



NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

Death in the line of duty...

A Summary of a NIOSH fire fighter fatality investigation

March 27, 2000

Floor Collapse Claims the Life of One Fire Fighter and Injures Two-California

SUMMARY

On January 10, 1999, three fire fighters became trapped when the second floor of a nightclub collapsed during an interior fire attack. One male fire fighter (the victim) died and two other fire fighters were injured as they battled the late morning blaze. Arriving on the scene of a two-story taxpayer building (commercial occupancy on the first-floor and living quarters on the second), fire fighters reported heavy smoke emitting from the second-floor windows and eaves with fire showing in a secondary front doorway that lead to the second-floor. The fire quickly spread up the walls of the first-floor to an area above the false ceiling over the first-floor. The fire also spread up the walls to the attic area above the second-floor.

As fire fighters prepared entry through the main front door, other fire fighters began applying water to the fire that was emitting through a secondary front door that led to the second-floor. Gaining entry through the main front door, two fire fighters from Engines 2550 (a Captain and a fire fighter) and three fire fighters from Engine 2552 (Lieutenant [injured], Engineer, and a fire fighter [victim]) advanced two 1 ½ -inch charged lines and began applying water to

the fire. Upon entering the smoke filled structure, they noticed that the ceiling (drywall drop ceiling) was down in some areas, and they could see fire going up the walls and across the ceiling. As fire fighters from Engine 2552 advanced their line, the Engineer was struck in the head by falling debris that knocked off his helmet and he was forced to exit. Minutes later, a third fire fighter from Engine 2550 joined his crew inside the structure. A fire fighter (injured) from Engine 2552 also entered at the same time, relieving the victim on his line. The Captain on Engine 2550 stated that as he continuously surveyed the interior conditions, it had appeared to him there had been a partial roof collapse (referring to the second-floor as the roof). He then exited the structure and went to the command post to give the Incident Commander (IC) a report on the interior conditions, explaining that he felt there had been partial roof collapse (second-floor). Before the IC could make any changes, the Captain returned to the interior of the structure to find his crew. Just as he located his crew, the second floor collapsed, trapping three fire fighters from Engine 2552. The Captain of Engine 2550 and his crew escaped



Incident Scene

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at:

<http://www.cdc.gov/niosh/firehome.html>

or call toll free **1-800-35-NIOSH**



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without injury. The rescue team quickly freed one fire fighter and had to use hydraulic jacks, airbags and cribbing to free the Lieutenant and the victim. All 3 fire fighters were transported to a local hospital where the victim was pronounced dead.

NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should:

- ***use extreme caution and recognize potential hazards that could exist when fighting a fire in a balloon-framed structure***
- ***implement an emergency notification system to rapidly warn all persons who might be in danger if an imminent hazard is identified or if a change in strategy is made***
- ***ensure that fire fighters wear protective clothing whenever they are exposed or potentially exposed to hazards***
- ***ensure that a separate Incident Safety Officer, independent from the Incident Commander, is appointed***
- ***ensure that when fire fighters are performing an interior attack with the possibility of a ceiling collapse, they should establish a collapse shelter***
- ***provide the Incident Commander with a Command Aide***
- ***ensure that once a Rapid Intervention Team (RIT) is established that they remain the RIT throughout the operation***
- ***develop and implement a preventative maintenance program to ensure that all SCBA's are adequately maintained***

Additionally building owners should:

- ***ensure that all modifications/renovations to buildings are in compliance with current building codes (i.e., any renovation or remodeling does not decrease the structural integrity of supporting members).***

INTRODUCTION

On January 10, 1999, a 52-year-old male fire fighter (the victim) died and two fire fighters were injured during an interior fire attack at a nightclub, which was part of a two-story taxpayer building. As the fire fighters applied water from the roofs of the adjoining structures, two crews entered the first-floor to perform an interior attack. During the fire attack, the second-floor collapsed, trapping three fire fighters. All three fire fighters had to be extricated from the debris. The three fire fighters were transported to the local hospital, where two of the fire fighters were treated for their injuries and the victim was pronounced dead.

