1000 FREDERICK LANE, MORGANTOWN, WV 26508 · 304.285.5916

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Executive Summary

Photo 1: Delta side of structure post-collapse. (*Courtesy of the fire department*)

On November 6, 2024, a 42-year-old career firefighter died, and a 38-year-old firefighter was injured while performing rapid intervention team (RIT) tasks at a vacant warehouse fire. The two firefighters were assigned to the RIT team on their arrival at the scene. At approximately 22:50 hours, the office of emergency communications (OEC) received the first call reporting a three-story warehouse on fire with an approximate location. Several additional calls reporting a warehouse on fire were received which gave a more specific address. The OEC dispatched the first alarm assignment for a warehouse fire at approximately 22:52 hours which included District Chief 20 (DC20), District Chief 8 (DC08), Engine 18 (E18), Engine 20 (E20), Engine 40 (E40), Engine 23 (E23), Tower 18 (T18), Ladder 20 (L20), and Safety Officer 30 (SF30). At approximately 22:57 hours, E18 updated responding units of a working fire. E18 arrived on-scene at approximately 22:58 hours to a "large warehouse fire showing from the roof, heavy fire" and assigned their side of the building as the Alpha side of the structure. E20 approached from the cross street and pulled past the fire building leaving room for L20. DC20 arrived and positioned across the street from the Alpha/Delta corner in a parking lot and established himself as the incident commander (IC). He reported "heavy fire from a one-story warehouse." E18 declared a defensive fire. The OEC broadcasted an emergency tone and rebroadcasted the defensive fire message across the channel.

At approximately 23:00 hours, L20A provided updated observations to IC, "Command, TIC (thermal imaging camera) reading through open doors is about 1,000 degrees at the roof, heavy smoke, fire, and

some of the roof is starting to collapse." IC acknowledged the report and requested both aerial devices be set up for elevated master stream operations. IC then updated all units that accountability was in place. E40 arrived and was assigned water supply for L20. E23 arrived and IC assigned them as rapid intervention team (RIT). At approximately 23:02 hours, L20A provided a conditions, actions, needs (CAN) report stating, "Collapse of the roof, heavy fire, exposure on the Charlie/Delta side going to have to get inside, already starting to smoke up. Trying to get water on it now. L20 in position to hit it with the pipe, no further needs." IC acknowledged the update and stated over the channel, "District 20 to all companies, do not go interior."

E23B (deceased firefighter) and E23C (injured firefighter) gathered the RIT equipment from the IC post and staged it on the Alpha/Delta corner of the fire building. IC broadcasted over the channel, "Command to all companies on Delta division, let's stay clear of that wall, it looks like it is going to collapse outwards." E23's crew, as part of their RIT duties, went to the Delta side man door and began attempting to force the burglar bars and doors open to "soften" the structure. At approximately 23:05 hours, IC requested a second alarm be dispatched. As this was called, E20 updated IC there was a collapse on the Delta side. Less than a minute later, E23A declared a Mayday. IC acknowledged the Mayday. OEC also notified IC of the Mayday and inquired if IC would like the third alarm assignment. IC requested the third alarm. L20 updated IC that one person had been removed, and IC requested a count on how many personnel were missing. L20 responded possibly one more and they were going to attempt a PAR. A moment later L20 updated IC there were two firefighters missing, they were actively working to get to them and requested operations go to a different radio channel.

At approximately 23:09 hours, R42 arrived and were assigned to the Delta side collapse for extrication of the trapped firefighters. IC updated OEC that the second firefighter is being extricated. At approximately 23:13 hours, L20 updated IC that all victims were out, and personnel were clearing the collapse zone. IC requested all personnel evacuate the area of the Delta side and that OEC cancel the third alarm. L20 exited the collapse zone with the second firefighter, and they needed advanced life support (ALS) to meet them at the front of L20. OEC notified IC that L20A was showing an alarm and asked for confirmation that all personnel were accounted for. IC confirmed all personnel were accounted for and requested all personnel stay away from the building and out of the collapse zone. E23C (injured firefighter) was transported to the hospital by ambulance 23. E23B (deceased firefighter) was transported to the hospital by medic 18 and was later pronounced deceased at the hospital.

Contributing Factors

- *Pre-incident planning*
- *Standard operating procedures/guidelines (SOPs/SOGs)*
- *Strategy and tactics*
- *Risk versus benefit analysis*
- *Safety officer presence*
- *Change of occupancy*
- *Vacant/dangerous building inspections*

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Key Recommendations

Fire service organizations should:

- *Develop pre-incident plans for structures within their first due response area, specifically dangerous or vacant structures.*
- *Develop and maintain SOPs/SOGs.*
- *Ensure ICs match their tactical strategy with the incident at hand.*
- *Train all personnel to employ risk management principles when operating on the incident scene.*
- *Strategically deploy safety officers.*

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

- *Complete change of occupancy inspections per applicable fire and life safety codes.*
- *Communicate across departmental boundaries.*

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 November 6, 2024, a 42-year-old firefighter died, and a 38-year-old firefighter was injured while engaged in RIT tasks at a vacant warehouse fire. On November 8, 2024, the fire department notified the National Institute for Occupational Safety and Health (NIOSH) of this incident and requested an investigation. From November 19 – November 24, 2024, two 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, and surveillance camera footage were obtained from the fire department and reviewed. NIOSH investigators also reviewed the training records of specific personnel involved in the incident and reviewed the department's SOGs and professional development model.

Fire Department

The career fire department in this incident consists of approximately 4,000 uniformed personnel and approximately 100 civilian personnel. Approximately 3,800 of those personnel are assigned to the emergency response division that provides fire protection and emergency medical services (EMS). The department's emergency response division works a 72-day duty cycle. Members work a total of 480 hours that are made up of 18 regular 24-hour shifts and two 24-hour debit day shifts. The emergency response division consists of four shifts following this schedule. The shifts, not including debit shifts, typically appear on a calendar as follows: 24 hours on duty, 24 hours off duty, 24 hours on duty, 120 hours off duty.

There are 93 fire stations located throughout the city that serve a population of approximately 2.3 million people across 637 square miles. The fire department divides the city into quadrants: northeast, northwest, southwest, and southeast. These are further divided into 21 districts. The fire department is certified as an Insurance Services Office class 1 department and is accredited through the Commission on Fire Accreditation International as of 2021. It provides aircraft rescue firefighting (ARFF) for two airports within the city. The fire department participates in a county wide mutual aid agreement for fire protection and suppression that was drafted in June 2017 and automatically renews every year. This agreement is across all departments within the county whether they are career, combination, or volunteer and it includes more than 71 different entities. The fire department responds to over 395,000 calls for service annually.

The emergency response division is made up of two deputy chiefs, three safety officers, three cascade units, one command van, one rehab unit, 21 district chiefs, 88 engine companies, 33 ladder companies, five tower

companies, 57 ambulances with an additional five during peak times, 41 medic units, five squads, seven ambulance supervisors, two senior ambulance supervisors, one EMS district chief, three rescue companies, four hazardous materials companies, and 16 ARFF units. The minimum daily staffing for the department is 849 personnel across all companies. The deputy chiefs, safety officers, cascade units, command van, ambulance supervisors, senior ambulance supervisors, EMS district chief and rehab unit are each staffed with a single person. The district chiefs, ambulances, medic units, and squads are each staffed with two personnel. Engine companies, ladder companies, tower companies, rescue companies, and hazardous materials companies are each staffed with four personnel. Ambulance units are classified as basic life support (BLS) while squads and medic units are classified as ALS. The fire department provides EMS service up to and including ALS-transport.

Training and Experience

The fire department hires through a civil service process. The minimum requirements to apply are that the applicant must be between 18 and no more than 36 years old when they take the oath of office, have completed 15 accredited college hours or two years of full-time active-duty military service with an honorable discharge, and have two or less moving violations in the last 36 months. Upon accepting a conditional job offer, the applicant must attend the academy and complete between eight and ten months of daily rigorous physical training and classroom instruction. Upon graduation, applicants have certifications in the Texas Commission on Fire Protection fire basic, Texas Department of State Health Services emergency medical technician (EMT) basic, and the National Registry of Emergency Medical Technicians.

Once the candidate successfully graduates from the academy, they are assigned to their fire station. Once assigned to their fire station and shift, all personnel complete a minimum of 24 hours of on-the-job training and continuing education per month.

Personnel within the department have a variety of career pathways they may choose to pursue once they have reached the rank of engineer operator (EO). Pursuing a career pathway involves a process of either promotion or acceptance into one of the “closed shops” within the fire department. Examples of the career pathways personnel may pursue include the OEC, inspection division, or arson division.

