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Career Lieutenant Dies and Five Injured in Structural Collapse of Mixed-Use Occupancy during Cause and Origin Investigation - Pennsylvania

Executive Summary

On June 18, 2022, at approximately 01:53 hours, the Fire Communications Center (FCC) dispatched Box 443 in response to a reported fire in a third-floor apartment, with initial reports indicating potential trapped occupants. Multiple units responded immediately. Engine 2 (E2) arrived on the scene within four minutes of dispatch, reporting smoke conditions and initiating suppression efforts. By 02:05 hours, Incident Command (IC) escalated operations, declaring "all hands in service" to fully address the fire. At 02:12 hours, IC reported that primary searches were negative, the fire had been knocked down, and secondary searches were underway. The fire was officially placed under control at 02:18 hours, and units began clearing the scene. Post-fire operations continued, with Fire Marshal 21 (FM21) arriving at 02:33 hours to begin an investigation, and Licensing and Inspection (L&I) officials arriving at 03:14 hours to assess structural stability.

Photo 1: Aftermath of building collapse.
(*Courtesy of fire department*)

Approximately 90 minutes after the initial dispatch, at 03:23 hours, the structure collapsed, trapping multiple firefighters inside. FCC dispatched additional suppression units, including Rescue 1, Collapse Unit 1, and additional emergency medical service (EMS) units. Engine 50 (E50) confirmed a full collapse at 03:27 hours and reported missing personnel. Battalion Chief 8 (BC8) requested a second alarm at approximately 03:30 hours to expand search and rescue operations. At approximately 04:09 hours, IC confirmed contact with three trapped firefighters, while a fourth trapped firefighter could not be accounted

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for. Over the next several hours, intensive rescue operations occurred, with four firefighters successfully extricated between 05:01 and 05:14 hours and transported to local hospitals. By 07:05 hours, IC reported that all personnel had been removed, and the final firefighter was transported at 07:11 hours. The IC officially marked the incident under control at 07:13 hours and began demobilizing response units.

Contributing Factors

- *Arson*
- *Change of occupancy*
- *Frequency of building inspections and follow-up inspections on deficiencies and failures*
- *Approval and documentation of structural alterations*
- *Age and condition of the building*
- *Recognized structural deficiencies*

Key Recommendations

Governing municipalities (federal, state, regional/county, and local) should:

- *Pursue in-depth change of occupancy inspections to ensure buildings are safe for occupancy and comply with the adopted fire and life safety codes.*
- *Identify and communicate hazardous building conditions, dangers, and other hazards to the fire department.*
- *Perform building inspections and follow-up inspections in a timely and efficient manner.*

Fire departments should:

- *Strategically deploy safety officers.*
- *Train all personnel to employ risk management principles and stop-work authority.*
- *Develop pre-incident plans for structures within their first due response area, including mixed-use occupancies and special hazards.*
- *Designate buildings as special hazards if they are unstable, in disrepair, or aged beyond their lifespan.*

The National Institute for Occupational Safety and Health (NIOSH) initiated the Fire Fighter Fatality Investigation and Prevention Program to examine deaths of fire fighters in the line of duty so that fire departments, fire fighters, fire service organizations, safety experts and researchers could learn from these incidents. The primary goal of these investigations is for NIOSH to make recommendations to prevent similar occurrences. These NIOSH investigations are intended to reduce or prevent future fire fighter deaths and are completely separate from the rulemaking, enforcement and inspection activities of any other federal or state agency. Under its program, NIOSH investigators interview persons with knowledge of the incident and review available records to develop a description of the conditions and circumstances leading to the deaths in order to provide a context for the agency's recommendations. The NIOSH summary of these conditions and circumstances in its reports is not intended as a legal statement of facts. This summary, as well as the conclusions and recommendations made by NIOSH, should not be used for the purpose of litigation or the adjudication of any claim.

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

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Introduction

On June 18, 2022, a three-story mixed use occupancy structure collapsed during the investigation phase of suppression operations. The collapse resulted in the death of a 51-year-old lieutenant and injuries sustained by one building inspector, one fire marshal lieutenant, and three firefighters. On June 21, 2022, the fire department and the U.S. Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. From July 13–July 23, 2022, three investigators representing the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) conducted interviews with fire officers and firefighters who responded to the incident. Site visits, photos taken at the scene, computer aided dispatch (CAD) notes, radio traffic audio, as well as video and camera footage obtained from the fire department were reviewed. NIOSH investigators also reviewed the training records of personnel involved in the incident and reviewed the department's standard operating procedures (SOPs) and professional development model.

Fire Department

This urban career fire department has 63 stations and provides EMS and fire suppression services to a population of approximately 1.6 million residents inside a geographical area of approximately 141 square miles. The fire department is led by a fire commissioner who is appointed by the mayor, a chief of staff, four deputy commissioners, a communications director, and a part-time medical director. The department is divided into four major components:

- **Operations** manages fire suppression, EMS, special operations, and aviation operations.
- **Logistics** heads health and safety, the fire academy and training, fire communications center, the technical support unit (apparatus, equipment, warehouse, water, and facilities), and information technology.
- **Planning/risk reduction** manages fire prevention, fire code, EMS community risk reduction, fire marshal units, performance, analytics, and management information systems.
- **Finance/administration** administers the budget, human resources, recruitment, employee assistance, employee relations, and special investigations.

The fire department divides the city into three divisions, each led by a deputy chief and executing aspects of the four components outlined above.

