MIFACE Investigation Report #10MI183

Subject: Fire Chief Died After Falling to Floor and Striking His Head

Summary

In winter 2010, a male Fire Chief in his 60s died from complications of a fall to the fire station's concrete floor after returning from fighting a fire at a single family home. The decedent and other fire fighters were cleaning equipment and restocking the apparatus. After speaking with several fire fighters, the decedent went to the air fill station for the SCBA tanks. He was working alone. The sequence of events which led to the fall was unknown. Coworkers heard a noise similar to the sound of "a hose falling". An assistant chief investigated and found the decedent lying on his back on the floor unconscious in the center of an aisle between a hose rack and a fire truck. He was bleeding from the back of his head. EMS was called while first aid measures were initiated. The decedent was transported to a nearby hospital and then to another hospital, where he died one week later from medical complications due to the fall. His cause of death as listed on the death certificate was blunt force head trauma. Although chronic medical conditions were identified on his autopsy, there were no findings to suggest that a medical condition caused his fall.

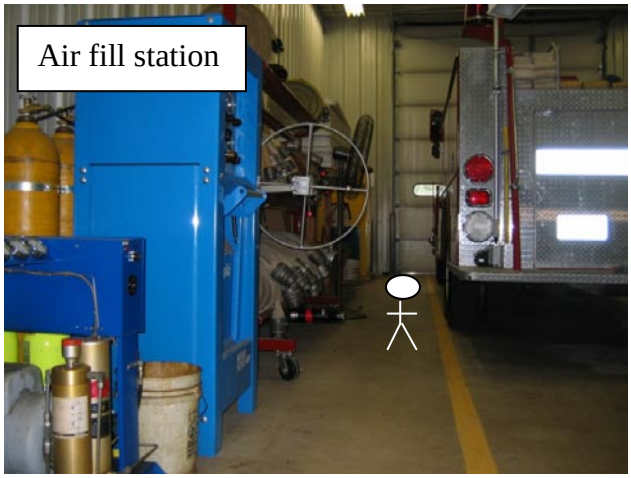

Figure 1. Incident scene. Decedent's position on floor when found by coworker

Key factors contributing to this incident were unknown. Although there is not documentation that a medical or physical condition contributed to this fatal incident, fire departments including those that are staffed by volunteers should consider implementing the safety and health recommendations listed below based upon the physical demands and medical requirements of fire fighting.

RECOMMENDATIONS

Although not documented as factors in this fatality, MIFACE recommends that Fire Departments adopt the following best practice recommendations to promote health and safety activities in their departments.

- Fire Departments should establish and provide a health and fitness program for its fire fighters consistent with NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters.*
- Fire Departments should provide periodic medical evaluations to ensure that fire fighters are fit to perform the duties of a firefighter. Fire Departments should assure that the health care provider performing these evaluations is knowledgeable about the physical demands of fire fighting, the personal protective equipment used by fire fighters, and the various recommendations contained in NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*
- Fire Departments should establish Standard Operating Procedures (SOPs) on the correct procedures/safe methods for reloading hose.
- Fire Departments should consider requiring the use of a ladder when servicing items that are out of reach from ground level on the fire apparatus.
- Fire Departments should evaluate the use of anti-slip control measures in walking areas to address a potential slip hazards on fire station floors which could become wet during post-fire activities.
- Fire Departments should appoint a designated Health and Safety Officer (HSO) who meets the qualifications defined in NFPA 1521, *Standard for Fire Department Safety Officer.* The HSO should be responsible to develop, implement and manage the department's risk management program as specified in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

BACKGROUND

In the winter of 2010, a male Fire Chief in his 60s died from complications of a fall to the fire station's concrete floor after returning from fighting a fire at a single family home. MIFACE was informed of the incident by the MIOSHA 24-hour hotline report. The MIFACE investigator contacted the Fire Department's Chief, who was the Deputy Chief and present at the incident site when the fall occurred. The Chief agreed to participate in the MIFACE research. During the writing of this report, the MIOSHA investigation file, death certificate and medical examiner's report was reviewed. The Chief agreed to let MIFACE take pictures of the incident scene. Incident scene pictures are courtesy of the MIOSHA investigating officer and MIFACE site pictures.

