

# **U.S. FIREFIGHTER INJURIES - 2013**

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November 2014**



**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 2013 National Fire Experience Survey, the NFPA estimates that 65,880 firefighter injuries occurred in the line of duty in 2013. An estimated 29,760 (45.2%) of the all firefighter injuries occurred during fireground operations. An estimated 11,800 occurred during other on duty activities, while 12,535 occurred at nonfire emergency incidents. The leading type of injury received during fireground operations was strain, sprain or muscular pain (55.3%), followed by wound, cut, bleeding, bruise (13.8%). 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 (2013) 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, Myles O'Malley, 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 2013 Firefighter Injuries

- 65,880 firefighter injuries occurred in the line of duty in 2013, a decrease of 5.1%.
- In addition to injuries, there were 7,100 exposures to infectious diseases, and 17,400 exposures to hazardous conditions.
- 29,760 or 45.2% of all firefighter injuries occurred during fireground operations. An estimated 11,800 occurred during other on duty activities, 4,015 while responding/returning from an incident, 7,770 during training activities, and 12,535 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 (55.3%); wound, cut, bleeding, bruise (13.8%); burns (5.1%) smoke or gas inhalation (5.0%). Strains, sprains, and muscular pain accounted for 58.4% of all nonfireground injuries.
- The leading causes of fireground injuries were overexertion, strain (26.5%) and fall, slip, jump (22.7%).

## 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 97 firefighters died on duty (See, "2013 Firefighter Fatalities ", NFPA Journal July/August) [www.nfpa.org/firefighterfatalities](http://www.nfpa.org/firefighterfatalities).

This report addresses 2013 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 (2013). An earlier report, [\*Fire Loss in the United States during 2013\*](#), 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 2013 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 65,880 firefighter injuries occurred in the line of duty in 2013. This is a decrease of 5.1% 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 7,100 exposures to infectious diseases (e.g., hepatitis, meningitis, HIV, others) in 2013. This amounts to 0.3 exposures per 1,000 emergency medical runs by fire departments in 2013.

The NFPA estimates that there were 17,400 exposures to hazardous conditions (e.g., asbestos, radioactive materials, chemicals, fumes, other) in 2013. This amounts to 16.7 exposures per 1,000 hazardous condition runs in 2013.

