1000 FREDERICK LANE, MORGANTOWN, WV 26508 · 304.285.5916

One Firefighter Dies During Unprotected Search in Nine-Apartment Building that was Originally Constructed to be a Single-Family House – Hawaii

Executive Summary

Photo 1: The apartment building, post-fire, Side Alpha
(Courtesy of NIOSH)

On January 6, 2025, 25-year-old firefighter died after becoming disoriented and trapped while conducting an unprotected search in a nine-apartment residential building fire. At 19:44 hours, the Fire Communications Center (FCC) dispatched Engine 2, Engine 4, Engine 9, Engine 29, Ladder 2, and Battalion 1 for a building fire. A caller noted that apartment #9 was involved. After receiving multiple calls, the FCC upgraded the incident to a second alarm at 19:45 hours. The second alarm dispatched Engine 1, Engine 22, Ladder 29, and Rescue 1. At 19:47 hours, Engine 2 arrived on-scene and provided a size up of a two-story apartment building, lazy smoke visible, but no flames. They pulled a pre-connect hoseline for fire attack while Engine 29 arrived and established a water supply. At 19:48 hours, Ladder 2 and Engine 9 arrived on-scene. At 19:50 hours, Ladder 29 and Battalion 1 arrived on-scene. Battalion 1 requested a conditions, actions, needs (CAN) report. Engine 2A responded that they had water on the fire from the exterior Side Charlie/Delta and the fire was located on the first division. Engine 9 entered and was performing searches on the second division. Engine 2 made entry from Side Charlie/Delta for fire control and primary search. Ladder 2 entered the building from the front door located on Side Alpha to perform searches on the first division. Engine 9 reported to Battalion 1 that they did not have a hoseline and that there was no fire on the second division. At 19:54 hours, Battalion 1 assigned Engine 4 to stage on Side Alpha with their rapid intervention team (RIT) gear and requested that Ladder 29 perform a 360 size-up of the building and secure utilities. At 19:55 hours, Engine 9A called a Mayday noting they were cut off with fire in the stairwell on the second division. Ladder 29A reported they had flames lapping up on the Side Delta toward the second division. Battalion 1 ordered multiple units to pull additional hoselines and assist with rescue of the Engine 9 firefighters. At 19:59

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hours, Engine 9A reported that they were on the second division landing on Side Alpha. He further reported that his facepiece was melting, they had two firefighters, two firefighters were missing, and they needed water. At 20:01 hours, Engine 9A reported to Battalion 1 they had two firefighters out of the building with Rescue 1 but were still missing two firefighters. Multiple units reported that deteriorating fire conditions were delaying entry to the building. Engine 9A advised Battalion 1 that the missing firefighters were Engine 9C and Engine 9D (deceased firefighter). One minute later, Engine 9C transmitted that he was outside the building. At 20:21 hours, Engine 4A transmitted that they found the downed firefighter on the Bravo/Charlie corner on the first division and requested assistance. At 20:24 hours, Ladder 29A transmitted priority traffic that if all personnel were accounted for, all units should go to a defensive strategy as the second division was now fully involved. At 20:25 hours, Battalion 1 advised the FCC that the victim had been extricated and moved to EMS. Engine 9D was transported to a local hospital where he was pronounced deceased.

Contributing Factors

- *Unprotected interior search*
- *Hoseline selection and deployment*
- *Door control/flow path*
- *Mayday operations*
- *Change of occupancy.*

Key Recommendations

Fire departments should:

- *Ensure that interior search crews' means of egress are protected by a staffed hoseline.*
- *Use the appropriate hoseline based on conditions present.*
- *Train on recognition of flow paths and interior fire attack techniques utilizing door control.*
- *Employ proactive RIT operations for access and egress.*

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

- *Ensure that the delegated zoning or building code enforcement authority shares change of occupancy information with the fire department.*

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 January 6, 2025, 25-year-old firefighter died after becoming disoriented and trapped while conducting an unprotected search in a nine-apartment residential building fire. On January 27, 2025, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On February 2 – 9, 2025, an investigator representing the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP), along with a representative from the International Association of Fire Fighters (IAFF), traveled to Hawaii to investigate this incident. The investigators conducted interviews with command officers, fire officers, firefighters, fire investigators, and other emergency personnel who were on-scene at the incident. NIOSH investigators inspected the personal protective equipment (PPE) used by the firefighter and inspected the apartment building. The investigators reviewed fire department standard operating guidelines (SOGs), training records, dispatch records, witness statements, investigation documents, and the medical examiner's report.

Fire Department

This career fire department has a 597 square mile jurisdiction, serves a population of one million residents, annually responds to an average of 60,000 calls, and provides emergency medical services (EMS) at the Basic Life Support (BLS) non-transport level. The fire department maintains 43 stations and an aircraft station.

The fire department is comprised of 1,120 uniformed personnel across five battalions. Fifteen suppression battalion chiefs and two administrative battalion chiefs manage the five battalions that are divided into three platoons each. Daily staffing is 333 firefighters. Staffing for engine and aerial companies is four to five personnel which includes a fire captain, an apparatus operator, and two to three firefighters. Hazmat and rescue companies are staffed with five personnel, including a fire captain, an apparatus operator, and three hazmat technicians or rescue technicians. The fire department's leadership is comprised of a fire chief, deputy fire chief, and four assistant chiefs who manage the four divisions.

Assistant chiefs oversee these divisions:

- **Fire Operations** manages incident response.
- **Administrative Services** performs budget, human resources, occupational safety and health, inventory management, and apparatus maintenance and replacement.

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- **Support Services** manages the training and research bureau and fire prevention bureau which conduct activities such as firefighter recruit training, incumbent firefighter training and education, certification, fire code enforcement, fire investigation, and public education.
- **Planning and Development** facilitates the accreditation process, maintains the department's strategic plan, grant funding programs, FCC, and radio operations.

