

# **U.S. FIREFIGHTER INJURIES - 2012**

**Michael J. Karter, Jr.  
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October 2013**



**National Fire Protection Association  
Fire Analysis and Research Division**

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## **Abstract**

Based on data the NFPA received from fire departments responding to the 2012 National Fire Experience Survey, the NFPA estimates that 69,400 firefighter injuries occurred in the line of duty in 2012. An estimated 31,490 (45.4%) of the all firefighter injuries occurred during fireground operations. An estimated 13,820 occurred during other on duty activities, while 12,760 occurred at nonfire emergency incidents. The leading type of injury received during fireground operations was strain, sprain or muscular pain (55.2%), followed by wound, cut, bleeding, bruise (12.2%). Regionally, the Northeast had the highest fireground injury rate.

Keywords: fire statistics, firefighter injuries, exposures, injury rates, fireground, non-fire emergencies, type of duty, cause of injury, collisions, community size

## **Acknowledgments**

The NFPA thanks the many fire departments that responded to the NFPA Survey for U.S. Fire Experience (2012) for their continuing efforts in providing in a timely manner the data so necessary to make national projections of firefighter injuries.

The authors gratefully thank the many NFPA staff members who worked on this year's survey, including Frank Deely, John Baldi, and John Conlon for editing and keying the survey forms and their follow-up calls to fire departments; and Norma Candeloro for handling the processing of survey forms and typing this report.

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## Overview of 2012 Firefighter Injuries

- 69,400 firefighter injuries occurred in the line of duty in 2012, a slight decrease of 1.0%.
- In addition to injuries, there were 8,150 exposures to infectious diseases, and 19,200 exposures to hazardous conditions.
- 31,490 or 45.4% of all firefighter injuries occurred during fireground operations. An estimated 13,820 occurred during other on duty activities, 4,190 while responding/returning from an incident, 7,140 during training activities, and 12,760 occurred at nonfire emergency incidents.
- The Northeast reported a higher number of fireground injuries per 100 fires than other regions of the country.
- The major types of injuries received during fireground operations were: strain, sprain, muscular pain (55.2%); wound, cut, bleeding, bruise (12.2%); thermal stress (5.8%) burns (5.7%). Strains, sprains, and muscular pain accounted for 58.5% of all nonfireground injuries.
- The leading causes of fireground injuries were overexertion, strain (27.5%) and fall, slip, jump (23.2%).

## Background

Firefighters work in varied and complex environments that increase their risk of on-the-job death and injury. A better understanding of how these fatalities, nonfatal injuries, and illnesses occur can help identify corrective actions which, could help minimize the inherent risks. Each year, the NFPA studies firefighter deaths and injuries to provide national statistics on their frequency, extent, and characteristics. Earlier this year, the NFPA reported 64 firefighters died on duty (See, "2012 Firefighter Fatalities ", NFPA Journal July/August) [www.nfpa.org/firefighterfatalities](http://www.nfpa.org/firefighterfatalities).

This report addresses 2012 firefighter injuries in the United States. The results are based on data collected during the NFPA Survey of Fire Departments for U.S. Fire Experience (2012). An earlier report, [\*Fire Loss in the United States during 2012\*](#), measured the national fire experience in terms of the number of fires that fire departments attended and the resulting civilian deaths, civilian injuries, and property losses that occurred. This year's report includes among its results:

- An estimate of the total number of 2012 firefighter injuries.
- Estimates of the number of injuries by type of duty.
- An estimate of the number of exposures to infectious diseases.
- Trends in firefighter injuries and rates.
- Fireground injuries by cause.
- Fire department vehicle accidents and resulting firefighter injuries.
- The average number of fires and fireground injuries per department by population of community protected.
- Descriptions of selected incidents that illustrate firefighter safety problems.

## Overall Results

Based on survey data reported by fire departments, the NFPA estimates that 69,400 firefighter injuries occurred in the line of duty in 2012. This is a slight decrease of 1.0% from a year ago, and the lowest it's been since NFPA analyses began in 1981. In recent years, the number of firefighter injuries have been considerably lower than they were in the 1980s and 1990s ([Figure 1](#)), but this is due in part to additional questions on exposures which allows us to place them in their own categories. Previously some of these exposures may have been included in total injuries under other categories.

The NFPA estimates that there were 8,150 exposures to infectious diseases (e.g., hepatitis, meningitis, HIV, others) in 2012. This amounts to 0.3 exposures per 1,000 emergency medical runs by fire departments in 2012.

The NFPA estimates that there were 19,200 exposures to hazardous conditions (e.g., asbestos, radioactive materials, chemicals, fumes, other) in 2012. This amounts to 18.2 exposures per 1,000 hazardous condition runs in 2012.

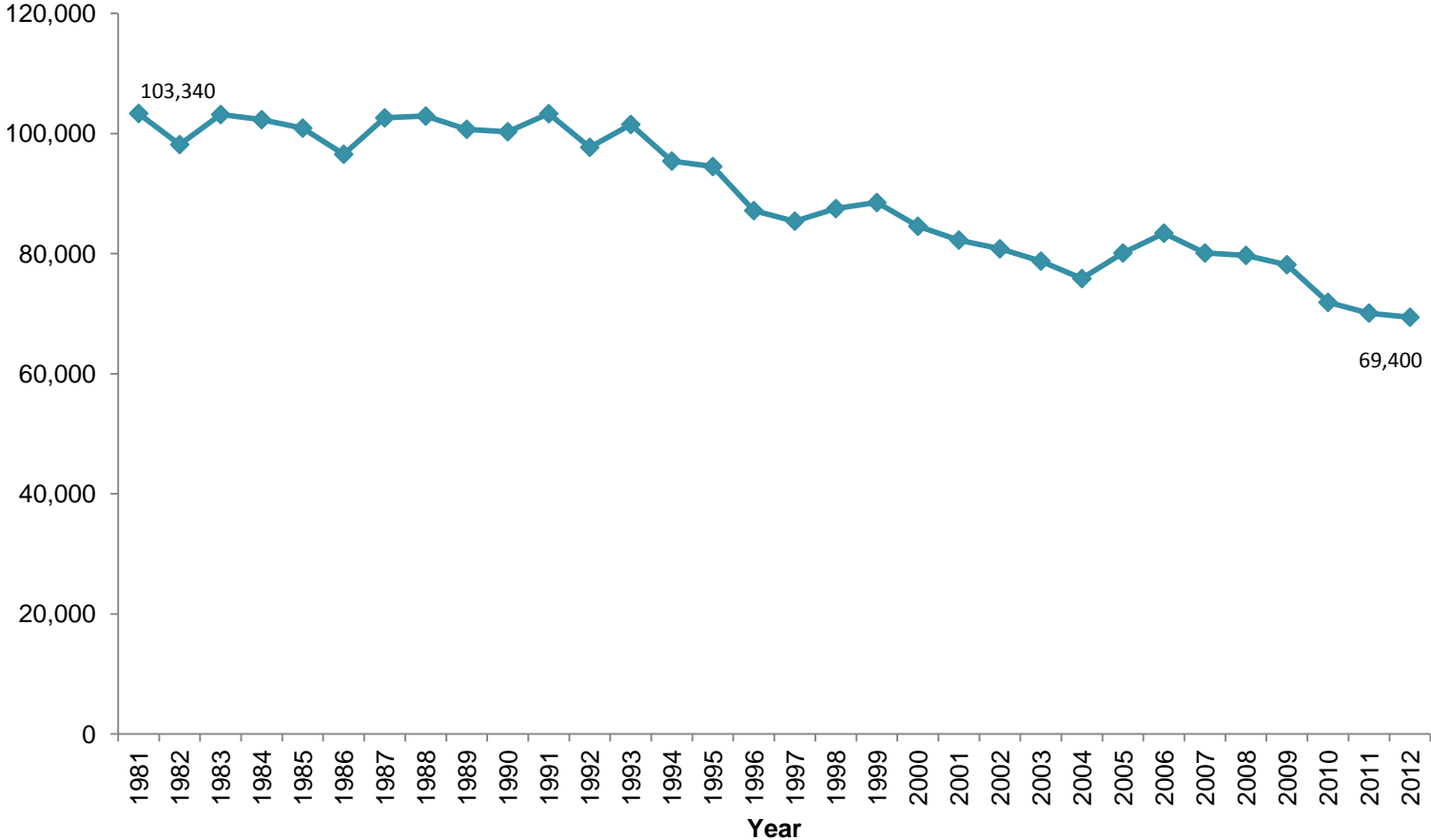
An estimated 14,350 injuries or 20.6% of all firefighter injuries resulted in lost time in 2012.