The National Institute for Occupational Safety and Health (NIOSH) was notified of the incident by the International Association of Fire Fighters (IAFF) and the United States Fire Administration on January 13, 1999. On February 25-26, 1999, a Safety and Occupational Health Specialist, an Engineer, and a Physical Scientist traveled to California to investigate the circumstances surrounding this fatal incident. Meetings were conducted with the Chief, Assistant Chiefs, Battalion Chiefs, the City building inspector, the department photographer, IAFF union representatives, representatives from the department's air-mask shop, and the fire fighters involved in the incident. NIOSH investigators obtained a copy of the department's Standard Operating Procedures (SOPs), photographs of the fire scene, the victim's training record, the Incident Commander's incident scene assignment sheet,



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maintenance records for the self-contained breathing apparatus (SCBA), interview statements from the department's internal investigation, a videotape from the fire scene, and the dispatch tapes. Training procedures and preliminary reports were reviewed. Investigators visited the site and photographs were taken. The department sent four SCBAs (the victim's and three others involved in this incident) to the NIOSH respirator certification laboratories for further evaluation. The evaluation completed by NIOSH indicated the victim's SCBA was working properly (see Attachment 1).⁸

The fire department involved in the incident serves a population of 380,000 in a geographical area of 72 square miles. The fire department is comprised of approximately 525 employees, of whom 475 are uniformed personnel. The fire department provides all new fire fighters with the basics of Fire Fighter level I training. The department requires all fire fighters to attend 16 weeks at the City Fire Academy, to complete Emergency Medical Technician (EMT) training provided in the Fire Fighter level I training, and to be State-certified. All new fire fighters are placed on a 18-month probation period. Throughout the probation period, they train and complete the Fire Fighter level II requirements. Refresher training courses are continued on a day-by-day basis. The victim's training records were reviewed and appeared to be sufficient and up to date. The victim had 29-years of experience as a fire fighter.

INVESTIGATION

On January 10, 1999, at 1043 hours, fire fighters responded to a dispatch report of a fire in a two-story building. The following were dispatched to respond:

Engine 2550 (Captain, Engineer, and 2 fire fighters)

Engine 2552 (Lieutenant [injured], Engineer, fire fighter [injured], and fire fighter [victim])

Engine 2545 (Captain, Engineer, and 2 fire fighters)

Engine 2548 (Captain, Engineer, and 2 fire fighters)

Engine 2555 (Lieutenant, Engineer, and 2 fire fighters)

Truck 2574 (Captain and 4 fire fighters)

Battalion Chief 2512 (BC)

At 1046 hours, Truck 2574 was the first to arrive on the scene and reported heavy smoke was emitting from a two-story building (see Photo). Dispatch also made a report that they had received calls stating that civilians were trapped on the second-floor of the burning structure. Truck 2574 established Command and requested a second alarm. Battalion Chief 2512 arrived on the scene and assumed command. He immediately struck a third alarm and shortly after struck a fourth alarm because there were buildings adjoining the burning structure and he wanted to control the fire from spreading (see Photo). Engines 2550 and 2545 arrived on the scene shortly after. Engine 2550 hooked up a 2 ½ -inch line to a nearby hydrant and proceeded to the burning structure as Engine 2545 hooked up a 5-inch supply line to the hydrant. Engine 2550 and Engine 2545 pulled two 1½-inch attack lines and took position at exposure A (see Diagram). Engine 2548 arrived on the scene and set up in the rear of the structure at exposure C and side D, while Truck 2574 placed their aerial ladder to exposure C. Engine 2548's original assignment was to act as the Rapid Intervention Team (RIT), but as they arrived at 1051 hours, they requested to set up in the rear due to the amount of apparatus already in the front. At 1052 hours, Battalion Chief-2514 arrived and was assigned to be in charge of Outside Operations. He immediately proceeded to side D and then to exposure A, to complete a size up of the structure.



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The “bird dog” (fire fighter who makes forcible entry) on Truck 2574 began forcible entry at exposure C. Engine 2542 arrived on the scene to assist with SCBA operations (changing and filling air bottles) while Special Truck 2592 arrived and proceeded to the command post to assist the IC with operations and to collect Pass Ports (accountability system). At 1056 hours, Engine 2552 arrived and the IC placed them at exposure A to take over as the RIT team.

Truck 2571 arrived on the scene and placed their aerial ladder to the roof of the adjoining structures on side D. Two fire fighters went to the roof to cut vent holes as the “bird dog” on Truck 2571 prepared entry at the main front door of exposure A. Truck 2571 had also placed two 1 ½-inch lines on the roof of side D to control the fire from spreading to the adjoining structures. Fire fighters on the adjoining roofs were also applying water down the exterior walls of the structure in an attempt to reach the fire coming up the walls.