Training, Education, and Professional Development

The fire department maintains a training and research bureau that provides initial firefighter recruit training, incumbent firefighter training, and continuing education for all firefighters, fire officers, and EMS personnel. The initial training for recruits consists of eight months of academy lecture and hands-on skills development. Recruits graduate the academy with International Fire Services Accreditation Congress (IFSAC) professional certification as Fire Fighter I, Fire Fighter II, Fire Apparatus Driver/Operator, and Hazmat Awareness and Operations. Recruits also graduate with a City Operator certification and as a nationally registered emergency medical technician (EMT).

Engine 9D (deceased firefighter) had 1.5 years of fire service with the department. He maintained training in and held numerous certifications as Fire Fighter I, Fire Fighter II, Fire Apparatus Driver/Operator, Hazmat Awareness and Operations, and EMT provider.

During this incident, the first four arriving apparatus on-scene had acting company officers (Engine 2, Engine 29, Ladder 2, and Engine 9). All were trained to the professional development set by the department, including a national hazard zone incident command training and certification program.

Apparatus and Communications

The fire department maintains 63 frontline apparatus, including 43 engines, 16 aerials, and four tankers. The aerials include a total of eight two-piece combination apparatus (equipped with a 100' mid-mount aerial ladder), six quint apparatus (equipped with a 75' rear mount aerial), and two tower apparatus (equipped with an 85' rear mount platform). The fire department has two hazmat companies, two heavy rescue companies, and three helicopters.

Table 1. Units dispatched to the building fire between 19:44 – 19:45 hours

First Alarm Units Dispatched		Second Alarm Units Dispatched	
Apparatus	**Arrival On-Scene**	**Apparatus**	**Arrival On-Scene**
Engine 2	19:47	Rescue 1	19:49
Engine 29	19:47	Ladder 29	19:50
Ladder 2	19:48	Engine 1	19:56
Engine 9	19:48	Engine 22	19:57
Engine 4	19:49		
Battalion 1	19:50		

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The primary Public Safety Answering Point (PSAP) dispatches for the jurisdiction's city services. These include law enforcement, fire, EMS, and mass transit. The FCC has four platoons with six dispatchers each. All fire dispatchers are also certified firefighters. Radio communications are conducted on dedicated tactical channels that are assigned to different areas of the jurisdiction. Box assignments include four engines, a ladder, and a battalion chief. The FCC can upgrade the incident based on what is reported. Second alarm adds two engines and a ladder. Third alarm adds two engines, a ladder, and an additional battalion chief. The portable radio designation/identifier for each firefighter is based upon assignment in each apparatus. This includes "A" for officer, "B" for driver/operator, and "C" or "D" for firefighters.

Building Construction and Occupancy Status

This single-family residence, built in 1906, was located at the front of the property near the street. Official department of planning and permitting records indicate that the building was relocated to the rear of the property in 1954 (**see Photo 2**), and an additional residence was built on the same property against the street. The two-story building involved in the incident was 32 ft x 62 ft, with 1,770 square feet on the first division, and 550 square feet on the second division. After the building was relocated, it was converted from a single-family residence into a nine-unit multi-family residence, with six units on the first division and three units on the second division.

Photo 2: The apartment building (red square), post-fire, view from above on Side Alpha.
(Courtesy of the fire department)

Photo 3: Post and pier foundation.
(Courtesy of NIOSH)

The building had a post and pier foundation, 2" x 6" floor joists, and 1" x 12" floor sheathing (**see Photo 3**). The walls were a combination of 2" x 4" studs with 1" x 12" interior sheathing and 1" exterior shiplap siding, and single wall construction. Single wall construction is unique to Hawaii and utilizes 1" x 12" boards oriented horizontally on one side, and 1" x 12" boards oriented vertically on the opposite side to create walls without any vertical structural members or studs (**see Photo 4**). The roof consisted of conventionally framed 2" x 4" rafters with 1" x 4" skip sheathing, which had been covered over by plywood at some point. The building had been

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remodelled during its life cycle, and as a result, there was a combination of 1" shiplap and Canec fiberboard interior wall finishes. Canec is a fiberboard building material made from sugar cane bagasse, which is the residual fiber that remains after juice has been extracted from the sugar cane. Canec fiberboard was used extensively as an interior wall finish until 1964. In this incident, the Canec interior wall coverings were heavily charred and likely contributed to flame spread within the structure (**see Photo 5**).

Photo 4, 5, and 6: Single wall construction (left) Canec fiberboard interior wall finishes (middle), and door (right). *(Courtesy of NIOSH)*

Throughout the building, there were several doors that were permanently shut to separate the individual dwelling spaces. These doors did not provide sufficient fire separation and even contributed to fire spread between units (**see Photo 6**).

Occupancy Status

In 1955, after the building had been relocated to the rear of the property, official building records show that the building's occupancy classification was listed as "Hotel & Apartments". This is the first recorded documentation indicating that the building was no longer a single-family residence. In 1974, a *Certificate of Occupancy* was granted for the building to contain 10 individual apartments. These occupancy changes were never shared with the fire prevention bureau, and as a result, it was never included in their inspection program or identified as a multi-family occupancy. The apartment layout within the building is shown below in **Diagrams 1 and 2**.