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- Division 1 consists of five battalions and 22 fire stations
- Division 2 has four battalions and 18 fire stations
- Division 3 has four battalions and 20 fire stations

The department has 60 engines, 29 ladders, one heavy rescue, two squads, and two marine units. The department operates specialty companies for technical rescue, hazardous materials incidents, and aircraft rescue and firefighting. The EMS division of the department consists of 63 medic units and associated supervisory staff, including field officers.

Engines are staffed with an officer and three firefighters, the ladders and squads with an officer and four firefighters, and the rescue with an officer and five firefighters. Each deputy chief and battalion chief is assigned an incident command technician or chief's aide. The operations-assigned personnel work a rotating 12-hour shift with four platoons. An Assistant Chief supervises each platoon, serving as the citywide shift command and assuming all operational and administrative responsibilities for field units. Shift times are 0800-2000 or 2000-0800 and average a 42-hour work week.

Training, Education, and Professional Development

The Commonwealth of Pennsylvania does not have prerequisite training or education requirements for an individual to become a firefighter. The department participates with the Pennsylvania State Fire Academy in the *Voluntary Participation and Certification Program*, which began in 2003 to provide national certification for department members through the National Board on Fire Service Professional Qualifications and the International Fire Service Accreditation Congress. Upon acceptance, fire department cadets/recruits are assigned to the department fire academy for an extensive 36-week academic, practical, and physical training program. While assigned to the academy, recruits train in firefighting operations and EMS. Upon successful completion of the academy, the firefighters are certified as Fire Fighter I and II, in Hazardous Materials Awareness and Operations, in applicable components of the NFPA 1035 standard, and as a state-certified Emergency Medical Technician (EMT). Firefighters are then assigned to either an engine or ladder within the operations division. As EMTs, firefighters are assigned as needed to work on basic life support (BLS) and advanced life support (ALS) medic units. During their probationary period, each firefighter is tested by the fire academy staff at nine months (written and practical examinations) and 12 months (written examination). Recertification for an EMT and paramedic (EMT-P) is every two years, which requires 18 hours of continuing education for EMT and 24 hours for EMT-P.

Members who are assigned to the Operations Division are required to complete at least one hour of training per shift. Fire officers and firefighters are required to complete a minimum of 170 hours of training annually. The deceased lieutenant was a well-trained 27-year veteran of the department, including assignments to a heavy rescue unit and Urban Search and Rescue Task Force.

Apparatus, Staffing, and Communications

The city police dispatch center answers emergency calls. If a caller requires a fire or EMS response, the call is transferred to the FCC. The FCC is operated by non-uniformed members of the fire department and consists of a shift supervisor, four call takers, four dispatchers, and one relief person. If

the incident is a building fire, the FCC assigns a predesignated number and type of companies to the incident. At the time of this incident, all incidents were assigned a "box" number based on the location of the street call boxes that were historically used as a method of transmitting alarms to the FCC.

All personnel on each unit are assigned call signs in relation to their riding position on the apparatus. Such as Engine (number) Officer, Engine (number) DPOP (Driver/Pump Operator), Engine (number) Pack, and Engine (number) Tip. The pack and tip call signs denote responsibilities for advancing hose lines and operating the nozzle. These terms are used throughout the report to identify personnel by position. All members are assigned a portable radio which is linked to the riding position. In the event of an emergency button activation, FCC can identify the member by position and relay that information to the IC.

The fire department has a Health and Safety Office (HSO) which consists of a deputy chief in charge of the HSO, a battalion chief, two captains, and two lieutenants. The HSO is in the department training academy. The department has four field deputy chiefs that serve as incident safety officers (ISOs) who are assigned to a shift and respond to "All Hands" notifications or greater fires.

Building Construction

The building involved in this incident was built in the 1880s and was of type III construction with many different occupancies and structural alterations over its lifecycle. Not all construction, alterations, and additions to the structure were approved by the city. Most recently, the first floor served as an arcade or gaming hall, take out restaurant, and pizzeria. The second and third floors had been through several remodels from single family apartments on each floor to a dormitory style layout with several "rooms" in each floor. The Side Bravo of the structure on the second floor was given a "bump out" or addition over the sidewalk. There originally was a set of concrete stairs that led to the addition and served as the entrance to the second floor (**see Photos 2 and 3)**. Eventually the stairs were demolished, but the addition remained. The building was constructed in "main street" or taxpayer style. These types of buildings often contain a basement or sub-division below the street level entrance and has exterior walk-up access from the basement to the street; this building had a BILCO® door entrance on the Bravo sidewalk. These buildings may be constructed using various techniques which are also found in type II,

Photo 2: Scene photo of Side Alpha of the structure. (*Courtesy fire department*)

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Photo 3: Bravo side of the structure. Note the bump out over the sidewalk and exposed windowsills where windows were covered over. (*Courtesy of fire department*)

III, IV, and even V construction [Shady and Tobin 2020]. Typically, they are constructed in a row style with masonry bearing walls and combustible construction making up the floors, ceilings, and interior surfaces (s**ee Photos 4, 5, and 6**). The masonry exterior walls are exposed to the elements and can become weak as mortar between the stones and bricks is degraded or washed out entirely [Dunn 2010]. In this incident, all exterior walls of the building were covered with stucco-type material that masked any degradation of the bricks and mortar (**see Photo 2**).

