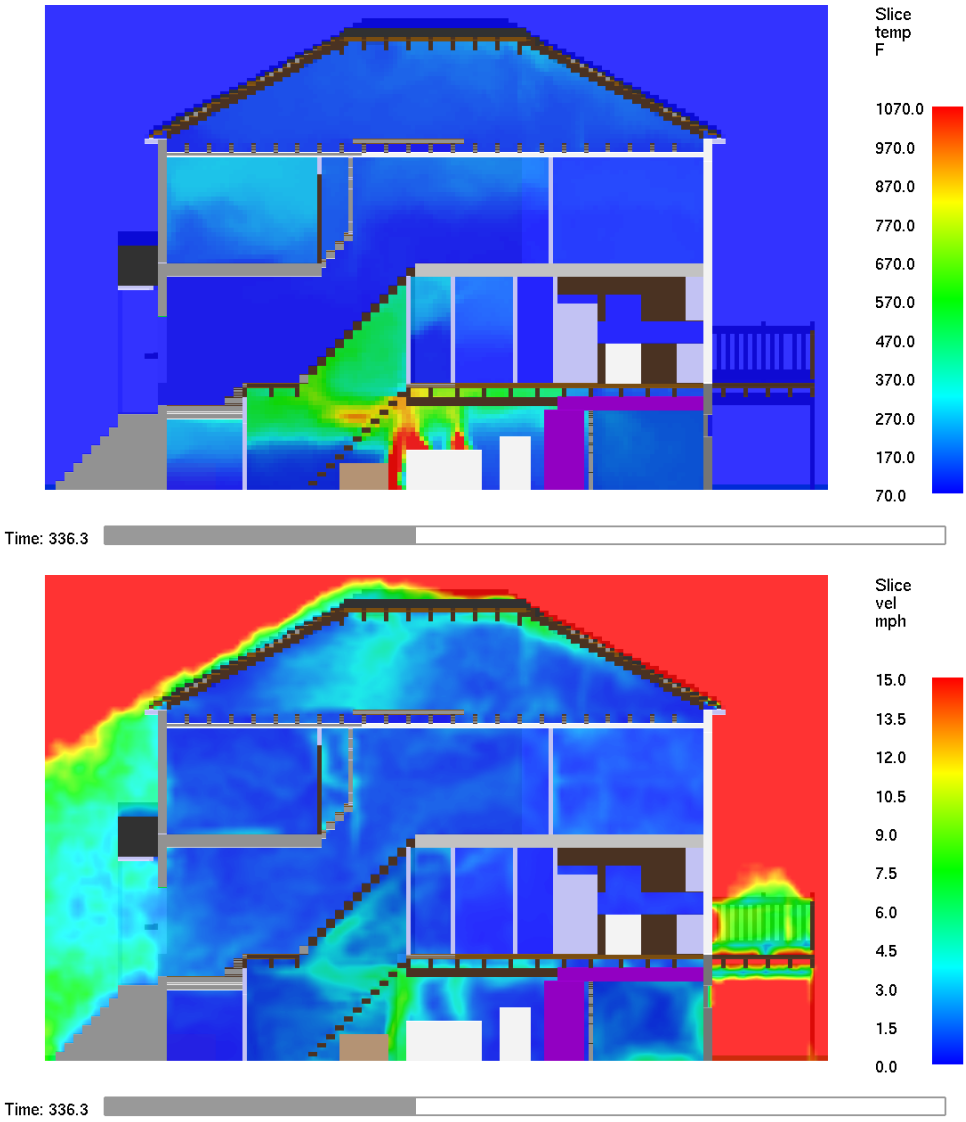


Figure 47: Temperature (top) and velocity (bottom) at the staircase at 14:09:36 (as the dining window is being vented).