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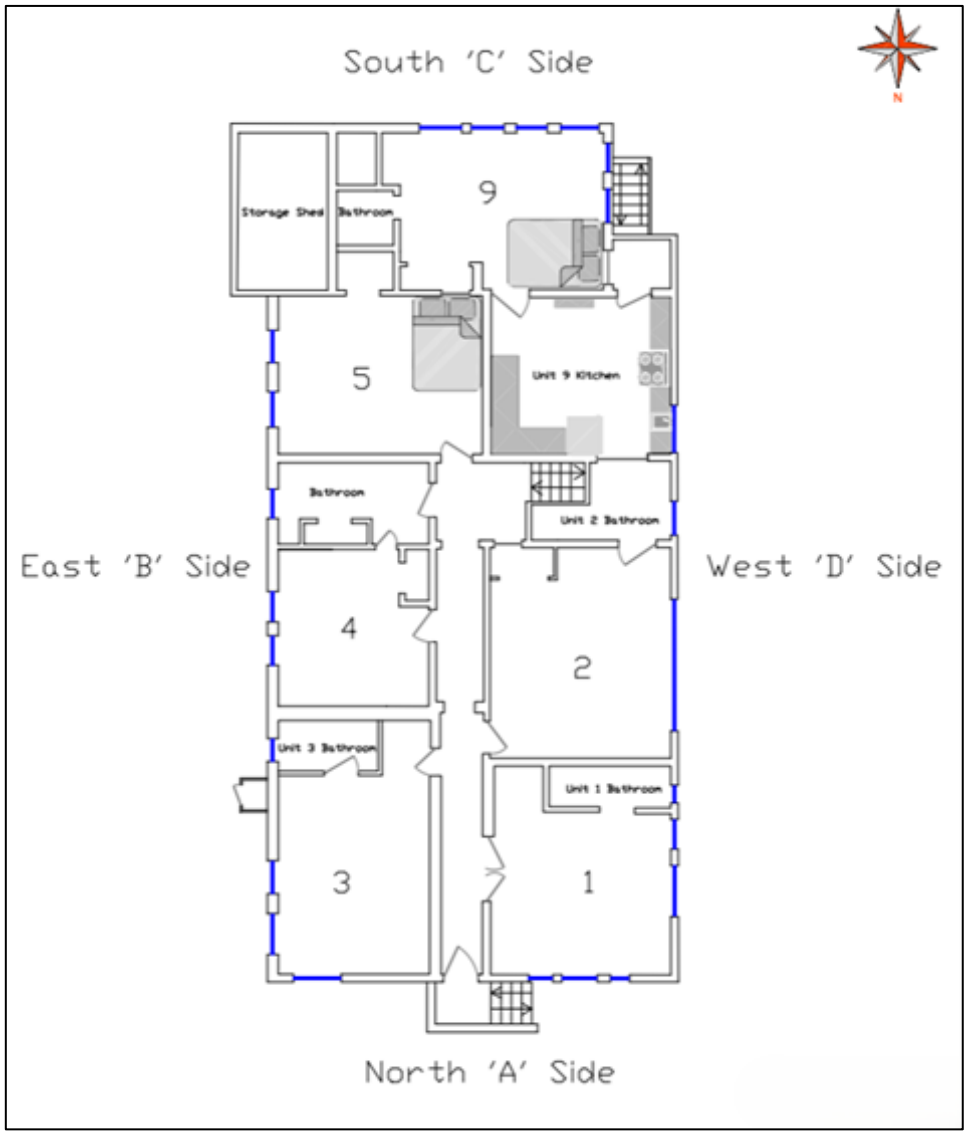

Diagram 1: First division of the apartment building with windows shown in blue.
(Courtesy of the Bureau of Alcohol, Tobacco, Firearms and Explosives)

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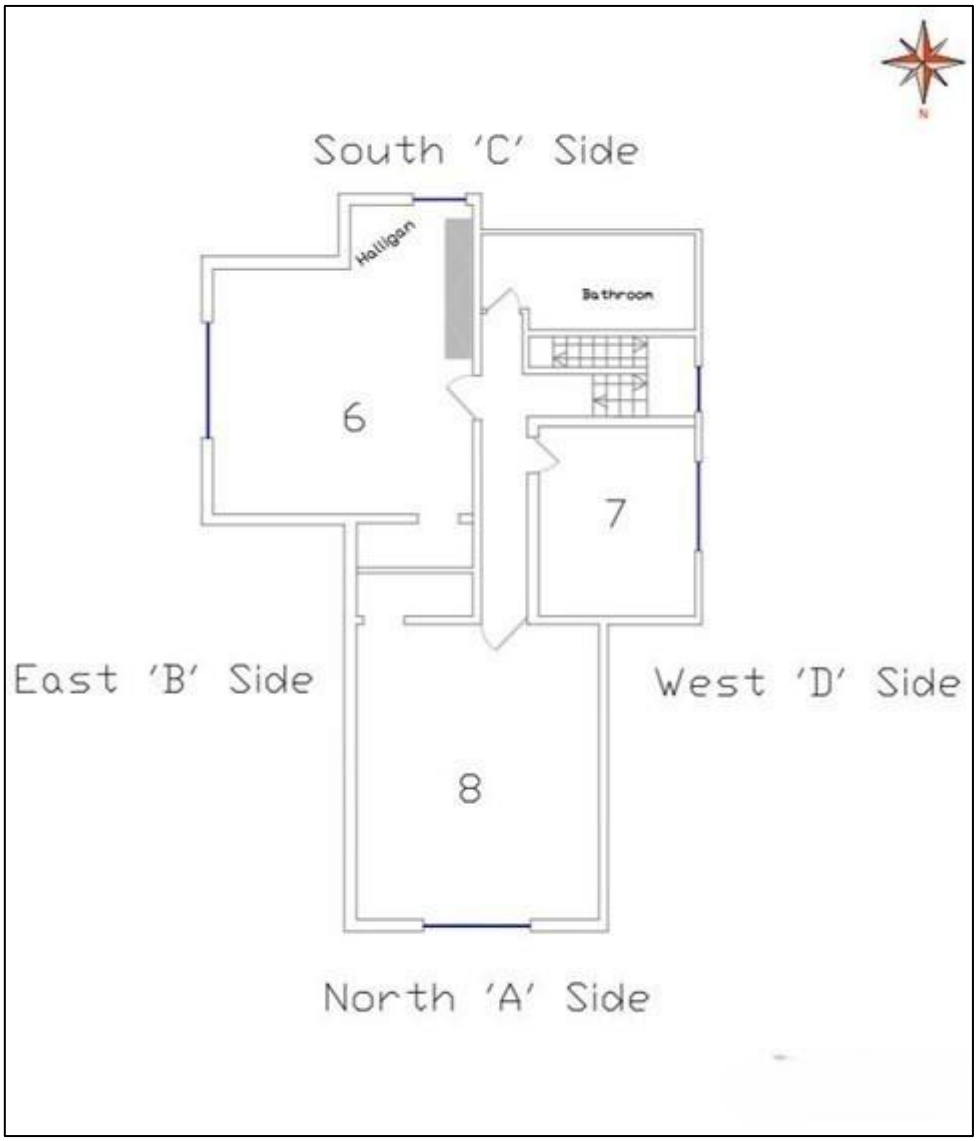