Photo 4 (Left) and 5 (Right): Legacy construction members common in type 3 "main street" buildings. (*Courtesy fire department*)

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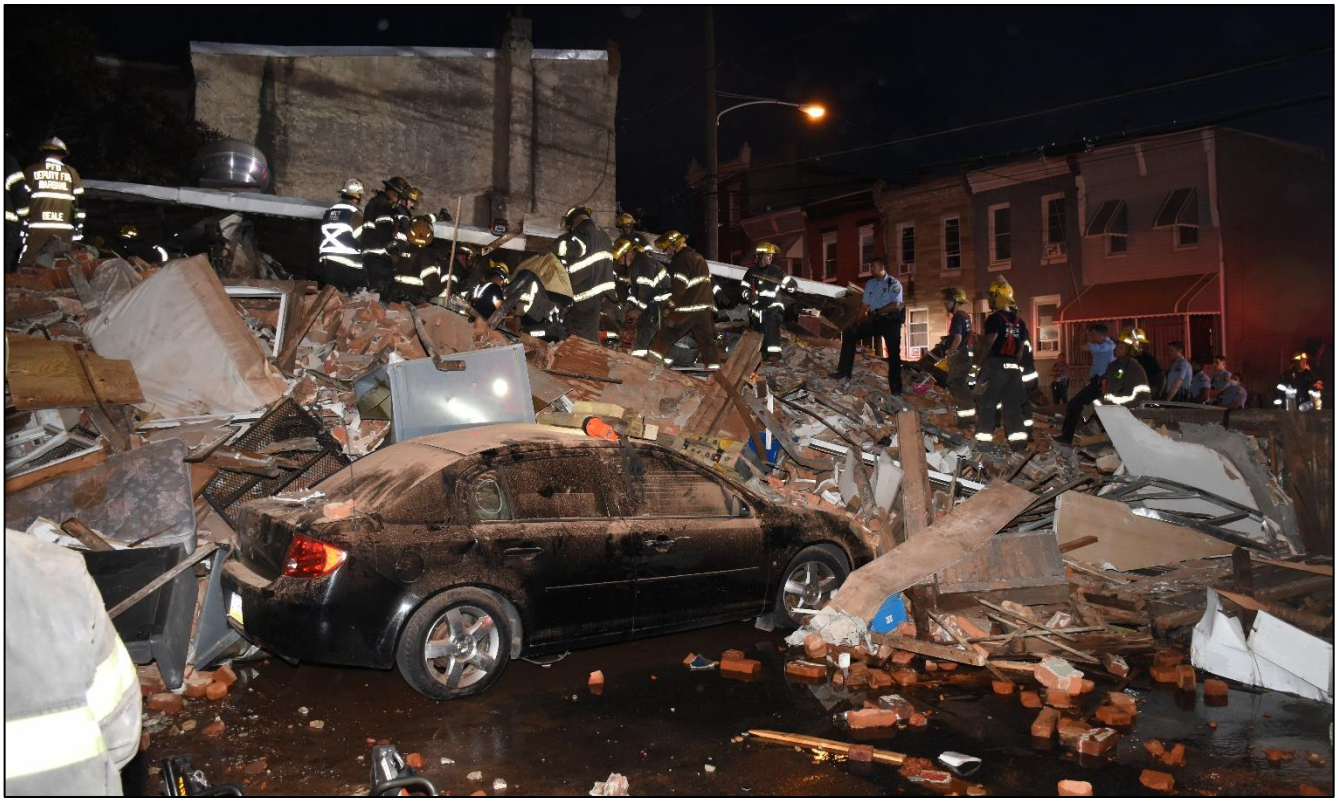

Photo 6: Incident scene of the Bravo side following the collapse. (Courtesy of fire department)

Personal Protective Equipment

The deceased and injured firefighters were wearing their department issued personal protective equipment (PPE) ensemble. This ensemble included structural firefighting turnout gear that met the requirements of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* [NFPA 1971 2018]. No evidence was identified to suggest that the PPE contributed to the fatality or injuries of personnel.

Weather Conditions

The weather on June 18, 2022, between 01:53 hours and 07:13 hours was fair with no precipitation. The temperature ranged from 73°-79°F with winds ranging from 8-16 mph out of the West Northwest. The humidity ranged from 37% to 48% [Weather Underground 2025].

Investigation

On June 18, 2022, at approximately 01:53 hours, the FCC dispatched Box 443 for an apartment fire on the third floor. The units dispatched were E2, E25, E50, E55, Ladder 3 (L3), L12, Battalion 8 (BC8), BC10, and Medic 22. E2, L3, and BC8 responded on the air within two minutes of dispatch and an update was made of "people trapped on the third floor and a possible second address." At approximately 01:56 hours, E2 arrived on-scene and sized up the fire as "a two-story, end of the row,

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16 by 35, appears to be occupied, we got medium smoke coming from the rear, one and one in service." FCC acknowledged the message and ordered all other incoming units to proceed in and stand by except for E2 and L3 (**see Photo 2**). Upon the arrival of BC8 on-scene, a second size-up was provided on the North Fire radio frequency of, "We got a three-story end of the row, 15 by 45 occupied store front. We have fire showing first floor, medium smoke on the second floor, light smoke on the third floor, Side Delta is an empty lot, Side Bravo is Third Street. We have three and two in-service at this time." At approximately 02:05 hours, IC updated FCC that they would be going all hands in service, which triggers a dispatch of additional firefighting, EMS, and supervisory resources. BC10 arrived and conducted size-up in the Charlie division. At approximately 02:12 hours, IC provided a progress report that "Primary is negative, fire is knocked down. We're conducting the secondary, making good progress." The IC placed the fire under control at approximately 02:18 hours, and units assigned to the box began clearing the scene. At approximately 02:24 hours, the IC updated that they were going to go "2 and 2" and keep the rapid intervention team (RIT) company and a medic unit, returning the remaining units of the alarm.

