FIREFIGHTER FATALITIES IN THE UNITED STATES-2011

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Abstract

In 2011, a total of 61 on-duty firefighter deaths occurred in the U.S. This is another sharp drop from the 73 on-duty deaths in 2010 and 82 in 2009, and the lowest annual total since NFPA began conducting this annual study in 1977. Stress, exertion, and other medical-related issues, which usually result in heart attacks or other sudden cardiac events, continued to account for the largest number of fatalities. More than half of the deaths resulted from overexertion, stress and related medical issues. Of the 32 deaths in this category, 31 were classified as sudden cardiac deaths (usually heart attacks) and one was due to a stroke.

Keywords: Firefighter fatality, statistics, heart attack, sudden cardiac death

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2011 Experience

In 2011, a total of 61 on-duty firefighter deaths occurred in the U.S.[*] This is the third consecutive year that the number of deaths has dropped sharply and is, for the second year in a row, the lowest annual total since NFPA began conducting this annual study in 1977.[1] In the previous three years, the totals were 73, 82 and 105 deaths, respectively. The average number of deaths annually over the past 10 years is 91. Figure 1 shows firefighter deaths for the years 1977 through 2011, excluding the 340 firefighter deaths at the World Trade Center in 2001.

Of the 61 firefighters who died while on duty in 2011, 35 were volunteer firefighters, 21 were career firefighters, three were employees of state land management agencies, and two were employees of federal land management agencies.[2]

In 2011, there were three double-fatality incidents. Two firefighters were killed during interior operations at a structure fire; two firefighters were killed when overrun by fire at a wildland fire; and two were killed when a silo exploded during a fire. More details will be presented throughout this report.

Analyses in this report examine the types of duty associated with firefighter deaths, the cause and nature of fatal injuries to firefighters, and the ages of the firefighters who died. They highlight deaths in intentionally-set fires and in motor vehicle-related incidents.[3] Finally, the study presents summaries of individual incidents that illustrate important concerns in firefighter safety.

Introduction

Each year, NFPA collects data on all firefighter fatalities in the U.S. that resulted from injuries or illnesses that occurred while the victims were on-duty. The term *on-duty* refers to:

- being at the scene of an alarm, whether a fire or non-fire incident;
- responding to or returning from an alarm;
- participating in other fire department duties such as training, maintenance, public education, inspection, investigation, court testimony or fund raising; and
- being on call or stand-by for assignment at a location other than at the firefighter's home or place of business.

[*] This annual study includes only on-duty firefighter fatalities that occurred in the 50 states and the District of Columbia. In addition, a firefighter in Guam died in 2011 while on station duty.

On-duty fatalities include any injury sustained in the line of duty that proves fatal, any illness that was incurred as a result of actions while on duty that proves fatal, and fatal mishaps involving non-emergency occupational hazards that occur while on duty. The types of injuries included in the first category are mainly those that occur at a fire or other emergency incident scene, in training, or in crashes while responding to or returning from alarms. Illnesses (including heart attacks) are included when the exposure or onset of symptoms occurred during a specific incident or on-duty activity.

The type of firefighters included in this study can be:

- members of local career and volunteer fire departments;
- seasonal, full-time and contract employees of state and federal agencies who have fire suppression responsibilities as part of their job description;
- prison inmates serving on firefighting crews;
- military personnel performing assigned fire suppression activities;
- civilian firefighters working at military installations; and
- members of industrial fire brigades.

Fatal injuries and illnesses are included even in cases where death is considerably delayed. When the injury and the death occur in different years, the incident is counted in the year of the injury.

The NFPA recognizes that a comprehensive study of on-duty firefighter fatalities would include chronic illnesses (such as cancer or heart disease) that prove fatal and that arise from occupational factors. In practice, there is no mechanism for identifying fatalities that are due to illnesses that develop over long periods of time. This creates an incomplete picture when comparing occupational illnesses to other factors as causes of firefighter deaths. This is recognized as a gap the size of which cannot be identified at this time because of limitations in tracking the exposure of firefighters to toxic environments and substances and the potential long-term effects of such exposures.

The NFPA also recognizes that other organizations report numbers of duty-related firefighter fatalities using different, more expansive, definitions that include deaths that occurred when the victims were off-duty. (See, for example, the USFA and National Fallen Firefighters

Memorial websites.[†]) Readers comparing reported losses should carefully consider the definitions and inclusion criteria used in any study.

Type of Duty

Figure 2 shows the distribution of the 61 deaths by type of duty. The largest share of deaths occurred while firefighters were operating on the fire ground (30 deaths). Although this total is consistent with the average of 31 deaths per year on the fire ground over the past 10 years, and it is far below the average of 69 deaths per year in the first 10 years of this study (1977 through 1986), it represents 49 percent of the on-duty deaths in the year. The share of deaths on the fire ground has not been this high since 1999, when 56 of the 112 deaths that year resulted from fire ground operations (50 percent).

Twenty-two of the 30 fire ground deaths occurred at 20 structure fires. Deaths in structure fires are discussed in more detail later in this report. There were seven deaths at six wildland fires and one at an outside fire. There were no firefighter deaths at vehicle fires in 2011. Thirteen of the 30 fire ground victims were career firefighters, 12 were volunteer firefighters and five were firefighters with state or federal land management agencies. The average number of career firefighter deaths on the fire ground over the past 10 years is 12 deaths per year, while the average for volunteer firefighters is 14 deaths per year. An additional four or more deaths of state or federal wildland management agency personnel, on average, occur on wildland fires each year.

Ten firefighters died while responding to or returning from emergency calls. It is important to note that deaths in this category are not necessarily the result of crashes. Five of the deaths were due to sudden cardiac events, four occurred in collisions or rollovers and one firefighter slipped on ice while responding to an emergency and fell, striking his head. All 10 victims were volunteer firefighters. This is the lowest number of deaths while responding to or returning from alarms, and the smallest share of on-duty deaths, that have been reported since the study began in 1977. All crashes and sudden cardiac deaths are discussed in more detail later.

Six deaths occurred during training activities. Sudden cardiac death claimed four of the six firefighters – one who collapsed during an ice rescue exercise, another during his annual

[†] USFA link is usfa.dhs.gov/fireservice/fatalities/index.shtm, National Fallen Firefighters' Memorial link is www.firehero.org/

fitness test, one while running a live fire training exercise and a recruit during maze training. Another of the six firefighters suffered a stroke after his annual SCBA qualification drill at the fire station. The sixth firefighter fell while climbing a rope after a ropes skills class, striking his head on the pavement.

Five firefighters died at non-fire emergencies, including three at the scene of motor vehicle crashes (two were struck by vehicles and one suffered sudden cardiac death), one who drowned during a water rescue and one who suffered sudden cardiac death at an EMS call.

The remaining 10 firefighters died while involved in a variety of non-emergency-related on-duty activities. Seven of the victims were engaged in normal administrative or station duties (all seven fatalities were due to sudden cardiac death), one was removing a sign from a wall when he fell from a step ladder, one firefighter was crushed while doing vehicle maintenance, and one collapsed while clearing debris after a storm.

Cause of Fatal Injury or Illness

Figure 3 shows the distribution of deaths by cause of fatal injury or illness. The term *cause* refers to the action, lack of action, or circumstances that resulted directly in the fatal injury.[4]

Half of the deaths resulted from overexertion, stress and related medical issues. Of the 32 deaths in this category, 31 were classified as sudden cardiac deaths (usually heart attacks) and one was due to a stroke. See the section below for more detail on sudden cardiac deaths.

The second leading cause of fatal injury was being caught or trapped, resulting in 15 deaths. Rapid fire progress resulted in the deaths of seven of the 15 firefighters – four of them at three wildland fires and three in two structure fires. Three were killed in separate structure fires when roofs or a ceiling collapsed. Two were killed when a silo exploded during suppression activities. One firefighter became lost inside at a structure fire. One firefighter drowned while attempting a water rescue. One firefighter was performing maintenance beneath a vehicle when the jack failed and vehicle crushed him.

The next leading cause of fatal injury was being struck by an object or coming into contact with an object. The eight firefighters killed included four in motor vehicle crashes and three struck by motor vehicles. These deaths involving motor vehicles are discussed in more detail in a separate section of this report. One firefighter was struck and killed when a wall collapsed at a structure fire.

Five firefighters were killed in falls. One firefighter fell from a step ladder and struck his head while removing a sign at the fire station. One firefighter slipped on ice while responding from his home to an emergency call. One firefighter fell from a rope he was climbing after a ropes skills class. One firefighter fell through the roof of a structure while performing ventilation operations. And one firefighter fell, unobserved, from a bridge at the scene of an outside fire.

One firefighter died of heat stroke while operating on a wildland fire on an extremely hot day.

Nature of Fatal Injury or Illness

The term *nature* refers to the medical process by which death occurred and is often referred to as *cause of death* on death certificates and in autopsy reports.

Figure 4 shows the distribution of deaths by nature of fatal injury or illness. Half of the fatalities, 31 deaths, were due to sudden cardiac death.

The other major categories of fatal injuries were internal trauma (14 deaths), burns (six deaths), and asphyxiation or smoke inhalation (six deaths). There was one death each due to stroke, drowning, and heat stroke. The cause of death for one firefighter, who was caught in a roof collapse, could not be determined by the medical examiner.