The Captain from Engine 2545 and a fire fighter from Engine 2555 entered the secondary front door, which lead to the second-floor (see Photo). As the two proceeded up the steps with the Captain on the nozzle, the steps collapsed, and the Captain and fire fighter retreated and exited the structure. The Captain reported to the IC that there was heavy fire near the stairs and that they could not access the second-floor. The Captain ordered a fire fighter from Engine 2545 to retrieve an axe and break loose the steps so they could proceed under them to the rear of the structure. After the steps were knocked out, the Captain and two fire fighters from Engine 2545 and a fire fighter from Engine 2555 entered the area applying water and proceeded toward the rear of the structure approximately 35-feet where they encountered a gas furnace. The furnace was blocking the fire fighters path to the rear of the structure, so they decided to remove the furnace and drag it to

the exterior. *[NOTE: The furnace is believed to be the fire’s point of origin. When the fire fighters removed the furnace they ripped all connections apart; however, the gas company had shut off the gas prior to the furnace’s removal.]* The fire fighters reentered the structure and proceeded approximately 5-feet past the original position of the furnace where they remained applying water to the interior of the bar area (see Diagram) throughout the fire attack.

After entry was made, fire fighters from Engine 2550 began to advance the attack line through the main front door while fire fighters from Engine 2552 requested permission to back up 2550. The IC ordered Engine 2552 to back up Engine 2550 and ordered Engine 2556, which had just arrived on the scene, to act as the RIT. Engine 2550 (Captain and fire fighter) and Engine 2552 (Lieutenant, Engineer, and fire fighter) advanced two 1 ½ -inch lines through the main front door. Engine 2550 began applying water to the fire on the left side near the bar as Engine 2552 proceeded down the right wall. Fire fighters stated that the interior was dark and smoke-filled, with moderate heat. They stated that fire was visible in the rear of the structure, rolling up the walls and across the ceiling. The Engineer on Engine 2552’s line was struck in the head by an unknown object, which knocked his helmet to the ground. When he could not locate his helmet, he passed the nozzle to the victim and exited the structure. The fourth fire fighter from Engine 2552 had just arrived on the scene (by a privately owned vehicle), and met up with the Engineer who had just exited the structure. After a short discussion with him, she entered through the main front door to join her crew. After joining her crew, she relieved the victim of his position on the line and thought that he was exiting the structure.

A fire fighter from Engine 2550 entered and joined his crew as the Captain surveyed the interior conditions, noticing what he thought to be a partial



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roof (which was actually the second-floor) collapse. The Captain exited the structure to relay interior conditions to the IC. He also told the IC that no civilians were located on the first floor. The Captain then reentered the structure to find his crew and order them out.

The fire fighter from Engine 2552 who relieved the victim stated that conditions were improving and they thought that the fire was under control. As the fire fighters backed up the Lieutenant on the line, they spotted a small spot fire overhead. The Lieutenant opened the line on the fire and it appeared the fire was out. Shortly after he shut down the nozzle, the second-floor collapsed on top of them, pinning them to the floor. The Captain from Engine 2550 located his crew and ordered them to exit as the collapse occurred. The Captain and his crew were able to escape the collapse without injury. Prior to the collapse, the IC was preparing to radio the interior crews to direct them to the exit and continue the attack on the exterior. ***[NOTE: The City Building Inspector stated the structure was built in 1890. The structure was balloon-framed with 2-inch by 10-inch lumber for floor joists. The floor joists spanned from side B to side D (approximately 26 feet), were spaced on 16-inch centers, and nailed directly to the sides of the 2-inch by 4-inch wall studs. The wall studs stretched from the first floor to the roof line with no headers or top plates separating the two floors. The structure had been remodeled several times, the last in 1986, when it was remodeled as a nightclub. A new furnace had been installed in an area where structural supports had been cut out. The wall studs had been cut and removed from the floor to the ceiling of the first-floor to provide an opening for the furnace. The removed studs had never been replaced, weakening the floor above. Additionally, fire stops were not present in the wall studs, allowing the fire to spread rapidly.]***

The IC received several calls from fire fighters stating that there had been a roof (second-floor) collapse and that fire fighters were trapped inside. The IC responded by directing the Outside Operations Chief to evaluate conditions and direct the RIT during rescue operations. He then ordered all outside suppression to be at a minimum during rescue operations. The fire fighters from Engine 2550, who were positioned along the bar when the collapse occurred, escaped without injury because the bar had created a collapse shelter between the second-floor debris and the first-floor. All three fire fighters from Engine 2552 (Lieutenant [injured], fire fighter [injured] and fire fighter [victim]) were trapped under the debris of the collapse.