## Injuries by Type of Duty

Estimates of firefighter injuries by type of duty are displayed in [Table 2](#) and [Figure 4](#). As in past reports, type of duty is divided into five categories:

- Responding to or returning from an incident (includes fire and nonfire emergencies).
- Fireground (includes structure fires, vehicle fires, brush fires, etc.), and refers to all activities from the moment of arrival at the scene to departure time (e.g., setup, extinguishment, overhaul).
- Nonfire emergency (includes rescue calls, hazardous calls, such as spills, and natural disaster calls).
- Training
- Other on-duty activities (e.g., inspection or maintenance duties).

**Figure 1  
Total Firefighter Injuries by Year (1981-2012)**



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1981-2012)

From 1994 on, number of exposures was collected separately

Results by type of duty indicate not surprisingly that the largest share of injuries occurs during fireground operations: 31,490 or 45.4% of all firefighter injuries in 2012, an increase of 3.2% from last year. Table 1 displays firefighter injuries at the fireground and injury rates for the 1981-2012 period. Injuries at the fireground decreased from their high of 67,500 in 1981 to 31,490 in 2012 for a decrease of 53.3%. The number of fires also declined steadily for an overall decrease of 52.5%. The rate of injuries per 1000 fires has not shown any consistent trend up or down for the period (Figure 2). These results suggest that even though the number of fires and fireground injuries declined similarly during the period, the injury rate did not, and when there is a fire, the fireground injury rate risk has not changed much for the period.

Overall for the 1981 to 2012 period, the number of injuries at nonfire emergencies increased from 9,600 in 1981 to 12,760 in 2012 for an overall increase of 33%. For the same period, the number of nonfire emergencies increased a substantial 294% due in large part to an increase in the number of medical aid incidents. When the injury rate per 1000 nonfire emergencies is examined, the rate has declined during the period from 1.24 in 1981 to 0.42 in 2012 (Figure 3), because the number of nonfire emergencies increased at a higher rate than the number of injuries at nonfire emergencies.

Also in 2012, 4,190 firefighter injuries occurred while responding or returning from an incident, 7,140 occurred during training activities, and 13,820 occurred during other on-duty activities.

### **Nature of Fireground Injuries**

Estimates of 2012 firefighter injuries by nature of injury and type of duty are displayed in Table 2. Table 2 indicates that the major types of injuries that occur during fireground operations are strain, sprain (55.2%); wound, cut, bleeding, bruise (12.2%); thermal stress (5.8%); burns (5.7%).

Results were fairly consistent during all non-fireground activities, with strains, sprains, and muscular pain accounting for 58.5% of all non-fireground injuries, and wound, cut, bleeding, bruise accounting for 16.0%.

### **Causes of Fireground Injuries**

Because fireground injuries are of particular concern their causes were examined (see Figure 5). The definition of cause here refers to the initial circumstance leading to the injury.