Diagram 2: Second division of the apartment building with windows shown in blue.
(Courtesy of the Bureau of Alcohol, Tobacco, Firearms and Explosives)

Incident Timeline

The following timeline is a summary of events that occurred as the incident evolved shortly after 19:44 hours on Monday, January 6, 2025. Not all incident events are included in this timeline. The times are to

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the minute and were taken from the fire departments' *National Fire Incident Reporting System* (NFIRS) fire reports, dispatch log, on-scene accountability documentation, and interview notes.

Time January 6, 2025	Fireground Operations, Response, and Details
19:44 Hours	• FCC dispatched Engine 2, Engine 4, Engine 9, Engine 29, Ladder 2, and Battalion 1 for a building fire with the caller noting apartment #9.
19:45 Hours	• FCC upgraded the incident to a second alarm and dispatched Engine 1, Engine 22, Ladder 29, and Rescue 1.
19:47 Hours	• Engine 2 arrived on-scene and provided a size up of a two-story apartment building, smoke visible, but no flames. • Engine 29 radioed that they would establish a water supply.
19:48 Hours	• Ladder 2 and Engine 9 arrived on-scene.
19:49 – 19:50 Hours	• Engine 4, Ladder 29, and Battalion 1 arrived on-scene.
19:51 Hours	• Engine 2A reported having water on the fire from the exterior and were trying to go to the interior. The fire location was reported to be on the first division on Side Charlie/Delta.
19:53 Hours	• Engine 2A made entry for a primary search. • Engine 9A was completing a primary search on the second division without a hoseline – no fire identified.
19:54 Hours	• Engine 4 staged on Side Alpha with their RIT gear. • Ladder 29 performed a 360 size-up to report and secure utilities to the building.
19:55 Hours	• Engine 9A called a Mayday noting they were cut off on the second division with fire in the stairwell. • Ladder 29A reported flames lapping up on Side Delta toward the second division.

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Time	Fireground Operations, Response, and Details
19:57 Hours	• Engine 9A requested a hoseline while reporting to Battalion 1 that they were on the second division Side Alpha, above the stairwell, overcome with flames.
19:58 Hours	• FCC advised all units on the fireground that a Mayday has been declared and requested all companies to maintain radio discipline.
19:59 Hours	• Engine 9A reported being on the second division landing but unsure what side of the building. His facepiece was melting, they had PAR of two, were missing two firefighters, and they needed water.
20:01 Hours	• Engine 9A reported to Battalion 1 that two firefighters were out with Rescue 1 but were still missing two firefighters. • Engine 22A, not yet entered, reported being on Side Bravo and hearing screams for help in the back corner of the building on Sides Bravo/Charlie.
20:02 – 20:03 Hours	• Engine 9A advised Battalion 1 that the missing firefighters were Engine 9C and Engine 9D (deceased firefighter). • Engine 9C said they were outside the building but Engine 9D was still unaccounted for.
20:04 Hours	• Battalion 1 requested the FCC send two EMS units to the scene.
20:06 Hours	• Ladder 29A had a ladder on Side Alpha, two ladders on Side Bravo, and were unable to ladder Sides Charlie and Delta due to the fire.
20:07 Hours	• Engine 29A was on the Charlie/Delta corner with heavy fire involvement and partial roof collapse.
20:09 Hours	• Engine 22A had three hoselines conducting fire attack from the exterior on Sides Bravo and Charlie. They reported no longer hearing screams for help and did not have control of the fire yet.
20:17 Hours	• Engine 22 advised Battalion 1 that they had water on the fire on the second division of the Sides Bravo and Charlie but were unable to control the fire from their position.

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Time	Fireground Operations, Response, and Details
20:21 Hours	• Engine 4A transmitted priority traffic that they found the downed firefighter on the Bravo/Charlie corner and requested assistance.
20:24 Hours	• Ladder 29A transmitted via priority traffic that if all personnel were accounted for, all units should go to a defensive strategy as the second division was now fully involved. • Engine 4A came down with the victim through Side Alpha and needed medical assistance immediately. • Battalion 1 ordered all units not assisting with the victim to completely exit and evacuate the structure. • The FCC transmitted emergency tones, informed all personnel that strategy is changed from offensive to defensive, all personnel exit the building and give PARs upon exiting.
20:25 Hours	• Battalion 1 advised the FCC that the victim was extricated and being transferred to EMS. Engine 9D was then transported to a local hospital and pronounced deceased.

Personal Protective Equipment

At the time of the incident, Engine 9D was wearing full structural firefighting turnout gear and a NIOSH Approved® MSA Model G1, 45-minute, 4500 psi SCBA. The investigators inspected and photographed the PPE. Engine 9D had a personal two-way radio that was confirmed to be in the "on" position and on the correct tactical channel. During the incident, Engine 9D made two inaudible radio transmissions. He manually activated his PASS device approximately seven minutes after turning on his SCBA. There was no evidence to suggest that the turnout gear or SCBA contributed to the fatality.

Weather Conditions

At 18:53 hours on January 6, 2025, the outdoor temperature was 77°F, dewpoint was 70°F, the wind was out of the southwest at 8 mph, there had been no precipitation in the last 24 hours, and conditions were fair [Weather Underground 2025].

