FIREFIGHTER FATALITIES IN THE UNITED STATES-2014

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National Fire Protection Association
Fire Analysis and Research Division
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Abstract

In 2014, a total of 64 firefighters died while on-duty in the U.S., a significant decrease from the 97 deaths that occurred in 2013, when three incidents alone claimed a total of 32 lives. The largest share of deaths occurred at fire scenes (22 deaths). As in most years, sudden cardiac death accounted for the largest share of the on-duty deaths (36 deaths, or 56 percent). Deaths in road vehicle crashes, often the second most frequent cause of on-duty firefighter fatalities, continued low in 2014. With seven fatalities, this is the second lowest number of crash deaths over the past 30 years.

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

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2014 Experience

In 2014, 64 firefighters died while on-duty in the U.S. This total represents a significant decrease from the 97 deaths that occurred in 2013, when three incidents alone claimed a total of 32 lives. By contrast, in 2014, the largest multiple-death incidents were two double-fatality fires, both in apartment buildings. Figure 1 shows on-duty firefighter deaths for the years 1977 through 2014, excluding the 340 firefighter deaths at the World Trade Center in 2001. The annual average number of deaths over the past decade is 83.

Of the 64 firefighters who died while on duty in 2014, 34 were volunteer firefighters, 23 were career firefighters, three were employees of state land management agencies, two were state contractors, one was a civilian employee of a military fire department and one was a member of an industrial fire department.

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. 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 (including EMS calls); 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.
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.

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* USFA link is usfa.dhs.gov/fireservice/fatalities/index.shtm, National Fallen Firefighters' Memorial link is www.firehero.org/
Type of Duty

Figure 2 shows the distribution of the 64 deaths by type of duty. The largest share of deaths occurred while firefighters were operating at fires (22 deaths), accounting for about one-third of the on-duty deaths in 2014. This is the second lowest number of fire ground deaths since this study began in 1977, and the third time in the last five years that the total has been below 25. There has been an average of 31 fire ground deaths over the past 10 years (2005 through 2014). The total in 2014 is sharply lower than in 2013, because of the two major loss-of-life incidents that occurred at fires that year: the Yarnell Hill Fire in Arizona that killed 19 wildland firefighters in Arizona and the fire and explosion at the fertilizer plant in West, Texas, that killed nine firefighters.

Seventeen of the 22 fire ground deaths occurred at 15 structure fires. In addition, there were four deaths at four wildland fires and one at a vehicle fire. Ten of the 22 fire ground victims were volunteer firefighters, 10 were career firefighters and two were contractors with state 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 13 deaths per year.

Eleven 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. While six deaths occurred in collisions or rollovers, the other five were due to sudden cardiac events. All crashes and sudden cardiac deaths are discussed in more detail later in this report. Ten of the victims were volunteer firefighters and one was an employee of a state land management agency. The number of deaths that occurred while responding to or returning from calls has averaged 21 per year over the past 10 years and 15 per year over the past five years. The 11 deaths while responding to or returning from alarms in 2014 make up the second lowest total since this study was first done in 1977.

Nine firefighters died at non-fire emergencies -- five at medical emergencies, one while checking out an automatic alarm activation, one at the scene of a partial building collapse, one during a missing person search and one at a motor vehicle crash. Five of the nine suffered sudden cardiac deaths, two were struck by vehicles, one was struck by a collapsing cell phone tower and one was trapped in a floor collapse.

Eight deaths occurred during training activities. Sudden cardiac death claimed seven firefighters -- two during Work Capacity Tests, one during air management training, one during the fire department’s annual physical ability test, one while returning from an off-site physical and agility test, one at the fire station for driver training and one during wildland fire training. One firefighter died of
influenza while he was attending training out-of-state.

The remaining 14 firefighters died while involved in a variety of non-emergency-related on-duty activities. Eleven of the deaths were due to sudden cardiac death. Eight of the 11 were engaged in normal administrative or station duties, one was involved in vehicle maintenance activities, one had been cutting down trees on department property and one was clearing a blocked culvert to assist a member of the community. One was killed when his aircraft crashed while on patrol checking for wildland fires. One died when his fire department vehicle crashed as he was returning it to the station after an unrelated service repair. One was electrocuted while assisting at an Ice Bucket Challenge event.

**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. Overexertion, stress and medical issues accounted for by far the largest share of deaths. Of the 37 deaths in this category, 35 were classified as sudden cardiac deaths (usually heart attacks), one was due to a stroke and one to influenza. See the section below for more details on sudden cardiac deaths.

The second leading cause of fatal injury was vehicle crashes, which claimed nine lives. Another three firefighters were struck and killed by vehicles. These vehicle-related deaths are discussed in detail later in this report.

Five firefighters were caught or trapped by rapid fire progress (including flashover) in three incidents. All of these incidents were structure fires, including the two double-fatality incidents mentioned above.

Structural collapses resulted in two deaths. One firefighter was investigating a reported structural collapse at an apartment building when the walkway on the second story of the building collapsed beneath him. The other firefighter was killed when the roof collapsed at a structure fire.

In separate incidents, three firefighters became lost inside structures.

Three firefighters died in fatal falls. In separate incidents, two firefighters fell through the floor and into the basement while on the fire ground (one during overhaul at a dwelling fire and the other while checking on an adjacent building after a fire). Both died of smoke inhalation. The third firefighter fell at a fire camp during a wildland fire and died of traumatic injuries.

As mentioned earlier, one firefighter was struck and killed by a collapsing cell phone tower. The victim was in the process of rescuing a construction worker injured in the collapse of one cell phone
tower during maintenance work, when a second tower collapsed on him.

**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.* As in almost every year since 1977, sudden cardiac death accounted for the largest share of the deaths annually, with 36 deaths. Sudden cardiac deaths will be discussed in more detail in the next section.