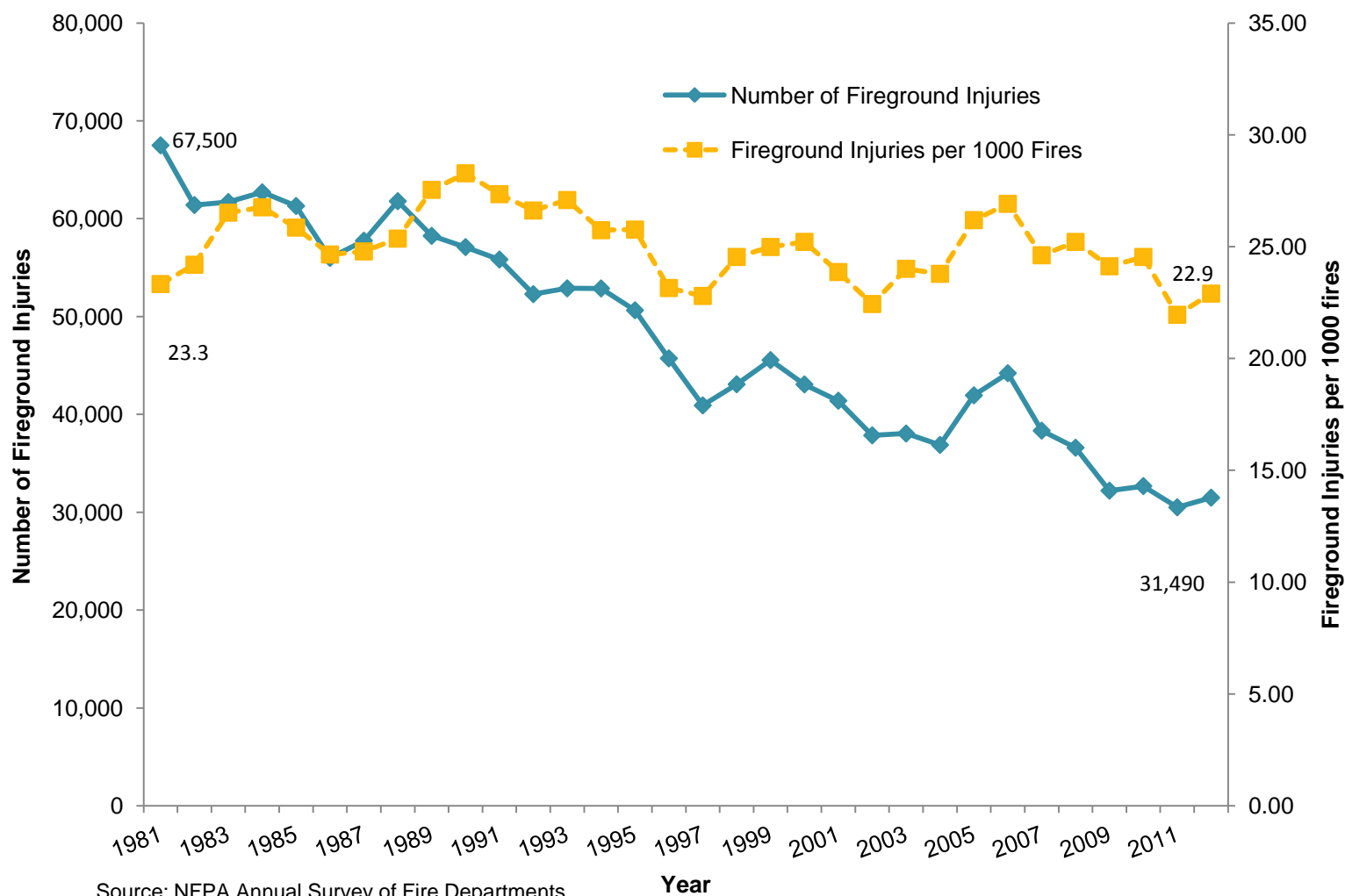


**Table 1**  
**Total Firefighter Injuries at the Fireground, and**  
**at Nonfire Emergencies, 1981-2012**

Year	Total Firefighter Injuries	Firefighter Injuries at the Fireground		Firefighter Injuries at Nonfire Emergencies	
		Injuries	Injuries per 1,000 Fires	Injuries	Injuries per 1,000 Incidents
1981	103,340	67,500	23.3	9,600	1.24
1982	98,150	61,400	24.2	9,385	1.17
1983	103,150	61,700	26.5	11,105	1.29
1984	102,300	62,700	26.8	10,600	1.21
1985	100,900	61,300	25.9	12,500	1.38
1986	96,540	55,900	24.7	12,545	1.30
1987	102,600	57,755	24.8	13,940	1.41
1988	102,900	61,790	25.4	12,325	1.13
1989	100,700	58,250	27.5	12,580	1.11
1990	100,300	57,100	28.3	14,200	1.28
1991	103,300	55,839	27.3	15,065	1.20
1992	97,700	52,290	26.6	18,140	1.43
1993	101,500	52,885	27.1	16,675	1.25
1994	95,400	52,875	25.7	11,810	0.84
1995	94,500	50,640	25.8	13,500	0.94
1996	87,150	45,725	23.1	12,630	0.81
1997	85,400	40,920	22.8	14,880	0.92
1998	87,500	43,080	24.5	13,960	0.82
1999	88,500	45,500	25.0	13,565	0.76
2000	84,550	43,065	25.2	13,660	0.73
2001	82,250	41,395	23.9	14,140	0.73
2002	80,800	37,860	22.4	15,095	0.77
2003	78,750	38,045	24.0	14,550	0.70
2004	75,840	36,880	22.1	13,150	0.62
2005	80,100	41,950	26.2	12,250	0.56
2006	83,400	44,210	26.9	13,090	0.57
2007	80,100	38,340	24.6	15,435	0.65
2008	79,700	36,595	25.2	15,745	0.66
2009	78,150	32,205	24.1	15,455	0.62
2010	71,875	32,675	24.5	13,355	0.50
2011	70,090	30,505	22.0	14,905	0.50
2012	69,400	31,490	22.9	12,760	0.42

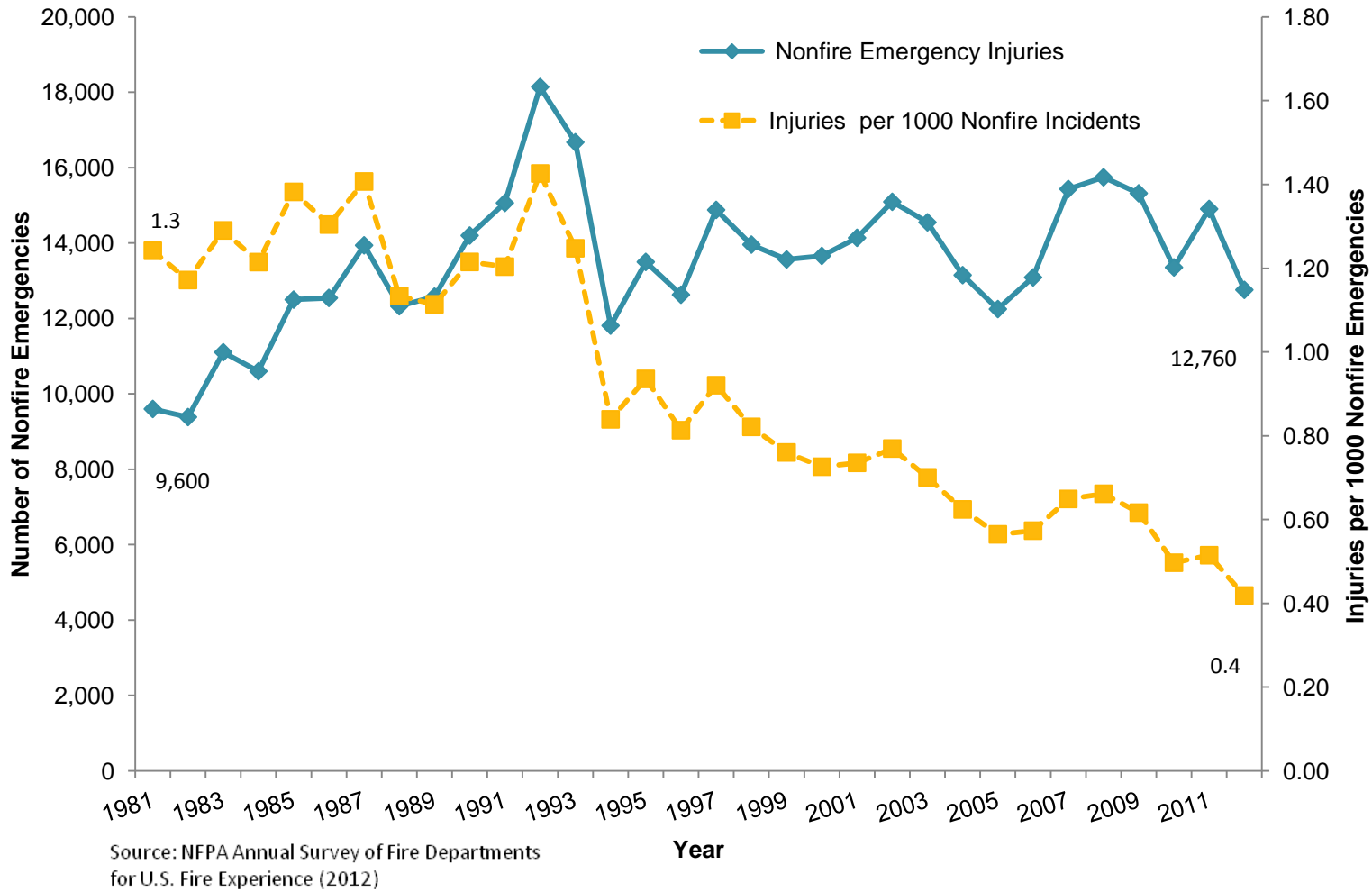
Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1981-2012)