Investigation

At 19:44 hours, the FCC dispatched Engine 2, Engine 4, Engine 9, Engine 29, Ladder 2, and Battalion 1 for a building fire, with the caller noting apartment #9. After receiving multiple calls, the FCC upgraded the incident to a second alarm at 19:45 hours. The second alarm dispatched Engine 1, Engine 22, Ladder 29, and Rescue 1. The FCC advised all incoming units to operate on the B2 tactical channel 3 for the incident.

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At 19:47 hours, Engine 2 arrived on-scene and provided a size up of a two-story apartment building, lazy smoke visible, but no flames. Engine 2 pulled a pre-connect, 200 feet of 1 3/4", for fire attack and requested the next arriving engine establish a water supply. Upon arrival, Engine 29 connected to the hydrant with 100 feet of 4" supply line and relayed water to Engine 2. Engine 29's crew observed grey smoke as they approached the building. At 19:48 hours, Ladder 2 and Engine 9 arrived on-scene. Engine 2A requested their hoseline be charged and requested another company to bring forcible entry tools. Engine 2 firefighters observed smoke and fire coming through a window on Side Delta (apartment #9 kitchen). At 19:49 hours, Engine 4 arrived on-scene.

At 19:50 hours, Ladder 29 and Battalion 1 arrived on-scene. Battalion 1 staged 500 feet down the road from the incident and performed command from his vehicle using a tactical board and aide. Engine 2A again requested their hoseline be charged. Engine 29D made the same request for a charged hoseline but was on the wrong tactical radio channel. Engine 2A made an additional, new request to have their hoseline pressure increased. Engine 2B boosted the pressure to 120psi. Engine 2B previously secured the water supply before sending pressure to the hoseline. At 19:51 hours, Battalion 1 requested confirmation on incident status, indicating he had Engine 2 with a pre-connect stretched into the building; Engine 29 providing a water supply; and Engine 9, Ladder 2, Ladder 29, and Engine 4 on-scene. After Battalion 1requested a CAN report, Engine 2A responded that that they had water on the fire from the exterior (Charlie/Delta corner) and were going to try to go interior. Battalion 1 requested the location of the fire and asked if another company was assisting. Engine 2A responded that the fire was located on the first division. At 19:52 hours, Battalion 1 assigned Engine 29 to stage on Side Alpha as a 2 ½" pre-connect hoseline was stretched to Side Alpha.

At 19:53 hours, Engine 2A told Battalion 1 that they were making entry for a primary search on Sides Charlie/Delta of the first division. Rescue 1A then said that Ladder 2 firefighters were making entry on Side Alpha of the first division. They observed smoke coming from the sill on the Alpha/Delta corner prior to making entry. Battalion 1 requested that Ladder 2 complete a primary search on the first division. Engine 9A told Battalion 1 that they were conducting a primary search on the second division. Battalion 1 asked Engine 9A if they had a hoseline, to which Engine 9A said no and that there was no fire on the second division. Engine 9, however, had a set of irons and a thermal imaging camera with them. Upon entering the second division, they had limited visibility with light colored smoke but no heat.

At 19:54 hours, Battalion 1 assigned Engine 4 to stage on Side Alpha with their RIT gear. Battalion 1 requested that Ladder 29 perform a 360 size-up to report and secure utilities to the building. Engine 29A indicated they had an electric service line above them on the Alpha/Delta corner with flames blowing out on Side Delta. As Ladder 2 completed a search of apartment #3 (Alpha/Bravo corner), they observed light smoke and a flash coming from down the hallway (towards Side Charlie). As Ladder 2 firefighters completed searches of apartments #1 and #3, a firefighter kicked open the door of apartment #2. Upon entering between two to three feet into apartment #2, heat and flames were observed spreading towards the firefighter from Side Charlie of the room. Within approximately 10 seconds, the room flashed, and the firefighter immediately exited apartment #2. Ladder 2 was forced to evacuate out Side Alpha. This fire extended out of apartment #2, into the hallway, and eventually up the stairs to the second division.

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At 19:55 hours, Engine 9A called a Mayday noting they were cut off on the second division with fire in the stairwell. He also engaged his radio's emergency alert button. Battalion 1 acknowledged the transmission and Ladder 29A reported there were flames lapping up on Side Delta toward the second division. They deployed another pre-connect hoseline, 200 feet of 1 ¾", off Engine 2. The FCC confirmed to Battalion 1 that they had a Mayday from Engine 9A. Battalion 1 requested the FCC to sound the emergency tones. Engine 9 firefighters were forced to the floor due to rapid heat and zero visibility.

At 19:57 hours, the FCC transmitted the emergency tones and Battalion 1 advised all companies operating at the incident that they had a confirmed Mayday. Engine 9A reported to Battalion 1 that they were on the second division, above the stairwell, overcome with flames. They requested a hoseline. Battalion 1 requested Engine 1 to stretch a line to the second division and assist with getting the Engine 9 firefighters out. Engine 22A then advised that they were on Side Bravo with a hoseline set up. Battalion 1 requested they stretch that hoseline to the second division and get Engine 9 out. Engine 22A ordered their firefighters to make entry. At 19:58 hours, the FCC advised all units on the fireground that a Mayday has been declared and requested all companies to maintain radio discipline. Ladder 2A advised Battalion 1 that they had a ground ladder and asked if he would like them to ladder the building.

At 19:59 hours, Battalion 1 requested a CAN report from Engine 9. Engine 9A responded that they were on the second division landing but unsure what side of the building. He further reported that his facepiece was melting, they had PAR of two, were missing two firefighters, and they need water. Battalion 1 then requested a CAN from Engine 22A who responded that they were making entry. Engine 22B advised that their apparatus was positioned at the Alpha/Bravo corner with only one hoseline deployed. Battalion 1 requested Engine 4 to stretch another hoseline off Engine 22 to get into the second division to assist with the Mayday. Engine 4 deployed 200 feet of 1 ¾". Two Engine 9 firefighters, Engine 9A and 9B, found a door at the end of the hallway (apartment #8). Engine 9B used strength and an axe to breach through the door unaware of where it went, but thinking the environment had to be better on the other side. Engine 9A was now alone and found the hole in the door by feel. Both firefighters exited a window leading to a small roof. They then climbed down a 24 ft ladder thrown by Rescue 1.