The deceased firefighter (E23B) had eight and a half years of experience with the department. The deceased firefighter (E23B) participated in a variety of monthly company level trainings. Fire department training records show participation in training such as hazardous materials, RIT skills, building construction, multi-company drills, equipment and apparatus familiarization, EMS continuing education, area familiarization, and tactical decision making on offensive and defensive fires. Per department records, E23B firefighter routinely logged 30 hours of training per month.

The injured firefighter (E23C) had approximately six years of experience with the department. The injured firefighter (E23C) participated in a variety of monthly company level trainings. Fire department training records show participation in training such as Mayday training, building construction, operational readiness,

EMS continuing education, and truck company tactics. Per department records, E23C firefighter routinely logged between 24 and 30 hours of training per month.

Apparatus, Personnel, and Accountability Equipment

The minimum staffing for the career fire department in this incident is two personnel assigned to a district chief vehicle (district chief and incident command technician (ICT)) and four personnel assigned to engines, truck, and rescue companies. The city often must "brown out" companies due to staffing issues while maintaining a sufficient standard of cover for fire protection and EMS services. Staffing vacancies are filled with personnel working their debit day, picking up optional overtime, or being mandated to work overtime. Personnel are assigned to a specific position and apparatus by the staffing office.

OEC calls are received by civilian call takers. The OEC dispatchers for the fire side of the center are sworn personnel at the rank of communications captain or above with a minimum of five years within the department. The OEC dispatchers utilize a digital trunking 700-megahertz encrypted system for all radio communications.

The fire department in this incident utilized a pre-established run card assignment based on information provided by the civilian call taker. A first alarm assignment for a warehouse fire included two district chief units, four engines, two truck companies, a medic unit, and a safety officer. The three rescue companies spread throughout the city were recently added to working fires across the city. However, it was noted by the fire department that this incident type was missed in the change. The captain assigned to R42 self-dispatched their unit to this fire upon hearing E18 call the working fire. **Tables 1 and 2** below provide staffing levels and location when the collapse took place.

Table 1: First Alarm units at the time of collapse

Resource Designation	Staffing Level (#)	Status and Location
District Chief 20 (DC20)	2	On-scene with Command
District Chief 8 (DC08)	2	On-scene with Alpha side operations
Engine 18 (E18)	4	On-scene, side Alpha
Engine 20 (E20)	4	On-scene, side Delta
Engine 40 (E40)	4	On-scene, Alpha/Delta corner at hydrant
Engine 23 (E23)	4	On-scene, RIT, side Delta
Tower 18 (T18)	4	On-scene, side Alpha
Ladder 20 (L20)	4	On-scene, side Delta
Safety 30 (SF30)	1	Arrived after removal of second firefighter from collapse
Rescue 42 (R42)	4	Self-dispatched to the incident due to recent changes in run card assignments. Arrived after

		the collapse, assigned to extrication of trapped firefighter
Medic 40 (M40)	2	Cancelled by OEC when M18 became available and was closer to the incident.
Medic 18 (M18)	3 (2 assigned, 1 intern)	On-scene, requested to be added to the incident as they were available and nearby

Table 2: Second Alarm units at the time of collapse

Resource Designation	Staffing Level (#)	Status and Location
District Chief 26 (DC26)	2	Enroute. Arrived after second firefighter was extricated
District Chief 19 (DC19)	2	Enroute. Arrived after second firefighter was extricated
Engine 17 (E17)	4	Arrived as second firefighter was extricated
Engine 25 (E25)	4	Arrived as second firefighter was extricated
Engine 42 (E42)	4	Enroute. Arrived after second firefighter was extricated
Engine 27 (E27)	4	Enroute. Arrived after second firefighter was extricated
Ladder 7 (L7)	4	Enroute. Arrived after second firefighter was extricated
Ladder 26 (L26)	4	Enroute. Arrived after second firefighter was extricated
Safety 24 (SF24)	1	Enroute. Arrived after second firefighter was extricated

The fire department also has specific callsigns for each position on an apparatus. **Table 3** provides the relationship between the position on the unit and the callsign. For example, L20A is the senior captain on Ladder 20.

Table 3: Callsign by riding position

Apparatus Type	Riding Position	Callsign
District Chief	District Chief Incident Command Technician	DC#A DC#B
Engine	Captain Firefighter 1 Firefighter 2	E#A E#B E#C

	Engineer Operator	E#D
Tower/Ladder	Senior Captain Firefighter 1 Firefighter 2 Engineer Operator	T#A or L#A T#B or L#B T#C or L#C T#D or L#D
Rescue	Captain Firefighter 1 Firefighter 2 Engineer Operator	R#A R#B R#C R#D
Medic	Engineer Operator Firefighter 1 Firefighter 2 (or intern)	M#A M#B M#C
Ambulance	Engineer Operator Firefighter 1	A#A A#B
Safety Officer	Safety Officer	Safety#

Accountability Equipment

The fire department utilizes an electronic accountability system that integrates the individual firefighter's self-contained breathing apparatus (SCBA) and portable radio and transmits information to a computer terminal in the command vehicle. The accountability, or SDI terminal, is operated by the ICT that responds with the district chief. This system provides ICs with real-time accountability of on-scene firefighters. This includes digital time stamps, fireground priority reminders, and other critical command tools for managing firefighter Mayday situations. Through multiple audio and visual alerts, SDI bridges communication gaps commonly encountered on the fireground to help ICs organize and manage incidents. The system also facilitates comprehensive handling of Mayday messages, captures radio transmissions, and identifies firefighters in distress.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

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]. Both firefighters were wearing a NIOSH Approved® SCBA with an integrated personal alert safety system (PASS) device that were certified to the 2013 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services* [NFPA 1981 2013]. Both firefighters in this incident were wearing the appropriate facepiece but were not connected to and breathing from their SCBA at the time of the collapse.

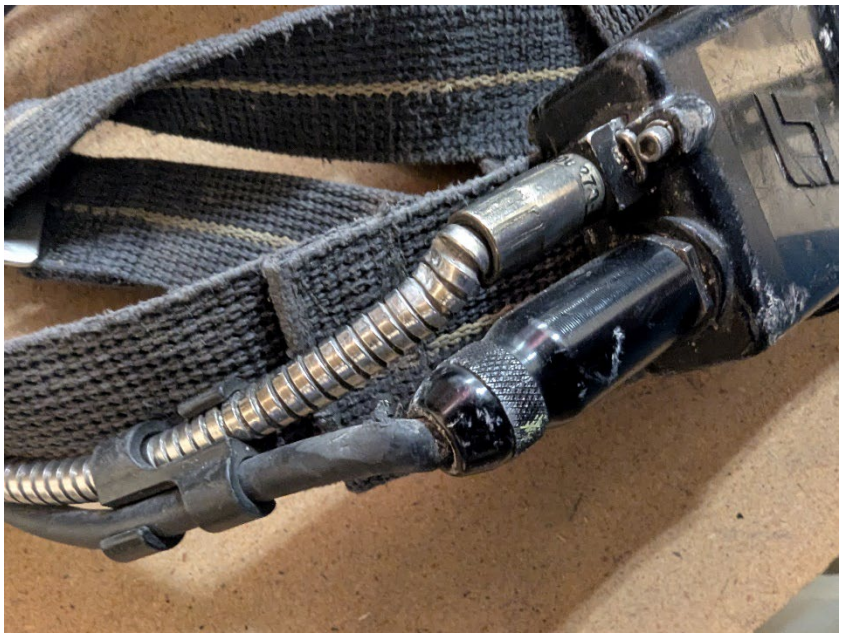

Photo 2 (top) & 3 (bottom): Show damage to the high-pressure hose near the PASS device of the deceased firefighter's SCBA. (*Courtesy of NIOSH*)

NIOSH investigators examined and photographed the PPE ensemble and SCBA of each firefighter at the arson evidence office. The SCBA of E23B had signs of crush damage to the high-pressure lines near the PASS device (**See Photos 2 and 3**). No evidence was identified to suggest that the SCBA units contributed to the fatality or injury.

Environmental Conditions

The weather on November 6, 2024, at 22:50 hours was mostly cloudy. The temperature was 76°F with winds from the east-northeast at 5 mph. The

humidity was 91% with no precipitation. At 23:50 hours, the humidity increased to 94% with no precipitation with winds from the east at 6 mph [Weather Underground 2024].