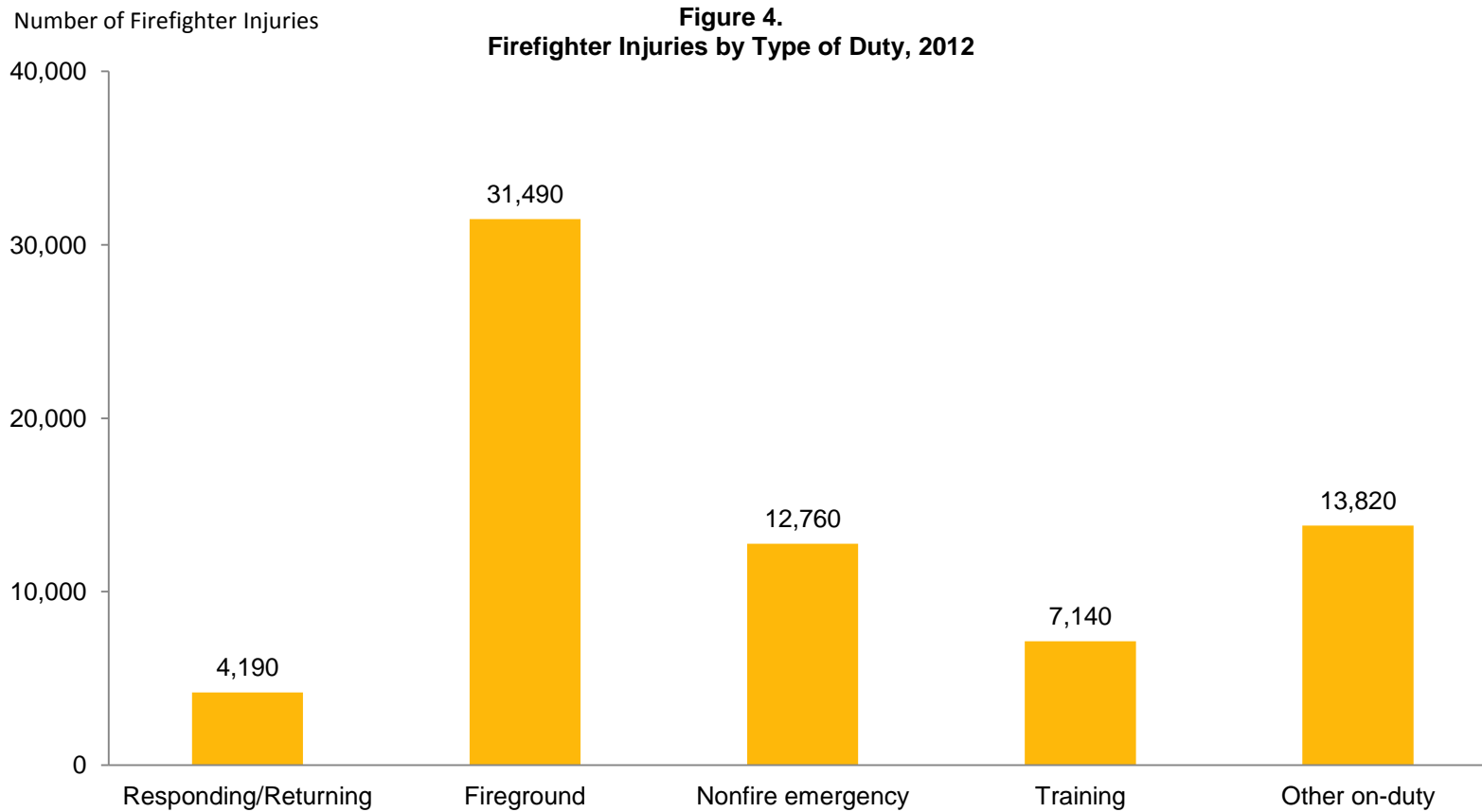
**Figure 2. The Number of Injuries at the Fireground and Fireground Injuries per 1000 Fires**



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2012)

**Figure 3. The Number of Injuries at Nonfire Emergencies and Injuries per 1000 Nonfire Emergencies**





Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2012)

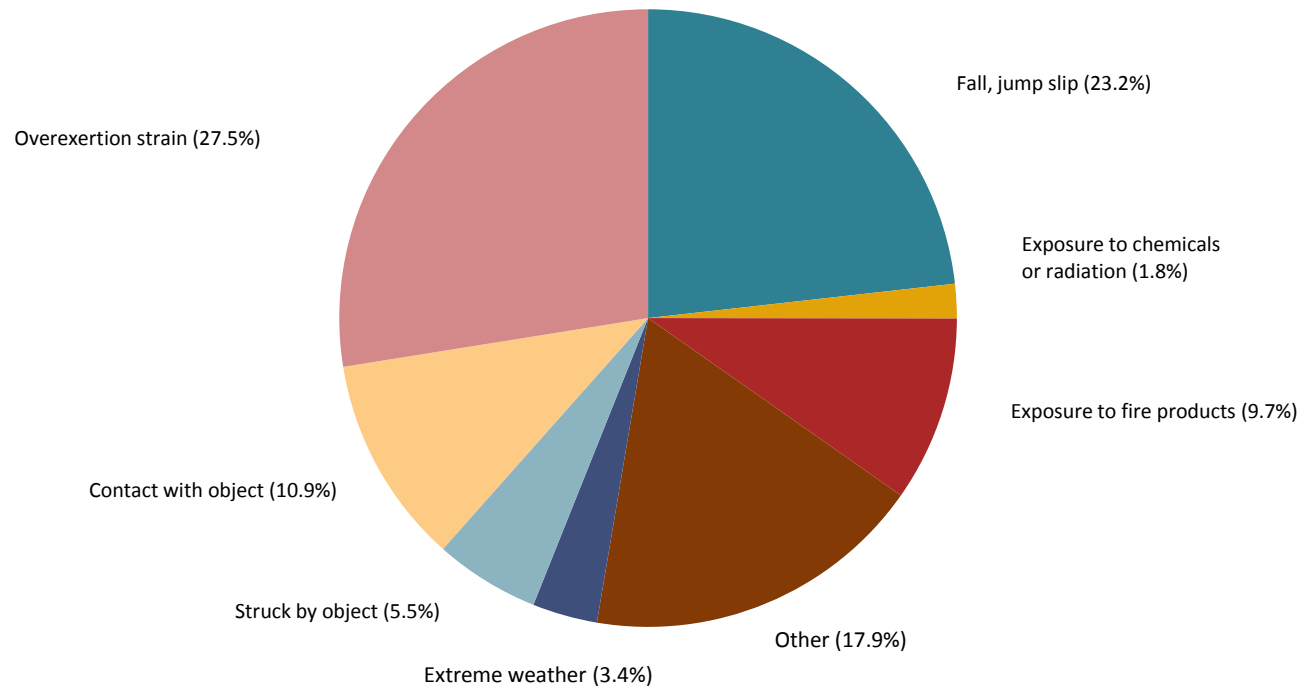
**Table 2. Firefighter Injuries by Nature of Injury and Type of Duty, 2012**

