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## **Abstract**

In 2007, a total of 102 on-duty firefighter deaths occurred in the U.S. This is a sharp increase over the 89 firefighter fatalities that occurred in 2006, but returns to the long-term trend of close to 100 on-duty deaths annually. The largest share of deaths (36 deaths) occurred on the fire ground. Stress, exertion, and other medical-related issues, which usually result in heart attacks or other sudden cardiac events, continued to be the leading cause of fatal injury. Of the 40 stress-related fatalities in 2007, 38 were classified as sudden cardiac deaths.

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

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## 2007 Experience

In 2007, a total of 102 on-duty firefighter deaths occurred in the U.S. This is a sharp increase over the 89 firefighter fatalities that occurred in 2006, but returns to the long-term trend of close to 100 on-duty deaths annually.<sup>1</sup> Figure 1 shows firefighter deaths for the years 1977 through 2007, excluding the 340 firefighter deaths at the World Trade Center in 2001.

Of the 102 firefighters who died while on duty in 2007, 53 were volunteer firefighters, 42 were career firefighters, four were employees of state land management agencies, one was an employee of a federal land management agency, one was a contractor with a federal land management agency, and one was a member of an industrial fire brigade. This is the largest number of career firefighters to be killed in a single year since 1989 (not including the deaths at the World Trade Center in 2001). The average number of on-duty career firefighter deaths had been approximately 30 over the previous 10 years.

In 2007, there were seven multiple-fatality incidents -- the most severe of which resulted in the deaths of nine career firefighters. This incident in Charleston, South Carolina, is described in the accompanying sidebar. The other six multiple-fatality incidents were all double-fatality incidents. Two firefighters were killed in a tanker (water tender) crash while responding to a fire; two in a gas explosion; and eight were killed while operating inside at four separate structure fires. More details will be presented throughout this article.

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.<sup>2</sup> A 10-year analysis showing trends in highway vehicle crashes is included. Finally, the study presents summaries of individual incidents that illustrate important problems or 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; while responding to or returning from an alarm; while 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 victims include 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 firefighter on-duty 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. 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 102 deaths by type of duty. Fire ground operations accounted for 36 deaths. That total is the fourth lowest in the past 10 years, the sixth lowest in the 31 years that we've done this study, and also close to the average number of fire ground deaths annually over the past 10 years (not including the deaths at the World Trade Center in 2001). Twenty-two of the victims were career firefighters and twelve were volunteer firefighters.<sup>3</sup> Two of the victims worked for state or federal land management agencies. The higher-than-usual number of career firefighter deaths in this category is accounted for to a large degree by the nine-fatality incident in Charleston. (The average number of career firefighter deaths on the fire ground over the past 10 years is 13 deaths per year.)

There were 30 fatalities while responding to or returning from alarms. It is important to note that not all deaths in this category are the result of crashes. Twenty of the 30 occurred in collisions and rollovers, nine were due to sudden cardiac events or stroke, and one fell off a pumper inside the station after returning from a fire. Twenty-five of the victims were volunteer firefighters, four were career firefighters and one was an employee of a state land management agency. All crashes and sudden cardiac deaths are discussed in more detail later.

Thirteen deaths occurred during training activities. These included four during or while preparing for equipment drills, four while returning home from training programs, two at training classes, two during physical fitness activities or annual testing, and one during live fire training. Three of the victims, including the firefighter killed in the live fire training exercise, were recruits or new hires.

Seven firefighters were killed at non-fire emergencies, including two while investigating a call about an odor of gas, and one each at scenes of a motor vehicle crash, an EMS call, a rescue in a ravine, a hazardous material spill and while attempting to rescue a drowning victim.

The remaining 16 firefighters died while involved in a variety of non-emergency-related on-duty activities. These activities included normal administrative or station duties (11 deaths), preparations for community fire prevention events (two deaths), preparing for a parade (one death), returning to base from a prescribed burn (one death) and flagging at a fire line construction project (one death).

### **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.<sup>4</sup>

Deaths resulting from exertion, stress and other (often medical) issues made up the largest category of fatalities. Of the 40 deaths in this category, 38 were classified as sudden cardiac deaths (usually heart attacks) and two were due to strokes. See the section below for more detail on sudden cardiac deaths.

The second leading cause of fatal injury was being struck by an object or coming into contact with an object. The 32 firefighters killed included 27 in motor vehicle crashes and one struck by a motor vehicle. Those deaths are discussed in more detail in a separate section of this article. Two firefighters were struck and killed by shrapnel in a propane tank explosion. One firefighter was struck by a falling tree while training in the use of a power saw. One firefighter was struck by a wooden canopy that collapsed onto him at a structure fire.

The next leading cause of fatal injury was being caught or trapped, resulting in 23 deaths. Nine of these 23 firefighters were killed in the roof collapse at the Charleston fire. One other firefighter was killed in a roof collapse and one was killed in a wall collapse. Eight firefighters were trapped by fire progress in five structure fires -- five were asphyxiated and three were fatally burned. Three firefighters became lost inside fire-involved structures -- two ran out of air and one was fatally burned. One firefighter became trapped under water and drowned.

Six firefighters were killed in falls -- two through holes burned in floors in structure fires, two off parked apparatus at fire stations, one from the roof of a fire-involved structure, and one from a bridge during extrication operations at a motor vehicle crash.

One firefighter was electrocuted at a grass fire when he came into contact with a downed power line.

### **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. The largest number of fatalities, 38 deaths, were due to sudden cardiac death. The other major categories were internal trauma (29 deaths), asphyxiation (23 deaths) and burns (four deaths). The remaining deaths included two drownings, two due to projectile wounds, two strokes, one electrocution and one due to crushing injuries.

### **Sudden Cardiac Deaths**

Sudden cardiac death is consistently the number one cause of on-duty firefighter fatalities in the U.S., and this was the case again in 2007. Although the number of deaths in this category has fallen since the early years of this study -- from 70 in 1977 to 38 in 2007 -- sudden cardiac death still accounts for close to 40 percent of on-duty deaths annually.

Of the 38 victims of sudden cardiac events in 2007, post mortem medical documentation showed that 10 had severe arteriosclerotic heart disease, five were hypertensive, four were reported to have had prior heart problems -- such as prior heart attacks, bypass surgery or angioplasty/stent placement -- and three were diabetic. (Some of the victims had more than one condition.) Over the past 25 years, post mortem information or other details on the victims' medical histories have been available for 720 of the 1,155 sudden cardiac death victims. Of those 720 victims, 663 (or 92.1 percent) had suffered prior heart

attacks, had severe arteriosclerotic heart disease, had undergone bypass surgery or angioplasty/stent placement, or were diabetic or hypertensive.

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 procedures for screening candidate firefighters and handling health problems that might arise during an individual's fire service career. NFPA 1500, *Fire Department Occupational Safety and Health Program*, calls for fire departments to establish a firefighter health and fitness program based on 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. The National Volunteer Fire Council (NVFC) developed the Heart-Healthy Firefighter Program, launched in 2003, to address heart attack prevention for all firefighters and EMS personnel, through fitness, nutrition and health awareness.

An important part of their 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. The program has screened 8,000 firefighters, both career and volunteer, over the four years of the project for blood pressure, cholesterol, body fat and glucose.

- Cholesterol screening done all four years of the project 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).

- Body fat was only tested in 2005, but of the almost 2,000 firefighters tested that year, 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).

The testing will be offered again this year, with screenings planned for cholesterol, blood pressure and body fat. 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. More information can be found at: [www.healthy-firefighter.org](http://www.healthy-firefighter.org).

### **Ages of Firefighters**

The firefighters who died in 2007 ranged in age from 19 to 78, with a median age of 43.5 years. Figure 5 shows the distribution of firefighter deaths by age and cause of death (sudden cardiac death versus other causes).

The youngest victims of sudden cardiac death were aged 34 (three firefighters). Sudden cardiac death accounts for a higher proportion of the deaths among older firefighters, as might be expected. More than half of the firefighters over age 40 and almost two thirds of those over age 50 who died in 2007 died of heart attacks or other cardiac events.