At 20:01 hours, Engine 9A reported to Battalion 1 they have two firefighters out of the building with Rescue 1 but are still missing two firefighters. Battalion 1 acknowledged. Engine 22A reported that they were on Side Bravo and had not made entry yet. They heard screams for help in the back corner of the building. Battalion 1 requested a status report from Ladder 29 to soften the building to assist with the rescue operation. Ladder 29A reported that they have one ground ladder in place and two firefighters from Engine 1. Battalion 1 requested that all sides of the building be softened. At 20:02 hours, Engine 9A advised Battalion 1 that the missing firefighters were Engine 9C and Engine 9D (deceased firefighter). One minute later, an inaudible radio transmission was received from Engine 9C. Battalion 1 responded asking Engine 9C to locate Engine 9D, turn on their personal alert safety system (PASS) devices and a flashlight, and find a window to call for help. Engine 9C responded that he was outside the building but Engine 9D was still unaccounted for. Battalion 1 then attempted to call Engine 9D by name on the radio and requested they respond.

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At 20:04 hours, the FCC requested confirmation that the only missing firefighter at the incident was Engine 9D. Battalion 1 confirmed to the FCC and then relayed the message to Engine 22 and Engine 4. Engine 22A confirmed they are looking for Engine 9D but that they were still knocking down the fire and hadn't made entry. Battalion 1 then requested the FCC send two EMS units to the scene. The FCC confirmed that one EMS unit was on-scene, another was being dispatched, and asked Battalion 1 if he wanted a third alarm. Battalion 1 declined the third alarm but requested two racks of SCBA air cylinders and a fire investigator be sent to the scene. He also advised the FCC that an electric company representative on-scene.

At 20:06 hours, Battalion 1 requested a CAN report from Engine 4. Engine 4A responded that they were on Side Bravo stretching a hoseline to get to the second division to make entry. Ladder 29A then advised that they have a ladder on Side Alpha, two ladders on Side Bravo, and were unable to ladder Sides Charlie and Delta due to the fire. At 20:07 hours, Engine 29A reported that they switched out with Engine 2 personnel. They stretched a 1 ¾" bumper line from Engine 2. They reported they are on the Charlie/Delta corner with heavy fire involvement and partial roof collapse. Ladder 2A then reported they cleared the first three rooms on the first division and requested to exit the building to swap out air cylinders. Battalion 1 acknowledged, and Engine 2A then reported that they were exiting to swap out air cylinders.

At 20:09 hours, Engine 22A requested Engine 22B to increase water pressure to their hoseline. Battalion 1 then requested they provide a CAN report. Engine 22A advised that they have three hoselines conducting fire attack from the exterior on Sides Bravo and Charlie. They reported they no longer heard screams for help and did not have control of the fire yet. Battalion 1 acknowledged. At 20:11 hours, Battalion 1 assigned Ladder 2 to stage on Side Alpha and requested a CAN report from Engine 4 who reported they were still trying to get up to the second division. At 20:13 hours, Engine 29A then reported that they were at the Charlie/Delta entrance looking in but could not see Engine 9D and needed water. Battalion 1 asked if they were interior or looking from exterior to which Engine 29A responded that they were exterior firefighting the fire. Battalion 1 requested they continue into the building to search the entire room. At 20:15 hours, Battalion 1 requested that Engine 2 stage on Side Alpha and that Engine 1 back up Engine 29 on the second division. He requested that they back them up on their hoseline or take another with them. Engine 29A then responded with a correction that they were on the first division of the Charlie/Delta corner and making their way to the second division.

At 20:17 hours, Engine 22 advised Battalion 1 that they had water on the fire on the second division of the Sides Bravo and Charlie but were unable to control the fire from their position. Battalion 1 then attempted to raise Engine 9D on the radio again. Ladder 29A reported that cleared from the second division of the Delta corner while Battalion 1 requested a CAN report from Engine 4. At 20:20 hours, Engine 29A reported the roof was fallen through with conditions changing to heavy smoke. Engine 4A advised Battalion 1 that they were still on the first division and completed a search of three rooms on Side Bravo and one on Side Delta. They reported they were making their way to the second division and still had fire on the first division Side Charlie. The FCC advised Battalion 1 that Engine 29 had a second Mayday. Battalion 1 requested a CAN report from Engine 29. Engine 29A requested to cancel their

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Mayday stating it was emergency traffic about the roof collapsing and second division fire penetration. Engine 29A confirmed they were not in an emergency situation.

At 20:21 hours, Engine 4A transmitted priority traffic that they found the downed firefighter on the first division, Bravo/Charlie corner and requested assistance. Engine 4A noted that Engine 9D's PASS was active, his foot was stuck on something, and he did not have a low air alarm. Battalion 1 acknowledged while Engine 29 reported they were going to swap out air cylinders and recycle. Ladder 29A reported they were conducting fire attack from the Charlie/Delta corner and had partial roof collapse on the second division. Battalion 1 requested Ladder 29A assistance with the rescue. Ladder 29A declined as they were conducting fire attack from the Side Delta exposure. At 20:22 hours, Engine 2A reported they were on the Charlie/Delta corner making entry to assist with the rescue. Battalion 1 requested confirmation of the unit that found the downed firefighter. The FCC then responded that they believed it was Engine 4 that had Engine 9D.