Nature of Injury	Responding to or Returning from an Incident		Fire ground		Nonfire Emergency		Training		Other on Duty		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Burns (Fire or Chemical)	30	0.7	1,820	5.7	55	0.4	110	1.5	205	1.5	2,220	3.2
Smoke or Gas Inhalation	140	3.3	1,410	4.5	60	0.5	15	0.2	60	0.4	1,685	2.4
Other Respiratory Distress	60	1.4	480	1.5	95	0.7	100	1.4	175	1.3	910	1.1
Burns and Smoke Inhalation	5	0.1	270	0.9	5	0.1	10	0.1	30	0.2	320	0.5
Wound, Cut, Bleeding, Bruise	625	14.9	3,830	12.2	1,680	13.2	1,275	17.9	2,495	18.1	9,905	14.3
Dislocation, Fracture	180	4.3	640	2.0	250	2.0	315	4.4	310	2.2	1,695	2.4
Heart Attack or Stroke	65	1.6	265	0.8	75	0.6	55	0.8	320	2.3	780	1.1
Strain, Sprain, Muscular Pain	2,410	57.5	17,375	55.2	7,890	61.8	4,355	61.0	7,505	54.3	39,535	57.0
Thermal Stress (frostbite, heat exhaustion)	135	3.2	1,825	5.8	115	0.9	325	4.6	65	0.5	2,465	3.6
Other	540	12.9	3,575	11.4	2,535	19.9	580	8.1	2,655	19.2	9,885	14.2
<b>Total</b>	<b>4,190</b>	<b>100.0</b>	<b>31,490</b>	<b>100.0</b>	<b>12,760</b>	<b>100.0</b>	<b>7,140</b>	<b>100.0</b>	<b>13,820</b>	<b>100.0</b>	<b>69,400</b>	<b>100.0</b>

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2012

Note: If a firefighter sustained multiple injuries for the percent incident, only the nature of the single most serious injury was tabulated.

**Figure 5.  
Fireground Injuries by Cause, 2012**



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2012)

Overexertion, strain (27.5%) and fall, jump, slip (23.2%) were the leading causes of fireground injuries. Other major causes were contact with object (10.9%); and exposure to fire products (9.7%).

### **Fire Department Vehicle Collisions**

The NFPA reported earlier that 16 firefighters died in motor vehicle collisions in 2012. (See “2012 Firefighter Fatalities” July/August *NFPA Journal* [www.nfpa.org/firefighterfatalities](http://www.nfpa.org/firefighterfatalities)).

In 2012, there were an estimated 14,300 collisions involving fire department emergency vehicles, where departments were responding to or returning from incidents (see [Table 3](#)). To put this number in perspective however, fire departments responded to over 31.8 million incidents in 2012 so that the number of collisions represents about one tenth of 1 percent of total responses. However, these collisions resulted in 725 firefighter injuries or 1.0% of all firefighter injuries.

Also, 750 collisions involving firefighters’ personal vehicles occurred in 2012 while departments were responding to or returning from incidents. These collisions resulted in an estimated 70 injuries.

**Table 3**  
**Fire Department Vehicle Collisions and**  
**Resulting Firefighter Injuries**  
**While Responding to or Returning From Incidents, 1990-2012**

Year	Involving Fire Department Emergency Vehicles		Involving Firefighters Personal Vehicles	
	Collisions	Firefighter Injuries	Collisions	Firefighter Injuries
1990	11,325	1,300	950	175
1991	12,125	1,075	1,375	125
1992	11,500	1,050	1,575	150
1993	12,250	900	1,675	200
1994	13,755	1,035	1,610	285
1995	14,670	950	1,690	190
1996	14,200	910	1,400	240
1997	14,950	1,350	1,300	180
1998	14,650	1,050	1,350	315
1999	15,450	875	1,080	90
2000	15,300	990	1,160	170
2001	14,900	960	1,325	140
2002	15,550	1,040	1,030	210
2003	15,900	850	980	85
2004	15,420	980	1,150	220
2005	15,885	1,120	1,080	125
2006	16,020	1,250	1,070	210
2007	14,650	915	665	120
2008	14,950	670	1,000	70
2009	15,100	820	870	100
2010	14,200	775	1,000	75
2011	14,850	970	790	190
2012	14,300	725	750	70

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1990-2012)



## Average Fires and Fireground Injuries per Department by Population Protected

The average number of fires and fireground injuries per department by population of community protected in 2012 are displayed in [Table 4](#). These tabulations show (1) that the number of fires a fire department responds to is directly related to the population protected, and (2) that the number of fireground injuries incurred by a department is directly related to its exposure to fire, i.e., and the number of fires attended by the department. The second point is clearly demonstrated when we examine the range of the statistic: from a high of 87.1 for departments that protect communities of 1,000,000 or more to a low of 0.2 for departments that protect communities of less than 2,500.

A useful way to look at firefighter injury experience and to obtain a reading on the relative risk that departments face is to examine the number of fireground injuries that occur for every 100 fires attended. This takes into account relative fire experience and allows more direct comparison between departments protecting communities of different sizes. The number of fireground injuries per 100 fires is displayed in column 4 of [Table 4](#). The overall range of rates varied less from a high of 3.3 for departments that protect communities 250,000 to 999,999 to a low of 1.1 for departments that protect communities of 5,000 to 9,999 population. Thus, the wide range noted in average fireground injuries by population protected narrows when relative fire experience is taken into account. The overall injury rate for departments protecting communities of 50,000 population or more was 2.4 injuries per 100 fires or 71% higher than the injury rate for departments protecting communities of less than 50,000 population.

The risk of fireground injury per 100 firefighters by size of community protected was also calculated and is displayed in column 5 of [Table 4](#). Larger departments generally had the highest rates with departments protecting communities of 250,000 to 499,999 having the highest rate with 8.3 injuries per 100 firefighters. As community size decreases, the rate drops quite steadily to a low of 0.8 for departments protecting less than 2,500 people. That is a more than an ten-to-one difference in risk of injury between communities of 250,000 to 499,999, and the smallest communities (less than 2,500).