Sudden Cardiac Deaths

Overall, sudden cardiac death is the number one cause of on-duty firefighter fatalities in the U.S. and almost always accounts for the largest share of deaths in any given year. These are cases where the onset of symptoms occurred while the victim was on-duty and death occurred immediately or shortly thereafter. The number of deaths in this category has fallen significantly since the early years of this study, and in 2011, the 31 sudden cardiac deaths with onset while the victim was on-duty is the lowest since this study began in 1977. From 1977 through 1986, an average of 60 on-duty firefighters a year suffered sudden cardiac deaths (44.7 percent of the on-duty deaths during that period). The average number of deaths fell to 44 a year in the 1990s and to 38 in the past decade. In spite of this reduction, sudden cardiac death still accounted for 41 percent of the on-duty deaths in the last five years, and 51 percent in 2011 alone.

For 22 of the 31 victims of sudden cardiac events in 2011, post mortem medical documentation was available and showed that 13 were hypertensive, six had coronary artery

disease, five were diabetic, and four were reported to have had a history of cardiac problems -- such as prior heart attacks, bypass surgery or angioplasty/stent placement. Some of the victims had more than one condition. Other risk factors were represented among the victims of sudden cardiac death, including obesity, high cholesterol, smoking and family history. Medical documentation was not available for the other nine firefighters.

NFPA has several standards that focus on the health risks to firefighters. For example, NFPA 1582, *Comprehensive Occupational Medical Program for Fire Departments*, outlines for fire departments the medical requirements that must be met by candidate firefighters and incumbent fire department members. NFPA 1500, *Fire Department Occupational Safety and Health Program*, calls for fire departments to establish a firefighter health and fitness program that meets NFPA 1583, *Health-Related Fitness Programs for Fire Fighters*, and requires that firefighters meet the medical requirements of NFPA 1582.

Information on developing a wellness-fitness program is available from other organizations, for example, the IAFC/IAFF Fire Service Joint Labor Management Wellness-Fitness Initiative[‡] and the National Volunteer Fire Council's Heart-Healthy Firefighter Program.[§] The Heart-Healthy Firefighter Program was launched in 2003 to address heart attack prevention for all firefighters and EMS personnel, through fitness, nutrition and health awareness.

An important part of this NVFC program includes health screenings that they make available annually at several fire service trade shows around the country. The purpose of the program is to lower the incidence of cardiac-related problems in the fire service by educating firefighters and their families about nutrition, fitness and heart disease prevention. While those screenings provide valuable information to the individuals tested, they've also collected data that provides a disturbing picture of the health status of many of the nation's firefighters. Since 2003, the program has screened more than 10,000 firefighters, both career and volunteer, for blood pressure, cholesterol, body fat and glucose.

The results of the testing over the years is shown in Appendix A. Through this program, many firefighters have been tested more than once, have come to understand their personal level of risk, and have adopted a more heart-healthy lifestyle.

[‡] http://www.iafc.org/associations/4685/files/healthWell_WFI3rdEdition.pdf
[§] http://www.healthy-firefighter.org/

Ages of Firefighters

The firefighters who died in 2011 ranged in age from 18 to 82, with a median age of 45 years. Two were age 80 or over. Figure 5 shows the distribution of firefighter deaths by age and whether the cause of death was sudden cardiac death or not.

Sudden cardiac death accounts for a higher proportion of the deaths among older firefighters, as might be expected. Almost 60 percent of the firefighters over age 40 who died in 2011 died of heart attacks or other cardiac events. The youngest victim of sudden cardiac death was aged 26.

Figure 6 shows death rates by age, using combined career and volunteer firefighter fatality data for the five-year period from 2007 through 2011 and estimates of the number of career and volunteer firefighters in each age group from NFPA's 2009 profile of fire departments (the mid-year in the range).[5]

The lowest death rates were for firefighters in their 20s and 30s. Their death rate was less than two-thirds the all-age average. The rate for firefighters aged 60 and over was almost four times the average. Firefighters aged 50 and over accounted for more than two-fifths of all firefighter deaths over the five-year period, although they represent only one-fifth of all career and volunteer firefighters in the U.S.

Fire Ground Deaths

Of the 30 fire ground fatalities, 11 were due to sudden cardiac death, six were due to internal trauma, six to burns, five to asphyxiation or smoke inhalation, and one to heat stroke. The cause of death for one victim has not yet been reported. Twenty-two of the deaths occurred at 20 structure fires, seven occurred on six wildland fires and one occurred at an outside fire involving railroad ties.

Figure 7 shows the distribution of the 30 fire ground deaths by fixed property use. Four of the seven victims at wildland fires were overrun by fire. Three of the four died of burns and one of smoke inhalation. Another firefighter suffered a fatal cardiac event. One firefighter died of heat stroke on a very hot day. And one was struck by a fire department vehicle in heavy smoke conditions.

Twelve of the 22 firefighter deaths at structure fires occurred in residential properties. Seven fires in one- and two-family dwellings killed eight of the 12 and four died in four fires in

apartment buildings. Two other firefighters were killed in fires involving vacant dwellings. Two firefighters were killed when a coal storage bin exploded, one was killed at a shed fire and one firefighter died at a fire involving a garage. One firefighter died at a church fire, one at a nursing home fire, one at a furniture store, and one at an office building.

Two of the structures had automatic suppression systems. One was a large single-family dwelling where the sprinkler system protected the living space, but the fire, involving an outdoor fireplace that had been installed inside the house, spread in the walls and up to the unprotected attic space. The ceiling collapsed, killing one firefighter and injuring several others. The other structure was the office building which had a partial sprinkler system that did not protect the fire floor and had no impact on the fire. None of the other structures had an automatic fire suppression system.

To put the hazards of firefighting in various types of structures into perspective, the authors examined the number of fire ground deaths per 100,000 structure fires by property use. Estimates of the structure fire experience in each type of property were obtained from the NFPA's annual fire loss studies from 2006 through 2010 (the 2011 results are not yet available) and from the updated firefighter fatality data for the corresponding years. The results are shown in Figure 8. Fires in vacant structures are included in the category for the intended use of the structure; for example, deaths in vacant houses are included in the residential fire category.

This figure illustrates that, although many more firefighter deaths occur at residential structure fires than at fires in any other type of structure, fires in some nonresidential structures, such as mercantile, public assembly and manufacturing properties, are more hazardous to firefighters, on average. There were 8.4 fire ground deaths per 100,000 nonresidential structure fires from 2006 through 2010, compared to 3.5 deaths per 100,000 residential structure fires. The highest death rates over the five-year period occurred in stores and offices. This is a reflection, in part, of the nine deaths that occurred at a single store fire in 2007. The low rate in health care and correctional properties over that five-year period may reflect the fact that these occupancies are among the most regulated and most-frequently inspected and that their occupants are among the most likely to call the fire department to report fires while the fires are still in their early stages. The low rate in that five-year period for storage properties, which includes garages at dwellings, reflects the relatively small number of fatalities that have occurred in such structures in recent years. In contrast, the similar rate in educational properties is a result

of a single fatality over the five-year period in a type of property that has a very low occurrence of reported fires.

From 2002 through 2011, there were 18 deaths in 16 fires in vacant buildings, and buildings under demolition or renovation.

Vehicle-Related Incidents

In 2011, four firefighters died in separate vehicle crashes. In addition to those deaths, three other firefighters were struck and killed by vehicles.

All of the vehicles involved in crashes in 2011 were road vehicles (no aircraft or watercraft). This is the lowest number of road crash deaths since the first year of the study in 1977. The number of road vehicle crash deaths over the previous 10 years ranged from nine to 25, with an annual average of 15 deaths.

All four of the crash deaths occurred while responding to incidents, and three of the four involved personal vehicles.

- A firefighter responding to a motor vehicle crash in his personal vehicle lost control on a curve and went into a ditch, striking a culvert, spinning across the road and striking trees. It was dark, he was speeding, was not wearing a seatbelt and was ejected. Driver distraction was cited as another possible factor in the crash.
- A firefighter responding in his personal vehicle to a report of a brush fire that was threatening structures went off the road, overcorrected and was broadsided by another vehicle. He was wearing his seatbelt. There were no additional details about factors in the crash. The incident turned out to be trash in a barrel.
- A firefighter responding in his personal vehicle on mutual aid for a dwelling fire swerved to the right to avoid a vehicle driving on the wrong side of the road, then overcorrected and struck trees on the other side of the road. He was wearing a seatbelt and was not ejected. No other details were reported.
- A firefighter responding to a wildland fire in a brush truck lost control on a curve and struck an embankment and trees. The road was wet and he was driving too fast for conditions. No other details were reported.

Three firefighters were struck by vehicles.

- A firefighter was struck by an emergency vehicle in heavy smoke conditions

when he was trying to escape a fast-moving wildland fire. The victim and other firefighters were trying to escape in their vehicles when they found they were blocked in at a closed gate and fence. He and others then tried to escape on foot when he was struck.

- A firefighter directing traffic at a motor vehicle crash on a highway was struck while trying to keep the left-hand lane closed to traffic. A driver came over the hill, tried to maneuver around slowed traffic and struck the victim, who was wearing personal protective equipment and a reflective vest. Speed and alcohol were not factors in the incident.
- Another firefighter was directing traffic at the scene of a motor vehicle crash when she was struck by a driver who never saw her standing in the middle of the intersection. The victim had come upon the crash while on her way to work, and was wearing an orange vest that she borrowed from another driver. Although she left her flashers and headlights on, her clothing was dark, she did not have a flashlight and conditions were still dark.