Building Construction

The county central appraisal district records for the property states the vacant warehouse was 13,160 sq. ft. and built in 1955 of average quality. This total square footage included the 1,680 sq. ft. of space that was designated for two story offices. The building also had a partial partition wall between the two overhead doors on the Alpha side, closest to the Delta side. This wall did not go from floor to ceiling or from wall to wall. The building had no cooling system but contained unit heaters. The wall construction was primarily concrete block with a brick veneer on what appeared to be the office portion of the building (**See Photos 1, 4, 5, and 6**). The brick veneer post collapse appears to have a gap or separation between the veneer and the block wall in the post collapse images, if this space existed pre-collapse, it increases the risk of collapse. One of the six overhead style doors on the loading dock (Alpha) side of the building had a canopy roof over it. The office (Delta) side of the building had a small porch with steps on either side to a double door storefront style entrance with burglar bars over the doors. This entrance also had a canopy over it with several slots in the brick veneer toward the Alpha side of the building where it appeared that an original, larger canopy had once

Photo 4: Detail of Delta side wall showing the brick veneer over block wall, slots for previous canopy roof tie ins, roof surface covering. (*Courtesy of the fire department*)

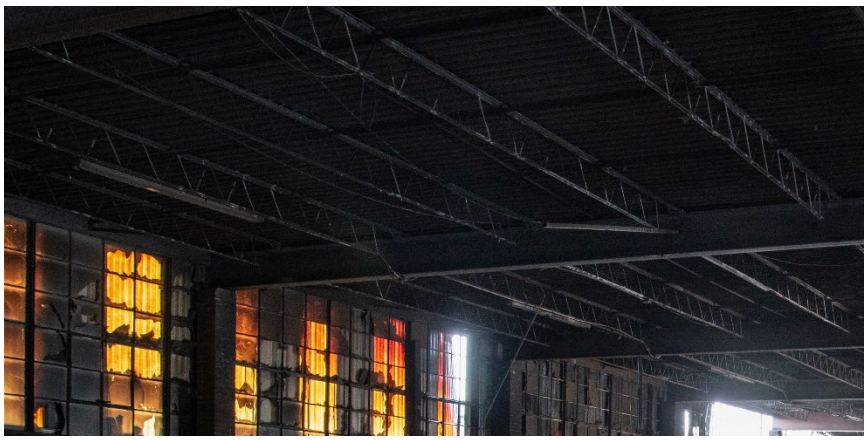

Photo 5: Photo showing interior details of the building and roof construction. (*Courtesy of the fire department*)

Photo 6: View of the structure from the Alpha/Delta corner post collapse and during overhaul operations. (*Courtesy of the fire department*)

been installed. The Delta side canopy roof was constructed of dimensional lumber with a wooden veneer and topped with asphalt roofing material. The Bravo side of the building also had one overhead style door. The building had no fire protection system [HCAD 2024]. The roof construction was made of steel bar joists landed on wide flange steel beams which were supported by brick columns or smaller wide flange steel columns throughout the warehouse. The bar joists were topped with steel decking and roll style asphalt roofing material. This should be noted during departmental pre-incident planning, especially when there may be a lack of additional supports to maintain structural integrity. If the bar joists fail early into an incident, the roof and attached walls of the structure will separate.

Timeline

The following timeline is a summary of events that occurred as the incident evolved. Not all incident events are included in this timeline. The times are approximate and were obtained by examining the dispatch records, audio recordings, witness statements, and other available information. All times are approximate and rounded to the closest minute. Each bullet occurred within the minute time block in the closest approximated order. The timeline is not intended, nor should it be used, as a formal record of events.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Time (Hours)	Fireground Operations, Response, and Details
22:50	• First call received by PSAP for a 3-story warehouse on fire. ○ Additional callers begin calling and giving a different location than the initial call.
22:52	• First alarm companies dispatched to a warehouse on fire at the address given by the initial call.
22:54	• First alarm assigned companies enroute to the scene.
22:56	• SF30 enroute. • Responding units given Northeast TAC 4 (NETAC 4) channel assignment for operations.

22:57	• E18 "We've got a column, working fire."
	  ○ OEC copies and rebroadcasts "Working fire."
	  ○ E18 repeats this message again within the minute.

22:58	• E18 arrives on scene, "Large warehouse, fire showing from roof, heavy fire, Alpha side is 66th Street." ○ OEC copies message. • E20 arrives on-scene. • L20 on-scene and reports "Working fire, mobile command." • DC20 on-scene, "Assuming command, heavy fire from a 1-story warehouse."
22:59	• E18 declares a Defensive Fire. • OEC asks E18 to repeat. • E18 repeats, "Defensive Fire." • OEC transmits the emergency tone and rebroadcasts, "All units, this is a Defensive Fire." • IC orders L20 to set up the ladder pipe. • T18 also reports they are setting their ladder pipe up and opening the garage doors on the Alpha side.
23:00	• IC copies T18. • L20 – "Command, TIC reading through open doors is about 1,000 degrees at the roof, heavy smoke, fire, and some of the roof is starting to collapse. ○ IC acknowledges the report, requests ladder pipes be set up on Ladder 20 and Tower 18. • IC – "SDI in place." • E40 – "On location, connecting to a plug and supplying L20."

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Time (Hours)	Fireground Operations, Response, and Details
	• E23 – "On location." ○ IC – "E23, I'm going to need you to be RIT."

23:01	• T18 – "Command, we're going to have E18 supply T18. We've got a plug right behind T18.
	  ○ IC copies the message.
	• Medic 18 requests assignment to the incident in place of Medic 40.
	• IC – "E40, supply L20, rear bumper."
	• E20 – "Command, D side Exposure, pulling 1.75" to protect it, we don't have a supply."
	  ○ IC copied the message.
	• E23 crew gets RIT equipment from DC20's vehicle.

23:02	• E18 establishes their water supply. • E40 acknowledges their assignment, asks if they are RIT after water supply. ○ IC – "E23 is RIT." • L20 – "We're set up for water." • L20A – "Ready to give CAN report."

23:03	• IC – "L20, Go ahead."
	  ○ L20A – "Collapse of the roof, heavy fire, exposure on C/D side going to have to get inside, already starting to smoke up. Trying to get water on it right now. L20 in position to hit it with the pipe, no further needs."
	  ○ IC – "Received, District 20 to all companies, do not go interior."
	• E20 requests personnel to assist with dragging supply line to a nearby hydrant.
	  ○ IC assigns this task to Medic 18.
	• E23 crew stages RIT equipment at Alpha/Delta corner of building.

23:04	• IC requests status of water supply. • E18C – "Water's coming." • IC updates OEC that water supply is established to both ladder pipes. • IC – "Command to all companies on Delta Division, let's stay clear of that wall, it looks like it's going to collapse outwards." • District 8 on location. ○ IC assigns District 8 side Alpha. • E23B and E23C walk up to Delta side porch to "soften" the structure.
23:05	• IC requests 2nd alarm dispatched. ○ OEC copies request for 2nd alarm.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Time (Hours)	Fireground Operations, Response, and Details
	• E20 – "Command, we got a collapse on the Delta side." ○ IC – "That's received. Command to all companies, stay away from Delta Division." • E23B's radio changes to the wrong channel. E23B's SCBA pressure is noted as having dropped approximately 650psi since arrival on-scene.

23:06	• E23A declares Mayday.
	  ○ IC – "We have a positive Mayday."
	  ○ OEC – "Command you had a mayday, possibly L20D."
	  ○ IC – "Received, yes, positive Mayday, we're working on getting him out right now."
	  ○ OEC – "Command, I just sent your 2nd alarm, do you want the 3rd alarm for your Mayday?"
	  ○ IC – "Yes, give me that 3rd alarm."
	• E23B's SCBA shows another approximately 600psi drop. SCBA also showing in full alarm.

23:07	• ICT sends an electronic PAR check over the radio to E23B. E23B's SCBA pressure drops another approximately 1200psi.
	• L20 – Updates IC that one person was removed.
	  ○ IC copies, inquires about total missing personnel.
	  ○ L20 states they think one more, going to get a PAR.
	• E1 arrives.
	  ○ IC requests they report to IC Post.
	• E40 – Updates they have one more person trapped under debris.