At approximately 02:33 hours, FM21 arrived on-scene to begin their investigation. At approximately 02:45 hours, the IC updated that they were down to 1 and 1 and a medic unit but were still waiting on the utility company and L&I. L&I arrived on-scene at approximately 03:14 hours. At approximately 03:23 hours, roughly 90 minutes into the incident, the structure collapsed. L3 officer transmitted emergency traffic of a "three story collapse with members inside, need a box assignment and a collapse unit." At approximately 03:25 hours, Box 443 was dispatched for units Squirt 8 (SQT8), E25, E29, E50, L12, BC8, BC10, Rescue 1 (R1), Medic 29, Collapse Unit 1, Squad 72 and 72A. Note that E55, L25, Medic 15 and 19B, and EMS Squad 9 (ES9) self-dispatched to the incident unrequested. At approximately 03:27 hours, E50 arrived and sized up the scene as a "full collapse, missing 3 guys right now." Roughly one minute later E25 announced, "We have located two members. We are going to get them out. We are going to need medic units." SQT8 requested five additional medic units. At approximately 03:29 hours, SQT8 arrived and provided an additional scene size-up, "Three story property, we have members involved, looks like three stories, 15 by 45. We have wires down. We need [utilities] on emergency, have SOC (Special Operations) go into service upon arrival." At approximately 03:29 hours BC8 requested three additional medic units and L4 self-dispatched to the incident.

At approximately 03:30 hours, BC8 requested, "Strike out the second alarm. I have three members trapped in a collapse." FCC dispatched the second alarm of E7, E28, E45, E55, E59, L16, Tower Ladder 22 (TL22), BC2, BC3, BC4, and BC9. ES9 arrived and requested all hospital capabilities, medic units assigned, and alerted all EMS units to not be blocked in so they could transport. At approximately 03:34 hours additional units dispatched to the incident included Deputy 3, ES1, ES3, Safety Officer 1 (IS1), and Special Operations 1 (SOC1). At approximately 03:44 hours the first injured firefighter who jumped from floor two during the collapse was transported from the scene to a local hospital. Fire Marshal 13 (FM13) self-dispatched to the incident at approximately 03:46 hours. At approximately 03:56 hours the second firefighter was transported from the scene to a local hospital, and Squad 47 was dispatched to the incident. At approximately 04:09 hours the IC updated, "All hands working, in contact with two members on side C, in contact with one in the center, one member still unaccounted for." At approximately 04:43 hours the IC updated that all hands were still working to

remove three missing fire department members and one L&I inspector. Between 04:45 and 04:53 hours, the following units were requested: E11, E12, L14, L23, Medic 24, and Medic 46.

At approximately 05:01 hours, after the first two injured members were removed from the surface debris, the third member was removed from the debris pile and evaluated by EMS. At 05:04 hours, the fourth member was removed and evaluated by EMS evaluation. At 05:08 hours, the third member was transported by EMS to a local hospital. At approximately 05:14 hours, the fourth member was transported by EMS to a local hospital. At approximately 05:28 hours, the IC provided a progress report that personnel were still working the rescue of another member. During the rescue, it was discovered that the lieutenant and a firefighter were trapped almost together which made differentiating between the two personnel difficult. At 07:05 hours, the IC updated "All members have been removed from the pile." A fifth member was transported to a local hospital by EMS at approximately 07:11 hours. The sixth member (lieutenant) was declared deceased at the scene. At approximately 07:13 hours, the IC asked for the incident to be marked under control and released companies.

Fire Origin and Cause

The authority having jurisdiction cause and origin investigation determined that the fire started on the first floor and classified it as arson.

Cause of Death

As of the medical examiner report dated June 18, 2022, the preliminary cause of death is mechanical asphyxia due to entrapment in debris from collapsed building after fire.

Contributing Factors

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

- Arson
- Change of occupancy
- Frequency of building inspections and follow-up inspections on deficiencies and failures
- Approval and documentation of structural alterations
- Age and condition of the building
- Recognized structural deficiencies.

Recommendations

Governing municipalities (federal, state, regional/county, and local) should:

Recommendation #1: Pursue in-depth change of occupancy inspections to ensure buildings are safe for occupancy and comply with the adopted fire and life safety codes.

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The building involved in this incident was over 100 years old and type III style construction. It was declared imminently dangerous by the L&I department in 2002. Throughout the building lifespan, many structural and cosmetic alterations occurred. However, not all regulations for fire and life safety established by the authority having jurisdiction (AHJ) were followed for these alterations. According to information provided by the L&I department, some applications for changes occurred after the work was completed. This prevented the L&I inspectors from ensuring all the work was done according to plan, ordinance, and code requirements. The building was remodeled multiple times through its lifecycle on all floors, including designing a 7-unit apartment setup in the second and third floors and multiple different restaurants and a gaming hall on the first floor.