Figure 6 shows death rates by age, using career and volunteer firefighter fatality data for the five-year period from 2003 through 2007 and estimates of the number of career and volunteer firefighters in each age group from the NFPA's 2005 profile of fire departments (the mid-year in the range).<sup>5</sup>

The lowest death rates were for firefighters in their 20s. Their death rate was less than half the all-age average. Firefighters in their 30s had a death rate approximately two-thirds the all-age average. The rate for firefighters aged 60 and over was close to four times the average. Firefighters aged 50 and over accounted for two-fifths of all firefighter deaths over the five-year period, although they represent fewer than one-fifth of all firefighters.

### **Fire Ground Deaths**

Of the 36 fire ground deaths, 21 were due to asphyxiation, seven to sudden cardiac death, four to internal trauma, three to burns and one to electrocution. This very high number of asphyxiation deaths includes the nine deaths in Charleston.

Figure 7 shows the distribution of the 36 fire ground deaths by fixed property use. Three of the firefighters were killed on wildland fires. This is the lowest number of fire ground deaths on wildland fires since this study began in 1977. Deaths on wildland fires over the past 10 years have averaged over

10 deaths per year. Although the fire-ground-related wildland fire deaths were low in 2007, another four firefighters died while responding to or returning from wildland fires, and three of the training deaths in 2007 were related to training for wildland fire operations.

Operations at vehicle fires resulted in the death of one firefighter.

Seventeen of the 32 firefighter deaths at structure fires occurred in residential properties. Fires in single-family dwellings killed 13 firefighters and fires in apartment buildings killed four firefighters. There were nine deaths in the furniture store in Charleston (described in the accompanying sidebar). Two firefighters were killed in a restaurant fire and two were killed in a building undergoing demolition. There was also one death in a fire in a farm shed and one death at a fire in a detached dwelling garage.

Three of the fires, which resulted in four deaths, had automatic suppression systems. Two of the victims were killed in a high-rise fire where the sprinkler system had been shut off during demolition of the building. One firefighter suffered a fatal heart attack during suppression operations in an apartment building. The sprinklers in the building were in the corridors, but not the apartment units. One sprinkler outside the unit of origin operated. A firefighter fell from the roof of a building with a sprinkler system that operated and was effective in controlling the spread of the 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 2002 through 2006 (the 2007 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 vacant buildings and some nonresidential structures, such as mercantile, public assembly and manufacturing properties, are more hazardous to firefighters, on average. There were 6.4 fire ground deaths per 100,000 nonresidential structure fires from 2002 through 2006, compared to 3.7 deaths per 100,000 residential structure fires. The highest death rates over the five-year period occurred in stores and offices. The low rate in health care/correctional and educational buildings 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 reflects the small number of fatalities that have occurred in such structures in recent years.

## Vehicle-Related Incidents

In 2007, 27 firefighters died in vehicle crashes. In addition to those deaths, one other firefighter was struck and killed by a vehicle.

Nineteen of the 27 firefighters killed in crashes were responding to or returning from incidents when the crashes occurred. All but one were single-fatality crashes.

Ten of these 19 victims were driving their personal vehicles:

- A firefighter driving to the station in response to a motor vehicle crash lost control on black ice, crossed the centerline on the two-lane road and struck an on-coming vehicle head on. He was not wearing his seatbelt and was ejected. Speed was not a factor in this crash.
- A firefighter driving to a fire swerved around a slower vehicle, lost control of his vehicle and it overturned. He was speeding, was not wearing his seatbelt and was ejected.
- A firefighter driving to the fire station in response to a brush fire came over a hill, traveling in the center of the road, swerved to avoid another vehicle that was turning into a driveway, went off the road, overcorrected, spun, struck an embankment, rolled and struck a tree. There were conflicting reports from the police and her family as to whether or not she was wearing her seatbelt. She was not ejected.
- A firefighter responding to a medical call crashed his vehicle. He died of burns and smoke inhalation. No further details are available.
- A firefighter responding in light rain to the station for a mutual aid call lost control on a curve, struck a sign post, utility pole and tree, and overturned. He was speeding, was not wearing his seatbelt and was partially ejected.
- A firefighter responding to a call about a downed power line was killed when he struck a tree that had fallen across the road. He was wearing his seatbelt. No other details are available.
- A firefighter, driving to the station too fast for conditions in response to a wildland fire, failed to negotiate a curve in the road and struck an oncoming vehicle. He was not wearing his seatbelt but was not ejected.
- A firefighter responding to a motor vehicle crash on a rainy and foggy morning lost control of her vehicle on a curve, went off the road and hit a tree. No other details are available.
- Another firefighter responding to a motor vehicle crash was struck at a T-shaped intersection when he failed to stop and yield the right of way before turning onto the main road. He was struck by another vehicle whose driver could not stop in time to avoid him. He was not

wearing a seatbelt and was ejected. Driver inattention was also cited as a factor in the crash.

- A firefighter returning from the scene of a motor vehicle crash on a borrowed motorcycle crossed the centerline on a curve, went off the road, down a ditch and hit a tree. Excessive speed for conditions was cited as a factor in the crash.

Seven of these 19 victims were driving or riding in pumpers or water tenders (tankers):

- The driver and passenger of a tanker responding to a structure fire on mutual aid were killed when the driver lost control of the tanker on a curve, overcorrected, and the vehicle fishtailed and rolled. The tanker was carrying 1,000 gallons of water. The driver was speeding, neither victim was wearing his seatbelt and one was ejected and the other was partially ejected.
- A firefighter driving a pumper to a fire in a vacant building was struck by a speeding SUV at an intersection. There was no information reported on seatbelt use, but the victim was ejected through the windshield and pinned beneath the truck.
- A fire officer riding as passenger in a pumper responding to a fire was killed when the driver drove through a red light, failing to yield the right of way, and collided with another responding apparatus. The vehicle, a reserve piece, was found to have faulty brakes, although they were not a factor in the crash. The victim was not wearing his seatbelt and was ejected.
- A tanker overturned on a sharp left turn at a T-shaped intersection and rolled down an embankment. The tanker was a converted military surplus vehicle. No seatbelts were installed in the vehicle and the victim was not ejected.
- Another crash involving a converted tanker, this time a former fuel truck, resulted in the death of the driver when he lost control of the vehicle after coming out of a curve and overcorrected. The vehicle went off the shoulder, struck trees and overturned. The victim was not wearing a seatbelt. Excessive speed and driver inexperience were cited as factors in the crash.
- A firefighter driving a pumper on a call that turned out to be a false alarm lost control of the vehicle and overturned. He was wearing his seatbelt and was not ejected. Excessive speed for conditions was cited as a factor in this crash.

The remaining two fatal crashes while responding involved other fire department vehicles:

- A firefighter riding in the back seat of a ladder truck responding to a false alarm was killed when a school bus struck the truck at an intersection. The ladder truck, which was traveling through the intersection on a red light, spun and flipped, partially ejecting the victim. The

bus driver failed to yield for the emergency vehicle, as other motorists at the intersection had. It was not clear whether or not the victim was wearing his seatbelt. There were no children on the bus at the time of the crash.

- A fire police officer responding to a motor vehicle crash in a fire department box van collided with a propane truck and was fatally injured. According to newspaper accounts, he was making a U-turn to change directions on an interstate highway when he was struck, but there was no indication of who was at fault. The victim was not wearing a seatbelt and was ejected.

Two firefighters were killed in crashes while operating over or on wildland fires.

- A contractor for a federal wildland management agency was killed when his helicopter crashed after it drifted and its main rotor blades struck a tree while he was dropping off collapsible water containers to fire ground crews in a remote area. The final NTSB report on this crash has not been released yet.
- A state wildland agency employee was killed when the bulldozer he was operating rolled over. No other details have been reported.