The second leading nature of fatal injury was internal trauma, with 14 deaths. The other major category of fatal injury was asphyxiation or smoke inhalation, with nine deaths. There were two deaths due to burns and one death each due to electrocution, stroke, and influenza.

**Sudden Cardiac Deaths**

In 2014, the 36 sudden cardiac deaths with onset while the victim was on-duty is the highest since 2008, and ends the general downward trend in on-duty sudden cardiac deaths that was observed over the past 10 years. Cardiac-related events accounted for 56 percent of the deaths in 2014.

The number of deaths in this category, however, has fallen significantly since the early years of this study. From 1977 through 1986, an average of 60 firefighters a year suffered sudden cardiac deaths while on duty (44.7 percent of the on-duty deaths during that period). These are cases in which the onset of symptoms occurred while the victim was on-duty and death occurred immediately or shortly thereafter. The average number of deaths fell to 44 a year in the 1990s and to 34 in the past decade. In spite of this reduction, sudden cardiac death still accounted for 44 percent of the on-duty deaths in the last five years. Overall, sudden cardiac death is the number one cause of on-duty firefighter fatalities in the U.S. and with two exceptions (1984 and 2013), has accounted for the single largest share of deaths in any given year.

NFPA has several standards that focus on the health risks to firefighters. For example, NFPA 1582, *Standard on 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, *Standard on Fire Department Occupational Safety and Health Program*, calls for fire departments to establish a firefighter health and fitness program that meets NFPA
1583, *Standard on Health-Related Fitness Programs for Fire Department Members*, 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.

**Ages of Firefighters**

The firefighters who died in 2014 ranged in age from 21 to 84, with a median age of 52 years. *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. Two-thirds of the firefighters over age 40 who died in 2014, and almost all of those over age 60, died of heart attacks or other cardiac events. It is interesting to note that two of the three deaths of firefighters in their late 20s were due to sudden cardiac events.

*Figure 6 shows death rates by age, using combined career and volunteer firefighter fatality data for the five-year period from 2010 through 2014 and estimates of the number of career and volunteer firefighters in each age group from NFPA’s 2012 profile of fire departments (the mid-year in the range).*§

The lowest death rates were for firefighters under age 40. Their death rate was about half to three-fifths of the all-age average. The rate for firefighters aged 60 and over was three times the average. Firefighters aged 50 and over accounted for half of all firefighter deaths over the five-year period, although they represent one-quarter of all career and volunteer firefighters in the U.S.

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‡ [http://www.healthy-firefighter.org/](http://www.healthy-firefighter.org/)
Fire Ground Deaths

Of the 22 fire ground fatalities, eight were due to sudden cardiac death, seven to asphyxiation or smoke inhalation, five were due to internal trauma and two to burns. Seventeen of the 22 deaths occurred at 15 structure fires, four on four wildland fires and one at a vehicle fire.

Except for 2001 at the World Trade Center and 2013, when an exceptionally high number of firefighters were killed at the scene of fires (19 firefighters on the Yarnell Hill wildland fire and nine in an explosion at a fertilizer plant), deaths on the fire ground have been declining fairly steadily since 1999. The 22 deaths in 2014 match the second lowest total in a single year since NFPA began this study in 1977, and is the third time in the past five years that the total has been below 25.

Figure 7 shows the distribution of the 22 fire ground deaths by fixed property use. The 17 deaths at structure fires include five deaths in three apartment building fires, nine in fires involving one- and two-family dwellings and one death each in fires at a restaurant, an industrial facility and a storage property. One of the dwellings was vacant at the time.

Both double-fatality fires that occurred in 2014 involved apartment buildings. In one of those fires, the two victims were caught in a rapid fire event and suffered fatal burns while operating a hoseline on the upper story of a two-story structure. In the other fire, the two victims were trapped in the basement and died of burns and smoke inhalation. One additional fire in an apartment building also killed a firefighter, who was trapped by rapid fire progress while searching for occupants in the high-rise building.

The remaining nine single-fatality residential fires involved one- or two-family dwellings. Four of the nine firefighters suffered sudden cardiac death at the fire scene – one during interior operations, one while pulling a supply line to a hydrant, one while waiting in his mobile water supply apparatus (tanker) to dump water at the scene and one while picking up equipment at the scene after the fire. Three firefighters were lost inside during fire operations and died of smoke inhalation or asphyxiation. Two firefighters fell through floors into basements – one died of smoke inhalation and the other of traumatic injuries.

In the remaining structure fire deaths, a firefighter suffered a fatal cardiac event while ventilating the roof of a restaurant; another suffered a fatal cardiac event at a fire in an industrial property and the third was killed when the roof collapsed during a fire in a storage facility.

None of the structures in which firefighters died was reported to have had an automatic fire suppression system.
Among the nonstructure fire deaths, four firefighters died at separate wildland fire incidents – sudden cardiac death claimed two lives, one firefighter was killed in an aircraft crash and one firefighter fell and was fatally injured while at a fire camp during a wildland fire. One firefighter was struck by a passing vehicle on a highway at the scene of a motor vehicle fire.

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 2009 through 2013 (the 2014 results are not yet available) and from the updated firefighter fatality data for the corresponding years. The results are shown in Figure 8.

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 manufacturing, public assembly, storage and mercantile properties, are more hazardous to firefighters, on average. There were 10.4 fire ground deaths per 100,000 nonresidential structure fires from 2009 through 2013, compared to 2.7 deaths per 100,000 residential structure fires. The highest death rates over the five-year period occurred in manufacturing properties. The very high rate over this time period is largely influenced by the fertilizer plant fire in 2013 that killed nine firefighters. The low rate in educational properties over that five-year period may reflect the fact that these occupancies are among the most regulated, most-protected 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 rate in that five-year period for stores/offices and storage properties, which includes garages at dwellings, reflects the relatively small number of fatalities that have occurred in such structures in recent years. The rate for health care and correctional properties is the 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 2005 through 2014, there were 20 deaths in 17 fires in vacant buildings and buildings under demolition or renovation.