NFPA publishes several standards related to road safety issues.

- NFPA 1002, *Standard on Fire Apparatus Driver/Operator Professional Qualifications*, identifies the minimum job performance requirements for firefighters who drive and operate fire apparatus, in both emergency and nonemergency situations.
- NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, provides for the development of a written vehicle operations training program, including the organizational procedures for training, vehicle maintenance, and identifying equipment deficiencies.
- NFPA 1911, *Standard for the Inspection, Testing, Maintenance and Retirement of In-Service Automotive Fire Apparatus*, details a program to ensure that fire apparatus are serviced and maintained to keep them in safe operating condition.
- NFPA 1901, *Standard for Automotive Fire Apparatus*, addresses vehicle stability to prevent rollovers, and gives manufacturers options on how to provide it. New vehicles will have their maximum speed limited, based on their weight, and will have

vehicle data recorders to monitor, among other things, acceleration and deceleration, and seatbelt use.

The provisions of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, include requirements that operators successfully complete an approved driver training program, possess a valid driver's license for the class of vehicle, and operate the vehicle in compliance with applicable traffic laws. All vehicle occupants must be seated in approved riding positions and secured with seatbelts before drivers move the apparatus, and drivers must obey all traffic signals and signs and all laws and rules of the road, coming to a complete stop when encountering red traffic lights, stop signs, stopped school buses with flashing warning lights, blind intersections and other intersection hazards, and unguarded railroad grade crossings. Passengers are required to be seated and belted securely and must not release or loosen seatbelts for any reason while the vehicle is in motion.

In related efforts, the USFA has formed partnerships with the IAFF, NVFC and IAFC to focus attention on safety while responding in emergency apparatus. Details can be found on USFA's website.[**]

The focus of vehicle safety programs should not be exclusively on fire department apparatus, since, over the years, personal vehicles have been the vehicles most frequently involved in road crashes. NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, includes a requirement that when members are authorized to respond to incidents or to fire stations in private vehicles, the fire department must establish specific rules, regulations, and procedures relating to the operation of private vehicles in an emergency mode. NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, also requires training for those using personally-owned vehicles.

Requirements are also in effect for emergency personnel operating on roadways. The 2009 version of the Federal Highway Administration's Manual of Uniform Traffic Control Devices (MUTCD) requires anyone working on a roadway to wear an ANSI 107-compliant high-visibility vest. An exemption was created for firefighters and others engaged on roadways that allows them to wear NFPA-compliant retroreflective turn-out gear when directly exposed to flames, heat and hazardous material. NFPA 1500 requires firefighters working on traffic assignments where they are endangered by motor vehicle traffic to wear clothing with

[**] http://www.usfa.dhs.gov/fireservice/research/safety/vehicle.shtm

fluorescent and retroreflective material and use fire apparatus in a blocking position to protect firefighters. The 2009 edition of NFPA 1901 requires that ANSI 207-compliant breakaway high-visibility vests be carried on all new fire apparatus, and MUTCD 2009 allows emergency responders to use them in lieu of ANSI 107-compliant apparel. Advice on compliance with the updated Federal rules can be found at: MUTCD.[††] NFPA 1901 also requires reflective striping for improved visibility on new apparatus and a reflective chevron on the rear of fire apparatus. Advice on how to improve visibility of existing apparatus can be found at: video.[‡‡]

In August, 2010, NFPA's Standards Council established the Technical Committee for Traffic Control Incident Management. The technical committee will have jurisdiction over documents that address professional qualifications for emergency responders in relation to their operations on roadways. NFPA 1091, *Standard on Traffic Control Incident Management*, will identify the minimum job performance requirements necessary to perform temporary traffic control duties at emergency incidents on or near an active roadway.

Career/Volunteer Comparison

Figure 9 compares the number of deaths of career firefighters and volunteer firefighters from local fire departments since the study was first done in 1977. The 35 deaths of volunteer firefighters in 2011 is the lowest number reported in this study, and maintains the general downward trend seen since 1999. The 21 deaths of career firefighters is the lowest number for career firefighters, and matches the total reported in 1993. The high number for career firefighters in 2007 is due to a single nine-fatality incident. Otherwise, there has been no consistent improvement in the number of deaths of career firefighters over the past 10 years.

A breakdown of the fatality experience of the 56 career and volunteer firefighters killed in 2011 is shown in Table 1.

Other Findings

Four firefighters were killed in connection with intentionally-set fires in 2011; three at the scene of fires and one while responding to a fire. Three were structure fires and one was an outside fire involving railroad ties. From 2002 through 2011, 52 firefighters (5.7 percent of all

[††]http://www.respondersafety.com/Articles/2009_Edition_of_the_Manual_on_Uniformed_Traffic_Control_Devices_MUTCD_Released_December_16_2009.aspx

[‡‡] http://www.respondersafety.com/MarkedAndSeen.aspx

on-duty deaths) died in connection with intentionally-set fires. The number of these deaths annually has been dropping since 1985.

In 2011, there was one death that resulted from a false alarm or false call; in this case, a system malfunction. Over the past 10 years, 22 firefighter deaths have resulted from false calls, including malicious false alarms and alarm malfunctions.

Summary

There were 61 on-duty firefighter deaths in 2011; for the second consecutive year, the lowest total since NFPA began this study in 1977. The total number of deaths has been below 100 for six of the last 10 years. The annual average has dropped to 91 deaths per year (based on the past 10 years).

Although the total number of on-duty deaths has dropped significantly in each of the past two years, the number of cardiac-related deaths has not decreased as dramatically. The number of such deaths has been remarkably stable since 2005, with between 34 and 40 deaths annually. The 31 sudden cardiac deaths in 2011 is lower than that, but still accounts for approximately 50 percent of the total number of deaths.

The number of crash deaths continues to be lower than the average, with only four road vehicle crashes in 2011. This is the lowest total observed in the study since 1977. Historically, crashes have been the number two cause of on-duty firefighter deaths, with most of the crashes involving road vehicles. Over the past 10 years, the number of deaths in road vehicle crashes has averaged 14 a year, ranging from the low of four in 2011 to a high of 25 in 2003 and 2007. With nine deaths in 2009 and 2010, and four in 2011, it is possible that safe driving efforts have begun to take hold. It will be very important to watch to see if this trend continues.

The 30 deaths on the fire ground in 2011 is close to the 10-year average of 31, although it is a sharp increase over the 21 deaths in 2010. Deaths on the fire ground continue to be a concern, because traumatic deaths in recent years while operating inside structures have been occurring at rates higher than reported in the 1970s and 1980s, although the number of fires has been decreasing. (The rates for fire ground deaths in 2011 will be calculated when the number of structure fires in 2011 is reported in September.)

This NFPA study focuses on the fire deaths that are directly associated with specific on-duty activities, and does not track the effects of long-term exposure to toxic products that might

occur during an individual's time in the fire service. NIOSH has undertaken a multi-year study to examine the cancer risk of firefighters, using health records of approximately 18,000 current and retired career firefighters from suburban and large city fire departments. Results should be available in 2013. More information about the project is available on the USFA and NIOSH websites.[§§]

Summary of where the drop in deaths occurred in 2011

- Lowest number of sudden cardiac deaths
- Lowest number of road vehicle crashes
- No aircraft or watercraft crashes
- The number of deaths while involved in training activities is the lowest since 1999
- Lowest number of volunteer firefighter deaths ever
- Lowest number of career firefighter deaths (tied with 1993)
- Lowest number of deaths while responding to or returning from alarms

References

1. The NFPA's files for firefighter on-duty fatal injuries are updated continually for all years.
2. For this report, the term *volunteer* refers to any firefighter whose principal occupation is not that of a full-time, paid member of a fire department. The term *career* refers to any firefighter whose occupation is that of a full-time, paid fire department member.
3. For this report, the term *motor vehicle-related incident* refers to motor vehicle collisions (including aircraft and boats) and rollovers, as well as to incidents such as falls from or struck by vehicles where the involvement of the vehicle played an integral role in the death.
4. The categories for cause of injury and nature of injury are based on the 1981 edition of NFPA 901, *Uniform Coding for Fire Protection*.
5. Michael J. Karter, Jr., "U.S. Fire Department Profile Through 2009," NFPA Fire Analysis and Research Division, Quincy, Massachusetts, October 2010.
6. Rita F. Fahy, "U.S. Fire Service Fatalities in Structure Fires, 1977-2009," NFPA Fire Analysis and Research Division, Quincy, Massachusetts, June 2010. See: http://www.nfpa.org/assets/files/PDF/OS.FatalitiesInstructures.pdf?order_src=C072&lid=C072

[§§] http://www.usfa.dhs.gov/fireservice/research/safety/niosh_cancer_study.shtm and http://www.cdc.gov/niosh/fire/cancerStudy.html

U.S. Department of Justice Death, Disability and Educational Benefits for Public Safety Officers and Survivors

Line of duty deaths: The Public Safety Officers' Benefits (PSOB) Act, signed into law in 1976, provides a federal death benefit to the survivors of the nation's federal, state, local and tribal law enforcement officers, firefighters, and rescue and ambulance squad members, both career and volunteer, whose deaths are the direct and proximate result of a traumatic injury sustained in the line of duty. The Act was amended in 2000 to include FEMA employees performing official, hazardous duties related to a declared major disaster or emergency. Effective December 15, 2003, public safety officers are covered for line-of-duty deaths that are a direct and proximate result of a heart attack or stroke, as defined in the Hometown Heroes Survivors' Benefits Act of 2003.