Immediately after the collapse, a fire fighter from Truck 2571 had just come off the roof to move the aerial ladder when he heard the call of trapped fire fighters. He immediately went to the front door of exposure A and assisted the RIT (Engine 2553) in the search (Engine 2553 had arrived on the fourth alarm and taken over as the RIT). At that time the Outside Operations Chief replaced the RIT of Engine 2553 with the Heavy Rescue team (Truck 2571). The IC then ordered a roll-call. ***[NOTE: The Heavy Rescue team was composed of a Lieutenant and 4 fire fighters that had completed training in heavy rescue procedures. The training consisted of 40 hours of confined space training, the proper use of airbags, extrication equipment, hydraulic jacks, repelling, and search and rescue techniques.]*** Also assisting the Heavy Rescue team were the Outside Operations Chief, the Captain from Engine 2553, and the Captain from Engine 2541. The Safety Officer had arrived at this time and also assisted in the rescue by continuously evaluating the structure's stability.

The fire fighter from the Heavy Rescue team who entered the structure first spotted one of the three



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fire fighters approximately 15-feet inside the front door (see Diagram). After working his way through debris, he cut off the trapped fire fighter's SCBA, freeing her from the debris. The fire fighter then located the Lieutenant, who was approximately 5-feet away. As he moved the debris to reach him, the Lieutenant and fire fighters from the Heavy Rescue team retrieved airbags, hydraulic jacks, and cribbing needed to extricate the Lieutenant and the victim. They placed an airbag and cribbing under the debris to free the trapped Lieutenant. As they began to place a second airbag under the debris, they realized the regulator was not working, so they used the hydraulic jacks, which required additional time. Approximately 10 minutes after they reached the injured Lieutenant, they freed him and removed him to the exterior. Approximately 4 minutes later the victim was reached. The victim was found in a crouched position and heavy timbers from the second floor were applying constant pressure. The victim was unresponsive throughout the entire rescue. When they reached the victim, a pulse was not detected. Using the hydraulic jacks and cribbing, the Heavy Rescue team freed the victim and immediately started Cardiopulmonary Resuscitation. The victim was removed and transported to a local hospital where he was pronounced dead. The injured Lieutenant and fire fighter were also transported to a local hospital. They were treated for their injuries and released for further rehabilitation.

CAUSE OF DEATH

According to the medical examiner, the cause of death was listed as traumatic asphyxiation.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire fighters should use extreme caution and recognize potential hazards that could exist when fighting a fire in a balloon-framed structure.^{1,2}

Discussion: The vertical combustion spaces between the wall studs in balloon-frame construction provide a channel for the rapid spread of fire from floor to floor. Once fire spreads into the stud space or if the fire should originate in the stud space, it can readily spread from the vertical cavity into the horizontal joists and into the attic space. Therefore, a fire in a balloon-frame building is generally more difficult to control than one in a platform-frame building. When the fire spreads up the walls and under joists, the structure strength becomes a serious concern. Officers and the IC should always take this into consideration when completing a size-up of conditions. During the size-up, it should be determined what type of structure is involved and made clear to all fire fighters. The engineering firm that investigated this incident stated in their report that the building fit the literal definition of a firetrap.¹ (A place, especially a building, so constructed as to make egress hazardous in case of fire, *Webster's New Collegiate Dictionary*.)