At 20:24 hours, Ladder 29A transmitted priority traffic that if all personnel are accounted for, all units should go to a defensive strategy as the second division was now fully involved. Battalion 1 confirmed and requested a CAN report from Engine 4 along with their location. Engine 4A responded that they were coming out with the victim through Side Alpha and needed medical assistance immediately. Battalion 1 then ordered all units not assisting with the victim to completely exit and evacuate the structure. The FCC then sounded the emergency tones and advised all units on-scene that per Battalion 1, they were to change strategies from offensive to defensive. The FCC requested all units exit the building and conduct PAR checks. At 20:25 hours, Battalion 1 advised the FCC that the victim had been extricated and they were getting him to EMS. Engine 9D was transported to a local hospital where he was pronounced deceased.

Fire Origin and Cause

The fire department, in collaboration with the Bureau of Alcohol, Tobacco, Firearms and Explosives National Response Team, completed an on-scene origin and cause fire investigation. The fire was classified as accidental due to unattended cooking. The fire originated in the kitchen of apartment #9, located at the rear of the structure.

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:

- Unprotected interior search
- Hoseline selection and deployment
- Door control/flow path
- Mayday operations
- Change of occupancy

One Firefighter Dies During Unprotected Search in Nine-Apartment Building that was Originally Constructed to be a Single-Family House – Hawaii

Cause of Death

According to the medical examiner report, Engine 9D's cause of death was thermal injuries and inhalation of combustible products.

Recommendations

Fire departments should:

Recommendation #1: Ensure that interior search crews' means of egress are protected by a staffed hoseline.

Discussion: In this incident, Engine 9 made entry and conducted interior searches on the second division. When they entered, they had clear conditions, lights on within the building, and no indication of fire. They did not take a hoseline with them to control rapid fire growth or provide protection. Their means of egress was cut off by rapidly developing fire from the first division.

When conducting a search or fire attack above a fire, it is important for firefighters to recognize the potential danger of being trapped by the fire. This danger is influenced by the construction of the building. In buildings such as the one in this incident, vertical fire spread is more rapid. Flames may spread vertically and trap firefighters operating above the fire by traveling up the interior stairs, within concealed spaces, through windows, or up the combustible exterior siding [NIOSH 2012].

Fire departments should ensure that a charged hoseline is either advanced with the interior search crew or is operated by another firefighter to provide protection while entering an immediately dangerous to life and health environment. The only exception for entering a structure without an operational hoseline is when an occupant can be seen or heard within a few feet of the structure entry or the fire area. Additionally, deployed backup lines should be operational and dedicated to protect the interior crews and their means of egress [NIOSH 2012]. A backup hoseline performs three critical functions [IFSTA 2013]:

- Protecting the primary interior attack team from extreme fire behavior
- Protecting the means of egress for interior team(s)
- Providing additional fire suppression capacity in the event fire volume increases

Recommendation #2: Use the appropriate hoseline based upon current conditions.

Discussion: At this incident, the fire department had several 1 ¾" hoselines and one 2 ½" hoseline deployed around the structure for fire suppression. As the fire grew in intensity, units notified the incident commander that they had water on the fire, but it was not enough to gain control of the fire. Use of deck cannons from on-scene apparatus were not effective due to the limited access and obstructions to the fire building. This delay in fire suppression hampered the ability of RIT and others involved in the rescue operation to enter the structure.

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Firefighters need to provide the appropriate amount of water in the initial attack to put out the fire and stop potential fire growth. Fire departments generally use an 1 ¾" hoseline as the initial preconnect for residential structure fires. These lines are operated to provide 160 gallons per minute. These hoselines can be effective for suppression when the fire is confined to a single room and is in either the incipient or growth stages. However, modern furnishings such as televisions and mattresses are increasingly being manufactured with synthetic materials with high levels of hydrocarbons. These furnishings burn at greater speeds and intensity, facilitating rapid fire growth and extension [DeStefano 2016].

During an incident, firefighters should select and deploy the appropriate hoseline based upon fire conditions. While monitoring fire suppression activities, the incident commander, incident safety officer, or operations should evaluate whether the hose size is appropriate for the current fire conditions and other factors including [IFSTA 2015; IFSTA 2013]:

- Fire load and material involved
- Location of fire
- Size of building and fire area
- Potential fire spread

Selecting the correct size of hoseline is critical. Inability to provide a sufficient volume of water for the size of the fire may delay extinguishment and expose firefighters to danger from rapid fire development.

Recommendation #3: Train on recognition of flow paths and interior fire attack techniques utilizing door control.

Discussion: At this incident, Ladder 2 firefighters were completing searches in apartments #1 and #3 as a firefighter kicked open the door of apartment #2. Heavy fire immediately exited apartment #2 and created a flow path into the hallway, forcing Ladder 2 to evacuate out Side Alpha.

A flow path is "the movement of heat and smoke from the higher pressure within the fire area towards the lower pressure areas accessible via doors, window openings, and roof structures" [NFPA Glossary of Terms 2021]. Flow paths consist of an inlet and an exhaust with the direction of travel being determined by pressure. Heat and smoke in a high-pressure area will travel to an area of lower pressure. It is possible to have multiple flow paths within a structure dependent upon the size of the building, openings, closures such as fire doors, and overall structure design. Personnel working in the flow path (between the seat of the fire and the exhaust) operate in a significantly risky environment.

Maintaining door control is a critical component of coordinated ventilation and fire attack. Opening a door changes the ventilation profile of the structure and may have an adverse effect on fire behavior [IFSTA 2013]. Controlling the door limits the fresh air available to the fire and reduces the flow path. Once water is applied to the fire, it is no longer ventilation limited. This allows for more rapid and safer ventilation [Gray and Norwood 2024].

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Recommendation #4: Employ proactive RIT operations for access and egress.

Discussion: This fire department utilized rotating units for RIT until the arrival of a heavy rescue company. During this incident, Engine 4 was assigned to stage on Side Alpha with their RIT equipment. After the Mayday was called, rescue efforts were ordered with multiple units being assigned to assist with extricating Engine 9. These units were unable to make entry into the structure through the existing access and egress points due to the fire conditions and delay in effective fire suppression.