According to the current Fire Chief, the paid-on-call township fire department consisted of 27 volunteers. The current Chief indicated that the decedent had been the township's Fire Chief for many years. The decedent had conducted a bi-monthly training to the volunteer staff and maintained the appropriate training records. Volunteers signed the training form indicating they understood the training offered. The Fire Chief indicated the department personnel discussed issues identified after a fire response and during training sessions.

The fire department did not have a written safety and health program nor did it have a pre-placement and annual medical evaluation program for its fire fighters.

MIOSHA General Industry Safety and Health Division did not issue any citations to the fire department at the conclusion of its investigation.

INVESTIGATION

The decedent was at home when he received the 6:52 p.m. call for a structure fire. He met other fire fighters at the station and they proceeded to the fire location. The decedent was the Incident Commander at the fire.

After extinguishing the fire, four fire fighters and the decedent returned to the fire station at approximately 9:00 p.m. The current Fire Chief was one of the four fire fighters returning to the fire station. The fire fighters were cleaning gear and restocking the apparatus with the clean and dry equipment. The decedent had a conversation with a fire fighter by the office area and then left the office area to walk to the west side of the building near Bay 4 and the air fill station for the SCBA tanks. At Bay 4 there was an aisleway between the apparatus and a hose rack.

One of the fire fighters had left the air compressor on and the decedent walked to the air compressor and air tanks to turn off the unit (Figure 2). He was observed by a coworker at the air fill station. At approximately 10:00 p.m., his coworkers heard a noise that sounded like "hose falling". The assistant chief investigated and saw the decedent lying on his back in the aisleway on the floor, between a fire truck and hose rack, unconscious. The air compressor was still on. (Figures 1 and 3)

Figure 2. Air compressor and tanks

The assistant chief yelled for his fellow fire fighters to get the crash bag containing medical equipment. He shook the decedent and called his name. The fire fighters initiated first aid, including the administration of oxygen while the assistant chief called dispatch for an ambulance. The decedent regained consciousness. He had a small laceration on his head and wrist.

The arriving EMS crew found the decedent sitting on floor, with blood coming from his nose and a fire fighter holding a pressure bandage to the back of his head. The decedent asked to get off of the floor. He stood up and, with the help of other fire fighters, took two steps to sit down on the

tailboard at the back of the apparatus. The current Fire Chief indicated that, at this time, the decedent was disoriented, and asked, "What are you doing?" The decedent was told that gauze was held on the back of his head because he fell. At this time, the decedent indicated he didn't fall.

The decedent walked from the apparatus tailboard to the ambulance gurney. At this time, the decedent denied dizziness, passing out, or falling. He then became non-responsive and unable to answer questions.

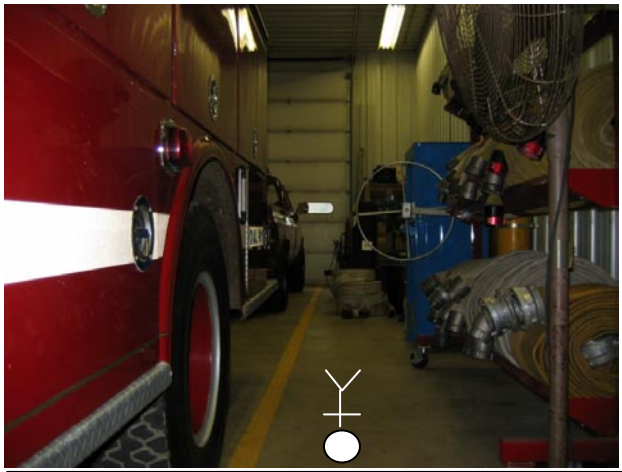

Figure 3. Incident scene. Decedent's position on floor when found by coworker

The ambulance transported the decedent to a nearby hospital. The current Fire Chief indicated to the MIFACE researcher that the decedent experienced "cardiac issues" on the way to the hospital and after arriving at the hospital. The cardiac issues were confirmed on autopsy. He was transferred to another hospital. Medical treatment included inducing a coma to relieve pressure on his brain. He died seven days later due to the injuries sustained at the time of the fall.