An explanation for this difference is that although a department protecting a community with a population of 250,000 to 499,999 has, on average, more than 22 times as many firefighters than a department protecting a population of less than 2,500, the larger department attends more than 92 times as many fires, and as a result, it incurs considerably more fireground injuries.

**Table 4**  
**Average Number of Fires, Fireground**  
**Injuries and Injury Rates**  
**by Population of Community Protected, 2012**

<b>Population of Community Protected</b>	<b>Average Number of Fires</b>	<b>Average Number of Fireground Injuries</b>	<b>Number of Fireground Injuries Per 100 Fires</b>	<b>Number of Fireground Injuries Per 100 Firefighters</b>
1,000,000 or more*	4,223.2	87.1	2.1	4.3
500,000 to 999,999	2,506.5	81.5	3.3	7.1
250,000 to 499,999	1,157.0	38.0	3.3	8.3
100,000 to 249,999	509.5	9.8	1.9	4.5
50,000 to 99,999	223.0	4.0	1.8	3.9
25,000 to 49,999	113.6	2.1	1.8	3.4
10,000 to 24,999	65.2	1.0	1.5	2.4
5,000 to 9,999	35.3	0.4	1.1	1.3
2,500 to 4,999	24.5	0.3	1.2	1.0
Under 2,500	12.5	0.2	1.6	0.8

\*Excludes New York City

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2012

## **Average Fires and Fireground Injuries by Population Protected and Region**

Table 5 displays the average number of fires and fireground injuries per department by population of community protected and region of the country<sup>3</sup>. As in the nationwide results in Table 4, the results of each region of the country indicate that the number of fires a fire department responds to is directly related to the population protected, and the number of fireground injuries incurred by a department is directly related to the number of fires attended. The Northeast reported a higher number of fireground injuries per 100 fires for most community sizes where all departments reported sufficient data by region.

**Table 5**

**Average Number of Fires and Fireground Injuries per Department and Injuries per 100 Fires, by Population of Community Protected, and Region, 2012**

Population of Community Protected	Northeast			Midwest			South			West		
	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires	Average Fires	Average of Fireground Injuries	Fireground Injuries per 100 Fires
250,000 or more	4,659.7	227.0	4.8	2,055.4	95.5	4.6	1,823.6	47.1	2.6	2,494.6	52.7	2.1
100,000 to 249,999	900.5	33.2	3.7	592.4	10.5	1.8	564.5	9.4	1.7	330.1	6.3	1.9
50,000 to 99,999	275.3	10.9	4.0	196.3	4.0	2.0	267.9	3.2	1.2	176.3	2.8	1.6
25,999 to 49,999	126.0	3.3	2.6	96.8	2.0	2.0	144.0	2.3	1.6	100.6	1.0	1.0
10,000 to 24,999	57.0	1.3	2.3	61.1	0.9	1.5	76.7	0.8	1.0	65.2	1.1	1.7
5,000 to 9,999	29.0	0.6	2.0	35.4	0.4	1.1	43.1	0.2	0.5	34.1	0.5	1.5
2,500 to 4,999	19.9	0.4	2.0	23.1	0.3	1.3	29.5	0.3	1.0	25.1	0.1	0.4
Under 2,500	9.1	0.3	3.3	12.1	0.1	0.9	16.5	0.1	0.6	11.5	0.2	1.7
Overall Regional Rate	31.9	0.9	2.8	43.3	0.7	1.6	49.6	0.7	1.4	58.5	1.0	1.7

Note that the results above do not include New York City. With New York the overall fireground injury rate for the Northeast would be 5.9.

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2012

## Improving Firefighter Safety

As the statistics in this report and previous reports attest, fire fighting presents great risks of personal injury to firefighters. Moreover, because of the kind of work performed and the hazards of the incident scene environment, it is unlikely that all firefighter injuries can be eliminated. A risk management system and the application of existing technology, however, can offer options to reduce present injury levels and bring about corresponding reductions that are recommended by NFPA that could be taken at the local level.

- Commitment on the part of top fire service management to reducing injuries [NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, Section 4.3](#)
- Establishment of a safety committee headed by a safety officer to recommend a safety policy and the means of implementing it [NFPA 1500, Section 4.5](#).
- Develop and implement an investigation procedure that includes all accidents, near misses, injuries, fatalities, occupational illnesses, and exposures involving members. [NFPA 1500, 4.4.4 and 4.4.5](#)
- Provision of appropriate protective equipment and a mandate to use it. [NFPA 1500, Section 7.1 through 7.8](#)
- Development and enforcement of a program on the use and maintenance of SCBA [NFPA 1500, Section 7.9 through 7.14](#)
- Development and enforcement of policies on safe practices for drivers and passengers of fire apparatus [NFPA 1500, Section 6.2 and 6.3](#)
- Development of procedures to ensure response of sufficient personnel for both fire fighting and overhaul duties. [NFPA 1500, 4.1.2; NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments; and NFPA 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Department\)](#)
- Implementation of regular medical examinations and a physical fitness program [NFPA 1500, Section 10.1 through 10.3; NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments; NFPA 1583, Standard on Health-Related Fitness Programs for Firefighters-](#)
- Adoption and implementation of an incident management system. [NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, Section 8.1; and NFPA 1561, Standard on Emergency Services Incident Management System](#)
- Training and education for all members related to emergency operations [NFPA 1500, Chapter 5](#)

- Implementation of programs for the installation of private fire protection systems, so that fires are discovered at an earlier stage, exposing the firefighter to a less hostile environment [\*NFPA 1 Uniform Fire Code\*](#) [\*NFPA 101 Life Safety Code\*](#),<sup>®</sup>; [\*NFPA 5000 Building Construction and Safety Code\*](#)
  - Increased efforts in the area of fire safety education programs, so that citizens are made aware of measures to prevent fires and of correct reactions to the fire situation [\*NFPA 1201, Standard for Providing Emergency Services to the Public\*](#), Chapter 6
- Other NFPA standards that may help in reducing firefighter injuries include:
- [\*NFPA 1584, Standard on the Rehabilitation Process for members During Emergency Operations and Training Exercises\*](#), 2008 Edition, Chapter 4 Preparedness and Chapter 6 Incident Scene and Training Rehabilitation
  - [\*NFPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualification Risk Management\*](#), 2010 Edition, Section 4.8 The Risk Management process
  - [\*NFPA 1620, Standard for Pre-Incident Planning\*](#), 2010 Edition, Chapter 4 Pre-Incident Planning Process, Chapter 5 Physical & Site Considerations, Chapter 7 Water supplies & Fire Protection Systems, Chapter 8 Special Hazards

Efforts need to be made to recognize that firefighter injuries can be reduced. By addressing the priorities listed above Fire Service organizations can make significant strides towards reducing the number and impact of such injuries.