23:08	• E23B's SCBA pressure drops approximately 450psi. SDI showed the remaining pressure at 0psi. • L20 advises IC there are two firefighters missing, they are actively working, requests operations go to a different channel and the rescue stay on this channel. ○ IC copies.
23:09	• Rescue 42 arrives. ○ IC assigns Rescue 42 to the Delta side for extrication of trapped firefighter.
23:10	• IC inquires if there is another firefighter missing.
23:11	• Tower 18 requests water. • OEC calls IC with 10-minute incident clock and advises L20A is showing in alarm.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Time (Hours)	Fireground Operations, Response, and Details
	○ IC requests L20 PAR report, other personnel answer he is OK, working the rescue. • Alpha division requests additional medic units from IC. • E23B's PASS alarm shows cleared in electronic accountability system.
23:12	• IC requests two medic units added to the incident. • Tower 18 updates they have water flowing on Alpha side of building. • IC advised the second firefighter is being extricated.
23:13	• L20 updates all victims are out, all personnel clearing the collapse zone. • IC requests all personnel evacuate the area of Delta side. • IC requests OEC cancel the 3rd alarm. • Engine 25 and Engine 17 arrive. • L20 updates they are exiting the collapse zone with the 2nd victim. They need ALS, automated external defibrillator (AED) protocol is in effect.
23:14	• IC asks all units to clear Delta side. • OEC cancels 3rd alarm. • L20 requests to ALS meet them at front of L20. • IC orders Medic 17 to Delta side.
23:15	• DC 26 and DC 46 arrive. • L20 requests ALS a third time. • IC orders E18 and T18 to stay back from the wall on the Alpha Division, L20 is about to start flowing in that area. • SF30 arrives.
23:16	• Engine 42 arrives. • T18 reports bulk of the fire is knocked on the Alpha side. Asks if IC wants the stream redirected. • OEC notifies IC that L20A is showing in alarm. Asks for confirmation that all personnel are accounted for.
23:17	• IC confirms all personnel are accounted for. • IC requests all personnel stay away from the building. • E27, Medic 40, L26 arrive on-scene.
23:18	• L20 updates all wounded are out and everyone is outside the collapse zone. • OEC updates IC they are at the 20-minute incident clock.
23:44	• IC declares the incident under control.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Time (Hours)	Fireground Operations, Response, and Details
23:53	• E23B transported by Medic 18 to a nearby hospital. • E23C transported by Ambulance 23 to a nearby hospital.

Investigation

On November 6, 2024, at approximately 22:50 hours, a 9-1-1 call was received by the OEC for a three-story warehouse on fire with an approximate location. As the first call was being handled by civilian call takers, additional calls were being answered for the incident of a warehouse on fire near the location provided by the initial call. As the call taker began entering information into the CAD terminal, the first alarm suggested units populated. The OEC personnel dispatched the suggested units to the area the first caller provided the call taker.

The dispatched units included DC20, DC08, E18, E20, E40, E23, T18, L20, and SF30. Within four minutes of the initial call, all first alarm units were enroute to the incident location. OEC assigned this incident NETAC4 for operations. At approximately 22:57 hours, E18 updated "We've got a column, working fire." OEC copied the update and rebroadcasted the working fire.

At approximately 22:58 hours, E18 arrived on-scene and sized the incident up as, "Large warehouse, fire showing from the roof, heavy fire, Alpha side is 66th street." OEC copied the message. E20 approached from the cross street (i.e., Delta side) within seconds of E18's size up. L20 arrived and positioned behind E20 on the Alpha/Delta corner (**See Photo 7**) and reported, "Working fire, mobile command." Seconds later DC20 arrived and updated, "Assuming command, heavy fire from a one-story warehouse."

Photo 7: Arrival conditions of L20 at the Alpha/Delta corner.

(*Courtesy of the fire department*)

At approximately 22:59 hours, E18 broadcasted this incident as a defensive fire. OEC asked E18 to repeat their last message. E18 repeated, "Defensive fire." OEC transmitted an emergency tone and rebroadcasted "All units, this is a defensive fire." IC ordered L20 to set up their ladder pipe. T18 reported setting up their ladder pipe up and opening garage doors on the Alpha side. IC copied the report from T18. At approximately 23:00 hours, L20A radioed IC, "Command, TIC reading through open doors is about 1,000 degrees at the roof, heavy smoke, fire, and some of the roof is starting to collapse." IC acknowledged the report and requested the ladder pipes on T18 and L20 be set up. IC updated all units that SDI was in place. E40 arrived and advised IC, "On location, connecting to a plug and supplying L20." E23 arrived and IC assigned them RIT responsibilities.

At approximately 23:01 hours, T18 updated, "Command, we're going to have E18 supply T18. We've got a plug right behind T18." IC acknowledged the message. Medic 18 requested to be added to the incident instead of Medic 40. IC ordered E40 to supply L20 through the rear bumper. E20 updated, "Command, D side exposure, pulling 1¾ to protect it, we don't have a supply." IC acknowledged the update. E23 crew went to DC20's vehicle and retrieved the RIT equipment for their assignment. E18 established their water supply. E40 acknowledged their assignment and asked if they were to be RIT after establishing a water supply. IC advised E23 is RIT. L20 advised they were setup for water. L20A called IC and was ready to give a CAN report.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

At approximately 23:02 hours, IC was ready for the CAN report. L20A stated, "Collapse of the roof, heavy fire, exposure on C/D side going to have to get inside, already starting to smoke up. Trying to get water on it right now. L20 in position to hit it with the pipe, no further needs." IC responded, "Received, District 20 to all companies, do not go interior." E20 requests personnel to assist with dragging a supply line to a nearby hydrant. IC assigned the crew of Medic 18 to assist. E23 staged the RIT equipment on the ground near the Alpha/Delta corner of the building. At approximately 23:04 hours, IC requested the status of the water supply to which E18C responded, "Water's coming." IC updated OEC that a water supply was established to both ladder pipes. DC08 arrived as IC updated all companies on scene, "Command to all companies on Delta Division, let's stay clear of that wall, it looks like it's going to collapse outwards." IC assigned DC08 to side Alpha. E23B and E23C walked up onto the Delta side porch to "soften" the building as part of the RIT assignment.

At approximately 23:05 hours, IC requested the 2nd alarm be dispatched. E20 called IC, "Command we got a collapse on the Delta side" (**See Diagram 1**). IC responded, "That's received. IC to all companies, stay away from Delta Division." The ICT noticed that E23B's radio suddenly changed to the wrong channel for the incident and that their SCBA pressure dropped approximately 650 psi since their arrival on scene. At approximately 23:06 hours, E23A declared a Mayday. IC acknowledged the mayday. OEC called IC, "Command you had a Mayday, possibly L20D." IC confirmed the message, "we're working on getting him out right now." OEC confirmed to IC the 2nd alarm was dispatched and asked if IC wanted the 3rd alarm for the Mayday. IC asked for the 3rd alarm. E23B's SCBA showed approximately 600psi more drop as well as the PASS showing it was in full alarm.

At approximately 23:07 hours, L20 updated IC that one firefighter had been removed. The ICT sent an electronic PAR check over the radio to E23B. E23B's SCBA pressure dropped an additional 1,200 psi. IC asked how many personnel were missing. L20 thought one more and went to get a PAR. E1 arrived and was ordered to report to the IC post. E40 updated that they had one more person trapped under debris. A moment