The current Fire Chief indicated to the MIFACE researcher that the floor was dry at the time of the incident, the air compressor was working properly, and that there was no physical or electrical damage to the air compressor unit. The Fire Chief also stated that all hoses in the hose rack were intact and not disturbed. Fire fighters did not observe any marks on the apparatus, and indicated that the decedent had not appeared to be in any type of distress prior to the incident. This investigation revealed no specific event or factor that caused the decedent to fall.

The Medical Examiner report indicated both the weight and the height of the decedent. Using the adult body mass index (BMI) calculator, it was found that the decedent's BMI was 31.8. The Centers for Disease Control and Prevention (CDC) indicates that a BMI of 30 or greater is considered "obese".

CAUSE OF DEATH

The cause of death as listed on the death certificate was blunt force head trauma. Also listed on the death certificate was: Other significant conditions contributing to death but not resulting in the underlying cause of death were coronary artery atherosclerosis, hypertension and pulmonary emphysema. There was no suggestion on the autopsy that a medical condition had caused his fall. Toxicological tests were not performed.

RECOMMENDATIONS/DISCUSSION

Fire departments should consider implementing the safety and health recommendations listed below based upon the physical demands and medical requirements of fire fighting.

- Fire Departments should establish and provide a health and fitness program for its fire fighters consistent with NFPA 1583, *Standard on Health-Related Fitness Programs for Fire Fighters.*

Ongoing exercise programs for firefighters have been shown to reduce the risk of work-related injuries and lost work days. In addition to consulting NFPA 1583 to establish a health and fitness program, MIFACE recommends Fire Departments access the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) website (http://www.cdc.gov/niosh/fire/). The FFFIPP examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. After scrolling down the FFFIP home page, an opportunity is presented to review all completed investigation reports, including those relating to "medical" issues. The FFFIPP reports include the investigation results, medical findings and discussion of the medical issue(s) relating to the fatality, and recommendations for prevention.

Additional guidelines on wellness fitness programs have been developed:

- ❖ IAFF, IAFC [2000]. The fire service joint labor management wellness/fitness initiative. Washington, DC: International Association of Fire Fighters, International Association of Fire Chiefs.

- ❖ NVFC and USFA [2004]. Health and wellness guide for the volunteer fire service, Emmitsburg, MD: Federal Emergency Management Agency; USFA, Publication No. FA-267/January 2004. National Volunteer Fire Council and United States Fire Administration.

- Fire Departments should provide periodic medical evaluations to ensure that fire fighters are fit to perform the duties of a firefighter. Fire Departments should assure that the health care provider performing these evaluations is knowledgeable about the physical demands of fire fighting, the personal protective equipment used by fire fighters, and the various recommendations contained in NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments.*

At the time of the MIFACE visit, the current Fire Chief was in the process of initiating a medical evaluation program which included a physical exam with fit testing and one x-ray view of the chest. The Fire Chief was evaluating proposals from outside vendors. The x-ray is expensive, increases exposure to radiation and is the least useful component of a baseline or periodic medical evaluation. A comprehensive medical history and symptom review by a health care

provider familiar with the activity of a firefighter is the most useful and cost effective part of the medical evaluation.

The NIOSH Fire Fighter Fatality Investigation and Prevention program has addressed the unique medical issues pertaining to fire fighters. NIOSH has identified that one of the ways to reduce the risk of sudden cardiac arrest or other incapacitating medical conditions among fire fighters is fire department implementation of NFPA 1582, *Standard on Comprehensive Occupational Medical Program for Fire Departments*. This voluntary industry standard provides the components of medical evaluation and medical fitness for duty criteria. It is unclear if any of these recommended medical evaluations would have detected this fire fighter's underlying heart-related conditions.