**Vehicle-Related Deaths**

In 2014, 12 firefighters died in vehicle-related incidents, including nine firefighters who died in single-fatality vehicle crashes. Three other firefighters were struck and killed by vehicles.

Two of the vehicle crashes involved aircraft. One of these occurred during a routine fire patrol over a wildland area when the aircraft struck trees on a ridge line under a low cloud ceiling with reduced
visibility. The other aircraft crash occurred during wildland fire operations when the aircraft, making its second fire retardant drop, possibly struck a tree with its wing. Visibility was good at the time but there was smoke in the area. Both crashes are being investigated by the National Transportation Safety Board (NTSB) but the final reports have not yet been released.

Five of the seven firefighters who died in road crashes were killed while responding to incidents and one was killed while returning from an incident. Three were responding to structure fires, one to a grass fire, one to a motor vehicle crash and another was returning from a structure fire.

- A chief responding to a motor vehicle crash in his fire department vehicle hit a patch of ice on a curve in the road and slid into a ditch. He was wearing his seatbelt and was not ejected.
- A chief responding to a grass fire was driving his department's mobile water supply apparatus (tanker) when he swerved to avoid another vehicle but struck that vehicle, which caused his truck to tip over and slide down the highway. The other vehicle was another responding fire apparatus that was trying to make a U-turn after missing the turnoff. The victim was not wearing a seatbelt and was not ejected.
- A firefighter driving a mobile water supply apparatus to a house fire swerved to avoid a head-on collision, went off the right side of the road and overturned. There were no details reported on seatbelt use or ejection.
- A fire chief who was a full-time law enforcement officer was responding to a house fire in his public safety vehicle when he lost control of the vehicle, ran off the road and overturned. He was not wearing a seatbelt and was ejected.
- A firefighter driving a mobile water supply apparatus to a structure fire struck a logging truck head-on. He was not ejected. There were no other details about the crash or seatbelt use.
- The firefighter who died in a crash while returning from a structure fire was driving a pumper when he ran off the road on a curve, overcorrected and overturned. He was not wearing a seatbelt and was partially ejected. Careless operation was cited as a cause in the crash; he was not speeding.

In the final crash, a fire chief was returning to his station with a pumper that had just been serviced when the drive train failed and the pumper collided with a pickup truck on a highway. The chief and the five occupants of the pickup died in the fiery crash. He was wearing a seatbelt. The recently-completed repairs were not related to the drive train failure.
Of the seven firefighters mentioned above who died in road vehicle crashes, three were not using seatbelts (two were ejected or partially ejected and one was not), two were using seatbelts and were not ejected and no details on seatbelt use were reported for two victims (one of whom was not ejected). Factors reported in the crashes included weather conditions and careless operation.

Three firefighters were struck and killed by vehicles.

- One firefighter was checking on victims at a motor vehicle crash on an icy highway overpass when a passing vehicle lost control and struck him, causing him to fall more than 50 feet (15 meters) to the roadway below. Actions of the driver, the weather, inadequate protection of the highway work area and inadequate traffic management were cited as factors in the death.
- A firefighter was struck on a highway at the scene of a motor vehicle fire by a passing tractor-trailer truck. The emergency lights of the fire apparatus were operating at the time, but no other details about the incident were available.
- A firefighter searching along railroad tracks for a missing person was struck by one of two trains that passed simultaneously.

NFPA publishes several standards related to road and vehicle 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 and Emergency Services 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, Maintenance, Testing, 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.
- **NFPA 1906, Standard for Wildland Fire Apparatus**, establishes minimum design, performance and testing requirements for new vehicles over 10,001 lb. gross vehicle weight.
(4,500 kg) rating that are specifically designed for wildland fire suppression.

- **NFPA 1091, Standard for Traffic Control Incident Management Professional Qualifications**, just published in 2015, identifies the minimum job performance requirements necessary to perform temporary traffic control duties at emergency incidents on or near an active roadway.

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. This includes 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 remain seated and must not release or loosen their seatbelts for any reason while the vehicle is in motion. In related efforts, the USFA has an excellent [website](http://www.usfa.fema.gov/operations/ops_vehicle.html) with resources on emergency vehicle and roadway operations safety.

The focus of vehicle safety programs should not be exclusively on fire department apparatus, since, over the years, private 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 and Emergency Services Vehicle Operations Training Program*, also requires training for those using privately-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 personal protective clothing (turn-out gear) when directly exposed to flames, heat and

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¹ [http://www.usfa.fema.gov/operations/ops_vehicle.html](http://www.usfa.fema.gov/operations/ops_vehicle.html)
hazardous material. NFPA 1500 requires firefighters working on traffic assignments where they are endangered by motor vehicle traffic to wear clothing with 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."††

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 34 deaths of volunteer firefighters while on-duty in 2014 is the second lowest total for volunteers and well below the annual average of 44 deaths per year. It is the third time in the past five years that the total has been below 40 deaths. Overall, the number of deaths of volunteer firefighters while on duty has followed a general downward trend since 1999. The 23 deaths of career firefighters marks the fifth consecutive year that the total has been at or below 25. The trend for career firefighters has been relatively flat over the past 10 years, except for a spike in 2007 due to a single nine-fatality incident.

A breakdown of the fatality experience of the 57 career and volunteer firefighters killed in 2014 is shown in Table 1.

Intentional Fires and False Calls

Two firefighters were killed at the scene of an intentionally-set fire in an apartment building in 2014. From 2005 through 2014, 40 firefighters (5.0 percent of all on-duty deaths) died in connection with intentionally-set fires, either at the fire or while responding to or returning from the fire. The number of these deaths annually has been dropping since 1985.