A 1988 amendment increased the amount of the benefit from $50,000 to $100,000 and included an annual cost-of-living escalator. On October 1 of each year, the benefit changes as a result. The enactment of the USA PATRIOT bill in 2001 increased the benefit to $250,000. The current benefit is $ 323,035.75, tax free.

A decedent's spouse and minor children usually are the eligible beneficiaries. Generally, in cases in which the public safety officer had no surviving spouse or eligible children, the death benefit is to be awarded to either the individual most recently designated as beneficiary for PSOB benefits with the officer's public safety agency, organization, or unit, or, if there is no designation of beneficiary of PSOB benefits on file, then to the individual designated as beneficiary under the most recently executed life insurance policy on file with the agency at the time of death. (*See* 42 U.S.C. § 3796(a)(4) for specific details.) If no individuals qualify under 42 U.S.C. § 3796(a)(4), then the benefit is paid to the public safety officer's surviving parents.

Line of duty disabilities: In 1990, Congress amended the PSOB benefits program to include permanent and total disabilities that occur on or after November 29, 1990. The amendment covers public safety officers who are permanently unable to perform any gainful employment in the future. PSOB is intended for those few, tragic cases where an officer survives a catastrophic, line of duty injury. Only then, in the presence of the program's statutory and regulatory qualifying criteria, will PSOB's disability benefit be awarded. The bill's supporters anticipated that few PSOB disability claims would be eligible annually.

Public Safety Officers' Educational Assistance Program (PSOEA): An additional benefit, signed into law in October 1996 and amended in 1998, provides an educational assistance allowance to the spouse and children of public safety officers whose deaths or permanent and total disabilities qualify under the PSOB Act. This benefit is provided directly to dependents who attend a program of education at an eligible education institution and are the children or spouses of covered public safety officers. It is retroactive to January 1, 1978, for beneficiaries who have received or are eligible to receive the PSOB death benefit. Students may apply for PSOEA funds for up to 45 months of full-time classes. As of October 1, 2011, the maximum benefit a student may receive is $957 per month of full-time attendance.

Further benefits information: To initiate a claim for death benefits, to receive additional information on filing a disability claim or to receive additional information about coverage, call, email, or write the Public Safety Officers' Benefits Office, Bureau of Justice Assistance, Office of Justice Programs, U.S. Department of Justice, 810 7th Street, N.W., Washington DC 20531. The telephone number is (888) 744-6513 and the email address is ASKPSOB@usdoj.gov. PSOB death claims can now be filed online as well, at: https://www.psob.gov. Please note that the PSOB Office "Call Center" is now available to take calls Monday through Friday from 7:00 AM until 7:00 PM ET.

Table 1
Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2011*

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Type of Duty				
Operating at fire ground	12	57%	13	37%
Responding to or returning from alarms	0	0%	10	29%
Training	3	14%	3	9%
Operating at non-fire emergencies	0	0%	5	14%
Other on-duty	6	29%	4	11%
Totals	21	100%	35	100%
Cause of Fatal Injury				
Exertion/stress/other related	13	62%	18	51%
Caught or trapped	7	33%	5	14%
Struck by or contact with object	0	0%	8	23%
Fell	1	5%	4	11%
Totals	21	100%	35	100%
Nature of Fatal Injury				
Sudden cardiac death	13	62 %	17	49%
Internal trauma	0	0%	14	40%
Asphyxiation (including smoke inhalation)	5	24%	0	0%
Burns	2	10%	2	6%
Stroke/aneurysm	0	0%	1	3%
Drowning	0	0%	1	3%
Undetermined	1	5%	0	0%
Totals				
Rank				
Firefighter	14	67 %	24	69%
Company officer	6	29%	8	23%
Chief officer	1	5%	3	9%
Totals	21	100 %	35	100%

Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Firefighters, 2011* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Ages of Firefighters All Deaths				
20 and under	0	0 %	2	6%
21 to 25	0	0%	4	11%
26 to 30	0	0%	2	6%
31 to 35	1	5%	3	9%
36 to 40	4	19%	1	3%
41 to 45	4	19%	6	17%
46 to 50	4	19%	5	14%
51 to 55	7	33%	3	9%
56 to 60	0	0%	5	14%
61 to 65	1	5%	1	3%
Over 70	0	0%	3	9%
Totals	21	100%	35	100%
Ages of Firefighters Sudden Cardiac Deaths Only				
26 to 30	0	0%	1	6%
31 to 35	1	8%	1	6%
36 to 40	2	17%	1	6%
41 to 45	1	8%	3	18%
46 to 50	3	25%	3	18%
51 to 55	5	42%	3	18%
56 to 60	0	0%	3	18%
over 70	0	0%	2	12%
Totals	12	100%	17	100%
Fire Ground Deaths by Fixed Property Use				
Dwellings and apartments	9	75%	3	23%
Storage	0	0%	4	31%
Wildland	0	0%	2	15%
Vacant dwelling	1	8%	1	8%
Stores/offices	1	8%	1	8%
Nursing home	0	0%	1	8%
Church	1	8%	0	0%
Outside fire	0	0%	1	8%
Totals	12	100%	13	100%

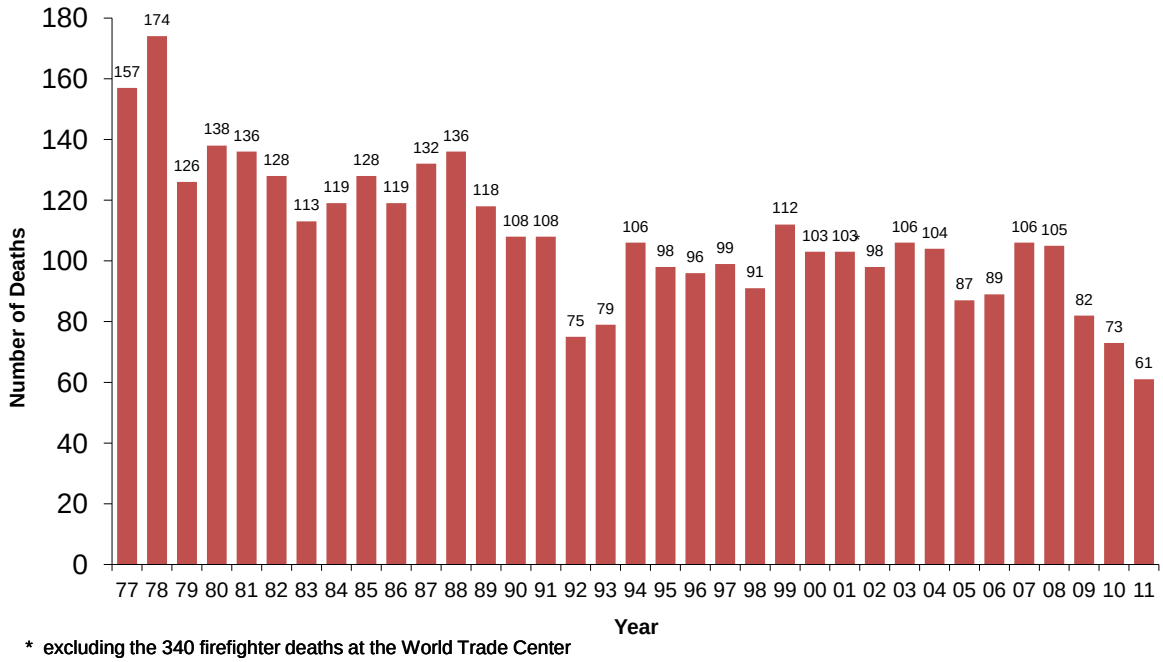
Table 1
Comparison of On-Duty Deaths Between
Career and Volunteer Firefighters, 2011* (Continued)

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
Years of Service				
5 or less	2	10%	12	34%
6 to 10	1	5%	3	9%
11 to 15	3	14%	2	6%
16 to 20	5	24%	7	20%
21 to 25	6	29%	5	14%
26 to 30	1	5%	1	3%
over 30	3	14%	3	9%
Not reported	0	0%	2	6%
Totals	21	100%	35	100%
Attributes of Fire Ground Deaths**				
Intentionally-set fires	2		1	
Search and rescue operations	2		1	
Motor Vehicle Crashes	0		4	
False Alarms	0		1	

* This table does not include the three victims who were employees of state land management agencies and two who were employees of federal land management agencies.