Recommendation #2: Fire departments should implement an emergency notification system to rapidly warn all persons who might be in danger if an imminent hazard is identified or if a change in strategy is made.^{3,4}

Discussion: There is a difference between withdrawing fire fighters and calling for an emergency evacuation of fire fighters. A normal withdraw action is ordered when a fire is spreading beyond the ability of fire fighters' control. An emergency evacuation is ordered when an extremely serious emergency has occurred or is about to happen, such as a missing fire fighter(s), explosion, or collapse. In an emergency evacuation, unlike a withdrawal, fire department tools and hoses are left behind and a roll call or a head count must be conducted as there may be a missing fire fighter. An emergency evacuation is a rare occurrence in the fire service, and because of



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its rarity confusion and delay may occur when it is ordered. For this reason, there should be a prearranged signal, tone, or sound to alert fire fighters of an emergency withdraw; fire departments should train their members for an emergency evacuation upon receipt of the signal. Fire fighters should immediately exit the structure upon receipt of the prearranged signal, leaving behind tools and equipment, which can be removed later. If fire fighters are performing an interior attack with the possibility of a ceiling collapse and hear the prearranged tone or signal, they should attempt to exit immediately. If fire fighters are unable to exit, they should attempt to establish a collapse shelter (see recommendation #5). Incident Commanders should use the prearranged emergency evacuation signal or tone whenever they decide conditions are unsafe for interior fire fighting or an emergency has occurred with a fire fighter.

Recommendation #3: Fire Departments should ensure that fire fighters wear protective clothing whenever they are exposed or potentially exposed to hazards. ⁵

Discussion: Fire fighters performing fighting tasks should wear the appropriate personal protective equipment. Fire department's should provide each fire fighter with the appropriate protective clothing and protective equipment to provide protection from the hazards to which the fire fighter is or is likely to be exposed. Such protective clothing and protective equipment should be suitable for the tasks that the fire fighter is expected to perform. The fire fighters performing interior operations in this incident were wearing wool pants as a part of their turnout gear. It is optional in the department's SOPs to wear turnout pants. One of the injured fire fighter suffered a severe burn to one of his knees and is undergoing medical treatment and rehabilitation.

Recommendation #4: Fire departments should ensure that a separate Incident Safety Officer,

is independent from the Incident Commander, is appointed. ^{4,6}

Discussion: According to NFPA 1561, paragraph 4-1.1, "the Incident Commander shall be responsible for the overall coordination and direction of all activities at the incident. This shall include overall responsibility for the safety and health of all personnel and for other persons operating within the incident management system." While the Incident Commander is in overall command at the scene, certain functions must be delegated to ensure adequate scene management is accomplished. An Incident Safety Officer should be appointed by the Incident Commander at an emergency scene. At an emergency incident where activities are judged by the Incident Safety Officer to be unsafe or to involve an imminent hazard, the Incident Safety Officer should have the authority to alter, suspend, or terminate those activities. The Incident Safety Officer shall immediately inform the Incident Commander of any actions taken to correct imminent hazards at the emergency scene.

Recommendation #5: Fire departments should ensure that when fire fighters are performing an interior attack with the possibility of a ceiling collapse, they should attempt to establish a collapse shelter. ³

Discussion: *A fire fighter operating at a serious building fire with the possibility of a ceiling collapse should attempt to stay near large pieces of furniture or stock which can serve as shelters or voids if the ceiling collapses. An open floor area or empty store presents a dangerous environment because, if the ceiling collapses, a fire fighter operating below will be pinned to the floor and will receive the full impact of the heavy ceiling. Serving counters extending from the front entrance to the rear of structures have saved lives of fire fighters caught beneath collapsing*



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ceilings.³ In this incident two crews entered to perform the interior attack. The crew from 2552 entered and went off to the right where there was no collapse shelter and the crew from 2550 entered to the left and proceeded along the bar (approximately 4 feet in height), which acted as a collapse shelter. When the collapse occurred, the crew of 2552 received the full impact of the heavy timbers from the second-floor. The crew from 2550 were knocked to the floor but were not trapped due to the bar which created a void between the collapsed debris and the floor and allowed them to escape.

Recommendation #6: Fire departments should provide the Incident Commander with a Command Aide.^{5, 7, 8}

Discussion: Aides are personnel assigned to assist the Incident Commander. During large operations, sector officers also may have aides to assist them. They do this by managing information and communications. They can keep track of assignments, locations, and the progress of companies, assist with tactical worksheets, or access reference materials and pre-fire plans. Another important function they may perform is to provide reconnaissance and operational details for the IC (his eyes and ears). Some jurisdictions assign full-time aides to command officers to perform routine administration functions and to act as drivers in addition to their fireground role. Departments should consider the aide to be an individual that has the experience and authority to conduct the required tasks.