In 2014, one death resulted from a false call. Over the past 10 years, 14 firefighter deaths have resulted from false calls, including malicious false alarms and alarm malfunctions.

†† http://www.respondersafety.com/MarkedAndSeen.aspx
Summary

There were 64 on-duty firefighter deaths in 2014. This is the third time in the past four years that the total has been below 65. (In 2013, there were 97 deaths, with 32 occurring in just three incidents.) From 1995 through 2008, the average number of on-duty deaths each year was in the low 100s. Since 2008, however, the 10-year average has been dropping steadily and now stands at 83 deaths per year.

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.

The International Association of Fire Fighters alone reported almost 100 firefighter cancer deaths in 2014. NIOSH undertook a multi-year study to examine the cancer risk of firefighters, using health records of approximately 30,000 current and retired career firefighters from three large city fire departments to look at mortality and cancer incidents. A follow-up study looked at exposure-response among 20,000 firefighters from the same fire departments. Results of the first phase, which reported evidence of a relationship between firefighting and cancer, were published in October, 2013.‡‡ Results of the second study, published in 2015, showed a causal relationship between firefighting and lung cancer and leukemia.§§

In spite of the sustained decline in on-duty fatalities over the past several years, sudden cardiac death continues to claim a major share of the on-duty deaths annually – more than half of the deaths in 2014, and the highest number since 2008.

Deaths in road vehicle crashes, often the second most frequent cause of on-duty firefighter fatalities, continued low in 2014. With seven fatalities in seven crashes, this is the second lowest number of crashes and crash deaths over the past 30 years. Importantly, none of the deaths in 2014 involved privately-owned vehicles, the first time that has been the case since 1983.

In 2014, no on-duty suicides were reported. Firefighter behavioral health is a topic that has garnered considerably more attention in recent years, particularly due to the efforts of the Firefighter Behavioral Health Alliance.*** The Alliance recently produced a report on behavioral health and suicide prevention that was published by the National Volunteer Fire Council, with support from USFA. NFPA

‡‡ http://www.cdc.gov/niosh/firefighters/pdfs/OEM_FF_Ca_Study_10-2013.pdf
*** http://www.ffbha.org/
1500 requires access to a behavioral health program that provides assessment, counseling and treatment for such issues as stress, anxiety, and depression.†††

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.

Credits

This study is made possible by the cooperation and assistance of the United States fire service, the Public Safety Officers’ Benefits Program of the Department of Justice, CDC’s National Institute for Occupational Safety and Health, the United States Fire Administration, the Forest Service of the U.S. Department of Agriculture, and the Bureau of Indian Affairs and the Bureau of Land Management of the U.S. Department of the Interior. The authors would also like to thank Carl E. Peterson, retired from NFPA’s Public Fire Protection Division and Thomas Hales, MD, MPH, of CDC-NIOSH, for their assistance on the study.

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. The Dale Long PSOB Improvements Act of 2012 expands the Hometown Heroes Act to include vascular ruptures.

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 $339,310, tax free.

A decedent’s spouse and minor children are the first eligible beneficiaries for PSOB Program purposes. 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; if the officer is not survived by a parent, the benefit may be paid to the officer’s children who would be eligible to receive it but for their age (i.e., adult children).

**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, 2014, the maximum benefit a student may receive is $1,018 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 be filed online as well at: https://www.psob.gov. Please note that the PSOB Office “Call Center” is available to take calls Monday through Friday from 7:00 AM until 5:00 PM ET.
Table 1
Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2014*

<table>
<thead>
<tr>
<th>Type of duty</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Deaths</td>
<td>Percent of Deaths</td>
</tr>
<tr>
<td>Operating at fire ground</td>
<td>10</td>
<td>43 %</td>
</tr>
<tr>
<td>Responding to or returning from alarms</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Operating at non-fire emergencies</td>
<td>2</td>
<td>9 %</td>
</tr>
<tr>
<td>Training</td>
<td>4</td>
<td>17 %</td>
</tr>
<tr>
<td>Other on-duty</td>
<td>7</td>
<td>30 %</td>
</tr>
<tr>
<td>TOTALS</td>
<td>23</td>
<td>100 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause of fatal injury</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Deaths</td>
<td>Percent of Deaths</td>
</tr>
<tr>
<td>Overexertion/stress/other related</td>
<td>10</td>
<td>43 %</td>
</tr>
<tr>
<td>Rapid fire progress/explosion</td>
<td>5</td>
<td>22 %</td>
</tr>
<tr>
<td>Motor vehicle crash</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Structural collapse</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Struck by vehicle</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Lost inside structure</td>
<td>3</td>
<td>13 %</td>
</tr>
<tr>
<td>Fell</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Exposed to electricity</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Influenza</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Struck by object</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>TOTALS</td>
<td>23</td>
<td>100 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of fatal injury</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Deaths</td>
<td>Percent of Deaths</td>
</tr>
<tr>
<td>Internal trauma/crushing</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Sudden cardiac death</td>
<td>10</td>
<td>43 %</td>
</tr>
<tr>
<td>Asphyxiation (including smoke inhalation)</td>
<td>8</td>
<td>35 %</td>
</tr>
<tr>
<td>Burns</td>
<td>2</td>
<td>9 %</td>
</tr>
<tr>
<td>Stroke/cerebral hemorrhage</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Influenza</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>Electrocution</td>
<td>1</td>
<td>4 %</td>
</tr>
<tr>
<td>TOTALS</td>
<td>23</td>
<td>100 %</td>
</tr>
</tbody>
</table>
### Table 1
Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2014* (Contd.)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Deaths</td>
<td>Percent of Deaths</td>
</tr>
<tr>
<td>Firefighter</td>
<td>11</td>
<td>48 %</td>
</tr>
<tr>
<td>Company Officer</td>
<td>8</td>
<td>35 %</td>
</tr>
<tr>
<td>Chief Officer</td>
<td>4</td>
<td>17 %</td>
</tr>
<tr>
<td>TOTALS</td>
<td>23</td>
<td>100 %</td>
</tr>
</tbody>
</table>