Three firefighters were killed in separate incidents while returning from training activities. All three were driving their personal vehicles when they crashed:

- One of the victims crossed the centerline into oncoming traffic and was struck by a tractor trailer truck. He was wearing his seatbelt and was not ejected. Road conditions and weather were not factors in the crash.
- One firefighter was struck on a divided highway by a tractor trailer truck that had itself been involved in a collision on the other side of the highway, traveled into the median and through the guard rail. No details on seatbelt usage were reported.
- No details have been reported yet on the third crash.

The remaining fatal crashes occurred while firefighters were engaged in other on-duty activities:

- A fire chief returning from a meeting in a fire department pickup truck apparently drifted across the centerline of a two-lane road, overcorrected, veering off the road on the right, down an embankment and into a reservoir, where he drowned in 36 feet of water. Speed was not a factor in the crash. He was found with the seatbelt across his chest, but not latched.
- A forestry employee returning to base from a prescribed burn in a department pickup truck crossed the centerline and struck an on-coming tractor trailer truck almost head on. Both vehicles caught fire and both drivers were killed. The victim was wearing his seatbelt and

was not speeding. Postmortem tests reported the presence of illegal drugs in his system.

- Another fire chief, driving to a meeting in a fire department SUV, went off the road in icy conditions and struck a tree. No other details were reported.

Of the 25 deaths in road vehicles mentioned above, 11 of the victims were not wearing seatbelts (eight were ejected), five were wearing their seatbelts, and one crash involved a motorcycle. Seatbelt use was not reported in the other eight crashes, but two of the victims were at least partially ejected, suggesting that they were not restrained. Excessive speed was a factor in at least six of the 24 crashes, one of which resulted in two deaths. Drugs may have been a factor in one crash. Other factors reported were failure to yield, driver inexperience and driver inattention.

Trends in road vehicle crashes from 1998 through 2007 are discussed in a separate section of this report.

One firefighter was struck by a vehicle and killed. He was at the scene of a vehicle fire shortly after 4:00 am, loading hose back onto fire apparatus in the right-hand lane on an interstate highway when he was struck by a bus traveling approximately 65 mph. The driver of the bus had not noticed the emergency lights of fire apparatus parked on the shoulder and in the right-hand travel lane or traffic cones set up near the fire scene, and was traveling in the right-hand lane. When he belatedly tried to change lanes, he sideswiped the first apparatus and struck the firefighter. The fire department had declined traffic control on the highway during their operations at the vehicle fire because there was no traffic on the road.

### **Career/Volunteer Comparison**

The distribution of deaths of career and volunteer firefighters from local fire departments is shown in Figure 9. While the number of volunteer firefighter deaths continued its historic fluctuation between the mid-40s and mid-60s with no clear trend, the number of career firefighter deaths jumped sharply in 2007, to the highest level since 1989 (not including the deaths at the World Trade Center in 2001). Deaths among career firefighters had been falling fairly steadily since 1985. Most, but not all, of the increase in 2007 can be explained by the nine-fatality incident in Charleston. Over the past 10 years, there have been an average of 30 career firefighter deaths annually, so the total of 42 on-duty deaths in 2007 is well out of range for the period. Among volunteer firefighters, the 10-year average has been 57 deaths per year, with 53 in 2007.

A breakdown of the fatality experience of the 95 career and volunteer firefighters killed in 2007 is shown in Table 1.

## **Other Findings**

From 1998 through 2007, 65 firefighters (6.5 percent of all on-duty deaths) died in connection with intentionally-set fires. The number of these deaths annually has been dropping since 1985, in part because of the decline in intentionally-set fires over the same period. Although there had been a sharp increase reported in 2006, the two reported fatalities in 2007 continues the downward trend. One of the victims in 2007 suffered a fatal heart attack while responding on foot to a fire in a vacant building and the other was involved in a collision while responding to a woods fire.

Two firefighters died in 2007 in crashes while responding to false alarms. Over the past 10 years, 33 firefighter deaths have resulted from false calls, including malicious false alarms and alarm malfunctions.

Of the 13 training-related deaths, eight firefighters suffered sudden cardiac death, four died as a result of internal trauma and one was fatally burned.

Of the seven deaths at non-fire emergencies, two were the result of sudden cardiac events; two were due to shrapnel injuries; and one each was due to stroke, internal trauma and drowning.

## **Conclusions**

On-duty firefighter deaths rose in 2007, from the high 80s reported in the previous two years, to just over 100. There are a few important factors in the increase:

- The nine-fatality incident in Charleston was the largest multiple firefighter fatality incident since September 11, 2001.
- The number of fatal crashes in 2007 (26 crashes) is tied with 1988 for the highest number of crashes in the 31 years of this study, and the number of deaths in crashes (27 deaths) is the second highest reported over those years.

There were some significant variations from the findings in recent years, mentioned earlier.

- The number of deaths on wildland fires in 2007 was much lower (three in 2007, compared to an average of 10 over the past 10 years, and as many as 26 in a single year).
- The number of career firefighter deaths was much higher (42 in 2007, compared to a 10-year average of 30 per year).

- Seven of the victims in 2007 were not career or volunteer firefighters, compared to an average of approximately 13 annually over the past 10 years.

But, the common trends held again, in 2007. Sudden cardiac death, usually heart attacks, claimed the largest number of deaths in the year, followed by crashes.

The 2008 Fire/EMS Safety, Health and Survival Week (formerly known as Stand Down), held in June and co-sponsored by IAFF and IAFC, recognized the range of issues impacting the health and safety of the fire service when they chose this year's theme, *Committed to Long-Term Results*. The activities for the week focused on three areas: vehicle safety (seat belts, stopping at red lights and stop signs, and safe driving); fitness/wellness (annual medicals and physical evaluations, provision and opportunity to use fitness equipment, and nutrition); and implementation of NFPA 1500.

## References

1. The NFPA's files for firefighter on-duty fatal injuries are updated continually for all years.
2. 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.
3. 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.
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 2005*, NFPA Fire Analysis and Research Division, Quincy, Massachusetts, October 2006. The analysis shown here assumes that the number of firefighters adequately estimates exposure and that the age distribution of career and volunteer firefighters is similar.

## **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 increases as a result. The enactment of the USA PATRIOT bill in 2001 increased the benefit to \$250,000. The current benefit is \$303,064, 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 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 disability:** 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 benefit. Students may apply for PSOEA funds for up to 45 months of full-time classes. As of October 1, 2006, the maximum benefit a student may receive is \$860 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 Program, Bureau of Justice Assistance, Office of Justice Programs, U.S. Department of Justice, 810 7<sup>th</sup> Street, N.W., Washington DC 20531. The telephone number is (888) 744-6513 and the email address is [ASKPSOB@usdoj.gov](mailto:ASKPSOB@usdoj.gov). PSOB death claims can now be filed online as well, at: <https://www.psob.gov>.

**Table 1. Comparison of On-Duty Deaths Between  
Career and Volunteer Firefighters, 2007\***

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
<b>Type of duty</b>				
Operating at fire ground	22	52 %	12	23 %
Responding to or returning from alarm	4	10	26	49
Other on-duty	9	21	4	8
Training	7	17	5	9
Operating at non-fire emergencies	0	0	6	11
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>
<b>Cause of fatal injury</b>				
Exertion/stress/other related	15	36 %	23	43 %
Struck by or contact with object	7	17	20	38
Caught or trapped	18	43	5	9
Fell	1	2	5	9
Exposure to electricity	1	2	0	0
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>
<b>Nature of fatal injury</b>				
Sudden cardiac death	15	36 %	21	40 %
Internal trauma	5	12	19	36
Asphyxiation (including smoke inhalation)	13	31	8	15
Burns	6	14	0	0
Stroke/aneurysm	0	0	2	4
Projectile wounds	0	0	2	4
Drowning	1	2	1	2
Crushing	1	2	0	0
Electrocution	1	2	0	0
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>
<b>Rank</b>				
Firefighter	26	62 %	40	75 %
Company officer	11	26	7	13
Chief officer	5	12	6	11
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>