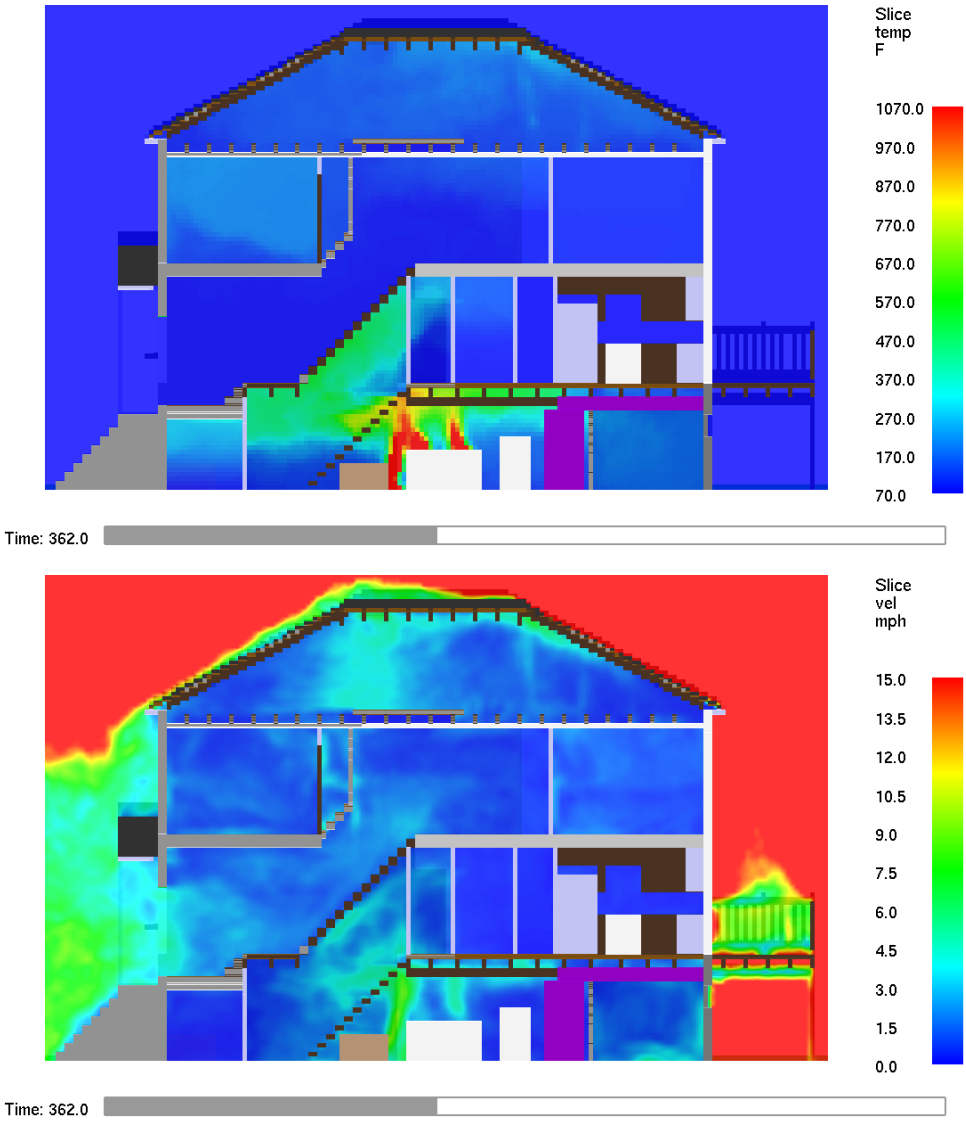


Figure 48: Temperature (top) and velocity (bottom) at the staircase at 14:10:02 (as the basement stair door opens).

Comparing Figure 43 to Figure 49, the fire in the basement is showing signs of growth in the flow path control scenario that are not observed in the no wind scenario. There is still limited flow up into the second floor when comparing the flow path control scenario with the no wind scenario.