** Because these attributes are not mutually exclusive, totals and percentages are not shown.

Figure 1
On-Duty Firefighter Deaths - 1977-2011



* excluding the 340 firefighter deaths at the World Trade Center

Figure 2
Firefighter Deaths by Type of Duty -- 2011

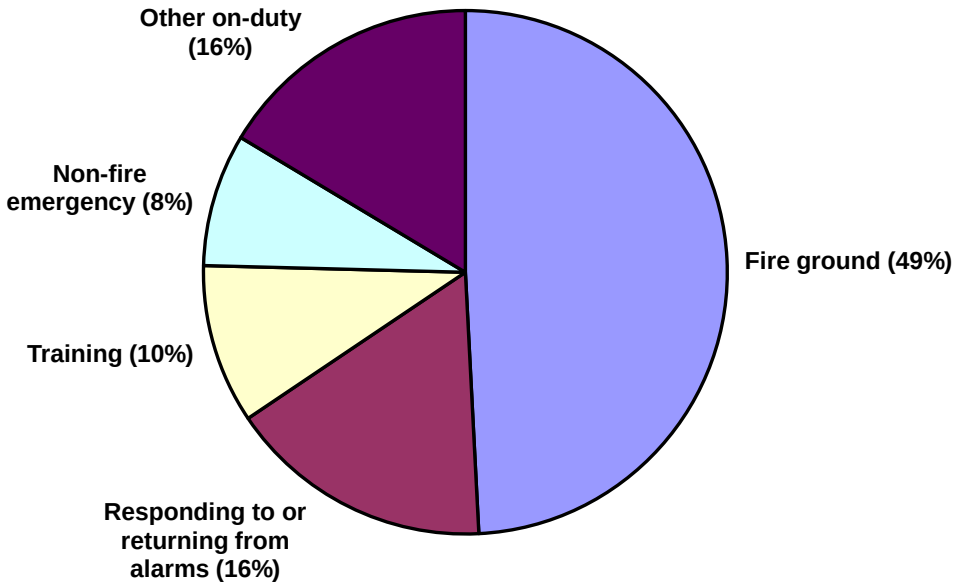


Figure 3
Firefighter Deaths by Cause of Injury -- 2011

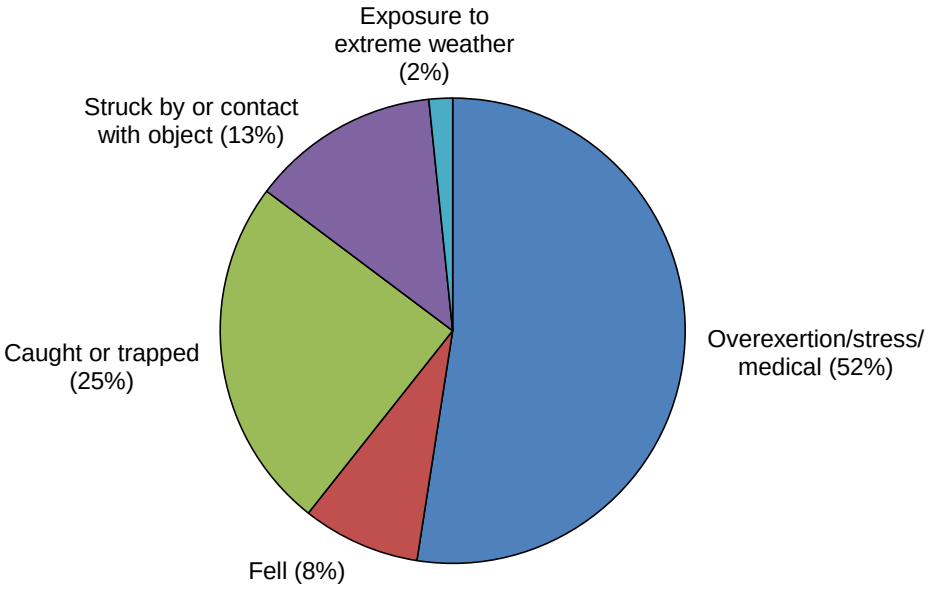


Figure 4
Firefighter Deaths by Nature of Injury -- 2011

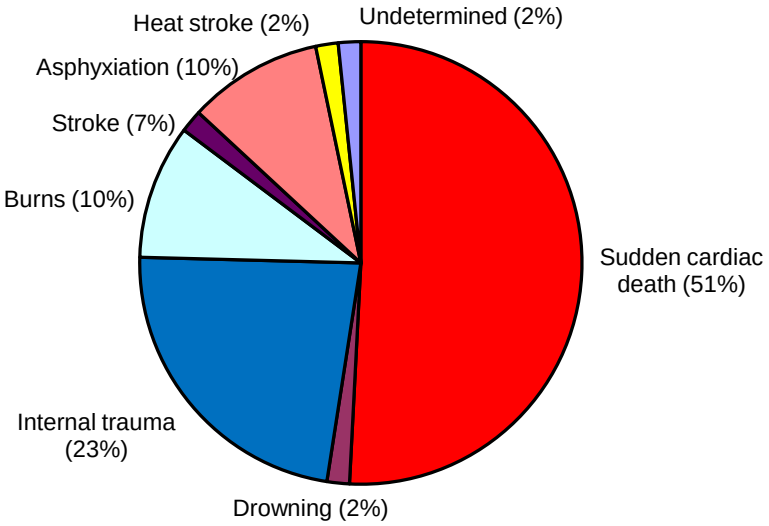


Figure 5
Firefighter Deaths by Age and Cause of Death -- 2011

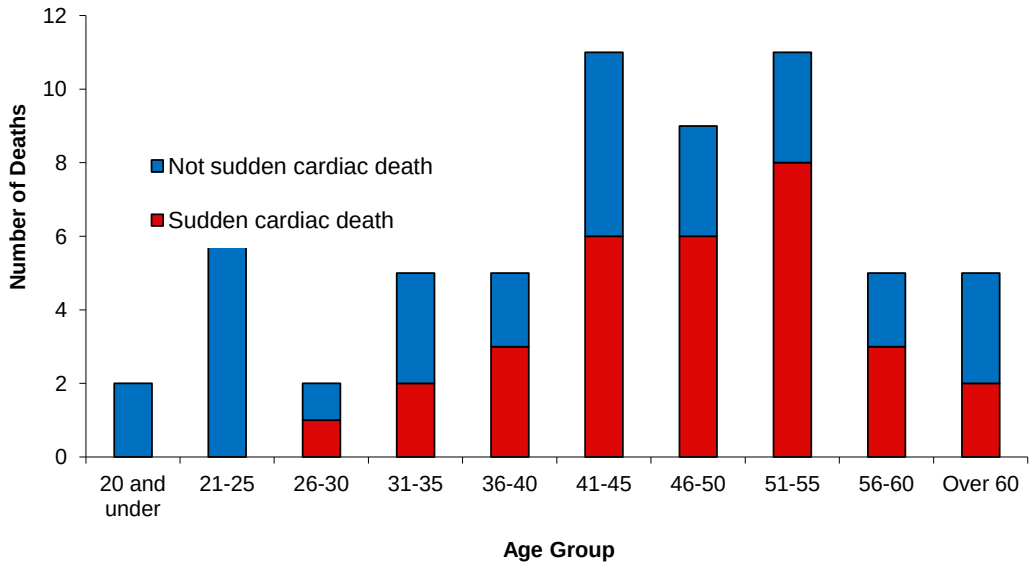


Figure 6
On-Duty Death Rates per 10,000 Career and Volunteer Firefighters
2007-2011