**Table 1. Comparison of On-Duty Deaths Between  
Career and Volunteer Firefighters, 2007\* (Continued)**

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
<b>Ages of Firefighters</b>				
<b>All deaths</b>				
20 and under	0	0 %	5	9 %
21 to 25	2	5	4	8
26 to 30	6	14	1	2
31 to 35	5	12	4	8
36 to 40	8	19	6	11
41 to 45	5	12	6	11
46 to 50	6	14	6	11
51 to 55	6	14	5	9
56 to 60	4	10	4	8
Over 60	0	0	12	23
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>
<b>Ages of Firefighters</b>				
<b>Sudden cardiac deaths only</b>				
31 to 35	1	7 %	2	10 %
36 to 40	3	20	1	5
41 to 45	3	20	1	5
46 to 50	2	13	3	14
51 to 55	3	20	2	10
56 to 60	3	20	3	14
over 60	0	0	9	43
<b>TOTALS</b>	<b>15</b>	<b>100 %</b>	<b>21</b>	<b>100 %</b>
<b>Fire ground deaths by fixed property use</b>				
Dwellings and apartments	8	36 %	9	75 %
Stores	9	41	0	0
Building under demolition	2	9	0	0
Restaurant	2	9	0	0
Storage	0	0	2	17
Wildland	1	5	0	0
Vehicle	0	0	1	8
<b>TOTALS</b>	<b>22</b>	<b>100 %</b>	<b>12</b>	<b>100 %</b>

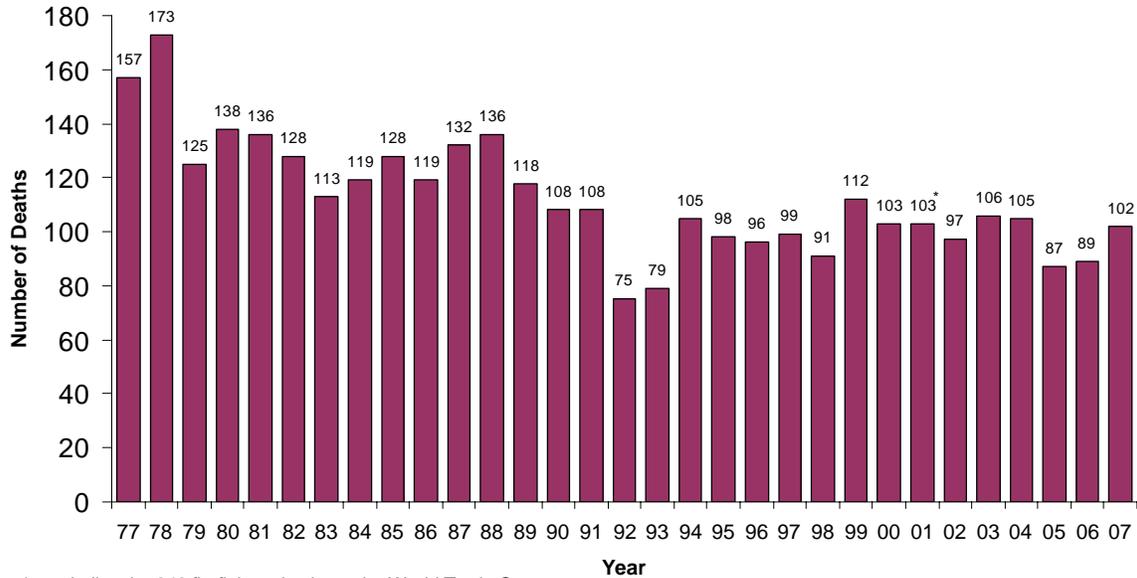
**Table 1. Comparison of On-Duty Deaths Between Career and Volunteer Firefighters, 2007\* (Continued)**

	Career Firefighters		Volunteer Firefighters	
	Number of Deaths	Percent of Deaths	Number of Deaths	Percent of Deaths
<b>Years of service</b>				
5 or less	8	19	21	40
6 to 10	6	14	5	9
11 to 15	8	19	6	11
16 to 20	8	19	2	4
21 to 25	4	10	5	9
26 to 30	3	7	0	0
over 30	2	5	12	23
Not reported	3	7	2	4
<b>TOTALS</b>	<b>42</b>	<b>100 %</b>	<b>53</b>	<b>100 %</b>
<b>Attributes of fire ground deaths**</b>				
Intentional fires	0		0	
Search and rescue operations	5		0	
<b>Motor vehicle crashes</b>	<b>5</b>		<b>17</b>	
<b>False alarms</b>	<b>1</b>		<b>1</b>	

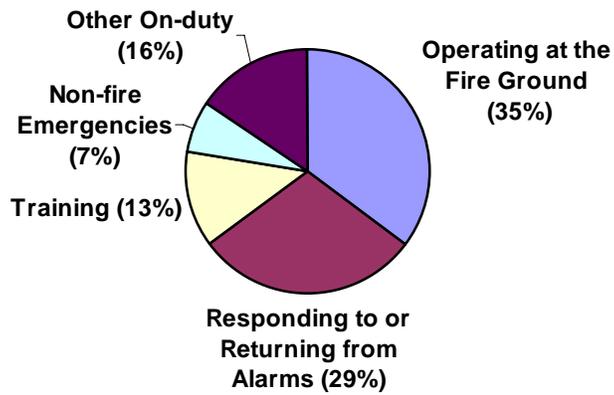
\* This table does not include the seven victims who were employees of or contractors for state or federal land management agencies, or members of prison crews or industrial fire brigades.

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

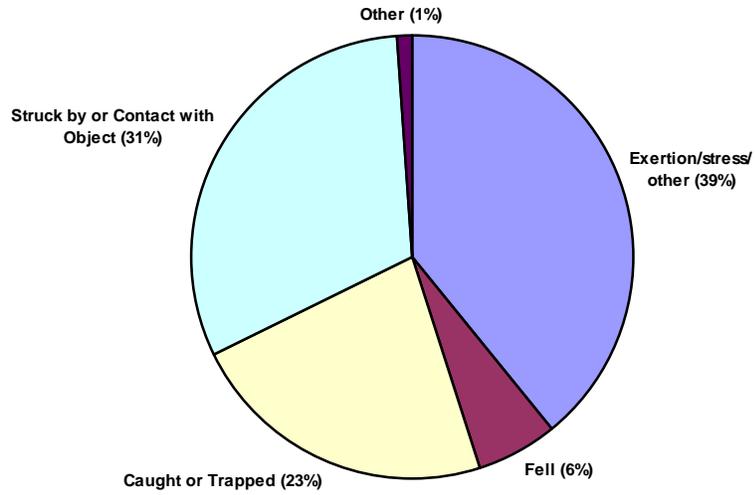
**Figure 1**  
**On-Duty Firefighter Deaths - 1977-2007**



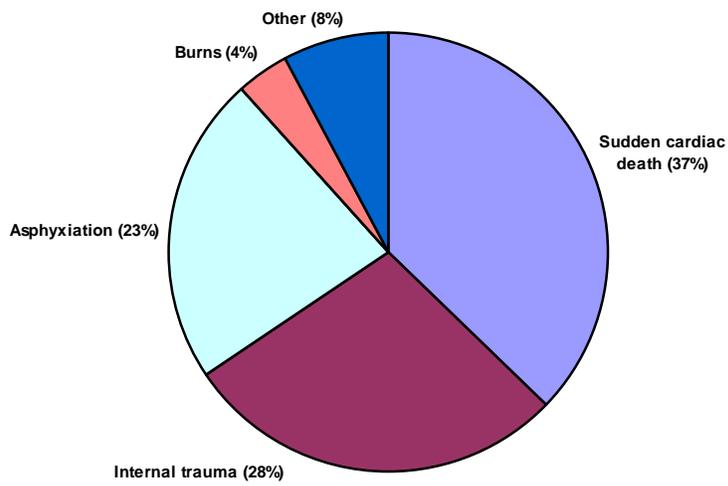
**Figure 2**  
**Firefighter Deaths by Type of Duty - 2007**