In large metropolitan cities, Battalion Fire Chiefs are required to respond quickly to emergency incidents. In their response, they have to be fully aware of heavy traffic conditions, construction detours, traffic signals, and other conditions. Also during their response, they must monitor and comprehend which companies are responding, fire ground activity, fire conditions,

and additional information from dispatch. If possible, they will also write down all incoming information from dispatch and the fire ground and make important decisions. Aides could provide the Battalion Fire Chief the opportunity to comprehend all information without distraction and complete the necessary tasks en route to the scene.

Recommendation #7: Fire Departments should ensure that once a Rapid Intervention Team (RIT) is established that they remain the RIT throughout the operation.⁵

Discussion: A RIT shall consist of at least two fire fighters and shall be available for rescue of a fire fighter or a crew if the need arises. The RIT shall be fully equipped with the appropriate protective clothing, protective equipment, SCBA, and any specialized rescue equipment that might be needed given the specifics of the operation under way. Once the RIT is established, they should remain the RIT throughout the operation. In this incident, a RIT was established as operations took place. Throughout the operations, the company serving as the RIT changed several times. After the collapse had occurred and rescue procedures took place, the RIT that entered to perform the rescue was replaced with the heavy rescue team.

Recommendation #8: Fire departments should develop and implement a preventative maintenance program to ensure that all SCBA's are adequately maintained.⁹

Note: Although there were no problems identified with the victim's SCBA, NIOSH additionally completed an evaluation of the department's SCBA maintenance program.

Discussion. Fire departments should establish respirator service and maintenance procedures and rigidly enforce them to provide respirators that are



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dependable and are constantly evaluated, tested, and maintained. Equally important is record keeping, a critical element of any respirator maintenance program. On February 26, 1999, NIOSH completed an evaluation of the departments SCBA program and issued a report (see Attachment 1).

Additionally, building owners should ensure that all modifications/renovations to buildings are in compliance with current building codes (i.e., any renovation or remodeling does not decrease the structural integrity of supporting members).

Discussion: Modifications, renovations, and remodeling of buildings require building permits to ensure all work done is in compliance with current building codes and does not decrease the structural integrity of supporting members. The structure involved in this fire incident had been remodeled and renovated several times in the past. For example, structural members had been moved or removed without appropriate restructuring or support, thereby creating a hazard for the occupants and fire fighters in case of a fire or other emergency. Specifically, wall supports were removed and never restructured, therefore weakening the second floor and roof above.

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INVESTIGATOR INFORMATION

This incident was investigated by the following: Frank C. Washenitz II, Safety and Occupational Health Specialist, Division of Safety Research, Surveillance and Field Investigations Branch; Tim Merinar, Engineer; and Tom McDowell, Physical Scientist, Division of Respiratory Disease Studies, Respirator Branch.

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Photo



Photo: This photo depicts the two-story tax payers building (commercial occupancy on the first-floor and living quarters on the second).