### Ages of Firefighters

#### All deaths

<table>
<thead>
<tr>
<th>Age</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 to 25</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>26 to 30</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>31 to 35</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>36 to 40</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>41 to 45</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46 to 50</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>51 to 55</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>56 to 60</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>61 to 65</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Over 65</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>TOTALS</td>
<td>23</td>
<td>34</td>
</tr>
</tbody>
</table>

#### Sudden cardiac deaths only

<table>
<thead>
<tr>
<th>Age</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 to 30</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>31 to 35</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>36 to 40</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>41 to 45</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>46 to 50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>51 to 55</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>56 to 60</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>61 to 65</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Over 65</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10</td>
<td>22</td>
</tr>
</tbody>
</table>
### Table 1
Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2014* (Cont’d.)

<table>
<thead>
<tr>
<th>Fire ground deaths by fixed property use</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Deaths</td>
<td>Percent of Deaths</td>
</tr>
<tr>
<td>Dwelling and apartments</td>
<td>10</td>
<td>100 %</td>
</tr>
<tr>
<td>Storage</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Vacant dwelling</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Restaurant</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Vehicle fire</td>
<td>0</td>
<td>0 %</td>
</tr>
<tr>
<td>Wildland fire</td>
<td>0</td>
<td>0 %</td>
</tr>
</tbody>
</table>

TOTALS                                  | 10                  | 100 %                  | 10               | 100 %            |

<table>
<thead>
<tr>
<th>Years of service</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or less</td>
<td>0</td>
<td>0 %</td>
<td>6</td>
<td>18%</td>
</tr>
<tr>
<td>6 to 10</td>
<td>5</td>
<td>22 %</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>11 to 15</td>
<td>6</td>
<td>26 %</td>
<td>4</td>
<td>12%</td>
</tr>
<tr>
<td>16 to 20</td>
<td>2</td>
<td>9 %</td>
<td>4</td>
<td>12%</td>
</tr>
<tr>
<td>21 to 25</td>
<td>3</td>
<td>13 %</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>26 to 30</td>
<td>3</td>
<td>13 %</td>
<td>6</td>
<td>18%</td>
</tr>
<tr>
<td>Over 30</td>
<td>4</td>
<td>17 %</td>
<td>11</td>
<td>32%</td>
</tr>
</tbody>
</table>

TOTALS                                  | 23                  | 100 %                  | 34                 | 100 %            |
Table 1
Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2014* (Cont’d.)

<table>
<thead>
<tr>
<th>Attributes of fire ground deaths**</th>
<th>Career Firefighters</th>
<th>Volunteer Firefighters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentionally-set fires</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Search and rescue operations</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Motor vehicle crashes</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>False alarms</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* This table does not include the seven victims who were employees or contractors with state land management agencies, or members of a military fire department or an industrial fire department.

** Because these attributes are not mutually exclusive, totals and percentages are not shown.
Figure 1
On-Duty Firefighter Deaths - 1977-2014

Figure 2
Firefighter Deaths by Type of Duty - 2014

* excluding the 340 firefighter deaths at the World Trade Center in 2001
Figure 3
Firefighter Deaths by Cause of Injury - 2014

- Overexertion/stress/medical (58%)
- Structural collapse (3%)
- Crashes (14%)
- Lost inside (5%)
- Rapid fire progress/explosion (8%)
- Struck (6%)
- Exposed to electricity (2%)
- Fell (5%)
- Other (5%)

Figure 4
Firefighter Deaths by Nature of Injury - 2014

- Sudden cardiac death (56%)
- Asphyxiation/smoke inhalation (14%)
- Burns (3%)
- Internal trauma (22%)
- Other (5%)
Figure 5
Firefighter Deaths by Age and Cause of Death
2014

![Figure 5 Diagram](image)

Number of Deaths

- Not sudden cardiac death
- Sudden cardiac death

Age Group

- 21-25
- 26-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56-60
- Over 60

Figure 6
On-Duty Death Rates per 10,000 Career and Volunteer Firefighters -- 2010-2014

![Figure 6 Diagram](image)

Average Death Rate

Death Rate per 10,000 Firefighters

Share of firefighters

<table>
<thead>
<tr>
<th>Age Group</th>
<th>16-19</th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60 and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>3.3%</td>
<td>21.1%</td>
<td>26.3%</td>
<td>25.3%</td>
<td>17.3%</td>
<td>6.7%</td>
</tr>
</tbody>
</table>
Figure 7
Fire Ground Deaths by Fixed Property Use*

* There were 22 deaths on the fire ground in 2014.

Figure 8
On-Duty Fire Ground Deaths per 100,000 Structure Fires -- 2009 - 2013
Figure 9
Career and Volunteer Firefighter Deaths
1977 - 2014*

*excluding the 340 firefighter deaths at the World Trade Center in 2001
2014 Selected Firefighter Fatality Incidents

Fireboat maintenance

On January 6, a firefighter with 20 years of service and assigned to the marine unit was working his regular shift. The 62-year-old firefighter, dressed in multiple layers of clothing to keep warm, was winterizing the fire/rescue boats and a barge for the extremely cold weather. The fire/rescue boats were trailered and a barge served as their fire station at the marina.

Shortly after midnight, the firefighter, who suffered from diabetes, developed difficulty breathing and called 911. Firefighters and paramedics arrived to find him in cardiac arrest. They immediately began medical assistance and transported him to a nearby medical facility. He was subsequently transferred to a hospital in critical condition where he remained until he died eight days later from a myocardial infarction.