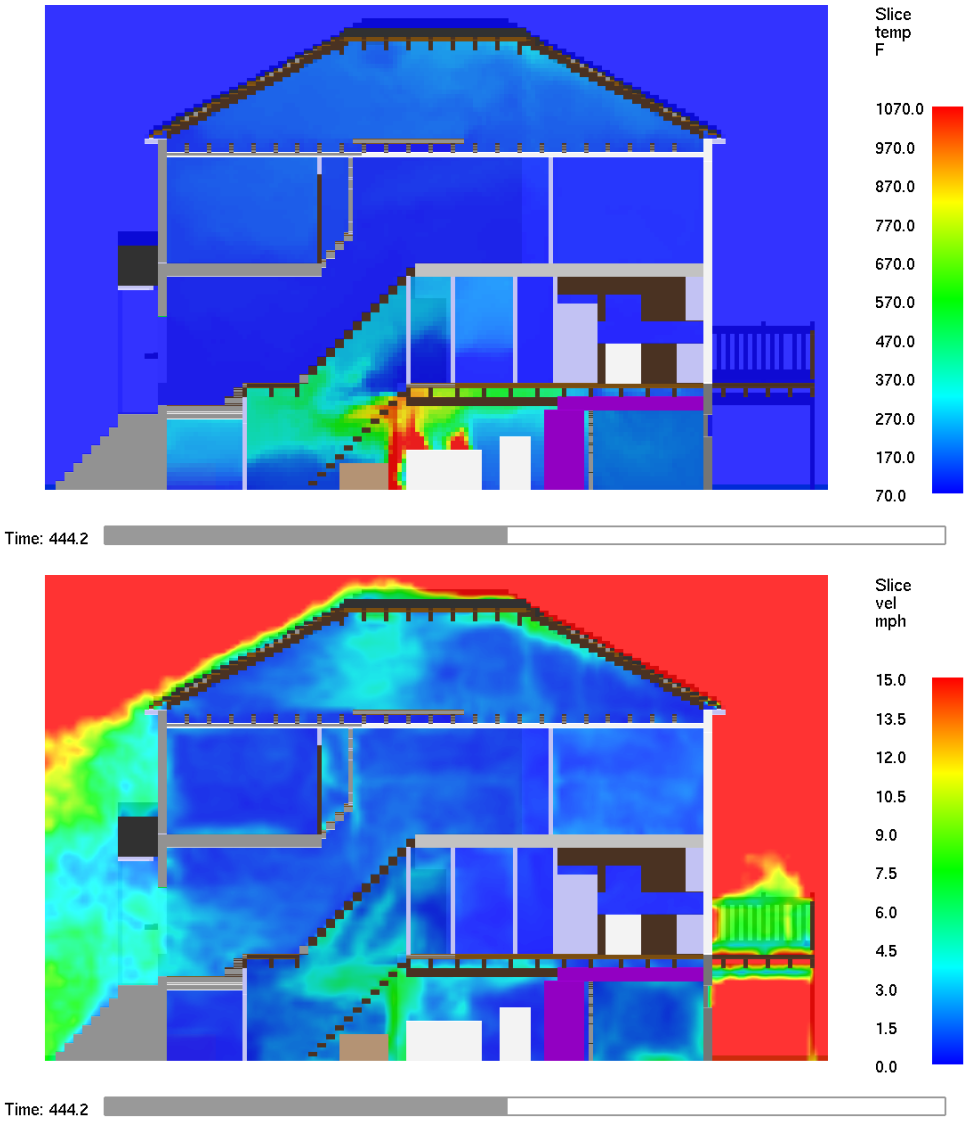


Figure 49: Temperature (top) and velocity (bottom) at 14:10:22 (as fire was seen venting from the dining window).

The conditions seen in Figure 49 persist for another 2.5 minutes. At that time the fire in the basement undergoes a period of rapid growth. Over the next 30 s the fire grows from 250 kW to 4 MW peak that is sustained for 20 s before dropping to a 2 MW plateau that lasts for 60 s before decaying down to 500 kW. This growth was not observed in the no wind scenario. At the peak of the fire, substantial flows are seen in the staircase to the second floor and flame temperatures are seen at the first floor landing of the basement stairs. Very high temperatures, however, are not seen at the second floor landing. Temperatures have increased to 300 °F to 400 °F; however, those temperatures do not persist as the fire decays in the basement.