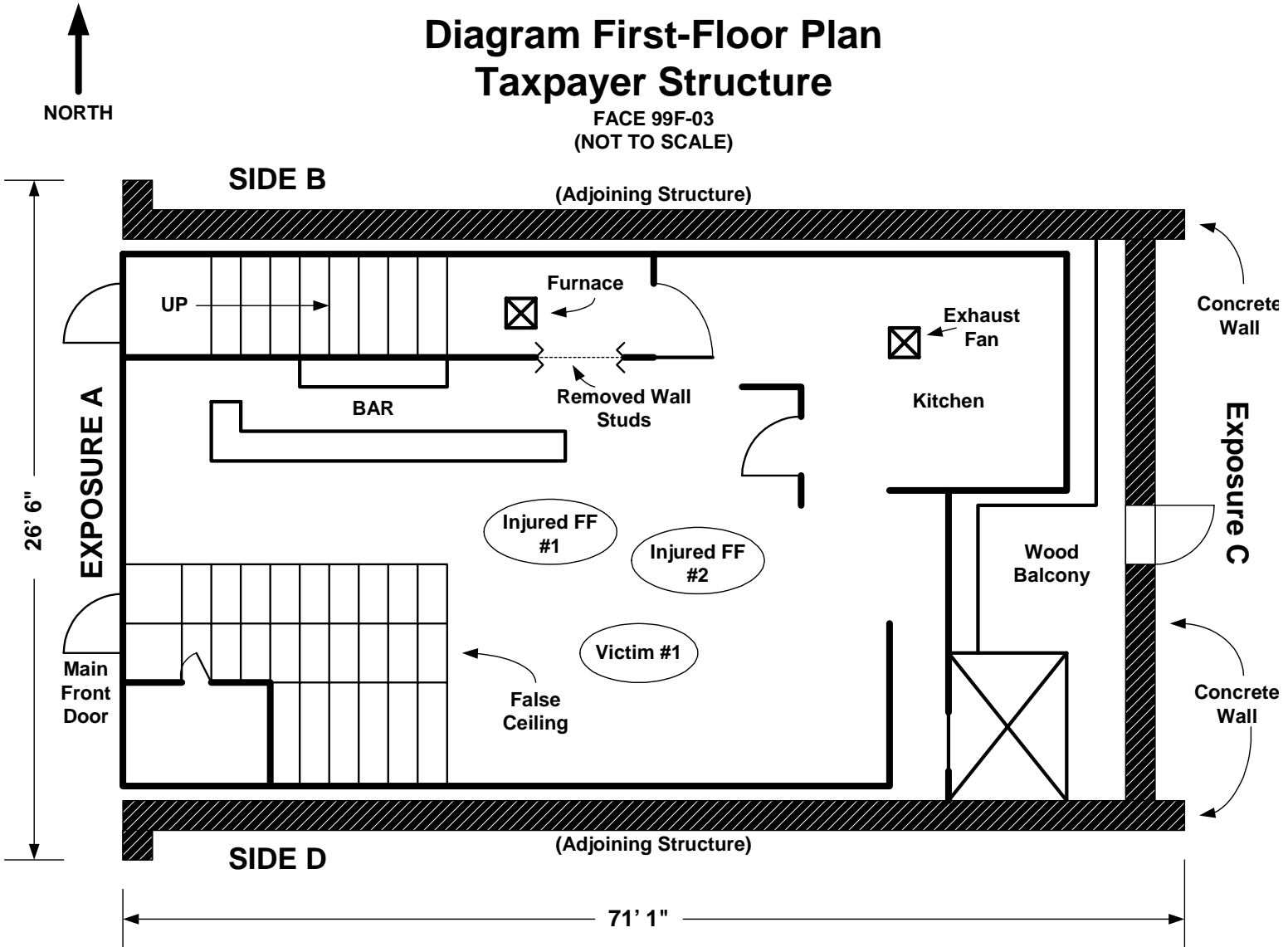
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Diagram First-Floor Plan Taxpayer Structure

FACE 99F-03
(NOT TO SCALE)





Fatality Assessment and Control Evaluation
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Attachment 1

NIOSH SCBA Evaluation Report



Centers for Disease Control
and Prevention (CDC)
National Institute for Occupational
Safety and Health - ALOSH
1095 Willowdale Road
Morgantown, WV 26505-2888

PHONE: (304) 285-5907
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March 12, 1999

Mr. Don Parker
Assistant Chief
Oakland Fire Department
150 Frank H. Ogawa Plaza
Oakland, California 94610

Dear Mr. Parker:

During our recent visit to the Oakland Fire Department on February 26 and 27, 1999, Thomas McDowell and I had the opportunity to evaluate your fire department self-contained breathing apparatus (SCBA) maintenance program. One of the objectives of our visit was to evaluate your SCBA maintenance program and to make recommendations for improvement. This evaluation was conducted on February 27, 1999, and consisted of visiting the SCBA maintenance area, reviewing maintenance records, and discussions with available fire department personnel.

Your current SCBA maintenance program involves contracting with an independent vendor to perform SCBA repairs on-site on an as-needed basis. While the current SCBA repair work appears to be adequate to correct SCBA break-downs, we would like to offer the following recommendations which are based upon these recognized standards:

Title 29, Code of Federal Regulations (CFR) Part 1910.134 known as The OSHA Respirator Standard

National Fire Protection Association (NFPA) 1404 Standard for a Fire Department Self-Contained Breathing Apparatus Program, 1996 Edition.

National Fire Protection Association (NFPA) 1500 Fire Department Occupational Safety and Health Program, 1997 Edition

1) The SCBA maintenance program should be under the direct control of one designated individual who is an Oakland Fire Department employee and who has no other fire fighting responsibility. However, due to cost considerations, staffing, and other issues, this is not always feasible at all departments and should be tailored to fit into each department's organizational structure.