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

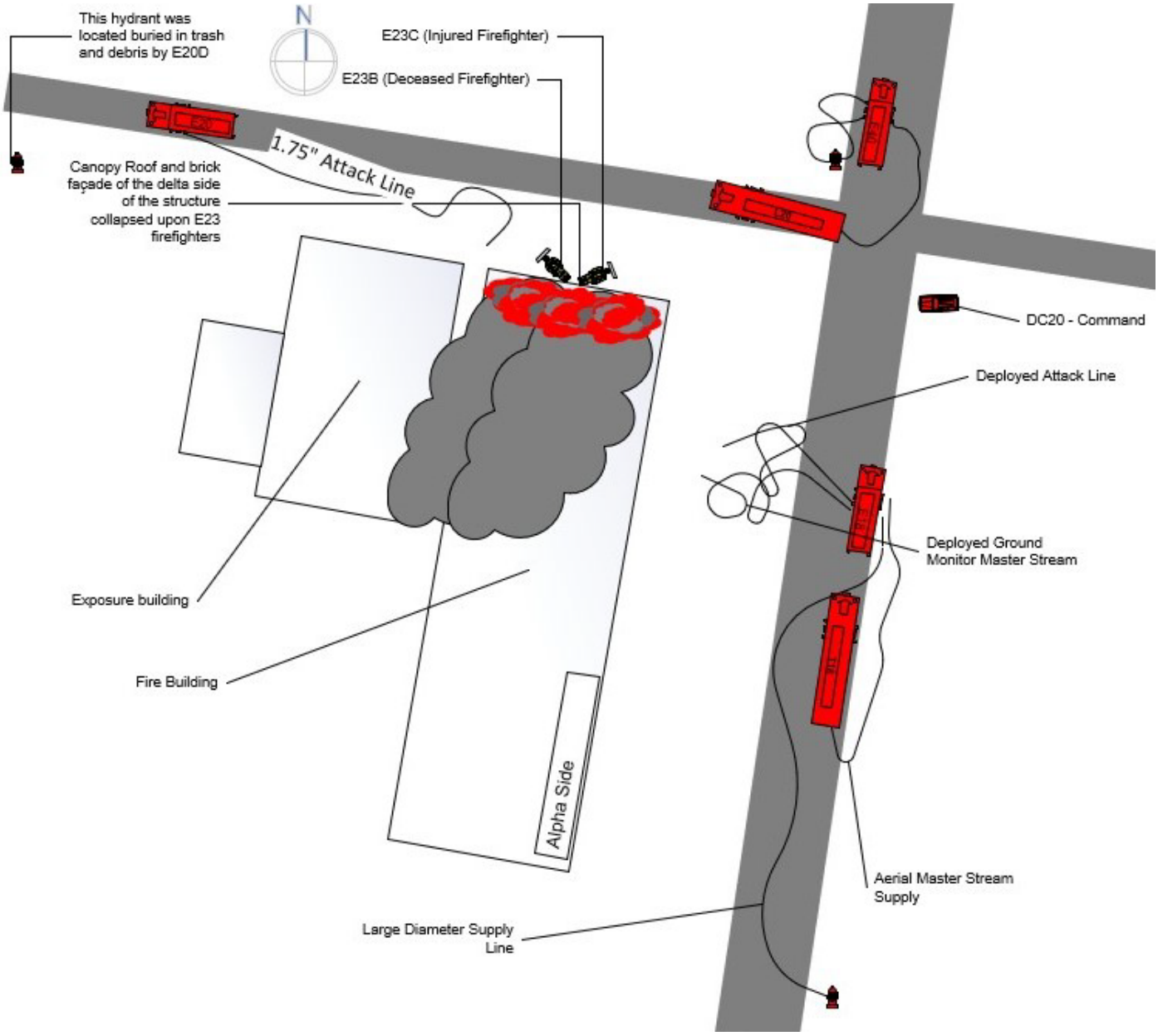

Diagram 1: Scene layout from above at time of collapse. (*Prepared by NIOSH*)

later L20 advised IC there were two firefighters missing and actively working to get them. L20 requested operations go to a different radio channel so the rescue could have this one. E23B's SCBA pressure dropped an additional 450 psi and the electronic accountability system in use by the department showed there was 0psi remaining in the SCBA.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

At approximately 23:09 hours, R42 arrived and assigned to the Delta side for extrication of the trapped firefighter. IC asked if there was another firefighter missing. At approximately 23:11 hours, T18 requested water. OEC updated IC they were at the 10-minute incident clock and advised L20A was showing in alarm. IC requested a PAR for L20, other personnel respond he was ok and working the rescue. T18 updated they had water flowing on Alpha side of the building. IC updated the second firefighter was being extricated. E23B's SCBA PASS alarm showed cleared in the electronic accountability system as well.

At approximately 23:13 hours, L20 updated all victims and personnel clearing the collapse zone were out. IC requested all personnel evacuate the area of the Delta side and that OEC cancel the 3rd alarm. L20 exited the collapse zone with the second victim, and they needed ALS and AED protocols in effect. IC again asked all units to clear from the Delta side. L20 requested ALS meet them at the front of L20. IC ordered Medic 17 to Delta side. At approximately 23:15 hours, L20 requested ALS a third time. IC ordered E18 and T18 to stay back from the wall on the Alpha division, L20 to be flowing water in that area. SF30 arrived on location. At approximately 23:16 hours, T18 reported the bulk of the fire was knocked down on the Alpha side and asked if IC wanted the stream redirected. OEC notified IC that L20A was showing in alarm and asked for confirmation that all personnel were accounted for. IC confirmed that all personnel were accounted for and requested all personnel stay away from the building. At approximately 23:18 hours, L20 updated that all wounded personnel were out, and everyone was outside of the collapse zone. EOC updated IC they were at the 20-minute incident clock. E23C was transported to the hospital by Ambulance 23 and treated for minor injuries. E23B was transported to the hospital by medic 18 and was later pronounced deceased at the hospital. IC declared the fire under control at 23:44 and the scene was turned over to the arson division.

Fire Origin and Cause

The cause of the fire was incendiary/arson.

Cause of Death

The cause of death listed in the county medical examiner's report is mechanical asphyxia with the manner of death being listed as homicide.

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:

- *Pre-incident planning*
- *SOPs/SOGs*
- *Strategy and tactics*

- *Risk versus benefit analysis*
- *Safety officer presence*
- *Change of occupancy*
- *Vacant/dangerous building inspections*

Recommendations

Fire service organizations should:

Recommendation #1: Develop pre-incident plans for structures within their first due response area, specifically dangerous or vacant structures.

The fire department in this incident has a section dedicated to the authority having jurisdiction's (AHJ) approved fire code compliance for several adopted International Code Council (ICC) fire codes:

- 2021 International Fire Code (IFC) with specific amendments for application within the city.
- 2021 International Building Code
- 2021 International Existing Building Code (IEBC)
- 2021 International Residential Code
- 2021 International Swimming Pool and Spa Code
- 2021 International Energy Conservation Code
- 2021 Uniform Mechanical Code
- 2021 Uniform Plumbing Code
- 2023 National Electric Code with all applicable amendments

The city handles vacant and dangerous building inspections and the associated responsibilities. The city provides a hotline for residents and visitors to report concerns. Tips received from the hotline are transferred to the appropriate entity within the city for follow up and any needed actions. Residential building concerns fall within the department of neighborhoods, inspection, and public services. Commercial building concerns fall within the responsibility of public works inspection and investigation division. These entities are entirely separate from the fire department's fire marshal office.

In this incident, the fire building was not occupied by an active business. The property had employed an individual to occupy the building as a form of security but there was no formal security in place. The individual was permitted by the building owner to live within the confines of the warehouse while it was in this unoccupied or vacant state. Chapter 3 of NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery*, defines a vacant building as a building that is currently unoccupied or unused and for which there is intention to reoccupy and reuse in the future [NFPA 1660 2024]. Section 311.1 *General* of the 2021 IFC specifies that temporarily unoccupied buildings, structures, premises, or portions thereof, including tenant spaces, shall be safeguarded and maintained in

accordance with sections 311.1.1 through 311.6Section 311.2.1 *Security* of the 2021 IFC states that exterior and interior openings that are open to other tenants or unauthorized persons shall be boarded, locked, blocked, or otherwise protected to prevent entry by unauthorized individuals [International Code Council 2021]. City code of ordinances, Article 9, Division 5 for dangerous buildings lists several ways the city classifies a dangerous building including: a vacant building, regardless of its structural condition, that has been unsecured for more than seven consecutive/inconsecutive days in any 30-day period [Municode 2024].

The vacant property in this incident was known to the city public works department and had recently undergone several rounds of exterior inspections. The structure had been occupied as recently as one month prior to this incident. Although the inspections had multiple failures, none of them qualified the building as dangerous; however, it was noted that all the inspections conducted through this process were only from the exterior of the building. Interior inspection of vacant properties can only be conducted using an administrative warrant unless personnel are invited in by the property owner.

Several of the line personnel interviewed by NIOSH investigators felt more communication regarding building inspections would be beneficial. It was noted during the field visit that the department recently began performing pre-incident plans for structures by emergency response personnel within the city. This was based on a risk assessment point total that fell within the range of High (36-42 points) or Special (43-49 points), requiring a pre-fire plan be performed. **Appendix A** shows the building's risk assessment and classifications provided by the department as well as their assigned point values for each.

Chapter 17 of NFPA 1660 states that pre-incident plans will assist personnel in effectively managing incidents and events for the protection of occupants, responding personnel, property, and the environment [NFPA 1660 2024]. Because many fire departments are unable to develop a pre-incident plan for all the structures within their jurisdiction, departments may opt to prioritize plans for structures that have 1.) elevated or unusual fire hazards, and 2.) life safety considerations [NIOSH 2024]. The information gathered and included in the pre-incident plan can help ensure the appropriate tactics are employed in the most effective way. Chapter 17 of NFPA 1660 (2024) indicates that the pre-incident plan should be a cooperative effort among the plan developer, facility management and operations staff, and responding personnel. Further, the plan should be coordinated with the incident management system (IMS).

A key component to the pre-incident planning process is the provision for training and education for portions that involve unique or unusual operations. Pre-incident plans should also be available to the IC while operating at an incident. When developing pre-incident plans, items to consider include [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

When developing a pre-incident plan the developer should [NFPA 1660 2024]:

- Visit the property to become familiar with its layout, contents, construction, and protection features.
- Use a standardized pre incident plan document which is utilized throughout the AHJ response area.