The AHJ adopted the following codes, with specific amendments, at the time of this incident:

- City Administrative Code
- 2018 International Building Code (IBC)
- 2018 International Residential Code (IRC)
- 2018 International Mechanical Code (IMC)
- 2018 International Existing Building Code (IEBC)
- 2017 National Electric Code (NEC)
- 2018 International Performance Building Code (ICCPC)
- 2018 International Energy Conservation Code (IECC)
- 2018 International Fire Code
- 2018 International Fuel Gas Code (IFGC)
- City Zoning Code
- 2018 International Plumbing Code (IPC)
- 2009 International Property Maintenance Code

Due to different ways tenants use spaces in mixed-use occupancies, AHJs and fire departments should seek a formal change of occupancy process that includes a complete building inspection [NIOSH 2025a]. In this incident, the 2018 IEBC adopted by the city has a provision for a change of occupancy stating that altered areas of a building and relocated buildings shall not be used or occupied until permitted by L&I. The 2018 IEBC also states that a building's occupancy cannot change until the code official issues a certificate of occupancy. Issuance of a certificate of occupancy does not mean that any violations of this code or other ordinances are approved [ICC 2018]. From the time the building was declared dangerous by the city until this incident, approximately 20 years later, the area of the fire building had more than one type of use. Documentation listed it as an arcade and pool hall, a takeout restaurant, and a pizza shop.

A carefully structured change of use policy by the AHJ may help prevent non-compliance and hazards through involvement with the tenant of the space throughout construction or remodeling. Based on the codes outlined above, it also considered a good practice for the AHJ to perform annual fire and life safety inspections throughout the business's life cycle.

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Recommendation #2: Identify and communicate hazardous building conditions, dangers, and other hazards to the fire department.

Hazard communication is imperative for personnel responding to an incident. When various hazards regarding a building are discovered by one department within the AHJ, that information should be communicated to other agencies that may interact with that building. Clear and open communication among different departments ensure that responding personnel know about pre-existing hazards or conditions which may impact operational and tactical decision-making on the emergency scene. This communication may also benefit residents and visitors of the municipality and reduce community risk by labeling buildings as a danger or hazard. The building owner may opt to conduct necessary maintenance or improvements to avoid being labeled as a danger or hazard [NIOSH 2025a].

For example, if a fire department took a medical run into this building prior to this incident and noticed structural deficiencies or hazards, the L&I and the fire marshal's office would be notified to conduct a building inspection. Initial inspection and follow up inspections, if necessary, can help ensure compliance from the building owner to applicable codes and adopted amendments. Again, if this occurred, the fire department would have been allowed to initiate development of pre-incident plans under the umbrella of community risk reduction and ensure identified hazards by the L&I or fire marshal were incorporated and communicated to the first due box assignment at a minimum.

AHJs could create a standardized process for hazard communication like the Occupational Safety and Health Administration (OSHA) Standard 1910.1200. This process would allow for a database to be compiled of various occupancies and target hazards within the AHJ that pose an above permissible level or risk for emergency operations. An example of hazard communications is the high-risk building marking system developed by the International Association of Arson Investigators (IAAI) and the United States Fire Administration (USFA) (**see Diagram 1**). The suggested exterior signage is designed to be affixed to unsafe or significant hazard containing buildings that are vacant or abandoned for recognition purposes.

Diagram 1: IAAI/USFA high-risk building marking system *(Courtesy of USFA)*

The building marking system developed by the IAAI/USFA is one example that provides information to incoming responders to call out when they are sizing up the structure and making decisions on the tactics to be employed. As building issues or deficiencies are corrected and approved by the AHJ, markers can be removed, and pre-incident plans can be updated.

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Recommendation #3: Perform building inspections and follow-up inspections in a timely and efficient manner.

Chapter 6, section 7, of NFPA 1730, *Fire Prevention Inspection and Code Enforcement Activities in Existing Occupancies*, states that inspection frequencies shall not be less than specified in **Table 1**. Examples of high-risk occupancies include multiple family dwellings, high-rise buildings, hotels, dormitories, lodging and rooming, assembly, childcare, detention, educational, healthcare, and industrial. Examples of low-risk occupancies include storage, mercantile, and business. Examples of moderate-risk occupancies include ambulatory health care and industrial occupancies that do not maintain, store, use, or handle hazardous materials in excess of exempt amounts. Critical infrastructures could include water treatment plants, special structures, public safety buildings, and power plants [NFPA 1730 2019].

Table 1: Minimum Inspection Frequencies based on Risk Classification (*Courtesy NFPA*)

Occupancy Risk Classification	Minimum Inspection Frequency
High	Annually
Moderate	Biennially
Low	Triennially
Critical Infrastructure	Per AHJ requirements

Given the primary objective of building and fire inspections is life safety, AHJs should seek to perform annual inspections for most occupancy types. This aligns with the frequency of inspection of the fire protection features of the building per various NFPA standards. During these inspections, it could be beneficial to incorporate a thorough risk assessment of the structure, communicate findings to all involved stakeholders, plan for resource management during an emergency, and develop a pre-incident plan containing resource management strategy. Progressive utilization of technology can ensure easy access to information gathered by all stakeholders [Bron 2025].

When a deficiency is noted or a new hazard is identified during a building or fire inspection, a follow-up or reinspection should be scheduled with the owner/occupant of the structure following AHJ guidelines. A reasonable amount of time between the initial inspection and the follow-up should be granted to allow for the occupant/owner or a contracted professional to bring the building back into compliance with the locally adopted codes. The AHJ could adopt specific guidelines on timeframes for achieving code compliance before the issues are elevated and punitive action is taken.