Guidance regarding the content and frequency of these medical evaluations can be found in NFPA 1582 and in the International Association of Fire Fighters (IAFF)/International Association of Fire Chiefs (IAFC) *Fire Service Joint Labor Management Wellness/Fitness Initiative*. These evaluations are performed to determine fire fighters' medical ability to perform duties without presenting a significant risk to the safety and health of themselves or others. According to these guidelines, the fire department should have an officially designated physician who is responsible for guiding, directing, and advising the members with regard to their health, fitness, and suitability for duty. Although the fire department is not legally required to follow the NFPA standard or the IAFF/IAFC initiative, doing so would help to ensure improved health and safety of candidates and members.

Applying this recommendation may be particularly difficult for smaller fire departments, like this small, paid on-call township department, to implement due to economic considerations. To overcome the financial obstacle of medical evaluations, the NIOSH Fire Fighter Fatality Investigation and Prevention program identified some options for implementation:

- The fire department could urge current members to get annual medical clearances from their private physicians or through their place of employment.

- Have the annual medical evaluations completed by paramedics and emergency medical technicians from the local ambulance service (vital signs, height, weight and visual acuity). This information could then be provided to a community physician (perhaps volunteering his or her time), who could review the data and provide medical clearance (or further evaluation, if needed).

- The more extensive portions of the medical evaluations could be performed by a private physician at the fire fighters expense (personal or through insurance), provided by a physician volunteer, or paid for by the fire department or municipality or township.

Federal Emergency Management Agency (FEMA) administers the Assistance to Firefighters Grants (AFG). Funding is available through the AFG grant process for the establishment of a firefighter wellness and fitness program. Program and funding cycle details can be found on the FEMA website (http://www.fema.gov/fire-prevention-safety-grants).

The decedent, according to the Medical Examiner's report, had evidence of a past heart attack in addition to coronary artery atherosclerosis and moderate to marked aortic atherosclerosis and pulmonary emphysema. Under NFPA 1582 and IAFF/IAFC guidelines, the physician medically evaluating the fire fighter should review job descriptions and essential job tasks required for all fire department positions to understand the physiological and psychological demands of fire fighters and the environmental conditions under which they must perform, as well as the personal protective equipment they must wear during various types of emergency operations. MIFACE did not contact the decedent's personal physician to determine the extent of his/her knowledge of these issues.

To further demonstrate the importance of establishing periodic medical evaluations, at the time of the MIFACE site visit, the current Fire Chief wanted to apply for AFG funding to purchase a new fire apparatus. He could not do so because he could not meet the AFG funding requirement of department certification that personnel driving and operating the requested vehicle meet or exceed the national standards for drivers/operators (fire vehicles NFPA 1002 (*Driver Operator Qualifications*), EMS DOT or KKK standards). The department could not meet the NFPA 1002 requirement that a driver pass a physical meeting NFPA 1582.

- Fire Departments should establish Standard Operating Procedures (SOPs) on the correct procedures/safe methods for reloading hose.

Fire departments should develop and implement SOPs on safe methods for reloading hose and the SOPs should apply to all persons reloading fire hose on the fire apparatus. Departmental SOPs could assist in ensuring that all personnel understand the correct ways in which to utilize the handles, handrails and steps that are on the vehicle. It is also important to discuss the footwear that fire fighters wear (e.g., rubber bunker boots, leather boots and station-type shoes) while climbing and performing duties on a fire apparatus.

According to the International Fire Service Training Association (IFSTA), *Essentials of Fire Fighting and Fire Department Operations Handbook*, to ensure safety on a fire apparatus, fire fighters should "use the steps and handrails when mounting or dismounting the apparatus." "Using the steps and handrails reduces the chances of accidentally slipping and falling from the apparatus." Fire fighters should be provided with training to ensure they understand the importance of any provided handrails and steps on fire apparatus, and that they are properly utilized. This training is especially important for departments that are using an apparatus hose bed above the water tank. The training should consist of using handrails, climbing, wearing the

proper foot wear, hand and foot placements, and learning about awkward body positions and working from heights.

- Fire Departments should consider requiring the use of a ladder when servicing items that are out of reach from ground level on the fire apparatus.