Chapter 18 of NFPA 1660 states that pre-incident plan physical elements and site considerations should be classified into five groups [NFPA 1660 2024]:

1. Construction
2. Building management systems and utilities
3. External site conditions
4. Internal and external security
5. Fences or other barriers

Section 18.2 of NFPA 1660 discusses the construction of the building and what should be included in the pre-incident plan such as the size of the building in its entirety (i.e., the overall height, number of stories, square footage, and exact or approximate year of construction. Within the construction section of the pre-incident plan, including data on various points of construction may be helpful such as [NFPA 1660 2024]:

- Wall construction, insulation, and integrity
- Roof construction and integrity
- Floor construction and integrity
- Pertinent building features
- Floor plan with room identifier, occupancy, and use of each room
- Location, types, and construction of access features
- Areas where fire, products of combustion, or other contaminants could spread due to a lack of structural barriers
- Atriums
- Storage arrangements
- Fire command center location, access, and fire rating of the area fire walls

Performing a pre-incident plan and recording the data allows the personnel responding to that structure to get inside and around the building before there is an emergency incident. This allows the personnel a basic familiarity with the location prior to the introduction added stressors during an emergency response. The 2021 IEBC allows the city to perform an inspection whenever a change of occupancy occurs within a structure. A change of occupancy is defined as [ICC 2021]:

- any change in the occupancy classification of a building or structure
- any change in the purpose of, or a change in the level of activity within, a building or structure
- change of use

This code provides an opportunity for the city to perform an inspection and pre-incident plan anytime a building changes owners or tenants to ensure awareness of hazards on the premises. While performing change of use and change of occupancy inspections, AHJ's and fire departments could help make buildings safer by ensuring compliance to codes and standards. It is imperative to the safety of personnel that the fire department and the AHJ are operating from the same edition of codes so there are not discrepancies in enforcement. The fire department in this incident is currently in process of formally implementing pre-incident plans in emergency response.

Recommendation #2: Develop and maintain SOPs/SOGs.

The fire department in this incident provided their SOGs to NIOSH investigators for review. The department has well-defined guidelines that provide a reference framework for personnel to use when they respond to incidents. The fire department also provides tracking on each document for when they are reviewed or revised with a date.

In the fire service, SOPs/SOGs exist to give personnel a basis to make split second decisions effectively and safely. If constructed well, operating personnel may not need to deviate from the written guidelines or policies. SOPs/SOGs allow fire departments to approach operational risk management in a standard manner that will include a full range of safety considerations [U.S. Fire Administration 2018]. Incorporating SOPs/SOGs in all facets of operations and training allows personnel to execute safety considerations as part of the IAP.

NFPA 1550, *Standard for Emergency Responder Health and Safety*, Chapter 6 outlines that fire departments should prepare and maintain written policies and SOPs that document the organization structure, membership, roles and responsibilities, expected functions, emergency operations, and training requirements including the procedures that will be employed to initiate and manage operations at the scene of an emergency incident. NFPA 1550 also states that fire departments evaluate current trends and research annually or following a near miss or catastrophic event to determine if policies and procedures are appropriate [NFPA 1550 2024]. Department guidelines had many segments that had not been reviewed in two or more years with many not having revisions in four or more years prior to the date of this incident.

Recommendation #3: Ensure ICs match their tactical strategy with the incident at hand.

In this incident, the fire department was dispatched to a working fire at a vacant warehouse. Moments after arrival, E18 declared a defensive strategy for operations. Each portion of the building type for this incident has its own set of tactical considerations to consider. Chapter 12 of NFPA 1700 provides specific tactical

considerations for each of these building types. Section 12.13 is specific to abandoned and vacant structures, while section 12.15 is specific for warehouses.

Abandoned or vacant structures are those no longer in use and could be in an unknown condition or compromised state (e.g., weakened structural components, missing or holes in the floors, and/or structural deficiencies). When operating at these types of structures [NFPA 1700 2021]:

- Consider exterior fire control prior to entry.
- Anticipate early collapse.
- Anticipate unpredictable or increased fire activity or impediments to normal firefighting operations based on gutted, deteriorated, and modified interiors.
- Consider occupancy by squatters and transients.

Warehouse and storage fires may be complex incidents that can expose responders to varying challenges and hazards. The complexity of these incidents is a function of several factors and can require significant resources to mitigate. Fires in these types of occupancies can involve large open areas and high fuel loads. Key risk factors for warehouse fires include [NFPA 1700 2021]:

- Construction features including construction type, total building size, details of fire-rated enclosures, and the presence of large open fire areas
- Types and hazard level of material stored
- Storage configurations such as height and type (e.g., rack storage, floor storage)
- Presence, type, and suitability of fire protection and detection systems.
- Available methods to facilitate ventilation such as roof vents, smoke control, and exhaust systems
- Availability and adequacy of water supply
- Equipment and machines that involve material handling

Section 12.15.2 of NFPA 1700 states that preplanning of warehouse and storage occupancies is a critical aspect of enabling an effective fire response. Section 12.15.5 of NFPA 1700 discusses how high fuel loads and long structural spans can facilitate structural collapse, suggesting that structural conditions be continually evaluated. A common denominator in both vacant fire building and warehouse fire building tactics is an increased risk of structural collapse. For large fires where the fire has vented through the roof, defensive operations should be initiated. Specifically, personnel should be evacuated from within the interior while roof areas and appropriate collapse zones are established and enforced. Aerial water streams and ground-level monitors can be used to help control the spread of fire and protect against exposures [NFPA 1700 2021].

The construction of a building can also help the IC identify an appropriate tactical strategy. The fire building in this incident was Type II construction consisting of approximately 13,160 square feet with 1,680 sq. ft. of the building designated as office space. The building contained no means of automatic fire suppression. The

roof was constructed of lightweight trusses topped with metal decking and asphalt roofing material. There was also no noted fire detection system. This combination allowed the fire to free burn until a passerby called to report the fire. The building also had burglar bars on the windows and a storefront style door on the Delta side.

Type II construction is split into two categories, Type II-A (protected) and Type II-B (unprotected). Type II-A requires that structural components have one-hour fire resistance, meaning the building will perform similarly to Type I but with a lower requirement for fire resistance. Type II-B allows structural components to remain unprotected, meaning major structural components have no fire resistance. A Type II-B building cannot be expected to provide structural stability under fire conditions and the failure of unprotected steel members must be anticipated. Chapter 2 of the *Essentials of Fire Fighting 8th Edition Firefighter 2* discusses that when Type II construction is exposed to temperatures above 1,000°F, unprotected steel will expand and twist, pushing out walls [IFSTA 2016].

RIT operations can be separated into a few stages depending upon the scale of the incident and tactical strategy employed. The collapse of the Delta side wall occurred while the personnel assigned to E23 were in process of working through what can be described as stage one. In the article *The Fire Scene: The Three Stages of RIT Operations*, stage one is described as the prevention stage (Salka Jr., 2024), meaning the RIT team members assemble and place RIT tools in a staging area. Oftentimes ladders are positioned around the structure for rapid escape if conditions dictate the need. Another prevention duty of the RIT team is "softening the building" or the removal of window bars or other barriers that could prevent a firefighter retreating out through a window or door. These actions all take time to complete, and the RIT team operations may benefit from having these actions performed before the RIT team is deployed in a rescue situation [Salka Jr. 2024].

Recommendation #4: Train all personnel to employ risk management principles when operating on the incident scene.

There were decisions made early into this incident that did not employ appropriate risk management principles. E18, within moments of arrival, declared this is a defensive fire over NETAC4, which was acknowledged by IC and rebroadcast by OEC with alert tones. L20A arrived within seconds of E18, performed a 360 of the structure and provided the findings to IC as well as a CAN report for effective containment of the fire. The CAN report informed the IC that the temperatures at the ceiling of the building were 1,000°F and portions of the roof collapsed.

Since the early 1990s, the fire service has operated under the mantra of "Risk a lot to save a lot, risk a little to save a little" [Avsec 2023]. Performing an offensive fire attack from inside a structure increases the inherent risk to the personnel performing the attack, whereas a defensive posture may provide an added level of safety by keeping personnel outside the structure. Fire departments should provide personnel with a standardized risk management approach that could be employed at any incident [NIOSH 2020]. Personnel

operating at an incident should be cognizant of the safety of themselves and their crew to maintain maximum effectiveness. Chapter 10 *Incident Management* of NFPA 1550 includes a section on risk management during emergency operations and while it specifically mentions the IC to include risk management in the IAP, the same could be applied to all personnel. Risk management principles should be utilized based on the following [NFPA 1550 2024]:

1. Activities that present a significant risk to personnel safety should be limited to situations where there is a potential to save endangered lives.
2. Activities that are routinely employed to protect property are recognized as inherent risks to the safety of personnel, and actions are taken to reduce or avoid these risks.
3. No risk to the safety of personnel is acceptable when there is no possibility to save lives or property.
4. Where the risk to fire department personnel is excessive, activities are limited to defensive operations.