Additionally, fire service organizations should:

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Recommendation #4: Strategically deploy safety officers.

The fire department in this incident has one assigned Incident Safety Officer (ISO) per shift for the entire city. In this incident, the ISO arrived at the scene as the original incident was declared under control. As units were cleared from the box alarm, the ISO returned to quarters. Standard practice in this city is that the fire marshal conducts a cause and origin investigation of the fire upon completion of all salvage and overhaul efforts. This is done with either just an engine company, or an engine and a truck company assisting to "dig" the fire. This incident occurred during the fire marshal investigation when only the fire marshal, L&I, engine, and truck company were on-scene. Upon the truck company declaring the Mayday, the ISO responded back to the scene.

ISOs are primarily responsible for identifying actions and activities on the fire scene that may pose an imminent threat to firefighter safety and employing stop work authority to correct or change the actions or tactics putting personnel at unnecessary risk [NIOSH 2025a]. While the presence of the ISO during the fire marshal investigation may not have prevented personnel from being involved in the collapse of the structure, having additional personnel assigned in the ISO role across the city would lessen the workload for one individual and allow them to remain and focus on personnel safety through wrap-up of the scene.

An alternative option for fire departments is to cross train all officers within the department to the 2020 NFPA 1521 Chapter 5 *Standards for the Incident Safety Officer*. These individuals could be assigned to focus on responder safety during the incident rather than the incident action plan (IAP) and operational needs. The department may have to adopt a formal policy to differentiate this role as an acting status within the department for incident scene needs. This will ensure that there is a third party on the scene, separate from the IC, who is monitoring the IAP, conditions, activities, and operations and employing necessary risk management principles at every phase of an incident [NFPA 1521 2020]. **Appendix A** includes a sample checklist that an ISO or person performing the responsibilities of the ISO could reference during the performance of their duties and responsibilities.

Recommendation #5: Train all personnel to employ risk management principles and stop-work authority.

Risk management and safety of the scene following a fire, especially in a building of significant age, becomes a primary concern during the fire investigation and "digging" of the fire. The NFPA 1321 Standard for Fire Investigation Units (FIU) Chapter 6 discusses health and safety requirements for FIUs. It is recommended that the FIU should have a policy for the completion of a site safety assessment prior to starting scene examination which should include the following components [NFPA 1321 2025]:

1. Hazard identification
2. Risk Assessment
3. Hazard mitigation via the hierarchy of controls [NIOSH 2025b]:
    a. Elimination
    b. Substitution

c. Engineering controls
d. Administrative controls
e. PPE

4. Monitor and review or audit

Hazard identification is the process of examining each work area and work task to identify hazards that may be inherent to the work being performed, especially since every scene is different due to the nature of fire investigations. Risk assessment is the process of assessing the risks associated with each of the identified hazards to implement appropriate control measures based on the probability that harm, injury, or illness may occur and the potential severity of the consequences of exposure [NFPA 1321 2025]. Controlling a hazard involves identifying and implementing the most efficient and cost-effective risk control measures while being mindful of the hierarchy of controls (**See Diagram 2**). Controlling exposures to occupational hazards is fundamental to protecting workers. Monitoring and review or auditing is important to ensure that the control mechanisms in place are still proper as the scene changes during the investigation and processing [NFPA 1321 2025].

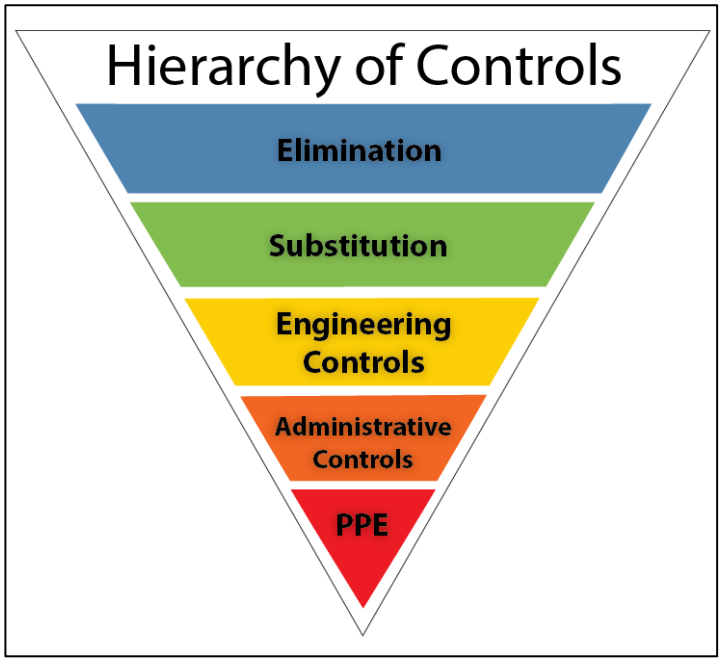

Diagram 2: Hierarchy of Controls
(Courtesy of NIOSH)

The hierarchy of controls identifies the preferred order of actions to best control workplace exposures and hazards [NIOSH 2025b]. Elimination of a hazard is the physical removal of the hazard and is the most effective control mechanism. Substitution involves replacing a component or method that creates a hazard with something that either does not create a hazard or creates a lesser hazard. This mechanism may not always be applicable in a fire or explosion investigation. Engineering controls isolate personnel from the hazards. Administrative controls, sometimes referred to as work practice controls, are changes in work procedures such as written policies, rules, supervision, training, etc. with the goal of reducing the duration, frequency, and severity of exposure to hazards. PPE is the least effective means of controlling hazards due to the potential for damage that would render the PPE ineffective and the extra physiological stress some PPE may put on the personnel [NFPA 1321 2025].