When servicing items that are on top of the fire apparatus, fire departments should consider requiring that fire fighters use a step ladder. Step ladders can be useful in allowing for stable access to elevated surfaces and would be a more appropriate choice for this particular job than a traditional fire ground ladder. When ladders are used, then the fire department must ensure that it is used in accordance with MIOSHA General Industry Safety Standard, Part 4 – Ladders.

When using a ladder, training must be provided and should include safe work practices for fire fighters to avoid the risk of being injured or killed while working from ladders. MIOSHA General Industry Safety Standard, Part 4 could be as a source of information and assist in developing a ladder training program to fire fighters who face the risk of a fall from a ladder.

- Fire Departments should evaluate the use of anti-slip control measures in walking areas to address a potential slip hazards on fire station floors which could become wet during post-fire activities.

Although the current Fire Chief indicated the floor was dry in the area where the incident occurred, the floor could easily become wet and slippery during post-fire work activities. Fire Departments should ascertain which floor areas could become wet and take action to minimize the slip hazard potential. Some options include the application of anti-slip strips, application of a slip-resistant (high traction) floor finish, wearing slip resistant footwear, placing low-profile, anti-slip absorbent mats in the area, and/or re-locating post-fire work activities which could result in a wet floor to locations out of the travel paths of fire fighters.

Additionally, good housekeeping measures should be used to immediately mop up standing water and, while the floor is drying, notifying firefighters of the potential slip hazard (for example, placing signage for “wet floor”)

- Fire Departments should appoint a designated Health and Safety Officer (HSO) who meets the qualifications defined in NFPA 1521, *Standard for Fire Department Safety Officer.* The HSO should be responsible to develop, implement and manage the department’s risk management program as specified in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

The current Fire Chief indicated that the department did not have a comprehensive risk management plan or a written health and safety policy meeting Section 4.2 and 4.3 of NFPA

1500, Standard on Fire Department Occupational Safety and Health Program. NFPA 1500 was developed to provide guidelines for establishing, implementing and managing a comprehensive safety and health program for a fire department and provides specific safety requirements for those members involved in rescue, fire suppression, emergency medical services, hazardous materials mitigation, special operations and other emergency services.

Section 4.7 of NFPA 1500 addresses the appointment of a fire department health and safety officer, who meets the qualifications defined in NFPA 1521, Standard for Fire Department Safety Officer. Chapter 4 of NFPA 1521 identifies the qualifications of the HSO and Chapter 5 identifies the functions of the HSO. The Michigan Office of Fire Fighter Training offers a Health and Safety Officer (Fire Fighter III) course designed to show the role of the Health and Safety Officer in policy and procedure issues that affect the health and safety of Fire Fighters. Risk analysis, wellness, program management, and other occupational safety issues are the main emphasis of the course.

FEMA has published a *Developing Effective Standard Operating Procedures for Fire and EMS Departments* (http://www.usfa.fema.gov/downloads/pdf/publications/fa-197-508.pdf) to provide a guide to the HSO to conduct a needs assessment, and to develop, implement and evaluate department-specific standard operating procedures. The document also provides appendices that , as well as gaining an understanding of selected laws, regulations and standards pertaining to emergency service, standard operating procedures topic areas and a list of resources.

The MIOSHA Consultation, Education and Training (CET) division can provide the HSO assistance in identifying MIOSHA standards relevant to the fire service and developing an outline of a Safety and Health Program. An organization which can provide support for a newly appointed fire department HSO is the Fire Department Safety Officer's Association (FDSOA): http://www.fdsoa.org/home/index.html. The Association was established to provide education and networking among Safety Officers.

REFERENCES

MIOSHA standards may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) http://www.cdc.gov/niosh/fire/

- Fire fighter suffers heart attack while fighting a structure fire and dies – Missouri. http://www.cdc.gov/niosh/fire/reports/face201217.html

- Fire fighter suffers heart attack and dies after fighting a structure fire. http://www.cdc.gov/niosh/fire/reports/face201210.html

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KEY WORDS: Fire fighter, fall, NFPA, Safety Officer, Medical Condition

January 16, 2013