Initiative 3 of the 16 firefighter life safety initiatives from the *Everyone Goes Home* project suggests that personnel focus greater attention on integrating risk management principles with incident management at all levels, including strategic, tactical, and planning responsibilities. This integration allows for appropriate risk management at all levels of operations from the newest to most experienced firefighter. Initiative 4, empowerment, states that all firefighters be empowered to stop unsafe practices [Everyone Goes Home 2025]. Annex J, Risk Management Plan Factors, of NFPA 1550 provides information on developing a risk management plan and includes a sample that fire departments could implement as a framework and then fine tune for their situation. The steps outlined in Annex J, per NFPA 1550 [2024] are:

1. **Risk identification:** Looking at every aspect of the fire department's operation and listing potential problems
2. **Risk evaluation:** Evaluating each risk identified in step one and determining the likelihood and potential severity (e.g., expense) of the occurrence.
3. **Establishing priorities for action:** Evaluating the frequency and severity of risks guides how departments establish priorities. A risk evaluated to be a low probability, but high severity often ranks as a high-priority item [NFPA 1550 2024]. Risks that have a lower likelihood can often be placed lower on the priority list.
4. **Risk control:** Once risks are identified and evaluated, a control for each should be implemented and documented with one of two primary methods – 1.) Eliminate or avoid the risk or activity that presents the risk, or 2.) Develop steps to control the level of the risk.
5. **Other control methods:** Other suggested methods of controlling risk include developing, implementing, and enforcing a safety program, developing SOPs/SOGs disseminating training, and completing inspections.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Recommendation #5: Strategically deploy safety officers.

The fire department in this incident had three personnel on each shift assigned to the position of safety officer for the entirety of the city. That equates to one safety officer for every 31 firehouses on average. Fire departments may find added benefits, such as response time, if they increase the number of personnel trained to perform the duties of a safety officer. With the safety officer position operating as a separate but incorporated part of the IC staff who looks for hazards and works with personnel, they may provide a separate, individual focus on the safety aspects of the incident. In other words, they are not assigned operational tasks but are solely focused on the safety of the personnel on scene and changing conditions separate from the IC and their plan.

Mayday declarations within career fire departments oftentimes occur within 20 to 35 minutes of the initial on scene time according to the 2021 Project Mayday report. Of 12,227 declared Maydays, approximately 6,352 or 51.95% were within this window of on scene time. In this incident, the Mayday occurred within seven minutes of the arrival of the first unit, putting this incident within the lowest frequency of occurrences. Only 0.5% of Maydays included within the sample set occurred in less than 10 minutes of the first arriving unit [Abbott 2021]. It is also known that a high percentage of Mayday declarations occur when only one chief officer is on scene, as high as 90% in 2019 [Marsar 2019]. This incident occurred approximately one minute after the arrival of the second district chief and ten minutes before the arrival of the assigned safety officer.

The incident safety officer (ISO) is responsible for identifying activities that pose an imminent threat to firefighter safety and subsequently stop, alter, or suspend the identified activity. When an ISO identifies unsafe conditions, operations, or hazards that do not pose an imminent threat to firefighters, they should take appropriate action through the IC to mitigate or eliminate the unsafe condition. Upon arrival to the scene, the ISO should conduct a quick, face-to-face with the IC if possible, to cover the scene layout, established perimeters or control zones, initial hazards, and the strategies and tactics employed in the IAP by the IC. ISOs should perform their own, independent 360 of the scene focused on personnel safety rather than for tactical reasons [Eskwitt 2018].

Fire departments may benefit if the deployment of safety officers occurs as part of the initial assignment to any incident where personnel could be assigned tasks within an immediately dangerous to life and health (IDLH) atmosphere such as a fire, hazardous materials incident, or technical rescue. Across the fire service it is common for the first arriving officer to establish command as the IC and subsequently pass command to the first arriving chief officer for the remainder of the incident. However, there are many times in which the second arriving command officer is tasked to operations or a division of the incident. Fire departments could see significant benefit to the safety of their personnel by assigning the second arriving command officer as the ISO and altering the assignments for high-risk incident types to include three command officers on the initial assignment. This would allow for the first arriving officer to assume command, the second arriving officer to assume the ISO role, and the third officer to be tasked according to the IAP based on their arrival.

The third officer could be assigned what has been traditionally assigned to the second arriving officer. This change would allow for personnel safety to be elevated on the hierarchy of the IAP.

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

Recommendation #6: Complete change of occupancy inspections per applicable fire and life safety codes.

The building was vacant as the previous occupant relocated operations. The lack of a building occupant falls under the adopted codes as being classified as a "dangerous building with unlawful existence." The public works department performed building inspections at this location prior to the incident but could only do so from the exterior as the building was secured. The AHJ could benefit from adding an additional process to notify various departments, including the fire department, when buildings in their respective territories are added to the dangerous or vacant building list. When the AHJ is notified of a change in occupancy, they could enact a joint inspection between fire department personnel as well as other municipal departments to allow for faster and clearer hazard communication across traditional departmental borders.

Because tenants utilize structures for different purposes, when tenants of commercial buildings change, so can the fire load and hazards inherent to the building. It could go from dry good storage, hazardous material storage, to medical supplies, or just about anything else the building owner chooses to allow. NFPA 1, *Fire Code*, Chapter 1, Section 1.3, states that this code applies to new and existing conditions and more specifically in repairs, renovations, alterations, reconstruction, change of occupancy, and additions to buildings and requires conformity. Further, NFPA 1 states plans for a new occupancy be submitted to the AHJ prior to the change of occupancy of any existing building. NFPA 1 also requires that plans be submitted for review by the AHJ prior to altering the means of egress or fire protection systems of any existing building [NFPA 1 2024]. The issuance of an occupancy permit following a request for a change of occupancy within a structure should be dependent on satisfactorily following all applicable codes and variances adopted and enforced by the AHJ.

NFPA 1, chapter 4, states that in any building or structure, a change from one occupancy classification to another shall be permitted only where the space conforms with code and variance requirements that apply to new construction for the proposed new use, except the following [NFPA 1 2024]:

1. Where, in the opinion of the AHJ, the proposed occupancy or change in use is not more hazardous than the existing use, based on life safety and fire risk, the AHJ shall be permitted to approve such a change of occupancy provided compliance with the requirements of the adopted code for buildings of like occupancy or use are specifically incorporated to safeguard the life, health, and welfare of persons.

2. Change of tenants or ownership shall not be construed to be a change of occupancy classification where the nature of use and assigned occupancy classification remain the same.

However, the ability to make these requirements more stringent lie with the AHJ. Specifically, the AHJ can require any change of occupancy request to be approved prior to the action taking place and enforce notification of any change of occupancy occurring. The 2021 IFC defines a change of occupancy as any time the code requires a greater degree of safety, accessibility, structural strength, fire protection, means of egress, ventilation, or sanitation than exists in the current building or structure such as a change in occupancy classification, or the purpose of or level of activity within a building [ICC 2021]. To ensure compliance prior to normal business operations, the AHJ could adopt a process that includes a site inspection for code compliance and incorporates a pre-fire plan as part of the process. Incorporating a pre-incident planning component into this process could allow responding personnel to be updated on any changes with the contents, occupied hours, and any fire protection changes to the structure. This process could also allow the responding personnel a tactical and safety advantage prior to arriving on scene by having at least a basic understanding of what they may be responding to.

Recommendation #7: Communicate across departmental boundaries.

Cross-departmental communication can ensure the disbursement of information and improve personnel safety within local government. This includes communication to other parts of the local government as well as the residents and visitors of the municipality. Communications is of the utmost importance for local governments and the complexity of disbursement continues to increase as society becomes more technology driven. Local government provides essential services, enforces regulations, and makes decisions that impact the lives of those residing, working, and visiting their communities every day and the information related to these items need to be disseminated to everyone within the community regardless of their abilities or backgrounds [Pond 2023]. Communication across departments can also support community engagement and legal obligations.

While it is imperative that local government entities ensure communication from the outward facing perspective, it is just as important to foster communication internally among departments. The local government where this incident occurred had multiple entities that had various aspects of code compliance and building complaints within the municipality. None of these entities had a process for communicating with other entities that may be involved. Creating a procedure for cross-departmental communication could help identify potential hazards in various occupancies. The building in this incident was originally reported as a potentially dangerous building but only one segment of the local government was aware of that.