Incendiary apartment house fire

On January 26, an engine company arrived at the scene of a fire in an occupied six-unit apartment building. The company was staffed with a fire officer and three firefighters and arrived approximately six minutes after dispatch. The original building was Type III construction built in 1877, but several additions were added at an unknown date using Type IV construction.

The officer and two firefighters placed a ladder to a second-story apartment window and advanced their 1.75-inch (44-millimeter) uncharged hoseline up the ladder and into the window five minutes after arriving on scene. The crew advanced the hoseline into the hallway, passing another engine company as it entered the building using a door from a small deck on the roof of one of the additions. The crew then headed down a hallway in zero visibility. The officer requested his hose line be charged with water, and the firefighter on the nozzle began directing the stream towards the ceiling. The second engine company that was near the doorway also began spraying water onto the flames and thick, acrid black smoke along the ceiling.

Five minutes after entering the second floor, a dramatic fire event occurred, resulting in three maydays called from the engine company. The first mayday was from a firefighter on the hoseline. Ten seconds later, a second mayday was called by the officer, who was able to back out of the door near the backup line and second engine company. The third mayday was called less than a minute later by one of the firefighters on the hoseline. The incident commander immediately called for additional resources and acknowledged and began managing the mayday.

A dedicated rapid intervention team was deployed to the second floor and located the first firefighter and removed him from the structure within 14 minutes after the first mayday. The second firefighter was located and removed from the building 24 minutes after the mayday was called. The firefighters were transported to the hospital where they both died. The cause of death for both was thermal burns and carbon monoxide exposure. Rapid fire progression was reported as preventing their escape. During the rapid fire development on the second story, the backup firefighter’s radio was keyed up, but there was no transmission.
One of the firefighters was 42 years old with 16 years of service. The second firefighter was 31 with four months of service on this fire department and 10 years with another. The fire was determined to be incendiary and the owner of the property was arrested and is awaiting trial.

NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201402.html.

Airplane crash

On January 31, a pilot scheduled to fly a routine fire detection route called in sick. A back-up pilot with eight years of service was called on the morning of the flight. He agreed to fly the route using a single-engine aircraft registered to and operated by the state forestry commission. The back-up pilot arrived at the airport at noon to check the weather and preflight the airplane.

At 12:40 p.m., the pilot began his fire detection flight using a predetermined flight route. He reported his flight progress to the dispatch center that monitored his approximate location. At 1:11 p.m., the pilot reported his location to the dispatch. This would be the last radio transmission from the pilot.

After not hearing from the pilot for 30 minutes, dispatch attempted to contact him. Not succeeding, dispatch notified the Federal Aviation Administration’s Flight Service Station and the Air Force Rescue Coordination Center of an overdue airplane.

Due to the rugged terrain and weather hampering the rescue operations, the crash site was not located for 11 days. It took another day to cut a roadway through three miles of thick forest from the main road to the crash site. Evidence showed that the airplane struck trees on a ridgeline before impacting the ground. A section of the left wing was found on top of the ridgeline. The cause of death was reported as multiple injuries due to the aircraft crash.

The National Transportation Safety Board is investigating the cause of the crash.

Struck by motor vehicle

On the evening of February 10, the fire department received approximately 650 calls to respond to motor vehicle crashes due to the inclement weather. The weather at the time included cloudy conditions with light precipitation, fog, and temperatures dropping below freezing. At 8 p.m., the fire department responded with a complement of two pumpers, one ladder truck, and one rescue vehicle to the overpass of the highway complex.

A 40-year-old firefighter with 14 years of service arrived on the first piece of apparatus. He was assisting a stranded motorist whose car had crashed into bridge barrier walls. The firefighter crossed over a protective barrier when he was struck by another vehicle. The firefighter, dressed in a turn-out coat, trousers, boots, and helmet, was thrown from the overpass and fell 56 feet (17 meters) below onto an underpass. Blunt force trauma from the fall was listed as the cause of death.
Contributing factors leading up to the incident were icy weather conditions, inadequate scene/traffic management, a firefighter operating in an unprotected zone, and an inattentive motorist.

The National Institute of Occupational Safety and Health has investigated this incident but as of this writing has not yet published its report.

**Balcony collapse**

On February 22 at 4:41 a.m., the fire department was notified by a 911 call for a roof collapse at a student housing complex that the university built in 1956. The fire alarm dispatched a full first alarm assignment supplemented by a special additional assignment for more equipment and firefighters. The first company on-scene had a crew of a lieutenant and two firefighters. The officer and one of the firefighters walked around the structure and reported that nothing was showing and requested a verification on the address.

The two-story building of ordinary construction contained 12 apartments, six on each level, all accessible from the outside. The second level apartments were accessible from an open balcony that had a flight of exterior stairs on either end of the building. Eighteen people lived in the apartments at the time of the incident.

The fire alarm verified the address and the apartment the call had come from. The lieutenant and the firefighter, accompanied by a university police officer, went up exterior stairs to the second story balcony. The firefighter and police officer stopped to talk to the occupants of one apartment while the lieutenant continued walking along the balcony, banging on doors as he headed to the other end of the building.

The second firefighter who stayed with the apparatus noticed what appeared to be gravel or rocks falling from under the balcony. The firefighter, understanding what was happening, jumped from the apparatus and yelled at the lieutenant to get off the balcony because it was going to collapse. At that moment, the firefighter and the police officer heard a loud bang and saw the balcony progressively collapsing toward them. All three saw the lieutenant fall and land on his back. The balcony then fell from the wall onto the lieutenant.