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Title 29, Code of Federal Regulations (CFR) Part 1910.134 (the OSHA Respirator Standard) at 1910.134(c) requires each respirator program to be administered by a suitably trained program administrator.

2) A preventative maintenance program should be established to ensure regularly scheduled preventative maintenance is conducted on each SCBA at least annually.

OSHA 1910.134(h) requires the employer to provide for the cleaning and disinfecting, storage, inspection, and repair of respirators used by employees.

NFPA 1404, Chapter 6-1.2 and 6-1.3 require annual inspection and servicing of SCBA by qualified personnel. *Chapter 6-1.3* requires annual servicing to be conducted following the manufacturer's recommendations and should include:

- a) Disassembly of the SCBA into major components
- b) Flow testing of the regulator
- c) Disassembly and cleaning of the regulator
- d) Replacement of worn parts, or those recommended by the manufacturer in the regulator assembly.
- e) Disassembly of the low-air alarm and cleaning and replacement of component parts as necessary.
- f) Cleaning and replacement of components of the facepiece and harness assembly, and replacement of component parts as necessary.
- g) Reassembly of the entire SCBA and testing for proper operation of all components.
- h) Proper recording of all performed maintenance on record keeping forms.

NFPA 1404, Chapter 6-2.1 specifies that a preventative maintenance program shall be established by the authority having jurisdiction for all SCBA used in the organization.

NFPA 1404, Chapter 6-2.2 specifies that the SCBA preventative maintenance program shall be conducted in order to prevent SCBA malfunction and failures of equipment during use.

3) Air quality analysis should be performed every 3 months and a certificate of compliance maintained at the filling station for all filling stations used to fill SCBA cylinders.

OSHA 1910.134(i)(1)(ii), *NFPA 1500, Chapter 5-3.6*, and *NFPA 1404, Chapter 7-1.1 and Chapter 7-2.2* require that compressed air used to fill SCBA cylinders meet or exceed the requirements for Type I-Grade D breathing air specified in the Compressed Gas Association (CGA) Commodity Specification for Air, G-7. 1.

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NFPA 1500, Chapter 5-3.7.1 and *NFPA 1404, Chapter 7-1.2* specify that breathing air used to fill SCBA cylinders should be tested every 3 months by an accredited laboratory. *Chapter 7-1.3* specifies that records shall be maintained for each air quality test.

4) A preventative maintenance program should be established to cover the breathing air compressor, air purification filters, and other equipment used to generate breathing air.

OSHA 1910.134(i)(5), and *NFPA 1404, Chapter 7-2.12 thru Chapter 7-2.14* specify requirements for the operation and maintenance of breathing air compressors and cylinder fill stations.

5) Records should be maintained for each SCBA which contain the following information:

NFPA 1404, Chapter 2-2.3 specifies that an individual record of each SCBA regulator and harness assembly shall be maintained. This record shall include the inventory or serial number, date of purchase, date of manufacture, date placed into service, location, maintenance and repairs, replacement parts used, upgrading, and test performance.

NFPA 1404, Chapter 2-2.4 specifies that an individual record of each SCBA cylinder shall be maintained. This record shall include the inventory or serial number, date of purchase, date of manufacture, date placed into service, location, hydrostatic test pressure and dates, and any inspection and repairs. The hydrostatic test dates shall appear on each cylinder according to the manufacturer's instructions and applicable government agencies.

NFPA 1404, Chapter 2-2.5 specifies that an individual record of each SCBA facepiece shall be maintained. This record shall include the inventory or serial number, date of purchase, location, maintenance and repairs, replacement parts, upgrading, and test performance.

NFPA 1500, Chapter 2-7.5 specifies that each fire department shall assure that inspection, maintenance, repair, and service records are maintained for all vehicles and equipment used for emergency operations and training.

These recommendations, are based upon the premise that all SCBA are life-saving devices which will only perform as well as they are maintained. Since they are expected to function and perform properly each time they are used, it is important that SCBA maintenance and inspection be given the utmost priority at the department level.

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I trust this information is beneficial to your needs. If you have any questions or require additional information, please contact me at (304) 285-5965.

Sincerely yours,

Timothy R. Merinar
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