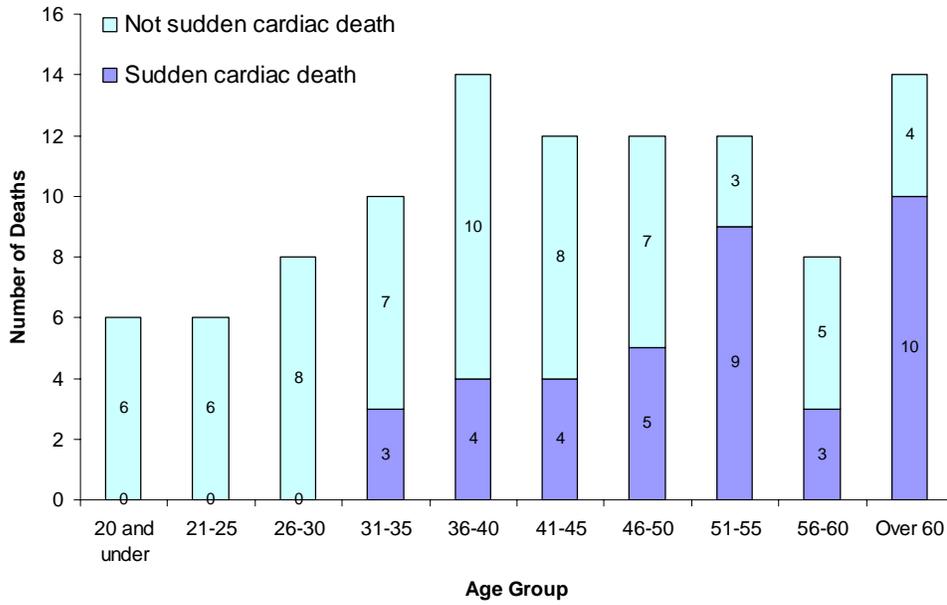
**Figure 3**  
**Firefighter Deaths by Cause of Injury -- 2007**



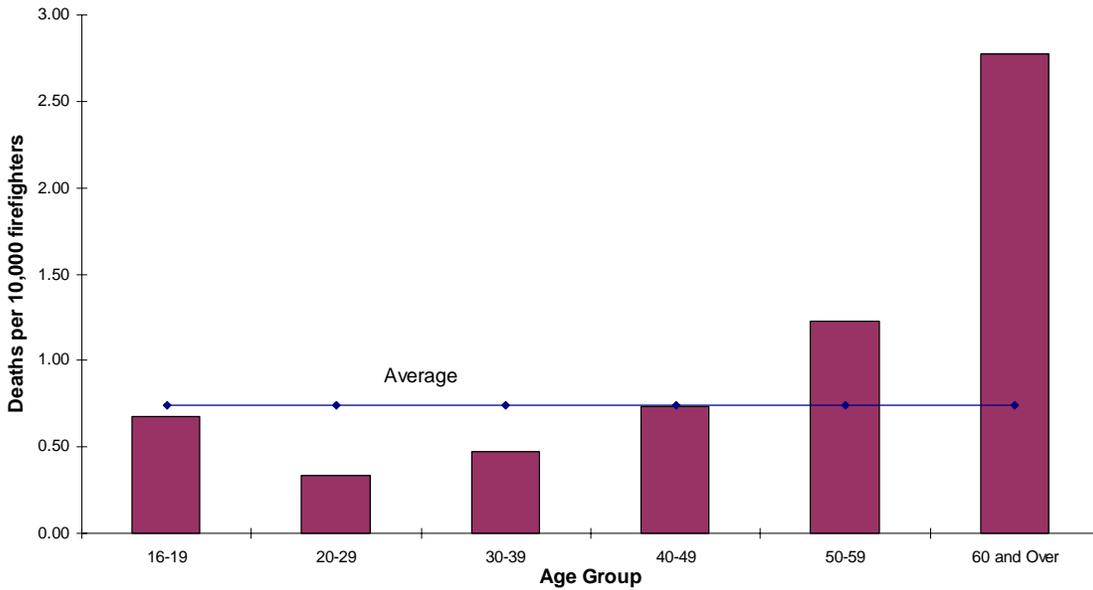
**Figure 4**  
**Firefighter Deaths by Nature of Injury -- 2007**



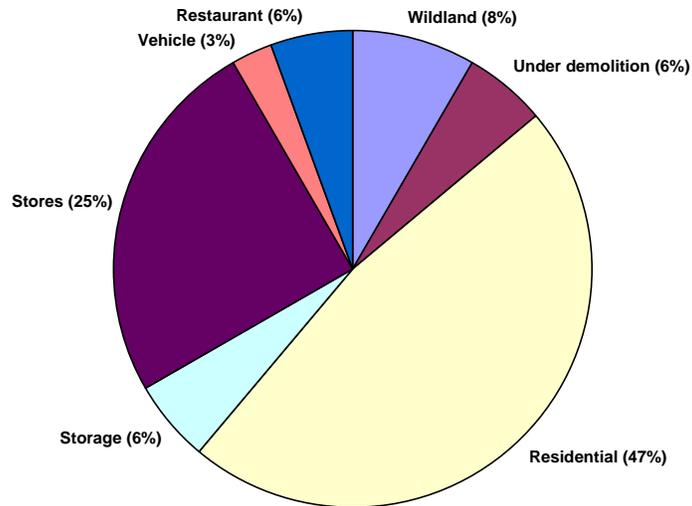
**Figure 5**  
**On-Duty Firefighter Deaths**  
**by Age and Cause of Death -- 2007**