### **Definition of Terms**

**Fire:** Any instance of uncontrolled burning. Excludes combustion explosions and fires out on arrival (whether authorized or not), overpressure rupture without combustion; mutual aid responses, smoke scares, and hazardous materials responses, e.g., flammable gas, liquid, or chemical spills without fire.

**Incident:** The movement of a piece of fire service apparatus or equipment in response to an alarm.

**Injury:** Physical damage suffered by a person that requires (or should require) treatment by a practitioner of medicine (physician, nurse, paramedic, EMT) within one year of the incident (regardless of whether treatment was actually received), or that results in at least one day of restricted activity immediately following the incident.

## **Description of NFPA Survey and Data Collection Method**

The NFPA annually surveys a sample of departments in the United States to make national projections of the fire problem. The sample is stratified by the size of the community protected by the fire department. All U.S. fire departments that protect communities of 50,000 or more are included in the sample, because they constitute a small number of departments with a large share of the total population protected. For departments that protect less than 50,000 population, stratifying the sample by community size permits greater precision in the estimates. A total of 2,795 departments responded to the 2012 fire experience survey. The national projections are made by weighting sample results according to the proportion of total U.S. population accounted for by communities of each size. Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty (or uncertainty) of the estimate. We are very confident that the actual number of total firefighter injuries falls within 5.0% of the estimate.

The results in this report are based on injuries that occurred during incidents attended by public fire departments. No adjustments were made for injuries that occurred during fires attended solely by private fire brigades, e.g., industrial or military installations.

Data collection for the selected incident summaries was enhanced by a form that was sent to departments requesting information. The form included questions on type of protective equipment worn, age and rank of firefighters injured, and description of circumstances that led to injury.

## Footnotes

1. Michael J. Karter, Jr., "2012 Fire Loss in the United States", *NFPA Journal*, Vol. 106, No. 5 (September 2013).
2. Around any estimate based on a sample survey, there is a confidence interval that measures the statistical certainty (or uncertainty) of the estimate. Based on data reported by fire departments responding to the NFPA Survey for U.S. Fire Experience (2012), the NFPA is very confident that the actual number of firefighter injuries falls within the range of 65,800 to 73,000.
3. The four regions as defined by the U.S. Census Bureau include the following 50 states and the District of Columbia:
  - Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
  - Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
  - South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.
  - West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming



## **Selected Individual Incidents**

(These Incidents were Selected to Illustrate Typical Firefighter Safety Problems)

### **Live-Fire Training**

A company officer with 18 years' experience suffered from smoke inhalation during a live-fire training evolution. On the third evolution of the training session, a three-person crew was stretching the initial attack line into the fire room, with the 40-year-old officer behind the firefighter operating the nozzle. As they walked into the room, the officer attached the SCBA regulator to his SCBA face piece. Once the regulator was attached, however, he found that it did not work and pulled it off. He tried to attach it again as he walked into the smoke-filled room, but before he could, he inhaled hot smoke. He then turned around and pushed his way through other members on their way into the room to reach fresh air. When he left the structure, outside crews and instructors halted the drill and evacuated the building.

On-scene EMS immediately treated the officer and transported him to the hospital for evaluation. Fortunately, he did not lose any time and returned to firefighting activities the next day. The department stated that the officer failed to ensure that his SCBA was on and that the regulator was properly seated before he entered the structure. They concluded that the regulator was misaligned on the SCBA face piece, causing it to malfunction.

### **Responding**

One firefighter was injured when a tanker overturned as he drove back to the station after a response to a structure fire was canceled. He had turned the 3,000-gallon (11,356-liter) tanker onto a narrow side street and was cresting the top of a hill, when the tanker left the roadway and overturned, landing approximately 200 feet (61 meters) down the hill.

The driver, who was wearing his seatbelt, has been a firefighter for 18 years and has a valid CDL license. He suffered a broken finger and was only hospitalized for a day.

The department reported that the apparatus was traveling at approximately 30 miles (48 kilometers) per hour and that the driver, who was alone in the tanker, suffered from a reaction to medication and blacked out. He said he remembered coming over the top of hill and then being extricated from the cab of the apparatus, but nothing in between. The fire department did not report whether it has a medical monitoring program.

### **Nonfire Emergency**

A 27-year-old firefighter with 2 years experience suffered a major head injury when he tried to inflate a raft to help the local animal control officer rescue a dog stuck in a creek. The victim, who was filling the raft using SCBA cylinders, had just attached a second cylinder and pressurized the fill valve to complete inflation when the cylinder detached from the coupling and went airborne, hitting the victim in the head.

The firefighter, who was not wearing any protective clothing, was knocked unconscious and suffered a fractured skull. He was hospitalized for 10 days and returned to firefighting activities nearly five months later. The department indicated that he was unfamiliar with the equipment and unaware of the hazards associated with the inflation process.

### **Struck by Vehicle**

A 55-year-old firefighter suffered head and hip injuries when he was struck by a car at the scene of a vehicle crash.

Just before 2 a.m., the fire department was dispatched to a vehicle crash on the highway. When firefighters arrived on the scene, they found an overturned tractor trailer from which diesel fuel had spilled. The firefighters helped the sheriff's department set up a cone barricade behind which they stationed a fire department staff vehicle and a sheriff's cruiser with emergency lights flashing to close the highway so the hazmat team and a tow company could remove the tractor trailer.

The victim, who was wearing a reflective traffic vest, and a sheriff's deputy were standing near the two cars at approximately 5 a.m. when they saw a speeding minivan coming through the cone barricade toward the two emergency vehicles. The minivan pushed the fire department staff car into the firefighter, who landed on the hood of the van, riding on it approximately 100 feet (30 meters) before he fell to the ground. The sheriff's deputy immediately notified EMS and the fire department, which transported the victim to the nearest trauma center.

The firefighter, a 15-year veteran of the department, was unable to perform firefighting activities for more than months. He is no longer allowed to perform interior firefighting due to limited range of motion and vertigo.

### **Brush Fire**

A 26-year-old firefighter with 7 years' experience was hit in the head by a branch while operating a hose line at a brush fire. His company officer saw the branch falling and yelled for him to move, but he could not get out of the way fast enough. The firefighter was wearing leather work boots and leather work gloves, but no other protective clothing.

After he was struck, the firefighter continued to work until those around him told him he was bleeding. He was taken to the hospital, where he received four stitches and returned to duty.

### **Hose Testing**

Three fighters were injured, two seriously, as they stood waiting while a hose was pressurized during an annual hose test at the fire station. The hose, which was 5 inches (127 millimeters) in diameter, suddenly burst and slid 14 feet (4.2 meters) into the three, knocking them onto the concrete pad.

One victim, a 32-year-old man with 6 years' experience, suffered a head laceration and was able to return to firefighting activities several days after the incident. The other two firefighters suffered more serious head injuries. One, a 39-year-old with 7 years' experience, was not allowed to perform firefighting activities for seven months, and the other, a 35-year-old with 7 years' experience, was unable to return to duty and has left the fire service.