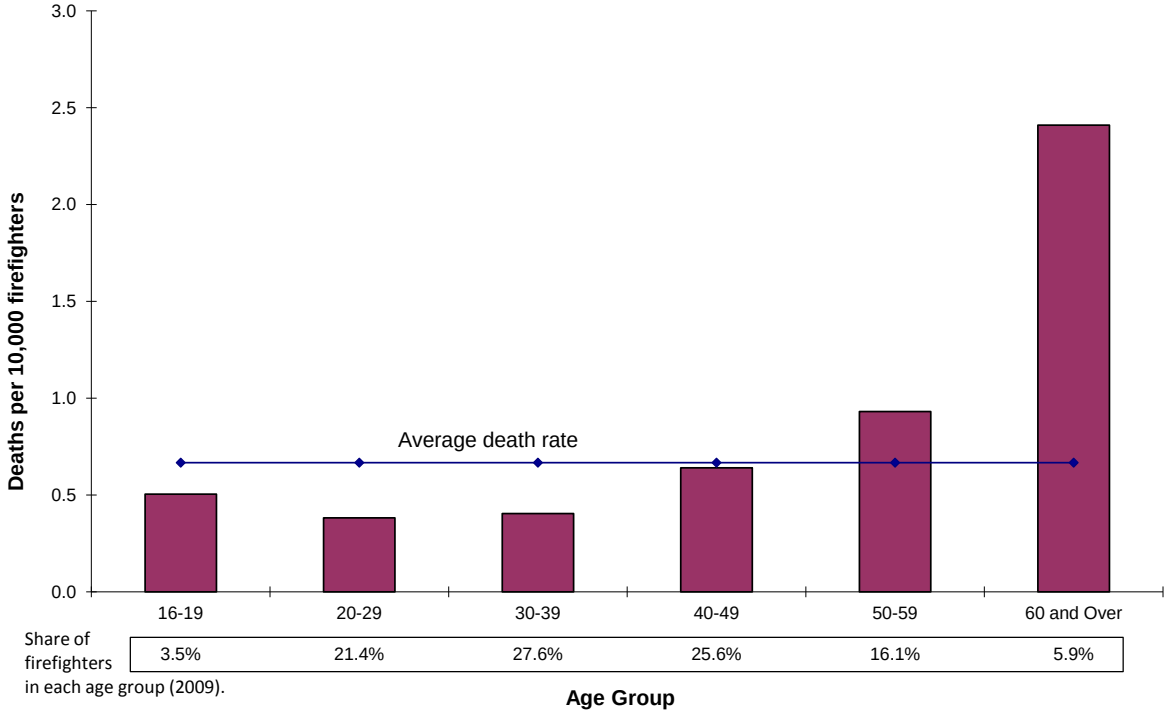
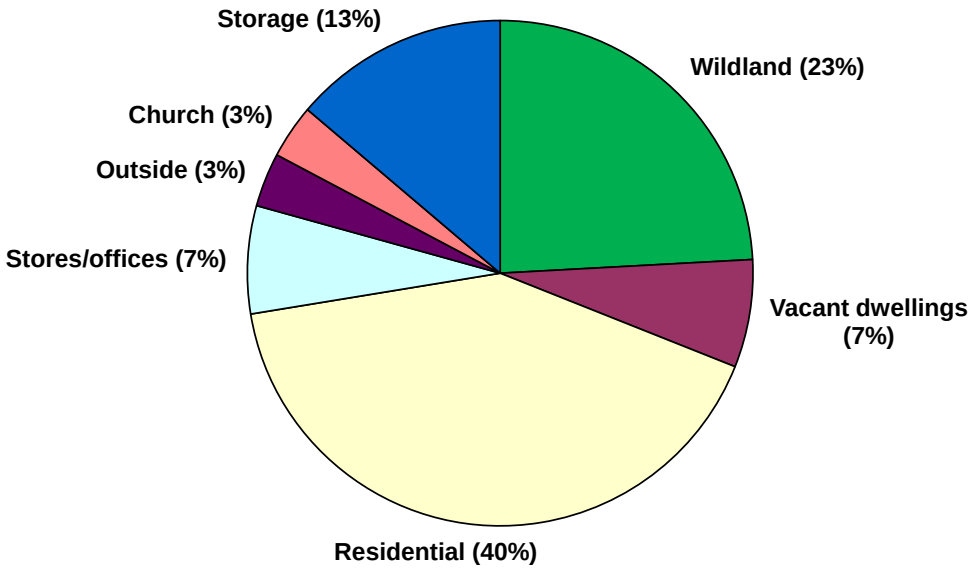


Figure 7
Fire Ground Deaths by Fixed Property Use -- 2011*



*** There were 30 deaths on the fire ground in 2011.**

Figure 8
On-Duty Fire Ground Deaths per 100,000 Structure Fires 2006-2010

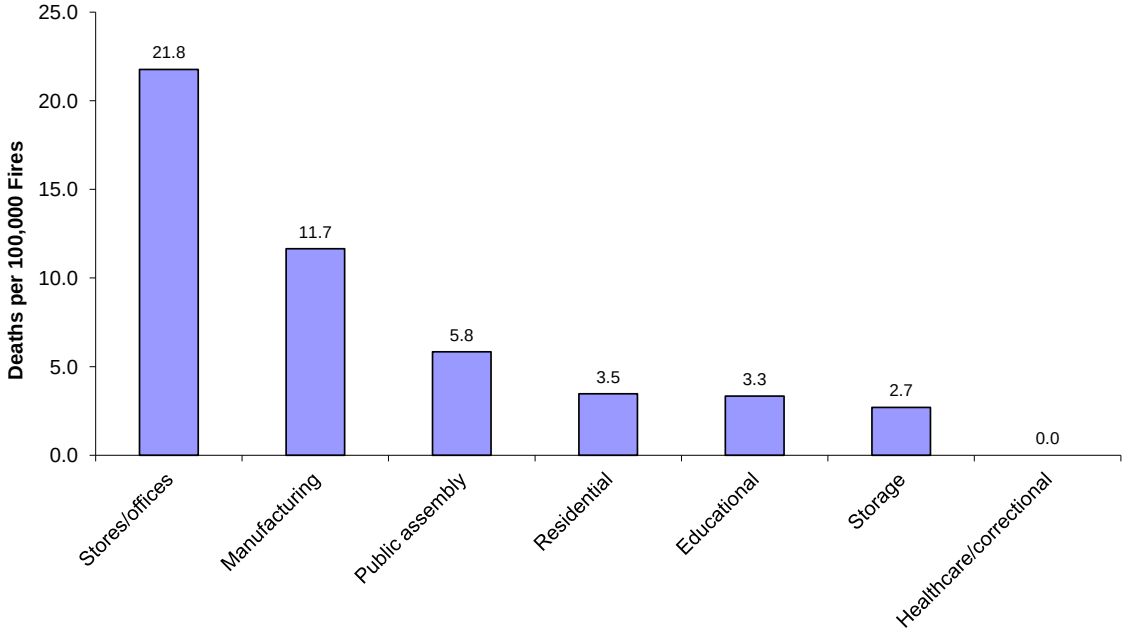
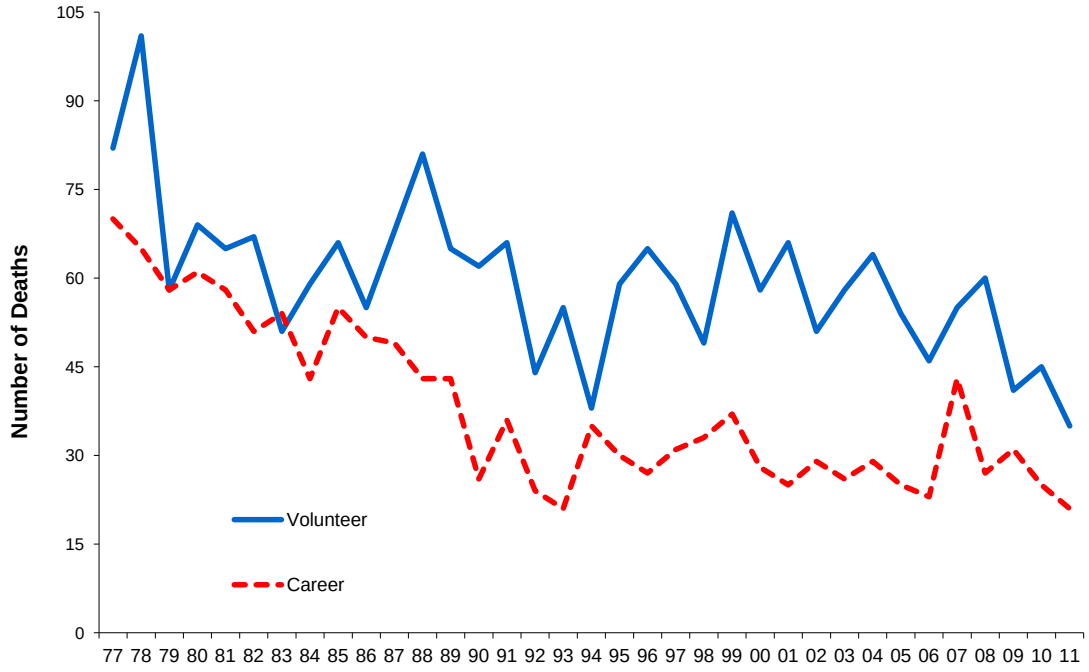


Figure 9
Career and Volunteer Firefighter Deaths
1977 - 2011*



* excluding the 340 firefighter deaths at the World Trade Center in 2001

Appendix A

This appendix presents summary findings from health screenings undertaken by the National Volunteer Fire Council's Heart-Healthy Firefighter Program since 2004.

- Cholesterol screening done from 2004 through 2007 found high or borderline-high levels (greater than or equal to 200 mg/dl) in 37.0 percent of the 7,904 firefighters tested.

- Blood pressure screenings from 2005 through 2007 found that 6.2 percent of the tested firefighters had Stage 2 hypertension; 28.9 percent had Stage 1 hypertension; and 48.0 percent were prehypertensive. Only 16.9 percent had normal blood pressure readings.

- Almost all of the 5,065 firefighters tested for glucose (non-fasting) in 2006 and 2007 were found to be in the desirable range (less than 140 mg/dl), with only 2.7 percent found to be diabetic (greater than or equal to 200 mg/dl) and 5.9 percent pre-diabetic (between 140 and 199 mg/dl).

- Of the almost 2,000 firefighters tested for body fat in 2005, 44.7 percent were found to be obese (defined as 25 percent or more of body fat for men and 32 percent or more for women).

Results of the testing in 2008 were reported in a slightly different format.

- Of the approximately 1,650 firefighters tested at four shows, 47.5 percent were determined to have a high overall coronary risk rating, based on the National Institute of Health's "National Cholesterol Education Program."

- Cholesterol screening showed that 5.8 percent of the tested firefighters were at high risk levels (greater than or equal to 240 mg/dl) and 21.4 percent were at moderate risk (200-239 mg/dl).

- Blood pressure screenings found that 27.9 percent of the tested firefighters had high blood pressure; and 49.6 percent were prehypertensive. The remaining 22.5 percent had desired or ideal blood pressure readings.

- Body fat was measured again in 2008, and 41.5 percent of the tested firefighters were found to be at high risk and another 25.1 were found to be overweight.

Only blood pressure was screened at a single show in 2009.