**Figure 6**  
**On-Duty Death Rates per 10,000 Career and Volunteer Firefighters**  
**2003-2007**

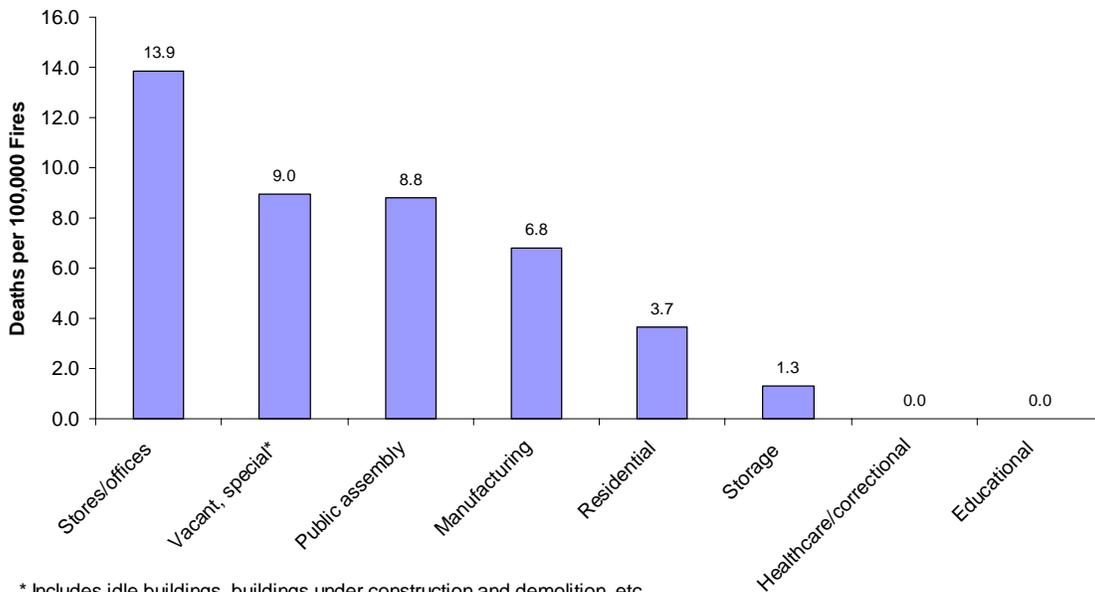


**Figure 7**  
**Fire Ground Deaths by Fixed Property Use -- 2007\***



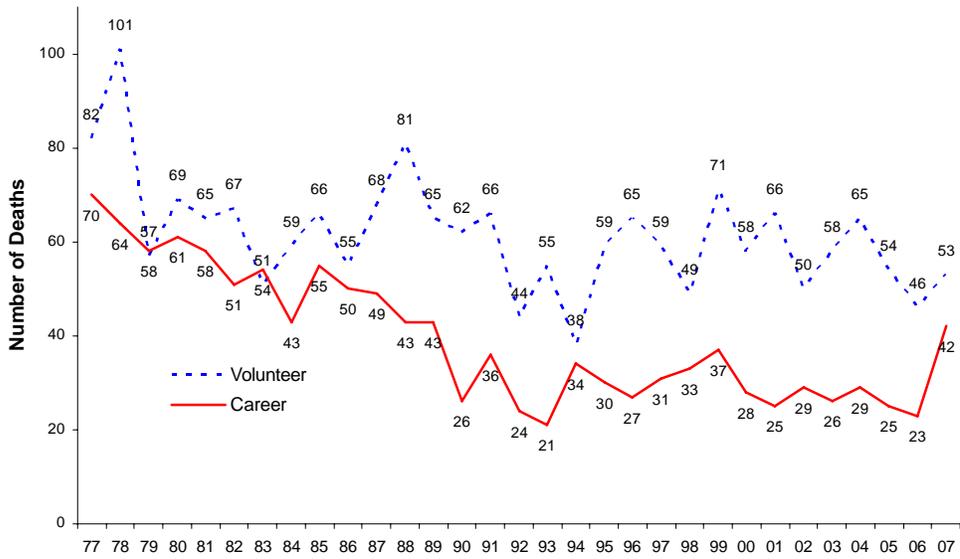
\* There were 36 deaths on the fire ground in 2007.

**Figure 8**  
**On-Duty Fire Ground Deaths per 100,000 Structure Fires 2002-2006**



\* Includes idle buildings, buildings under construction and demolition, etc.

**Figure 9**  
**Firefighter Deaths - Local Career vs. Local Volunteer**  
**1977 - 2007\***



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

## **SELECTED FIREFIGHTER FATALITY INCIDENTS**

## **Furniture store fire kills nine firefighters**

**By Robert F. Duval, NFPA**

At approximately 7:08 pm on June 18, 2007, the Charleston, SC, Fire Department began receiving 911 calls reporting a fire in the Super Sofa Store on Savannah Highway, including one from a store employee reportedly trapped in the building.

First-arriving units found smoke showing from a furniture store and warehouse building. The approximately 50,000-square-foot (4,645-square-meter) building was constructed of metal frame, metal roof trusses and a metal roof deck. As firefighters investigated further, they located fire in the loading dock area of the building, between the showroom and the warehouse. Suppression operations were begun as firefighters searched for the trapped employee, who was on the phone giving his location to a fire dispatcher, who relayed it to firefighters on scene. To help firefighters find him, the employee also pounded on the building's outer wall. Firefighters located him and were able to remove him through an opening they made in the metal outer skin of the building.

Meanwhile, firefighters entered the building with hose lines seeking the seat of the fire. While suppression efforts were underway, the fire grew rapidly and began spreading from the center of the building, through the showroom and eventually toward the front entrance. This rapid fire spread was followed quickly by structural collapses within the showroom areas. The combination of the fire spread and the collapses trapped firefighters within the showroom portion of the building, killing nine.

The cause of the fire continues to be listed as undetermined.

In addition to local, state and federal investigations in the aftermath of the fire, a blue ribbon panel from the nation's fire service was convened to look into the fire and the Charleston Fire Department to report on lessons learned from the tragedy and recommend improvements. The preliminary report from the blue ribbon panel was released in October, 2007. Recommendations for improvements in the following areas were included: training, staffing, communications, occupational health and safety, personal protective equipment, apparatus and equipment, and code enforcement. The final version of the panel's report was released on May 15, 2008.

The National Institute of Standards Technology (NIST) and the National Institute of Occupational Safety and Health (NIOSH) are both looking into the fire and will issue reports in the coming months. A preliminary draft of the NIOSH report was released in early May 2008.

The fire was the worst single firefighter fatality incident since the September 11 attacks at the World Trade Center, which killed 340 firefighters, two paramedics and a chaplain. It was the deadliest fire in South Carolina since a 1979 blaze killed 11 people in the Lancaster County jail.

### **Fall through floor**

At 3:21 p.m. on January 3, a passerby called 911 to report a fire in a single-family dwelling. The two-story wood-frame structure, which was of balloon construction and covered 1,200 square feet (111 square meters), had no automatic detection system. No one was home at the time of the fire.

The first engine company arrived on the scene at 3:35 p.m. with an officer and two firefighters who observed a large amount of smoke hanging close to ground with little visible fire. They also saw five firefighters who had responded directly to the scene from home or work and who were not dressed in protective ensembles. One of these firefighters informed the officer that he had pulled the electric meter.

The officer and one of the firefighters advanced a 1-3/4-inch (44-millimeter) hose to the doorway and forced the door open as the other firefighter operated the pump. The officer, who was wearing a protective ensemble but had no self-contained breathing apparatus (SCBA), instructed the firefighter, who was dressed in a full protective ensemble with SCBA, to play water from the doorway on visible fire and not to make entry until other fully attired firefighters arrived.

The firefighter stepped just inside the building to see if he could locate any fire and as he did so, he saw fire extending up the wall to his left. When he turned to position the hose line to extinguish the fire, he stepped through the fire-weakened floor. He caught himself and was holding himself up by his arms.

Two rescue attempts failed when the firefighters not wearing self-contained breathing apparatus were overcome by smoke and had to leave the building. During the third attempt to pull him from the hole, a large piece of ceiling struck the rescuing firefighter, knocking off his helmet and dislodging his face piece, which allowed burning embers to fall down his collar. He instinctively let go to remove the embers and the firefighter fell into the basement, where he became entangled in electrical wires.

Firefighters lowered a ladder to the basement, disentangled the firefighter and removed him from the building. He was still dressed in his full protective ensemble. His face piece was removed and it was noted that his SCBA's air cylinder was empty. Cardiopulmonary resuscitation (CPR) was started immediately and he was loaded into an ambulance and transported to a landing strip where a helicopter was waiting. At the hospital, the firefighter was placed on life support equipment. Two days later, he died as a result of asphyxiation.

All of the firefighter's equipment was examined and found to be in good condition, including his SCBA and PASS. It was noted that his PASS did not sound while he was in the building but did sound when it was taken off him and placed outside the building.

Investigators determined that the fire started in the basement and was caused by a failure in an electrical junction box/ceiling light. The fire then burned through the floor nearby in the area of a return air duct.

### **Motor vehicle crash during response**

On February 11 at approximately 4:30 p.m., an alarm was sounded for a motor vehicle crash with injuries. On hearing the alarm, a 28-year-old firefighter got into his pickup truck and began to respond. On the way, he entered a T-shaped intersection without stopping for the stop sign. The driver of another pickup truck, traveling through the intersection with the right of way, tried to avoid a collision by braking but was unsuccessful, striking the firefighter's vehicle on the driver's side to the rear of the cab

and causing the vehicle to spin around. The driver's door opened as it spun, ejecting the firefighter, who was not wearing his seatbelt. Both vehicles came to rest off the road.

The firefighter suffered severe head trauma and was rendered unconscious. Emergency medical technicians (EMTs) responded and transported him to a local hospital. He was later flown to a medical center and placed on life support. He died 13 days later, never having regained consciousness. The cause of death was listed as severe traumatic brain injury.

### **Propane gas explosion at gasoline station**

On January 30 at 10:42 a.m., the county 911 center received a telephone report for a gas leak at a convenience store/gasoline station and dispatched the local fire department one minute later. Two firefighter/EMTs in the department's EMS unit arrived four minutes later, parked the ambulance in front of the store and walked around to the back, where two 500-pound (227-kilogram) liquid propane gas (LPG) tanks were located.