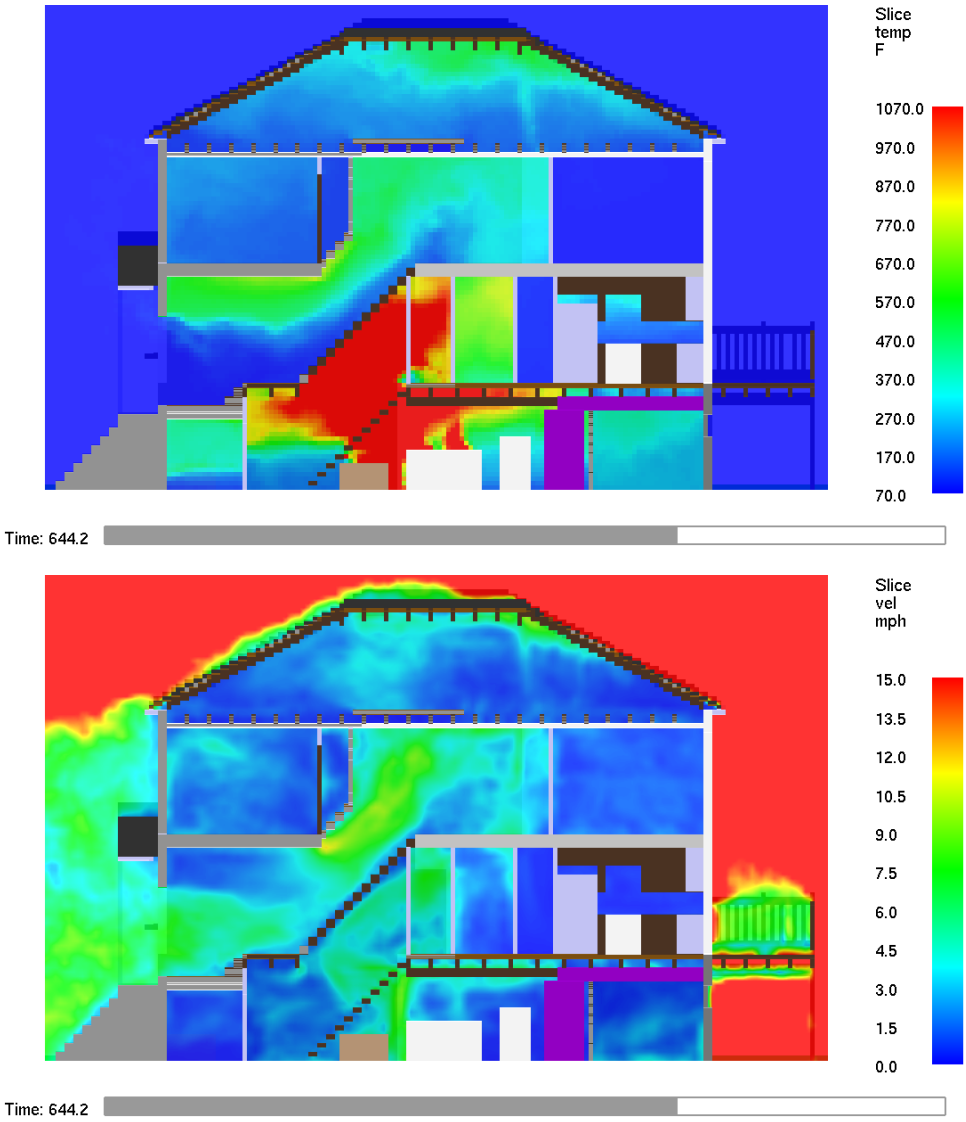


Figure 50: Temperature (top) and velocity (bottom) at the peak of the fire (~14:15).

Figure 51 shows temperatures on each floor of the house at the peak of the fire. Temperatures in the garage and rear room of the basement are hot enough to support pyrolysis of cellulosic materials (500 °F). The peak of the basement fire, however, is not sustained long enough for those temperatures to overcome the thermal inertia of materials in those locations. Ignition in these locations did not occur but could have if temperatures were sustained for longer. At 6 ft above the first floor, flame temperatures are observed extending part way into the dining area and through the archway into the kitchen. As in the basement, these temperatures do not persist for sustained ignition to occur in the model. At 3 ft above the first floor, except for the basement stair landing, temperatures remain low (under 300 °F). Firefighters would be able to get below the hot layer. On the second floor, temperatures at 6 ft peak near 350 °F. While not shown in an image, at 3 ft

temperatures peak near 300 °F at the stair landing and near 250 °F in the hallway towards the front bedroom.