The balcony was 4 inches (100 millimeters) thick and was constructed of a 1.5-inch (38-millimeter) painted metal form deck with 2.5 inches (64 millimeters) of concrete, supported on a steel ledger angle attached to the building and a 9-inch (230-millimeter) painted steel channel beam along the outer edge. The collapse occurred when the outer edge of the balcony failed, causing the balcony to swing down like a pendulum, strike the building and then fall away from the building and onto the lieutenant.

The firefighter and police officer ran back down the stairs to the lieutenant. First aid was started immediately after he was extricated. He was transported to a hospital where he was pronounced dead. The cause of death was traumatic compressional asphyxia. NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201407.html.
Air management training

On March 7, the 51-year-old fire captain, fully dressed in his personal protective equipment including his self-contained breathing apparatus, participated in the fire department’s rules of air management training. The training required the fire captain to carry a 50-foot (15-meter) section of 2.5-inch (64-millimeter) hose up five stories, back down to the ground level, and then repeat it with his crew.

The captain, who had 19 years of service, collapsed within a minute of completing the second climb. A nearby firefighter reacted immediately and found the captain with a pulse and rapid breathing but not responsive. The firefighter made a radio request for an ambulance and additional assistance as his crew carried the captain into an apparatus bay.

A cardiac monitor attached to the captain revealed ventricular tachycardia (a heart rhythm incompatible with life) and cardiopulmonary resuscitation and advanced life support (ALS) were started. ALS consisted of defibrillation, oxygen administration via bag-valve-mask, and cardiac resuscitation medications delivered via the intraosseous route. The captain was shocked four times while en route to a hospital emergency department. Although his pulse returned briefly, he never regained consciousness. After two and a half hours of extensive efforts, the captain was pronounced dead. The cause of death was listed as hypertensive and atherosclerotic cardiovascular disease.

NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201410.html.

Establishing a water supply

On April 21 at 11 p.m., the county 911 center received a call for a fire in a vacant single-family residence. The fire department with mutual aid was immediately dispatched. At 11:11 p.m., the first piece of apparatus, a pumper, arrived and was positioned directly in front of the building. Shortly afterward, a mobile water supply apparatus (tanker) arrived at the scene and established water supply to the pumper. Firefighters made an initial attack to the exterior wall and the front entry area.

The chief observed the heat and smoke conditions building up inside and ordered everyone out of the building and to change from an offensive to defensive mode. The chief also observed that the tanker’s water supply was getting low. He grabbed the 4-inch (100-millimeter) supply hose and started to drag it towards the nearest fire hydrant that was 300 feet (100 meters) away. The tanker operator also began dragging the supply line, but was ordered by the chief to connect the line to the pumper. After connecting the supply hose to the pumper, the tanker operator radioed the chief to let him know that he was ready for the water. The chief did not respond. After two or three more attempts on the radio, the firefighter went to assist the chief and found him collapsed at the hydrant.

Firefighters on scene immediately began cardio-pulmonary-resuscitation, and the chief was flown by helicopter to a hospital where medical staff was unable to resuscitate him. The cause of death was listed as atherosclerotic and hypertensive cardiovascular disease. Contributing factors were diabetes and obesity.
Training exercise

On May 30 at 6 a.m., a 58-year-old firefighter arrived at the station and started his shift at 7 a.m., participating in routine station and apparatus maintenance. He and another crew member began cutting the grass using a push mower, but he was interrupted by a response to a medical call. The call was so minor that the firefighter was not required to leave his chauffeur’s position on the apparatus. On returning to the station, he and the other firefighter finished cutting the grass, which took approximately half an hour.

At 1 p.m., the firefighter and his crew went to the training academy to participate in the annual physical ability test. There were eight untimed tasks to accomplish in the physical ability test, including the tire drag, wall climb, hose drag, carrying a high-rise pack to the roof and hoisting/lowering a high-rise pack, ground ladder extension, ceiling push/pull (simulating overhaul), tower climb, and crawl. The firefighter was the first to do the tasks, completing them in about nine minutes. He joked and mingled with his crew, exhibiting no physical distress. The weather at this time was 69 degrees Fahrenheit (21 degrees Celsius), with 59 percent humidity.

At approximately 2 p.m., the firefighter and a fellow crew member started the maze exercise. The maze was constructed of several obstacles and was built in a large metal shipping container. The firefighters were to navigate the course in full protective clothing including their self-contained breathing apparatus (SCBA). About eight minutes into the course, the firefighter started breathing heavily and removed his SCBA regulator. The crewmate asked him how he was doing. He stated that he had to take a break and sit down. They continued a short distance toward a set of stairs. The crewmember helped the firefighter up the stairs to a platform where he collapsed.

The crewmember banged on the metal walls of the container, alerting the rest of the company members. The firefighter was removed from the container and was immediately attended to by an ambulance crew who were also training at the academy. A cardiac monitor placed on the firefighter showed ventricular fibrillation. The firefighter was defibrillated; an intravenous line was inserted and cardiac resuscitation medications administered. The firefighter was transported to a hospital where the staff worked on him for an additional 28 minutes without success and he was pronounced dead. The cause of death was listed as atherosclerotic cardiovascular disease.

An autopsy showed severe coronary artery atherosclerosis, cardiomegaly, and left ventricular hypertrophy.

NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201420.html.

Pack test

On May 17, a 63-year-old wildland fire crew supervisor was performing a work capacity test (more commonly known as a pack test) to get his red card. Passing the pack test would certify the individual to perform fire suppression on private, state, and federal wildland property. The work capacity test requires an individual to complete a three-mile walk within 45 minutes while wearing a 45-pound (20-kilogram) weighted vest.
After four laps around the track (approximately one mile or 1.6 km), the supervisor grabbed his left leg and collapsed. He was found unresponsive, not breathing, and with a faint pulse. His pulse stopped a few seconds later. An ambulance was requested and cardiopulmonary resuscitation started. Breathing with a weak pulse returned, but only briefly. An automated external defibrillator (AED) was brought from the vehicle of a responding police officer. The AED did not work, so another was brought to the scene by the local fire department. One shock was administered approximately 11 minutes after the supervisor’s collapse, with no change to his condition.