Recommendation #6: Develop pre-incident plans for structures within their first due response area, including mixed-use occupancies and special hazards.

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In this incident, the L&I department handled all the building inspections and occupancy permits. The fire marshal's office oversaw all cause and origin investigations with assistance from the company assigned. The building in this incident was over 100 years old and could potentially qualify as a dangerous building. The first floor was a commercial pizzeria with no seating inside, the second and third floors were each individual apartments apart from the second floor having the addition on Side Bravo over the sidewalk that previously had served as an entrance. At the time of this investigation, the involved fire department did not have policies and procedures around company level fire inspections and pre-incident plans or origin, cause, and scene preservation, but they initiated development of these items after the incident.

Chapter 17 of NFPA 1660 [2024] states that, "the pre-incident plan shall be a cooperative effort among the pre-incident plan developer, facility management and operations staff, and responding personnel." Obtaining community buy-in for risk reduction involves a comprehensive approach that covers all aspects of community risk reduction, public fire and life safety education, and fire and life safety message distribution from the fire department and AHJ. The pre-incident plan developer should consult with entities who are able to provide valuable input, including technical experts who do not respond to incidents [NFPA 1660 2024].

Pre-incident plans should be incorporated into the IAP of the associated incident, ensuring that the IC has important information at the command post for ease of communication of hazards and pertinent information on the building or occupants. The following can be considered and included in the development of a pre-incident plan if applicable [NFPA 1660 2024]:

- Potential life safety hazard, including emergency responder safety
- Structure size and operations complexity
- Economic impact
- Importance to the community
- Location and seasonal variations
- Presence of hazardous materials
- Susceptibility to natural disasters

Once a site is selected for pre-incident planning, the developer determines the information needed following requirements set forth by the AHJ. Then a request is made to the fire department to ensure a holistic plan. The personnel developing the pre-incident plan should conduct a site visit, examining the exterior on all sides and work their way inside. They should note and sketch the layout, contents, construction type, and protection features. It should be noted if there were any changes to the building since the previous building inspection, especially if it could impact fire growth and behavior. If changes occurred, all other entities related to occupancy and inspections should be notified of the changes for any necessary or required follow up. Other pertinent information needed includes utility locations (inside and outside the structure), water supply locations, fire department connections (if present), ingress and egress challenges or limitations, known or potential hazards, and any fire department access issues. All information, including the drawings of the floor plan with all appropriate symbols accurately depicted in the correct locations, should be placed in a file or document and

distributed to all parties specified by the AHJ. This file or document may be shared electronically via a secure system, if agencies all can access the information [NFPA 1660 2024].

Recommendation #7: Designate buildings as special hazards if they are unstable, in disrepair, or aged beyond their lifespan.

The building type in this incident is frequently identified as a taxpayer or "main street" style. These are commonly two-or three-story type III buildings with masonry bearing walls and dimensional lumber making up the rest of the structure. In the northeast United States, they typically have a basement accessed from both inside and outside the structure in a walk-up style. At the time of this incident, the street level floor was a carry out pizzeria, and the second and third floors were both single family apartments. The building in this incident was also well over 100 years old and aged beyond its lifespan. In this type of situation, the collapse risk of walls needs to be evaluated continuously throughout the fire scene, especially when all the exterior is covered in a stucco finish. Stucco finish on buildings can hide many features that give insight into the condition of the building, such as missing or washed-out mortar, cracks that have already formed or are beginning to form between courses of brick, and the condition of the walls as a whole [Shady and Tobin 2020]. In this incident, the entire building had been refinished with a stucco exterior covering that may have hidden any exterior deficiencies.

Continuous and ongoing size-up, by all on scene personnel, is key to personnel safety in type III, taxpayer style buildings. The structural integrity of the building must be assessed and reassessed from the arrival of the first unit through the return in service of the last unit. Brick and joist construction buildings have high collapse potential from compromised structural integrity. The only risk management solution is avoidance. Pre-existing openings in exterior walls such as doorways or windows are inherent weak points in the structure design. If cracks begin forming during the incident, this may be a sign of impending collapse of the structure. Collapse and unseen fire spread are two potential red flags related to operations in taxpayer or mixed-use occupancies like in this incident [Shady and Tobin 2020]. The building in this incident had an additional entrance added on Side Bravo of the second floor at some time during its life, which was eventually converted into a room and the concrete stairs leading to it were demolished. It is unclear in this incident if the addition on floor two was approved by the municipality or not, as well as, whether the structural requirements relied on the concrete stairs which were demolished to maintain the structural integrity of the Bravo side wall. The type III row-style buildings get their structural strength from the exterior and adjoining masonry walls. If these walls are breached for any reason, such as in this case with the Bravo floor two addition, they must be engineered and approved to ensure they are not placing undue stress on the structural integrity of the building. The building also appeared to at some point in its lifespan to be part of a row based on the imaging of the front of the building that shows a partial archway that would have tied into the front of the building that would have adjoined on the Delta side and continued down the block. These buildings are typically designed as a row and harness the strength of the adjoined walls or party walls between the buildings. This provides for this particular building to be considered as an atypical taxpayer style building as there is no adjoining building as designed to provide for additional lateral stability.