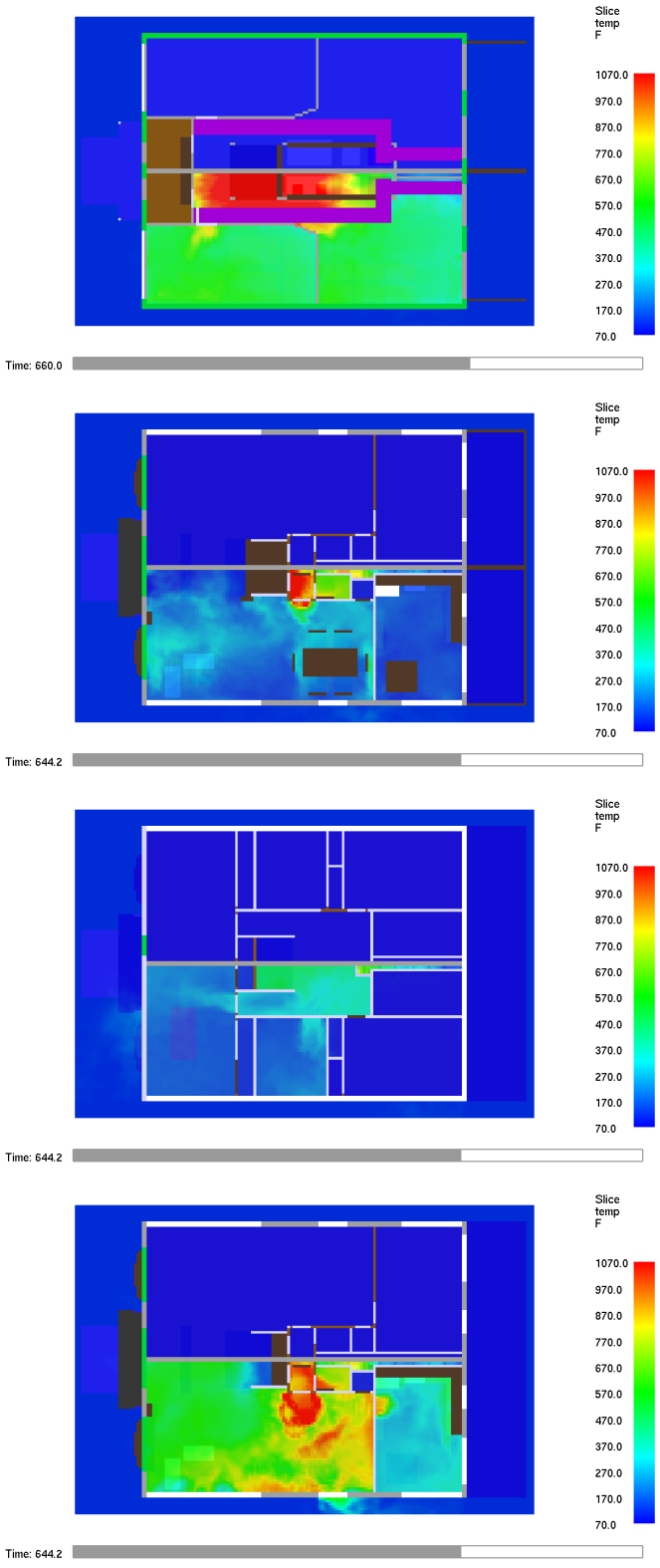


Figure 51: Temperature at the peak of the fire (~14:15).. Top – 6 ft above the basement floor. Top/Middle – 3 ft above the first floor. Bottom/Middle 6 ft above the second floor. Bottom – 6 ft above the first floor.

5. Conclusions

Three FDS simulations were run for the April 24, 2022, fire in the duplex at 10824/10826 Avenue N, Brooklyn, NY. The simulations focused on the fire conditions in 10824. The three simulations included 1) a timeline based on the events as they occurred on April 24, 2) a timeline assuming there was no wind that day, and 3) a timeline assuming that the upwind flow path was controlled.