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Another form of cross-department communication that agencies may find useful are visuals. As an example, marking the building on the exterior could provide a visual indicator for arriving responders that the building may need to be approached with different tactics. This could provide the IC with a visual indicator and reminder to set up operational perimeters and collapse zones earlier into the incident, potentially from the first arriving company onward. This type of system, sometimes referred to as a High-Risk Building Management Program (HRBMP) addresses the needs associated with hazard communication for these types of structures [NIOSH 2022]. An HRBMP consists of three phases, a determination, remediation, and emergency response. The remediation phase consists of two parts, demolition and marking. For buildings that fall within an HRBMP, remediation can involve clear communication and signage. The International Association of Arson Investigators (IAAI) and the United States Fire Administration (USFA) have developed an abandoned building project that depicts specific signage to be affixed to these types of buildings as seen in **Diagram 2**. However, this is just one example. It is likely that local government agencies have their own programs and systems for communicating such information.

Diagram 2: IAAI/USFA high-risk building marking system (*Courtesy of USFA*)

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Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Investigator Information

This incident was investigated by Louis (Rick) Lago, Investigator, and Stephen J. Ringer, Investigator, both with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH located in Morgantown, WV. The report was written by Stephen J. Ringer and Dr. Wesley R. Attwood, Investigator and Program Advisor.

Dan Madrzykowski and Keith Stakes from the Fire Safety Research Institute, part of the UL Research Institutes, provided a technical review of the investigation report. A subject matter expert review was provided by Michael Italia, Zoning Officer/Building Code Official, Barry Isett & Associates. The NFPA Emergency Response & Responder Safety Division also provided a technical review.

Disclaimer

The information in this report is based upon dispatch records, audio recordings, video 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 reference 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.*

Career firefighter dies and another injured while performing rapid intervention team tasks at vacant warehouse fire – Texas

Appendix A:

Building Risk Assessments and Classifications

(Courtesy of the fire department)

A. Life Hazards (4 – 15 points)
   a. Occupancy Type
      i. Light (1 point) - Light hazard occupancies are defined as occupancies or portions of other occupancies where the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected.
      Examples:

Animal Shelters	Hotels	Offices
Churches	Institutional	Residential Homes
Clubs	Kennels	Restaurants
Educational	Museums	Theaters and Auditoriums
Hospitals	Nursing Homes	Used attics
Libraries		

      ii. Ordinary (3 points) - Ordinary hazard occupancies are defined as occupancies or portions of other occupancies where the quantity and combustibility of contents are low to high and fires with relatively moderate rates of heat release are expected.
      Examples:

Agricultural Facilities	Glass Products Manufacturing	Post Office Processing
Automobile Parking	Horse Stables	Printing and Publishing
Bakeries	Laundries	Racetrack Stables
Canneries	Leather Goods Manufacturing	Repair Garages
Cereal Mills	Local Fairgrounds	Resin Application Area
Chemical Plants (ordinary)	Machine Shops	Textile Manufacturing
Confectionary Products	Metal Working	Tire Manufacturing
Distilleries	Mercantile/Retail	Tobacco Product Manufacturing
Dry Cleaners	Paper and Pulp Mills	Wood Machining
Electronic Plants	Paper Processing Plants	Wood Product Assembly
Exterior Loading Docks	Piers and Wharves	
Feed Mills		

iii. Extra Hazard (5 points) - Extra hazard occupancies are defined as occupancies or portions of other occupancies where the quantity and combustibility of contents are very high, flammable, or combustible liquids are present, dust, lint, or other materials are present, introducing the probability of rapidly developing fires with high rates of heat release.
Examples:

Asphalt Saturating	Plywood and Particle Board Manufacturing
Combustible Hydraulic Fluid Areas	Printing (inks, flashpoints, 100° F)
Die Casting	Rubber Facilities
Flammable Liquids Spraying	Sawmills
Flow Coating	Solvent Cleaning
Manufactured/Modular Home Assemblies	Textile Picking, Opening, Blending
Metal Extruding	Upholstering with Plastic Foams
Plastics Processing	Varnish and Paint Dipping

b. Number of Occupants - Number of occupants that are typically in the building. Buildings that fluctuate with occupants have its maximum occupancy limit, designed occupancy, or the estimated amount for a normal event listed (i.e., Church – use the typical Sunday Service).
   i. 0 to 10 — 1 point
   ii. 11 to 50 — 2 points
   iii. >50 — 3 points

c. Occupant Mobility – are the occupants able to egress the building without any assistance?
   i. Ambulatory (yes) — 1 point
   ii. Non-ambulatory (no) — 3 points

d. Building Code Classification - The Building Code classifies occupancies in specified categories. The Standard of Cover manual recommends that various types of classifications be grouped together into low, moderate, high, and special risks to ensure appropriate deployment of fire suppression resources. See Building Code Classification with Examples for definition of each classification.
   i. Group (M)-Mercantile — 1 point
   ii. Groups (E)-Educational, (R-1 to R-4)-Residential — 2 points
   iii. Groups (A)-Assembly, (B)-Business, and (S)-Storage — 3 points
   iv. Groups (I)-Institutional and (F)-Factory — 4 points

B. Building Type (7 to 25 points)

a. Type I (1 point) - Type I Fire Resistive construction has structural components that are non-combustible materials, usually steel or concrete, that offers a fire-resistance rating that ensures the efficiency of the inherent built-in fire protection. These types of construction are most common in Groups B and I building code classifications.

b. Type II (1 point) - Type II Non-Combustible construction may not afford any fire-resistive rating because it is generally designed with exposed structural elements. This type of construction is most common in Low-rise and Group R building code classifications.
c. Type III (2 points) - Type III Ordinary construction is usually divided into protected and unprotected subtypes. Exterior walls are usually masonry and built with brick or block walls and have a wooden roof, wall and floor assembly which is not protected against fire. These buildings are frequently found in "warehouse" districts of older cities. This type of construction is most common in Group B and R building code classifications.
d. Type IV (2 points) - Type IV Heavy Timber construction have large cross-sectional areas with all elements (columns, pillars, arches, floors, and roofs) being heavy wood design with a minimum nominal dimension of 8 inches or greater. Exterior walls are usually made of noncombustible masonry walls and usually found in older factories and mills.
e. Type V (3 points) - Type V Wood Frame construction has mainly wood components for exterior and interior walls are made many other materials permitted by international and local building codes. The three most common subtypes relating to framing and foundations include Post and Beam, balloon frame, and platform frame. This type of construction is most common in Group R building code classifications.

C. Square Footage - This is the square footage per floor of the building. This shall not be reduced by firewalls or separations. The County Property Appraiser files should be used if the square footage is not able to be determined.
   a. 0 to 2,500 sq. ft. 1 point
   b. 2,501 to 10,000 sq. ft. 2 points
   c. >10,000 sq. ft. 3 points

D. Number of Stories - This is the total number of stories for the building. If a building contains a basement, this should be added as a story. Buildings with attics that can be inhabited should also be added as an additional story.
   a. 1 to 3 1 point
   b. 4 to 6 3 points
   c. >7 5 points

E. Fire Protection - Identify if the building is protected by fire protection equipment. If the building is not completely covered, they should be considered as having none.
   a. Sprinkler System and Fire Alarm Monitored 1 point
   b. Fire Alarm or Sprinkler System Not Monitored 2 points
   c. None 3 points

F. Fire Flow
   a. 0 to 1,000 gpm 1 point
   b. 1,000 to 3,000 gpm 2 points
   c. 3,001 to 4,000 gpm 3 points

d. >4,000 gpm 5 points

G. Age of Building
   a. 0 to 10 years 1 point
   b. 11 to 21 years 2 points
   c. >21 years 3 points

H. Access to Building - The risk to the occupancy increases if access to the property is difficult. This delays operations to mitigate the incident. Examples of difficult access are parts of building not accessible to apparatus and security gates.
   a. No Access Problems 1 point
   b. Moderate Access (Security Gate) 2 points
   c. Significant Access Problems (50 percent inaccessible) 3 points

I. Community Value (3 – 9 points)
   a. Historic Value - Buildings that if they exhibit a catastrophic event would have a historic impact on the community. Examples would include historic buildings, churches museums.
      i. No 1 point
      ii. Yes 3 points
   b. Social Value - Buildings that if they exhibit a catastrophic event would have a social impact on the community. Examples would include City Hall, Libraries, Police Stations, Recreation Centers, schools, and churches.
      i. No 1 point
      ii. Yes 3 points
   c. Economic Value - Buildings that if they exhibit a catastrophic event would have an economic impact on the community. Examples would include large industrial properties such as Big Box stores, and large grocery stores.
      i. No 1 point
      ii. Yes 3 points

Officers should add up all points associated with each category to determine a Final Risk Assessment Score. Do to the extremely high number of buildings in each response area, a goal should be set at performing a Pre-Fire Plan on buildings with **High** and **Special** risk values first. District Chiefs and Company Officers should consider performing a Pre-Fire Plan on buildings with Low and Moderate risk as time permits.

Final Risk Assessment Score	
Low	14 to 22 points
Moderate	23 to 35 points
High	36 to 42 points
Special	43 to 49 points