They reported to a firefighter who had arrived before them and was standing by two gas company employees who were working on the two tanks. The two firefighters briefly examined one of the gas company employees who complained of a thermal injury from exposure to propane, but the employee refused treatment. The firefighter in charge then directed the two firefighters to evacuate the area and not let anyone enter the parking lot. The next firefighter to arrive reported to the firefighter at the rear of the building and was instructed to return to his vehicle, put on his protective ensemble and assist in keeping people from entering the parking lot. As another firefighter was walking toward the scene, an explosion occurred, completely destroying the store and gasoline pump area.

After the explosion, the bodies of the firefighter in charge and one of the firefighter/EMTs were found at the rear of the building where the tanks had been. The other firefighter/EMT sustained minor injuries and began to triage and treat the injured until additional EMS units arrived. The firefighter who went to his vehicle to put on his protective ensemble was shielded by his vehicle and was not injured. The firefighter who was walking toward the scene sustained multiple injuries. The two gas company employees were killed. Four employees of the store were seriously injured and required hospitalization.

The explosion was reported to have occurred less than 13 minutes after the initial 911 call. It was also reported that the gas company employees were attempting to transfer propane from one 500-pound (227-kilogram) tank to another and that the liquid withdrawal valve on the tank malfunctioned, allowing LPG to escape and disperse until it found a source of ignition.

The cause of death for the firefighter who was in charge was craniocerebral injuries as a result of shrapnel impact and for the firefighter/EMT was craniocerebral blast injury.

### **Fall from roof**

On June 21 at 5:00 p.m., firefighters responded for an alarm of fire at a four-story building that had been illegally converted from a factory to an apartment house. The structure was of ordinary construction and covered 7500 square feet (697 square meters). The building was equipped with a wet pipe sprinkler system but had no detection system. On arrival, firefighters observed smoke and fire coming from the area of a window of one of the fourth-story apartments.

A 23-year-old firefighter with less than two years experience was assigned the task of ventilating the roof. Attired in a full protective ensemble including SCBA, he ascended the aerial ladder carrying a power saw in addition to his regular tools. The power saw was equipped with a strap that was used as a sling, permitting the firefighter to carry it over his shoulder. On stepping off the ladder, he lost his footing and fell 60 feet (18 meters) to the sidewalk. He was transported to the hospital where he later died from his injuries. Cause of death was listed as blunt head and torso trauma.

An investigation determined that the fire started when an occupant attempted to extinguish a cigarette on the wood window sill. The sill smoldered for some time before igniting and fire spread to the rest of the wood sash. A single sprinkler head activated and kept the fire from spreading to the interior of the building.

### **Live burn training**

On February 9, a female fire recruit died participating in a live fire training exercise. The exercise was to simulate an actual fire response to a vacant row house. The three-story structure of ordinary construction contained 1200 square feet (111 square meters) of living space. Its third story extended from the front approximately one half of the building's length and terminated where a stairway came up from the second story. A window 41 inches (1 meter) off the floor and 27 inches (0.7 meters) wide was located at the third-story landing. A lean-to roof extended from the exterior third story wall just below the window to the end of the second story. The publicly-owned, condemned structure was an end unit of a group of three similar occupancies. Several weeks before the exercise, the building had been used for training in forcible entry and horizontal and vertical ventilation. Ceilings and portions of walls on the second and third stories had been removed.

At 11:54 a.m., 22 recruits, 11 instructors and adjunct instructors and two paramedics were at the site. An aerial ladder and pumper from the training academy were located in front of the building with the aerial ladder positioned to the roof and the pumper connected to a nearby hydrant. Also at the scene was a training academy utility truck carrying extra equipment and an ambulance. The first due chief officer and fire companies were notified of the training exercise and were present to observe. They remained in service for emergency incidents, but were later deployed on the training exercise when conditions deteriorated and the rescue effort took place.

The recruits were organized into three engine companies and three truck companies as evenly as possible, with an adjunct instructor or training academy officer assigned to each company. While all of the recruits and instructors in the fire building were in full protective ensembles and using SCBA, many did not have PASS devices. Engine 1, with four recruits and an adjunct instructor, was assigned to enter through the front and go to the third story and extinguish any fire. They were advised not to worry about fire on the second story as Engine 2 was assigned to the second story and would be coming in right behind them. The adjunct instructor was not provided a PASS or radio. Engine 2 was also assigned four recruits and an adjunct instructor and instructed to enter the rear of the building and proceed up the stairs behind Engine 1 and extinguish the fire on the second story. The adjunct instructor of Engine 2 was not provided with a PASS or a radio either. Engine 3 was to function as a rapid intervention crew (RIC). The officer was equipped with a radio.

Truck 1 was assigned to place ground ladders to the front of the fire building then enter the building and perform search and rescue. Truck 2 was to go to the rear of the building and perform forcible entry to

the ground level. The adjunct instructor was equipped with a radio. The crew of Truck 3 was to climb over the aerial to the adjacent roof and ventilate the involved structure.

An officer and two adjunct instructors went into the building and ignited fires. Two fires were ignited in a room on the third story and six fires were lit on the second story -- two in the front room, two in the room in the rear, one in the bathroom and one in a closet. Wood pallets and bales of hay were used to fuel the fires on the second and third levels. No fires were to be set on the first level. After they exited the building, the simulated dispatch was made.

An unknown amount of time passed before any of the crews entered the building, due to the crews not being prepared. When Engine 1 entered the building from the front, they advanced a 1-¾-inch (44-millimeter) hose line up the stairs to the second story. At the same time, Engine 2 brought a 1-¾-inch (44-millimeter) hose line to the rear and waited for Truck 2 to simulate forcible entry. On reaching the second story, Engine 1 encountered severe fire conditions that made the adjunct instructor feel uncomfortable with proceeding without extinguishing some of the fire. When he ordered the recruit on the nozzle to extinguish some of the fire, she was knocked down by the back pressure on the nozzle. The instructor took control of the nozzle and extinguished the fire to the point he was comfortable and the crew proceeded toward the third story.

Engine 2 encountered debris burning in the rear room on the first level and was delayed getting to the second level as planned. One of the recruits assigned to Engine 1 who was standing on the stairs between the 2<sup>nd</sup> and 3<sup>rd</sup> levels went to the adjunct instructor and told him her legs felt like they were burning. The adjunct climbed out the window at the 3<sup>rd</sup> level landing onto the 2<sup>nd</sup> story roof and then assisted the recruit to climb out. At this time, the other two recruits came up the stairs and saw the recruit who was the nozzle person attempting to climb out the window. She warned them to exit the building. They took the hose that was on the floor and still flowing water and went down the stairs, extinguishing the fires to the point that they could exit the building.

The adjunct grabbed the recruit's SCBA's harness and tried to pull her out the window but couldn't due to the height of the window. She fell backwards and landed on her feet. When he grabbed her a second time, he noticed that her face piece was partially dislodged and her face was starting to blister. The adjunct instructor, without a radio, could only scream for help. Truck 3, Engine 2 and the RIC became aware of what was going on and started making their way to the 3<sup>rd</sup> level. Members of Truck 3 who were on the third story roof responded to the instructor's call for help. The rescuers had difficulty pulling her out and their efforts continued several minutes, during which time the recruit lost consciousness. Members of Engine 2 made their way up to the third story and were able to push the recruit out onto the second-story roof. CPR was immediately started. She was removed from the building over the aerial and transported to the hospital where she died from thermal injuries and asphyxia.

An investigative report listed 36 potential violations of NFPA 1403, *Live Fire Training Evolutions*.

### **Fall from bridge**

On August 10 at approximately 1:15 a.m., fire companies were called to a motor vehicle crash with injuries. After the victim was removed from the vehicle and transported, members of the fire crew began spreading an absorbent material to clean up oil and gasoline leaking from the vehicle. A lieutenant dressed in a full protective ensemble without SCBA climbed up on the hood of the car in an attempt to

reach the keys in the ignition. He wanted to make certain that the ignition was in the off position to prevent a spark from causing a fire. The vehicle was pinned with the driver's side against the side of the bridge. Reaching through the driver's side window, he lost his balance and fell over the bridge's concrete wall to the ground 40 feet (12 meters) below. He died on scene from blunt force traumatic injuries.