Each simulation used the same geometry model which consisted of a detailed model of the duplex plus a notional model of surrounding structures to support development of the wind field. The 10824 half of the duplex was defined with surface boundary conditions representing the materials of construction and fuel loads present in the basement and on the first floor. While fuels were present on the second floor, fire spread to the second floor did not occur until after untenable conditions for firefighters developed which is outside the scope of this analysis.

Modeling of fire growth and spread has a significant amount of predictive uncertainty associated with it. This is due to the current state-of-the-art in modeling and our continuously developing understanding of how real world materials respond to fire. Coupled with uncertainty in the exact manner, time, and location where fire first spread from 10826 into the living areas of 10824, results of the three models are not an exact prediction. However, they can be used to gain insight into the events of that day.

5.1. Simulation of the Actual Event

The simulation of the actual events of the day matched well with post-fire photographs and video footage. Temperature predictions of the model agree with the level of damage seen in the kitchen, garage, and back room of the basement. Fire growth and spread including flame extensions out the first floor dining and bay window agree with observations and video. This provides confidence in the modeling assumption made and the results of the simulation.

The simulation results show a slowly growing fire in the basement that remains relatively small in size for an extended period of time. At the time the dining window is vented, the model shows an increase in fire growth in the basement followed by the basement door opening. Multiple factors may have contributed to this, including a change in wind conditions, a reduction in pressure on the first floor due to the window venting causing more airflow into the basement, or multiple possible mechanisms for the door latch to not hold the door closed. Once the door opens, with the dining window vented, the front door open, and the front bedroom door and window open, hot and vitiated gases collecting at the top of the basement stairs were able to rapidly flow into the first floor. This caused a significant acceleration in fire growth which was supported by the large flows up the basement stairs into the first floor. The availability of the flow path through the front bedroom also meant the basement fire was able to vent to the second floor and out the front of the house. The fire quickly spread into the first floor with flame temperatures extending up into the second floor. The open kitchen slider with wind driven flow prevented the fire and high temperatures from

entering the kitchen. The open basement slider with wind driven flow limited the spread of the basement fire to the rear of the basement.

5.2.Simulation of the Event with No Wind

The no wind simulation was performed to investigate the role the high winds played in the events of April 24. The no wind simulation resulted in no significant fire growth in the basement for a period of over 8 minutes beyond the time of the mayday call. Conditions on the first and second floor remained tenable for firefighters throughout the simulation. While as noted, prediction of fire growth and spread is uncertain, these results indicate that without wind the conditions for fire growth and spread in the basement were significantly less favorable. Without wind pressure helping to force air into the basement, there was significantly less airflow through the open basement slider. The results of this simulation show that the wind played a significant role in the events of April 24.

5.3.Simulation of the Event with Flow Path Control

The flow path control simulation was performed to investigate the impact of keeping the sliders on the rear of the house fully open during the event. With the sliders closed, air flow through the house due to the wind was significantly reduced, but not eliminated. It was assumed that the house was relatively leaky based on the older construction and previous flood damage. The high winds create an upwind pressure on the building that pushes air in through gaps around exterior doors and windows. In this simulation, with the sliders closed, a hot layer begins to form in the basement. Eventually, the additional heat feedback from the layer results in the fire undergoing a period of rapid growth, though at a later time than in the actual event simulation. The fire grows large enough for flames to extend into the living room; however, the simulation predicts that the growth is not sustained. Fire does not spread into the living room and ignition of materials does not occur in the garage or rear room of the basement. While there is uncertainty in these specific predictions, the results indicate that lack of flow path control was also a significant contributor to the events of April 24.