Effective RIT operations are dependent on proactive efforts. Upon arrival, the RIT officer, accompanied by one member of the RIT, will get a report from the incident commander and then should perform an incident scene survey while the remaining RIT members assemble the RIT equipment. During the 360-degree survey, the RIT officer and members should look for ways in and out of the structure, including window configurations, fire escapes, and construction features. The RIT officer should note the feasibility for placement of ground ladders for rescue or escape purposes. The RIT officer has a responsibility to set up and secure a suitable secondary egress for interior crews [Rowett 2018; Toledo Fire & Rescue Department 2012]. After these tasks are completed, the RIT equipment is put in place and the RIT officer informs the incident commander that a 360-degree survey is complete and the RIT is ready to intervene, if necessary. The entire RIT should stay in an area immediately accessible to the building for rapid deployment and maintain radio contact with the incident commander. The RIT officer should brief all RIT members with the results of the incident scene survey [Toledo Fire & Rescue Department 2012]. The RIT officer and members will coordinate with the incident commander to formulate rescue plan contingencies and to monitor radio and fireground conditions. RIT protection is not a passive assignment. This is a process of ongoing information gathering and diligent scene monitoring until the unit is released by the incident commander [NIOSH 2024; NFPA 1407 2020].

Laddering:

The RIT should work to place a ladder to at least one window on each side of the building on every division that firefighters are operating (i.e., laddering). Ground ladders improve the ability to perform vent-enter-search operations to rescue a firefighter as well as the ability of the Mayday firefighter to self-rescue. Once the RIT has determined the need for an egress ladder, it is necessary to remove the window glass, but only after conferring with the incident commander that the removal of the window will not affect firefighting operations. Placing the egress ladder(s) at the window(s) should be announced over the radio by the RIT officer. [NIOSH 2024; Rowett 2018; Toledo Fire & Rescue Department 2012].

Softening:

After identifying existing ways in and out of the structure, the RIT should soften the building by forcing doors and removing devices such as security bars from windows. This proactive tactic ensures the RIT can quickly enter the building in the event of a firefighter emergency and improves the ability of self-rescue for firefighters operating in the interior. The goal of softening is to remove any obstructed building access, but it should be performed in a way that does not introduce an unintended flow path [NIOSH 2024; Rowett 2018].

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Breaching:

In situations where the existing ways in and out of the structure, such as windows and doors, are not accessible due to fire conditions, the RIT should identify areas to enter by breaching walls. The initial survey of the structure includes identification of the construction features of the structure. Along with RIT equipment, the RIT should be able to identify areas to enter the building by breaching walls. The wall breach maneuver is generally taught as a firefighter survival technique to escape deteriorating conditions and the building. These maneuvers can also be employed to enter the structure to affect a rescue during a firefighter emergency [NIOSH 2024; Kiurski 2011]. All necessary actions, to include wall breaches and window conversions, should be executed to gain access to the interior of a structure.

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

Recommendation #5: Ensure that the delegated zoning or building code enforcement authority shares change of occupancy information with the fire department.

Discussion: In 1955, official building records show that the building's occupancy classification was listed as "Hotel & Apartments." This is the first recorded documentation indicating that the building was no longer a single-family residence. In 1974, a *Certificate of Occupancy* was granted for the building to contain 10 individual apartments. These occupancy changes were never shared with the fire prevention bureau, and as a result, it was never included in their inspection program or identified as a multi-family occupancy. During the incident, the fire department believed they were responding to a single-family dwelling.

The fire department in this incident maintains a fire prevention bureau that enforces fire codes for the jurisdiction, administers plans reviews, conducts fire inspections, and provides a fire and life safety education program for residents. The bureau utilizes the Hawaii State Fire Code for the jurisdiction which is an adoption of NFPA 1 Fire Code with modifications. The AHJ in this incident enforces zoning, subdivision, building, and housing ordinances through a department of planning and permitting. Through ordinance, this department enforces the 2018 International Building Code (IBC).

NFPA 1201, *Standard for Providing Fire and Emergency Services to the Public*, Section 6.3 recommends that fire departments establish a good working relationship with the agency or authority responsible for enforcing the building code so that the review of the design, construction, alteration, or demolition of buildings and structures can be monitored to identify fire protection concerns. This includes sharing vital information between the entities from inspections, permits, code violations, fire protection maintenance and service, and investigation of fires or other emergencies [NFPA 1201 2020; IFSTA 2016]. This also includes relevant information from change of occupancy permits and approvals.

When a change of occupancy is completed, the application of different code requirements may be required [IBC 2018]. Additionally, this can change factors such as the number of occupants being housed, storage of hazardous materials, or other unique hazards that can require significant change in

fire suppression and rescue tactics and strategy [IFSTA 2016]. This information is critical for fire department pre-incident planning. NFPA 1620 [2020] recommends that pre-incident plans document occupancy type and use including considerations for occupant load, accountability, means of egress, and assistance for people with self-evacuation limitations. When added to computer-aided dispatch, this information can assist incident commanders with formulating an incident action plan [NIOSH 2019].

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Investigator Information

This incident was investigated by Patrick R. Montague, Investigator, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV and James Johnson, Fire Ground Survival Master Instructor and Codes and Standards Representative, International Association of Fire Fighters. This investigation report was authored by Dr. Wesley R. Attwood, Investigator and Program Advisor, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH and James Johnson. A subject matter expert review was provided by Karl Fippinger, Vice President, Fire and Disaster Mitigation, International Code Council.

Additional Information

International Code Council (ICC)
The International Code Council is the leading global source of model codes and standards and building safety solutions that include product evaluation, accreditation, technology, training, and certification. The Code Council's codes, standards, and solutions are used to ensure safe, affordable, and sustainable communities and buildings worldwide. Access to codes and standards can be found at https://www.iccsafe.org/products-and-services/codes-standards/.

Disclaimer

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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.*