- Of the 137 firefighters tested there, 2.2 percent had Stage 2 hypertension; 20.4 percent had Stage 1 hypertension; and 54.0 percent were prehypertensive. Only 23.4 percent had normal blood pressure readings.

In 2010, cholesterol was tested at seven events. Glucose was tested at one event and body composition was tested at another event. The subjects in the screenings included firefighters as well as other show attendees (ie vendors, spouses, etc) and it is not possible to separate out the results for only the firefighters.

- Of the 1,395 participants tested for cholesterol at the seven shows, 6.7 percent were at the high risk levels (greater than or equal to 240 mg/dl) and 20.9 percent were at moderate risk (200-239 mg/dl).

- Of the 216 participants tested for glucose, 14.8 percent were found to be diabetic, 32.9 percent were pre-diabetic and 52.3 percent were in the desirable range.

- Of the 225 participants tested for body composition, 47.6 percent were found to be obese and 29.8 percent were overweight.

In 2011, cholesterol and glucose were tested at 10 events. Again, the subjects in the screenings included firefighters as well as other show attendees (ie vendors, spouses, etc) and it is not possible to separate out the results for only the firefighters.

- Of the 902 participants tested for total cholesterol (TC), 8.3 percent were at the high risk level (greater than or equal to 240 mg/dl) and 23.3 percent were at moderate risk (200-239 mg/dl).

- Of the 715 participants tested for high density lipoprotein (HDL) cholesterol, 43.6 percent were at high risk levels (less than 40 mg/dL) and 37.8 percent were at moderate risk (40-60 mg/dL).

- Of the 640 participants tested for total cholesterol/high density lipoprotein (TC/HDL) ratio, 37.2 percent were at high risk (greater than 5.0) and 30.5 percent were at moderate risk (3.5-5.0).

- Of the 82 participants tested for fasting glucose levels, 13.4 percent were found to be diabetic, 28.1 percent were pre-diabetic and 58.5 percent were in the desirable range.

- Of the 659 participants tested for non-fasting glucose levels, 3.0 percent were found to be diabetic, 10.9 percent were pre-diabetic and 86.1 percent were in the desirable range.

2011 Selected Firefighter Fatality Incidents

Ice Rescue Training

A 46-year-old firefighter/paramedic suffered sudden cardiac death during an ice rescue training exercise.

At 8 a.m., 20 firefighters met at the fire station and prepared for an ice rescue training session. The temperature outside was 26°F (-3°C) with 13 inches (33 centimeters) of fresh snow.

After preparations were complete, they drove their apparatus to a staging area near a frozen, river-fed pond that was to be used in the training. During the first hour, they practiced sled-based ice rescue as the victim, who was dressed in civilian clothing, watched from shore. After this segment of training was finished, the firefighter/paramedic put on an ice rescue suit weighing approximately 10 pounds (5 kilograms), entered the water, and swam to the training location. After an hour of this training, the firefighters left the pond and made their way back to the staging area by either climbing a steep bank covered with snow or walking about 400 feet (122 meters) through deep snow. The victim chose to walk the 400 feet (122 meters) through the deep snow.

As he was approaching the staging area, the firefighter/paramedic complained of shortness of breath and lay down in the snow. His fellow firefighters immediately gave him first aid and carried him on a stretcher to the rescue unit as he began to lose consciousness and exhibit seizure-like symptoms. By the time he got to the rescue unit, he was unresponsive, not breathing, and had no pulse. Paramedics started cardiopulmonary resuscitation (CPR), attached a cardiac monitor, and administered one shock with a defibrillator, all with no results.

An ambulance arrived, and he was taken to the hospital's emergency department. On the way, he was intubated, an intravenous line was inserted, and cardio resuscitation medications were administered. Three additional shocks from the defibrillator were also applied, with no success.

Advanced life support continued in the emergency room until the doctor pronounced the victim dead at approximately 12:18 p.m. The death certificate and autopsy listed the cause of death as coronary artery atherosclerosis.

NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201103.html?source=govdelivery.

Trapped in Apartment Building Fire

At 7:18 p.m., the 911 call center received a telephone call from an occupant reporting a fire in the six-unit apartment building in which she lived. The building, which was part of a larger complex, was a three-story, wood-frame structure with a brick veneer that had a ground floor area of 2,000 square feet (186 square meters). The fire began when food was left cooking unattended in the kitchen of a first-floor apartment, and fire spread throughout the apartment, out the patio doors, and up the exterior of the building to a second-story apartment. It also spread into the common hallway and up to the third floor.

Four engine companies, two aerial ladder companies, one floodlight unit, a medic unit, and a chief officer were initially dispatched to the scene. When the first engine company arrived, crew members reported smoke showing, and an additional engine company and rescue unit were dispatched. During rescue operations, one occupant was rescued over a ground ladder from the third floor, and another was taken, unconscious, from the second story of the building.

An acting officer and a firefighter, both dressed in full personal protective equipment (PPE) including self-contained breathing apparatus (SCBA), entered the building and made their way to the third floor to search the area above the apartment of origin. As they did, fire conditions deteriorated, and there was a rapid build-up of heat and thick, black smoke. The firefighter, who was searching a bedroom, was able to escape out a window and slid down a ground ladder using a headfirst bailout maneuver. However, the acting officer became trapped and initiated a "Mayday" 25 minutes after the first company arrived on scene. While trying to find a way out, he continued to communicate as conditions worsened. At some point, a flashover occurred.

Rescue efforts were made simultaneously from the front and rear of the building, as firefighters used hand lines to extinguish the fire. A firefighter climbed a ground ladder to the apartment the acting officer had been searching and found him in the living room. Paramedics performed advanced life support immediately and during transport to the hospital, and doctors made additional efforts at the emergency department for 45 minutes before he was pronounced dead. The cause of death was listed as thermal injuries.

Drowned in Lake

At 5:30 p.m., four firefighters were dispatched to rescue a 73-year-old man who had fallen from a small boat while fishing at a lake on private property. When they arrived, they saw another man in the boat approximately 100 feet (30 meters) from shore trying to keep the head of the unconscious man above water.

Two of the firefighters, who were dressed in street clothes, entered the water and began swimming toward the boat. However, one of them came out of the water almost immediately because it was so cold—only 55°F (13°C). The other firefighter, who was 33 years old, kept swimming until he realized something was wrong and shouted for help. He went under the water, surfaced, and submerged again.

While a civilian entered the water and rescued the firefighter, other units from the fire department reached the boat and rescued the two men. They started CPR and advanced life saving measures immediately on the firefighter and the man in the water and took them to an emergency room, where they were pronounced dead. An autopsy revealed that the firefighter died as a result of asphyxia due to drowning. The man who fell from the boat also drowned.

Struck by Motor Vehicle

At 12 p.m., firefighters and apparatus were fighting a wind-driven fire in a pasture of native grass that the fire department reported had started when strong winds brought electric lines into

contact with each other and the resulting sparks ignited the grass. Five water tankers were supplying water for five brush trucks.

As the fire approached the tankers and conditions deteriorated, the firefighters decided to leave the area. During their escape, however, one brush truck blocked another at the gated entrance to the pasture. The firefighters on the two trucks, who were experiencing extreme heat, near-zero visibility from the thick smoke, and high winds, were afraid for their lives, so they jumped off the apparatus and ran for safety.

After the fire had burned through the area, firefighters found the body of the man who had been driving the brush truck that was blocked by the other truck not far away in a ditch along the county road. The autopsy report listed the cause of death as massive blunt force trauma consistent with being struck or run over by a motor vehicle. The fire department believes that he was hit by another piece of fire apparatus leaving the area. Five other firefighters sustained burns of varying degrees.

NIOSH investigated this incident and offers recommendations on its web site at http://www.cdc.gov/niosh/fire/reports/face201109.html

Dies After Rope Training

A 35-year-old firefighter with 17 months service died at 9:30 p.m. as a result of a fall after participating in a two-day, eight-hour rope skills training session at the firehouse.

The drill was finished and the students were starting to put the gear away when the victim, who was dressed in civilian clothes with no PPE, started to climb one of the ropes, which was still attached to an aerial platform that had been used in the drill. The platform was located on the fire station apron and was elevated 20 to 30 feet (6 to 9 meters) in the air.

As the firefighter reached for another rope, the instructor and the chief shouted to him to stop and get down. At that point, he lost his grip on the rope and fell head first 6 to 8 feet (1.8 to 2.4 meters) to the concrete apron. First aid was immediately administered, and he was taken to the hospital, where he died.

NIOSH investigated this incident and offers recommendations on its web site at www.cdc.gov/niosh/fire/reports/face201112.html?source=govdelivery.

Trapped in a Burning Church

One firefighter died when he became trapped in a church that had been hit by lightning and set ablaze.

The fire department received the call to the wood-frame church, which had a ground floor area of 5,000 square feet (465 square meters), at 3:53 p.m. On arrival, firefighters saw light smoke and fire coming from the roof. A second alarm was sounded once command was established, and all available tankers were requested because there were no hydrants in the area.

While seven firefighters dressed in full PPE and SCBA advanced a hand line through the front door, two others, also dressed in PPE and SCBA, were sent to place ladders against the structure and make openings to allow the smoke to ventilate. Inside the church, the space was free of smoke except for a slight haze at the ceiling level, so the interior crew had pulled some of the ceiling down and directed water on the fire. Soon, however, the officer reported seeing too much fire and ordered the crew out of the building. The roof collapsed before they could act.