5.4.Summary

The three simulations show that a contributing factor to the events of April 24, 2022, was the high winds during the fire. The winds increased the ventilation of the fire and enabled rapid and sustained fire growth. The creation of an uncontrolled flow path through the opening of doors and windows on three levels of the structure notably increased the impact of the wind. With multiple large openings on the front and rear of the building, ventilation was available to support fire growth and spread. The upwind horizontal ventilation provided oxygen to the fire which enabled a rapid transition to flashover in the basement. The downwind vertical ventilation in the stairwells provided the flow path to the first and second floors. Hot gas/flame velocities along this flow path were on the order of 10 to 15 mph. Without these two factors, the simulations indicate it was likely

that conditions inside of Exposure 4 would not have rapidly become dangerous and that more time would have been available to control and extinguish the basement fire.

APPENDIX E. EFFECTS OF EMOTIONAL STRESS ON OPERATIONAL PERFORMANCE

The authors of this chapter offer an understanding of human performance under stress that has been developed through the FDNY MPI. The MPI has partnered with Ivy League professors, the U.S. military's special operations community, and professional sports teams to better understand how firefighters and fire officers operate under excessive emotional stress. The purpose of the MPI team is to provide a level of understanding that allows all department members to engage in a more informed conversation.

Emotional Stress

Physical stress and emotional stress are fundamentally different phenomena. Emotional stress is far more impactful than physical stress on performance. Physical exertion cannot replicate the impacts on the body that emotional stress can cause. Emotional stress is the body's reaction to a perceived threat, and performance degrades when such stress is left unchecked. In these moments, the body creates excess neurochemicals, natural defense mechanisms against a perceived threat. When these neurochemicals enter the bloodstream, they begin putting the body into survival mode, leading to the loss of ancillary tasks.

If firefighters participate in an athletic endeavor, such as an exercise or sporting event that raises their heart rate, they typically suffer no cognitive or motor impairments. Conversely, when their heart rate is elevated because of emotional stress, it immediately affects their cognitive and motor responses. Emotional stress need not be perceived as wholly negative. When appropriately understood and regulated, stress is also responsible for generating optimal performance. Moderate spikes in stress hormones and neurochemicals allow the body to overcome environmental, physical, and emotional obstacles.

Robert Yerkes and John Dodson, early 20th century psychologists, studied human performance under stress. Together, they created the Yerkes-Dodson model, which established an empirical link between human performance and stress. Their findings, displayed in an "upside-down 'U' curve," demonstrated that under-arousal—apathy, boredom, complacency, or over-confidence—could negatively affect performance. However, as emotional stress levels increased, performance

improved. Yerkes and Dodson found that optimal performance occurred at the intersection of increased stress hormones and the body's ability to regulate them. Conversely, on the "backside of the curve," hyperarousal could rapidly lead to diminished performance as stress levels increased and the body lost the ability to control the stress hormones and neurochemicals.

Stress under Pressure

Innumerable factors cause the body to react, resulting in a rapid increase in emotional stress. These factors can be internal, external, mental, or physical. Perhaps the most significant factor that yields an emotional stress reaction is uncertainty. The environment in which FDNY members operate is one of constant uncertainty. Operating in a rapidly changing, fast-paced, and dynamic atmosphere of a structural fire challenges even the most experienced and prepared members. Reports of people trapped or the inability to locate the main body of the fire are just two examples of stressors that can affect firefighters at a call for service. The limited and often zero-visibility atmosphere of a structural fire removes one of the body's primary senses. Compounding this limited visibility, each individual on the fireground can comprehend only a small portion at any given moment, leaving operators with an incomplete picture. The human brain treats uncertainty as a potential threat. Novelty is a closely related factor that has the ability to push the performance capabilities and limits of firefighters and officers alike. An individual exposed to something for the first time reacts differently to an event from a more seasoned person. In contrast to the space in which FDNY members operate every day, elite military units utilize all available intelligence to identify the problems before the mission steps off, intending to reduce uncertainty as much as possible. The events that occurred at this fire were novel to the newest and most seasoned members alike.

Fitness levels also significantly affect the body's ability to manage emotional stress inputs. While the body reacts differently to stress created by physical exertion and stress created by high-risk, high-threat, challenging environments, physical and emotional stress often occur simultaneously when operating on the fireground. Individuals who find themselves in a high-stress situation and are more physically fit are better suited to metabolize the emotional stress because their bodies will be under less physical strain than those less physically fit. Fatigue systematically reduces and removes the body's ability to absorb stress. Fatigue can therefore exacerbate the impacts of emotional stress on the body.