The ambulance arrived with paramedics who provided advanced life support including defibrillation, intubation, and intraosseous line placement. They administered two additional shocks while transporting the supervisor with still no change in his condition. Cardiopulmonary resuscitation and advanced life support continued for 11 minutes in the emergency department at the hospital until he was pronounced dead.

The death certificate listed the cause of death as an acute myocardial infarction caused by hypertension, type II diabetes mellitus, and morbid obesity. Investigators concluded the physical exertion associated with the pack test initiated a probable myocardial infarction and his sudden cardiac death.

NIOSH investigated this incident and offers recommendations at www.cdc.gov/niosh/fire/reports/face201413.html

Apparatus crash

On June 19, the 43-year-old fire chief with 27 years of service picked up the pumper at a repair shop and was driving it back to his fire station. The shop had performed work on the pumper’s water system. It was approximately 9 p.m. and the fire chief was driving at an estimated speed of 55 miles per hour (89 kilometers per hour). The roadway was posted for 60 miles per hour (97 kilometers per hour) for commercial vehicles.

The front drive train broke, and the chief lost control of the pumper. One of the wheels on the vehicle locked up, causing it to turn in a counter clockwise direction. The pumper crossed the dividing line of the highway into the path of an oncoming pickup truck. The driver of the pickup veered to the right but was unable to avoid crashing into the pumper at the edge of a ditch. The front of the pick-up collided with the passenger side of the fire apparatus near the vehicle’s diesel fuel tank, which ruptured as a result. Multiple callers reported a “fire engine” explosion. Both vehicles came to a rest in the ditch. The pumper came to a stop on its roof with the fire chief trapped inside. He was using a shoulder and lap safety belt. The pickup came to a rest in front of the pumper. Both vehicles became fully involved in the fire.

The pickup truck contained a family of five: a 29-year-old man, a 29-year-old woman, and their three children, a four-year-old boy and three-year-old twins, a boy and a girl. All were killed by blunt force trauma on impact. The adults were wearing seatbelts and the children were not. All three children were ejected from the pick-up. The fire chief died from smoke inhalation and thermal injuries. The repairs that had been completed on the pumper were not related to the drive train failure.
Returning from a fire

On June 30, a fire captain who had just participated in extinguishing a residential structure fire refilled the 1,000-gallon (3,785-liter) water tank on the fire apparatus and was driving the apparatus back to the fire station on a two-lane highway. The 52-year-old fire captain with 30 years of service had just exited a slight right-hand curve and went off the right side of the highway. He navigated the apparatus back onto the roadway but overcorrected the vehicle, causing it to spin counter clockwise and slide off the left side of the road. The apparatus rolled over, hitting trees before coming to a stop on its roof. The captain, not wearing any restraints, was partially ejected and was partially pinned under the vehicle. He died from his injuries while fellow firefighters attempted to extricate him. Weather conditions were good and it was estimated that he was driving within the speed limit. The cause of death was listed as trauma.

Electrocution

A local fire department was approached in mid-August by a university marching band to participate in an “Ice Bucket Challenge” fund-raising event on campus. The socially conscious fire department agreed to the request as it had in the past with other organizations. The event was scheduled for August 20 but was postponed to the following day due to a thunderstorm. The day of the event was clear and sunny, with temperatures in the 90s and a calm wind.

On August 21 at 10:30 a.m., a detail of two fire captains and two firefighters arrived at the campus on a 95-foot (29-meter) aerial platform apparatus. After meeting with university personnel, a site was selected for the event, which involved using the apparatus to hover over a number of students while spraying them with water from a fog nozzle. The fire personnel conducted a safety briefing, noting the location of the hydrant, trees, and power lines. The fire personnel set up the apparatus by extending the stabilizers, elevating and rotating the platform 90 degrees off the right side of the apparatus, and connecting the hose to a water supply. One of fire captains and one of the firefighters were in the bucket of the aerial platform during the event.

Students left the area after they were doused by the fog nozzle and the challenge was completed. The fire personnel began preparing to get the platform back into service. The fire personnel in the bucket raised it too high, however, and the captain came in direct contact with a 69kV power line, causing a large arc. The firefighter then came into contact with the power line, causing a second arc, and the captain came in contact a second time, causing a third arc.

The captain stationed on the ground was on the apparatus when contact was made and was able to jump free and was not injured. The firefighter on the ground was pulling the safety pin on the front driver’s side stabilizer when he felt pain in his legs and back and was forced back away from the apparatus. He radioed dispatch for help and asked to have the electricity shut off. Once the electricity was shut off, he lowered the bucket.

Additional help arrived and the fire captain and firefighter who were on the ground as well as the firefighter in the bucket were sent to a hospital. The captain and firefighter that were on the ground were held for observation and later released. The firefighter who was in the bucket sustained moderate to severe burns and remained in the hospital for nearly one month. The captain who was in the bucket was airlifted to a level-1 trauma center due to the severity of his injuries. He sustained full-thickness burn
injuries to more than half of his body. He died 31 days later, after undergoing numerous skin grafts, being placed on dialysis due to a decrease in his kidney function, multiple organ failures, and severe sepsis.

**Influenza**

On October 24, a 39-year-old fire captain with 13 years of service was detailed to an out-of-state hazardous-material training exercise. He was late for class and an instructor went to his hotel to check on him. At the hotel, the instructor learned that the captain wasn’t feeling well. The fire captain was transported to the hospital where his condition worsened. On October 27, the fire captain died as a result of influenza.