### **Struck by motor vehicle**

On July 27 at 3:00 a.m., fire companies responded to a tractor-trailer fire on the interstate highway. The highway was configured with two lanes of traffic and a shoulder on each side of a median strip. The tractor trailer was parked on the shoulder. The fire originated in the rear tires of the tractor trailer and was caused by its brakes locking up. The fire spread to the body of the trailer before being extinguished.

Three emergency vehicles responded and parked with their emergency lights on. Two parked on the shoulder behind the tractor trailer and one parked in travel lane one between the other two. Orange cones were set up to divert traffic to lane two. Companies were putting their equipment away when a commercial bus traveling in lane one at an estimated 65 miles (105 kilometers) per hour veered to the left to avoid a rear-end collision. The bus traveled through the cones before sideswiping the apparatus parked in lane one and striking a 43-year-old firefighter who was placing a rolled section of hose in a driver's-side compartment. The firefighter was thrown approximately 230 feet (70 meters) and died instantly.

### **Electrocuted at a grass fire**

On September 24, at 2:00 p.m., a tractor-trailer truck was forced to turn around because the road was closed for construction. In the process, the truck hit and knocked down a utility pole that was supporting energized electrical power lines. The energized wires sparked and ignited a grass fire when they fell. A passerby called 911 immediately and notified them of the fire. Fire companies were dispatched to fight the wind-driven fire, which was burning near a residential area. A fire lieutenant dressed in protective trousers with knee high fire boots and leather gloves was operating a hose line when he came in contact with the power line. It was reported that a firefighter working in the area spotted the downed lieutenant and with another firefighter pulled him from the downed power line. The firefighters began performing CPR on the lieutenant in an attempt to save his life. He was in critical condition as he was taken by air ambulance to a regional medical center where he died within the hour. Cause of death was electrocution.

### **Physical fitness evaluation**

On April 25 at 2:30 p.m., a fire captain died when participating in an annual physical fitness and job task evaluation. All members of the fire department's suppression force are required to take part in the evaluation. Personnel are not allowed to participate if their systolic blood pressure is 150 and above or their diastolic blood pressure is 100 and above during a screening immediately prior to the evaluation.

The 56-year-old engine company fire captain with 22 years of service was participating in a part of the program that required him to walk at a rapid rate for 30 minutes. The walk was held at a local university's track. The fire captain, dressed in a tee shirt and gym shorts, was well into his walk when he collapsed. On scene fire department medical personnel began life saving measures and transported him to the hospital, where continuing efforts to resuscitate him failed and he was pronounced dead approximately 30 minutes from the time he collapsed. The cause of death was listed as complications of atherosclerotic cardiovascular disease.

### **Motor vehicle crash while responding**

At about noon on March 24, two firefighters were killed while responding to a fire on a mutual aid call. The two firefighters were riding in the water tender (tanker) with other firefighters following in their privately owned vehicles. The driver of the tanker was 45 years old. The other firefighter riding in the passenger seat was 19 years old. Neither was wearing the seatbelts provided.

The 1000-gallon (3785-liter) tanker was responding on a dry two-lane highway under good weather conditions. The tanker was traveling at an estimated speed of 50 mph (80 kph) in a 45 mph (72 kph) speed zone when it came out of a slight left-hand curve. The driver braked and steered to the left, crossing the double yellow centerline. The driver then steered to the right, overcorrecting, and causing the apparatus to begin to skid sideways. It went off the right-hand side of the road before skidding back on the road and overturning. It rolled three or four times traveling 55 feet (17 meters), before coming to a rest on its roof across the highway. The driver was ejected from the truck as it rolled and the passenger was trapped in the cab. Both firefighters were pronounced dead at the scene of the crash. Cause of death for both firefighters was blunt force trauma.

The fire that the firefighters were responding to was an uninhabited manufactured home that was completely destroyed.

### **Helicopter crash**

On July 23 at 11:00 a.m., a helicopter went down in a remote and heavily wooded area approximately 12 miles (19 kilometers) from its base camp. The helicopter, flown by a contract pilot, was to drop off water blivets (bladders) so firefighters on the ground fighting a complex of fires would have fresh drinking water. The blivets were suspended beneath the helicopter on a 150-foot (46-meter) line.

A number of firefighters witnessed the crash. They reported that as the helicopter set the blivets down on the ground, it drifted to the right and the main rotor blades came in contact with a tree. The 150-foot (46-meter) line, along with the blivets, remained attached to the helicopter as it made a turn to the left, hesitated and then flew down hill. The helicopter was destroyed when it crashed into the heavily forested area and a postcrash fire consumed the helicopter's cabin area. No abnormal engine sounds were heard during the event and the investigation into the crash is on-going.

### **Heart attack at fire**

On February 19, a 44-year-old acting lieutenant with 20 years of service died during a fire in an apartment building. At 8:00 a.m., the acting lieutenant reported for work and checked his equipment and filled out the daily paper work required of that position. During the morning, he and his crew participated in a bladder cancer screening. At 12:30 p.m., they were dispatched to a fire in a two-story residential structure where they searched for victims, ventilated and helped to extinguish the fire.

At 4:40 p.m., they were dispatched to their second fire of the day. The fire was in an eight-story apartment building of fire-resistive construction.

On arrival, the acting lieutenant observed a large volume of black smoke coming from windows on the sixth story. He and one firefighter dressed in full protective ensembles with SCBA climbed the six flights of stairs at a rapid pace. Reaching the sixth story, they entered the smoke-filled fire apartment

and began a search for victims, ventilating at the same time. Thirty minutes into the fire, the acting lieutenant collapsed as he walked out of the apartment.

CPR was started immediately and a defibrillator was used. The acting lieutenant remained asystolic throughout the transport to the hospital and was pronounced dead upon arrival. The cause of death was listed as ischemic heart disease.

### **Lost inside fire building**

On April 16, at 06:00 a.m., numerous 911 calls were placed to the fire department to report a structure fire. Five minutes after dispatch, arriving companies observed a large amount of fire on the exterior left rear corner of the building. Winds of 25 mph (40 kph) with gusts up to 48 mph (77 kph) were prevalent at the time of the fire and caused rapid spread of fire, heat and smoke throughout the structure within minutes.

The structure was a large, two-story, single-family dwelling of lightweight wood-truss construction, covering 5,000 square feet (465 square meters) of ground floor area. The officers of the first engine and truck companies made independent size-ups and met in front of the building. They both observed a vehicle in the driveway and vehicles on the street in front of the house. No interior lights were on and, given the early morning hour, they suspected that it was an occupant rescue situation. A second alarm was requested as a result.

The members of the first engine and truck company, dressed in full protective ensembles with SCBA, entered the building, the engine company advancing a 2-½-inch (64-millimeter) hose and the truck to perform a primary search to the first level. The windows were still in place and the interior conditions were little smoke and no heat. The companies proceeded to the second story, where they encountered smoke banked down three to four feet (0.9 to 1.2 meters) from the ceiling. The officer and one of the firefighters from the truck company were in the process of searching the master bedroom when conditions rapidly deteriorated to thick black smoke with no visibility and high heat conditions. They began to evacuate the bedroom to exit the building. The officer crawled into the hallway and became entangled with a table, which caused him to fall down five to six stairs to a curve in the staircase. He called out to the firefighter, who stated he was having trouble finding the staircase.

The engine and a rescue company located the officer and were able to bring him to the front yard. Learning that a firefighter was trapped inside, a Mayday was sounded. Multiple rescue attempts were made to ascend the stairs, despite the heat and fire conditions. The on-scene fire companies working to bring the fire under control reentered the structure and searched until they found the body of the firefighter in the master bedroom. The cause of death was listed as thermal and inhalation injuries. As a result of this tragic incident, a number of improvements in the fire department's operations have been proposed.