The department reported that the three firefighters were in violation of standard operating policies and testing standards. None of them was wearing protective clothing and they were standing close to the hose.

### **Responding**

While participating in a local parade, an engine company with four firefighters on board was dispatched to a report of an unknown type of fire. Approximately 1 mile (2 kilometers) into the response, the apparatus left the roadway and overturned onto the driver's side. The officer was able to use the radio to call for assistance.

The 34-year-old driver suffered a left shoulder injury and complained of abdominal pain. He was only wearing bunker pants and leather boots while driving. The company officer, a 41-year-old with 20 years' experience, suffered bruised ribs, shoulder sprain, and elbow injury. He was wearing bunker pants, leather boots, and turnout coat. The two firefighters in the crew cab, both

of whom were wearing bunker pants, coats, and leather boots, received various contusions, sprains, and strains. All four were able to return to firefighting activities within a month. The department's investigation revealed that speed and lack of seatbelts contributed to the injuries. The 2007 engine is equipped with a 750-gallon (2,839-liter), L-shaped tank and has three-point seatbelts at all riding positions. The department has a regularly scheduled preventive maintenance program, and preemptive traffic control devices have been installed throughout its response area. The fire chief also said that the department has standard operating procedures for apparatus responses and an annual apparatus safety training program.

The chief disciplined the driver and suspended him from driving fire apparatus for one year.

### **Firefighter Assaulted**

A 26-year old firefighter was seriously injured when an irrational woman threw a pot of hot cooking oil in his face as he tried to remove her from a multifamily house to which firefighters had responded to investigate an odor of smoke.

Earlier that morning, the department had responded to the same address for an odor of gas but found nothing. Upon their arrival the second time, firefighters were approached by the caller, who told them that the occupant of the first-story apartment was despondent and possibly suicidal.

During the investigation, one of the firefighters looking through a broken window noted a slight odor of gas and heard the igniter on the stove operating. Both men entered the first-floor apartment, and the company officer immediately went into the kitchen to monitor for an explosive atmosphere, while the firefighter began searching for occupants. A few seconds after shutting off the stove's burners, the officer heard the firefighter screaming in pain, yelling "she threw something on me!"

The firefighter, who was wearing a protective ensemble without his SCBA face piece in place, had been attacked by the apartment's occupant when he tried to move her from the building to safety. He was hospitalized for three days and unable to perform firefighting activities for over a month.

### **Structure Fire**

SA 58-year-old firefighter sustained a head injury when he fell down a flight of stairs as he tried to leave a burning home after his SCBA ran out of air.

The firefighter was part of a crew responding to a 911 call reporting a house fire at 8:37 p.m. When the fire department arrived, firefighters encountered a fire in a rear bedroom that was rapidly spreading into the attic and venting out an eave on the left side of the single-story, single-family home.

The company officer and the firefighter from the first-arriving engine company had just advanced a hand line into the smoke-filled building, when the firefighter's SCBA end-of-service alarm began ringing. A few moments later, as he continued to advance the hose line with his officer, the ringing stopped and his face piece stuck to his face. Out of air, he frantically pushed his way past several firefighters entering the wood-frame building in an effort to escape.

The company officer followed a few minutes later, only to find that the firefighter had not left the building. The officer reentered the house and heard a PASS device sounding in the basement. He found the lost firefighter unconscious at the bottom of the basement stairs and directed firefighters in the area to remove him from the building.

The victim, a 27-year veteran of the fire service, tripped and fell down the stairs, striking his head, while trying to leave the building. He is unable to return to service due to his head injury. The department indicated that the firefighter, who was wearing a complete protective ensemble with integrated PASS device, might not have had a full cylinder of air when entered the house and that his exit was impeded by other members entering the structure. The department did not say whether the company officer called a mayday or a rapid intervention team had been established.

### **Structural Collapse**

Three firefighters received minor injuries when the floor they were working on collapsed.

The fire department received multiple 911 calls reporting the fire in an unoccupied flea market in a two-story, 50,000-square-foot (4,645-square-meter) building of ordinary construction. The second floor covered approximately half the length of the first floor. The building did not have an operating sprinkler or smoke detection system.

When the fire department arrived, crews found heavy fire on the second floor that was spreading into the attic and to the roof. Firefighters were assigned to perform vertical ventilation reported that the fire had weakened the roof and that they would not be able to complete ventilation. Interior crews operating on the first floor reported clear visibility, but they were unable to locate

stairs to the second floor. The incident commander switched to defensive mode and began an exterior attack after all companies had left the building.

Approximately three hours into the fire, with the main body of fire knocked down, the incident commander decided to reenter the second floor from the roof of the one-story section of the building and placed a spotter on an aerial to observe the operation. An engine company with an officer and two firefighters had cautiously entered the second floor to begin overhaul when the second floor collapsed without warning into the first floor.

The spotter immediately called a mayday, and the dedicated rapid intervention team was deployed. The incident commander then conducted a roll call to account for all personnel and asked that ambulances be sent to the scene.

Two of the three victims walked out of the building on their own and were cared for by on-scene personnel. The rapid intervention team found the third victim inside under debris on the first floor and extricated him with relative ease.

None of the victims, all of whom suffered contusions, was wearing SCBA or PASS devices, but all had on protective clothing, including trousers, coats, helmets, boots, and gloves. They were cleared by a physician to return to firefighting activities within a few days.

### **Structure Fire**

Two firefighters were burned while fighting a fire in a single-story, wood-frame, one-family house that started on a porch when a discarded cigarette ignited an upholstered couch. The home had no smoke detectors, and a delay in fire department notification allowed the fire to spread to the attic before firefighters arrived.

When the first apparatus arrived, a 31-year-old firefighter and a 51-year-old captain advanced the first hand line through the front door. Inside the house, conditions grew worse as crews performing vertical ventilation on the roof were having difficulty venting it.

As the two men advanced their hose line down a hallway, the captain was struck by falling debris that dislodged his SCBA face piece. He was disoriented and getting burned, and the firefighter went to help his officer. When he turned around, he dropped the hose line, and his turnout coat rode up above the waistline, exposing the clothing under his protective ensemble, resulting in burns to his lower back.

A second crew advancing a backup hose line behind the two victims saw that they were in trouble and got them quickly to safety. Neither injured man initiated mayday communications . A dedicated rapid intervention team was in place at the time of the incident, but it was not needed because the two had left the structure. The incident commander immediately pulled all companies from the house, conducted a roll call, and changed tactics to a defensive stance.

The captain, who has been with the fire department for 21 years, suffered minor smoke inhalation and some first-degree burns to his head and face. He was wearing a complete protective ensemble. He was cleared by a physician to perform firefighting activities several days later.

The firefighter, who had 8 years' experience, suffered first- and second-degree burns to his lower back. He was cleared to resume firefighting activities nearly two months after the incident. The department reported that his turnout coat became caught in his SCBA frame, allowing it to ride up, exposing his lower back.