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Developing a dangerous or hazardous building program that involves scoring buildings based on age, occupancy type, special hazards or circumstances, and occupancy status can provide a hierarchy for pre-incident planning urgency. Buildings in a row style with shared bearing walls, or party walls, between occupancies necessitate additional safety considerations when the remainder of the row is present, but the fire building is no longer part of a row. In some instances, additional weaknesses may occur when the rest of a row is removed, and the building is now a standalone. Responders could benefit from having additional call outs for taxpayer buildings with "star bolts" installed on them. What are commonly referenced as star bolts can also have other shapes for the washer against the masonry wall face. Star bolts are put into place to hold older buildings together and can indicate that the walls are weakened and may catastrophically fail [Kohlstedt 2019]. Traditionally, star bolts or other shape bolts will run from Side Alpha to Side Charlie to provide intersecting support with the floor joists in each division. The floor joists will typically run from Side Bravo to Side Delta and place much of the building weight on those two bearing walls. These walls, when configured in a row format, may have the weight of both buildings being transferred into them through the floor joists of the adjoined buildings.

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Investigator Information

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Disclaimer

The information in this report is based upon dispatch records, audio recordings, witness statements, and other information that was made available to the National Institute for Occupational Safety and Health (NIOSH). Information gathered from witnesses may be affected by recall bias. The facts, contributing factors, and recommendations contained in this report are based on the totality of the information gathered during the investigation process. This report was prepared after the event occurred, includes information from appropriate subject matter experts, and is not intended to place blame on those involved in the incident. Mention of any company or product does not constitute endorsement by NIOSH, Centers for Disease Control and Prevention (CDC). In addition, citations to websites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these websites. All web addresses referenced in this document were accessible as of the publication date. *NIOSH Approved is a certification mark of the U.S. Department of Health and Human Services (HHS) registered in the United States and several international jurisdictions.*

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Appendix A

Sample Incident Safety Officer Checklist (*Courtesy NFPA*)

ISO INCIDENT CHECKLIST

Safety officer: _____ Incident number: _____ Date: _____

Response type: _____ Location: _____

Incident commander: _____ Sector chief(s): _____

Time of incident (1): _____ Safety on location (2): _____ Elapsed time (2-1): _____

ISO Duties

(1) Report to incident commander. Discuss incident (incident strategy, plan of action, safety plan).

(2) Walk the incident and establish a perimeter, checking the following items as they relate to safety. Advise command staff of risk assessment of incident. **Relate any immediate safety concerns to incident commander.**

✓ = OK ✕ = Issue ◯ Circle applicable category

Strategy and Tactics

- ❑ Offensive/defensive/marginal attack
- ❑ Crews following incident commander strategy?
- ❑ Ventilation (vertical/horizontal, fans, crew location, means of egress — windows/doors, smoke conditions — volume/color/force — as related to safety of personnel)
- ❑ Incident layout (site drawing, crew locations, rapid intervention team)
- ❑ Risk management (Is the action necessary?)

Hazards

- ❑ Utilities (hydro, natural gas, LP-Gas tanks)
- ❑ Environmental (heat, cold, ice, snow, rain, wind)
- ❑ Structural conditions (roof, walls, floors, facades, signs, other construction features)

(3) After the initial incident assessment, continue to observe all listed items as well as others that might affect the safety of personnel, including the following *(periodically check back to incident commander for update briefing)*:

- ❑ Accountability (set-up, Phase I, Phase II, Phase III, PAR, rapid intervention team)
- ❑ PPE (turnouts, hoods, helmet, shields, gloves, boots, SCBA)
- ❑ Communications (radios, face-to-face, crews, sectors, command)
- ❑ Hazard control zones (No-entry zone(s): red/white, hot zone: red, warm zone: yellow, cold zone: green)
- ❑ Rehabilitation (location, fluids, food, crew rotation, manpower, shelter, heat/cooling, EMS)
- ❑ Ladders (selection, placement, secured, hazards — wires/footing, two means of egress)
- ❑ Equipment use (selection/placement of hose lines, water supply, tools, safety equipment, lighting)
- ❑ Apparatus (placement, collapse/heat zone, staging, effectiveness, enough resources)

(4) Exercise emergency authority to stop or prevent imminent unsafe acts — notify incident commander immediately — ensure all personnel are aware of any special circumstances or danger.

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ISO INCIDENT CHECKLIST *(continued)*

(5) Other considerations:

(a) In other than imminent unsafe acts, individuals or crews violating OFS policies and procedures will be addressed through the incident commander or through the post-incident analysis process.

(b) Be aware of the need for addressing critical incident stress if necessary as per SOP.

(c) In the event of accident/injury investigation, ensure the following is considered: scene preservation, critical injury protocol, seize PPE/equipment, document the scene with digital pictures, scene sketch (locations, measurements, etc.), witnesses, and statements.

(6) Resources

❑ Inspector ❑ Police ❑ EMS ❑ Hydro ❑ Gas Co. ❑ Water branch
❑ OC Transpo ❑ Engineer ❑ Heavy equipment ❑ Hazardous materials team

Scene Sketch

(Consider including direction, street names, apparatus, hose lines, hydrants, etc.)

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