External factors can also impact firefighters and ICs at the scene of an incident. With the proliferation of camera-equipped smartphones and various platforms to share videos or live-stream emergency scenes, members operating at incidents become the subject of immediate scrutiny. This is just another stressor that pushes individuals outside their comfort zone and causes them to manage the impacts of emotional stress.

Impacts of Stress

On April 24, 2022, every individual operating on the fireground undoubtedly experienced varying levels of emotional stress and its negative impacts. Unexpected rapid fire extension, challenges with water supply, and members trapped and missing all culminated in an extremely rare, unpredictable event. How those stressors reveal themselves is highly individualistic in the types of impacts and their severity.

Auditory exclusion is a common effect of emotional stress. As emotional stress builds during an event, the human body filters out things it deems irrelevant. In the case of firefighting, radio transmissions might be disregarded or not be heard due to the body's physiological state. Task saturation—when the mind operates at full capacity and cannot take on additional tasks—might lead to "cognitive lockup," causing members to fixate on a problem or event. Another effect of emotional stress involves tunnel or even blurred vision. As the body processes auditory and visual inputs, it prioritizes what it feels is relevant at that moment.

Distortion, a common phenomenon resulting from elevated stress, can affect the individual's interpretations of time and space. For instance, one individual could perceive a space as much smaller or larger than it really is while another perceives it differently. Spatial perceptions can also impact decision-making in terms of access and egress. What might seem utterly unachievable to one person due to space or distance might be achievable in the mind of another. Individual perceptions of time can be similarly affected because the events may seem longer or shorter than they are.

The physical implications of elevated emotional stress levels can often manifest in diminished dexterity and motor skills. When initially descending the back side of the curve, a firefighter's fine motor skills become increasingly limited, and finite tasks suffer. As emotional stress increases, gross motor skills are affected, and cognition rapidly declines. As a result, those operating on the

fireground may find it difficult to translate their thoughts into orders and directions or to decipher orders and directions. Thus, individual decision-making becomes much more difficult.

When operating in a high-risk, high-threat, challenging setting, the brain reverts to its fight, flight, or freeze instincts, which stifle decision-making. These instinctive reactions occur without rational thought. The flight response may cause an individual to exit a situation to survive while the freeze response may render an individual incapable of making a decision and effectively frozen in place. In the wake of an unrelated fire that severely tested members of the FDNY, one fire officer said, "There were things I wanted to do and things I wanted to say, but I was unable to. It was as if my IQ dropped lower as the fire grew hotter." This statement aptly characterizes the freeze response in firefighters.

One of the most significant impacts of elevated emotional stress relates to memory and the ability to recall events. When stressed, the human brain struggles to recall what occurred accurately. Stress traumatizes the brain, embedding memories in an order that differs from reality or combining multiple events into a single memory, thereby distorting one's perception of what happened. A joint FDNY–Columbia University study examined firefighters' ability to recall specific details following all-hands fires. Firefighter participants were asked to recall handie-talkie transmissions during a recent fire operation. The study found that compared to the recorded transmissions, on average, only 28% were recalled accurately, thus illustrating the effect of filtering on memory. For example, if firefighters operated in an engine, they tended to recall engine–centric transmissions. The same held true for those in ladder companies.

Furthermore, the same study illustrated the principle of self-relevance in recall. If a transmission was directed toward a specific firefighter, that individual was more likely to recall it after the event. Moreover, the responses of firefighter participants showed that many guessed rather than recalled segments of events, but experience tended to coincide with a slight improvement in recall rates. These findings go to show the deleterious effects of dynamic, uncertain, and complex events on memory. This study demonstrated that gaps in a firefighter's memory are normal, and even more common during high-stress events. In sum, memories are malleable and can be influenced or altered by external events or forces.

Optimizing Human Performance in the FDNY

The FDNY has a long history of performing optimally at inexplicably challenging events and will continue improving its fireground operations with a greater understanding of human performance. Better understanding human performance and leveraging it as a force-multiplier will position the FDNY for successful outcomes in the future.