At 4:10 p.m., everyone was ordered to the front of the church for an accountability check, where the incident commander discovered that one firefighter was missing. A rapid intervention team tried unsuccessfully to reach the downed man, and attempts to reach him through different entrances were blocked by the fire. After the fire was knocked down, firefighters recovered the victim's body from under roof debris. The cause of death was smoke and soot inhalation.

NIOSH investigated this incident and offers recommendations on its web site at www.cdc.gov/niosh/fire/reports/face201114.html?source=govdelivery.

Struck by Collapsing Wall
A firefighter died when the wall of a burning building collapsed, trapping him under debris.

The fire department dispatched 15 firefighters in three engines and the fire chief's vehicle at 3:15 p.m., after receiving a report of a fire in a 96-year-old building that, with two other buildings, occupied an entire city block. The two-story building had masonry walls, a flat wood roof, wood floor joists embedded in the walls, and a steel beam supporting the second level joists, with two additions extending to the rear. The building was also equipped with bracing that used tie rods with star-shaped anchor plates to keep the masonry wall from bowing laterally. The original structure housed an antique shop and faced the street; the additions contained storage and living quarters. The building, which covered 14,600 square feet (1,356 square meters) of ground floor area, had no sprinklers.

The first officer arrived on scene at 3:19 p.m. and staged the engine at the right front corner of the building. Seeing smoke rising in a large column and pushing out from cracks around the windows, he instructed two firefighters to pull a 1 3/4-inch (45-millimeter) hose line to the front door to be used as an attack line. Two other firefighters pulled a section of 5-inch (125-millimeters) supply line and connected it to a hydrant and the engine.

At this point, the owner asked the lieutenant if he would go just inside the door to get two boxes. The lieutenant, who was not wearing his SCBA, managed to retrieve one of the boxes, but when he tried to get the second one, conditions had worsened and he was unable to re-enter the building. When the hand line was used, dark brown smoke rolled from the building, reducing visibility even more.

After a discussion with the firefighters, the lieutenant told them to knock out three large, plate-glass windows, which increased the amount of smoke coming from the building, and conduct defensive operations from the sidewalk. The second engine company staged at the right rear

corner of the building and ran two hand lines, while two additional hand lines were run off the first engine. Two arriving firefighters also removed a 35-foot (10-meter) ground ladder from the first engine company and placed it on the right side of the building to open windows for ventilation.

When the chief arrived, command was transferred to him, and he maintained defensive operations. At 3:25 p.m., he requested mutual aid and received an aerial ladder, a fire chief, and five firefighters. The aerial ladder was placed at the right rear corner of the building, where the two chiefs met and saw a large vertical crack running up the building's wall. They agreed to maintain the defensive operation.

As the fire vented through the roof and continued to grow, it burned through power lines, causing them to fall to the ground on the right side of the building and ignite a utility pole and the vinyl siding on the exposure. A deck gun was put into operation to protect the exposure, and the aerial ladder master stream directed water onto the roof of the antique shop.

When one of the chiefs saw the ground ladder against the right side of the building, he said that it should be removed, and two firefighters, who were standing near him, went to take it down. As they were lowering the ladder, the wall collapsed outward, hitting the firefighter between the ladder and building and knocking him down. The other firefighter tried to grab him, then spun around, and moved across the alley, managing to avoid the falling debris.

Firefighters immediately removed the victim from the collapse zone, rendered first aid, and transported him to the local hospital emergency room. He was transferred by air ambulance to a trauma hospital, where he later died of blunt cranio-cerebral injury. No other injuries were reported.

NIOSH investigated this incident and offers recommendations on its web site at www.cdc.gov/niosh/fire/reports/face201115.html.

Burn Over

Two firefighters died when they were unable to outrun a wildfire ignited by a lightning strike.

After four days of containment, a wildfire broke through the lines, and nine firefighters already in the area, including two tractor/plow operators, responded. During the initial operating period, one of the tractor/plows became stuck in a dry pond, and the firefighter driving it called for help. The firefighter operating the other tractor/plow responded, but soon became stuck among a number of large stumps.

With the fire rapidly approaching them, the two firefighters left the tractor/plows and tried to escape. At 2:50 p.m., however, the fire overran them, and they died of burns. Two other firefighters sustained minor injuries while trying to save the victims, both of whom had fire shelters they did not deploy.

Station Duty
At 7:45 a.m., at the end of a 24-hour shift, a 35-year-old firefighter was found in his bunk, unresponsive and without a pulse. During the shift, he had been assigned to a two-person rescue unit that had responded to 10 emergency medical calls. The unit returned from its last call at 6:08 a.m., and he was last seen at 6:15 a.m. before retiring to the dormitory.

Paramedics immediately started CPR, attached a heart monitor/defibrillator, established intravenous in both arms, intubated him, and used a bag valve mask for ventilations as they rushed him to the hospital. Despite their efforts and those of the hospital staff, the firefighter died. The nature of his death was listed as atherosclerotic coronary artery disease. He had been under the care of a cardiologist and had not complained of feeling unwell during his last shift.

Vehicle Maintenance
A fire lieutenant with 27 years of service died while performing routine maintenance on a department vehicle. He had been put in charge of vehicle maintenance for the department early in his career and performed the repairs and record keeping. Although he was not a formally trained vehicle mechanic, he had worked on construction equipment and had a part-time job in a small vehicle repair shop.

At 12:30 p.m., after speaking with another member of the fire department, the lieutenant went to change the oil on a newly acquired SUV parked outside the rear of the station. He used a 3 ½-ton (3.175-tonne), portable, hydraulic jack to raise the vehicle and positioned himself under it on a creeper to remove the oil drain plug. Before he could start to remove the plug, however, the jack failed and the SUV fell on him. At 12:45 p.m., a firefighter went to speak with the lieutenant and found him under the vehicle. He ran into the station and got the on-duty crew, which tried to raise the vehicle with the hydraulic jack. When that proved unsuccessful, someone retrieved a hydraulic spreader from one of the apparatus and used it to raise the vehicle off the lieutenant.

He was pulled from under the vehicle, unconscious, not breathing, and without a pulse, and EMS personnel rushed him to the hospital, where he died two days later. The cause of death was asphyxiation due to compression of the torso.

NIOSH investigated this incident and offers recommendations on its web site at www.cdc.gov/niosh/fire/reports/face201119.html?source=govdelivery.

Station Duty
A 61-year-old fire lieutenant died when he struck his head after falling from a 6-foot (1.8-meter) step ladder while trying to remove a metal sign from the outside wall of the fire station at approximately 12 p.m. He was working alone and was not discovered until a passerby found his body and called 911.

EMS personnel and deputy sheriffs were dispatched to the call. EMS personnel arrived first and determined that the lieutenant had died as a result of the fall. An autopsy revealed that the cause of death was blunt force trauma to the head.

Silo Explosion
At 7:58 a.m., the local fire department was notified of smoke rising from a silo containing coal used to feed a coal-fired water heating system in an adjoining structure that supplied the community with hot water. The silo, constructed of pre-cast concrete, measured 17 feet by 10 feet (5 meters by 3 meters) and was 50 feet (15 meters) tall. It could hold 175 tons (159 tonnes) of coal, but contained only 120 tons (109 tonnes) at the time of the incident.

Responding firefighters decided to empty the silo to extinguish the fire. They managed to remove 80 tons (73 tonnes) of coal and doused the flames with a mixture of 1,500 gallons (5,678 liters) of water and Class A foam before taking a break, thinking they had brought the fire under control.

After their break, the firefighters noticed that the fire had flared up. In hopes of bringing it back under control, a 20-year-old crew member and his 21-year-old colleague used a boom lift that had been used earlier to gain access to the roof of the bin to deploy a 1 ¾-inch (45-millimeter) handheld hose line. After they had applied water for approximately three to four minutes, the explosion occurred, killing them instantly.

The cause of death was trauma. A third firefighter who was in the hot water boiler room sustained a broken rib and multiple bruises.

Struck by Automobile
A 45-year-old firefighter driving to the school where she taught fifth grade died when she was struck by a car at the scene of a motor vehicle crash.

She came across the crash, in which a tractor trailer truck had rear-ended a van, at 7:30 a.m. She stopped, called 911 to report the crash and went to check on the individuals involved, none of whom were injured. The driver of the tractor trailer gave her a non-certified reflective traffic vest that she immediately put on, and she began directing traffic in the center of the intersection.

Several minutes later, she was hit by a passing car and thrown to the side of the road. She was flown by helicopter to the hospital, where she was pronounced dead a short time later. The cause of death is listed as multiple blunt force injuries and trauma. Factors contributing to her death were speed, darkness, and poor visibility.

Fall from Bridge
A 60-year-old firefighter with seven years service died as a result of traumatic injuries he sustained when he fell from a bridge at 2:00 a.m. while responding in thick fog to a report of fire in a large pile of railroad ties. He and a lieutenant stopped on the bridge in the area where the fire was supposed to be and used it as a platform to search for the blaze. In zero visibility, they walked in different directions until the lieutenant became concerned that he could no longer hear his partner. After searching for him unsuccessfully, the lieutenant called for help.

Firefighters saw light shining from the firefighter's flashlight below the bridge and recovered his body. It is not known how or why he fell from the bridge.