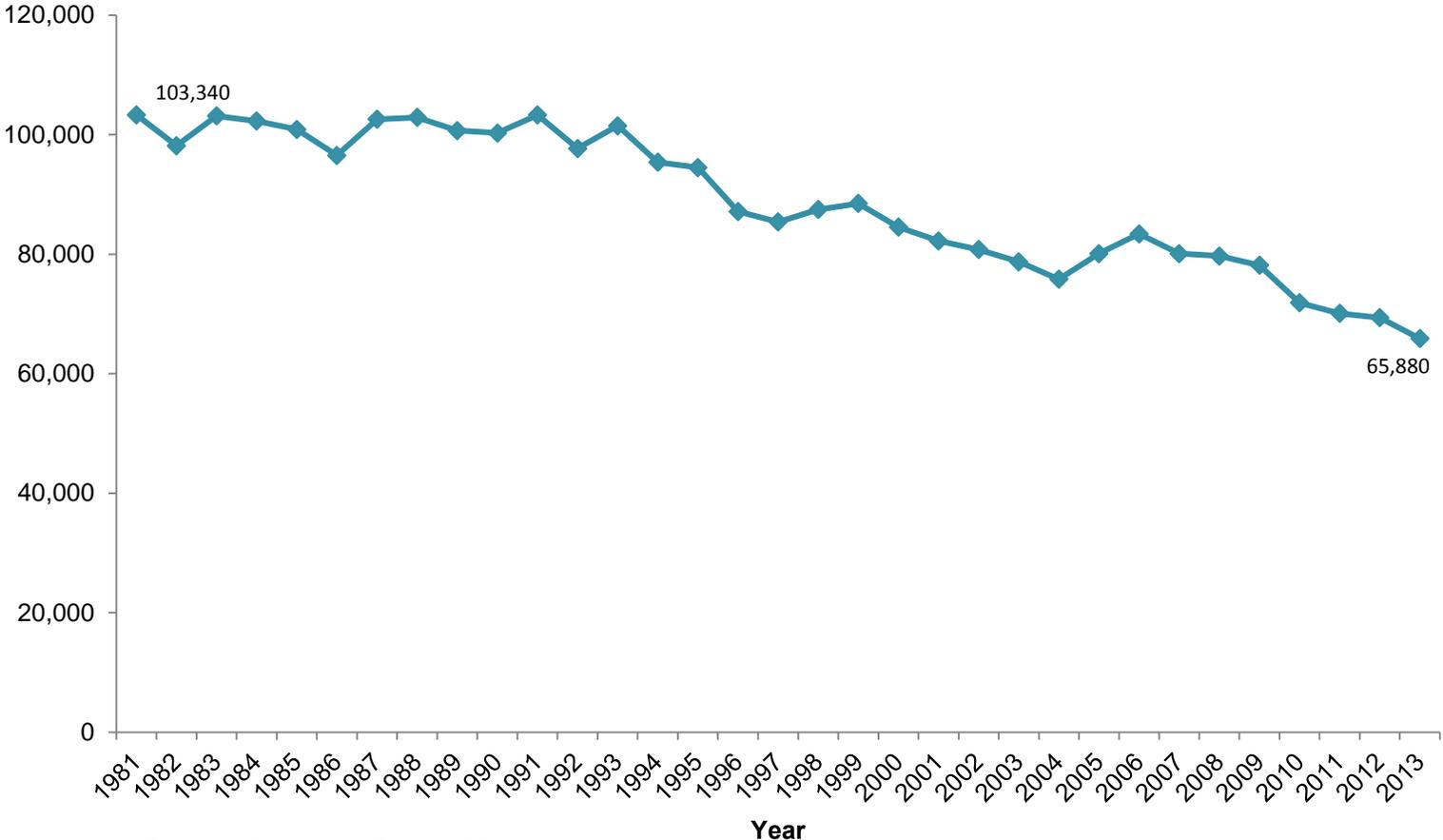
An estimated 10,000 injuries or 15.2% of all firefighter injuries resulted in lost time in 2013.

## 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 (1981-2013)**



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1981-2013)

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: 29,760 or 45.2% of all firefighter injuries in 2013, a decrease of 5.5% from last year, and the lowest since NFPA analysis began in 1981. Table 1 displays firefighter injuries at the fireground and injury rates for the 1981-2013 period. Injuries at the fireground decreased from their high of 67,500 in 1981 to 29,760 in 2013 for a decrease of 55.9%. The number of fires also declined steadily for an overall decrease of 57.1%. The rate of injuries per 1,000 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 2013 period, the number of injuries at nonfire emergencies increased from 9,600 in 1981 to 12,535 in 2013 for an overall increase of 31%. 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 1,000 nonfire emergencies is examined, the rate has declined during the period from 1.24 in 1981 to 0.41 in 2013 (Figure 3), because the number of nonfire emergencies increased at a higher rate than the number of injuries at nonfire emergencies.

Also in 2013, 4,015 firefighter injuries occurred while responding or returning from an incident, 7,770 occurred during training activities, and 11,800 occurred during other on-duty activities.

### **Nature of Fireground Injuries**

Estimates of 2013 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 (55.3%); wound, cut, bleeding, bruise (13.8%); burns (5.1%); smoke or gas inhalation (5.0%).

Results were fairly consistent during all non-fireground activities, with strains, sprains, and muscular pain accounting for 58.4% of all non-fireground injuries, and wound, cut, bleeding, bruise accounting for 17.8%.

### **Causes of Fireground Injuries**

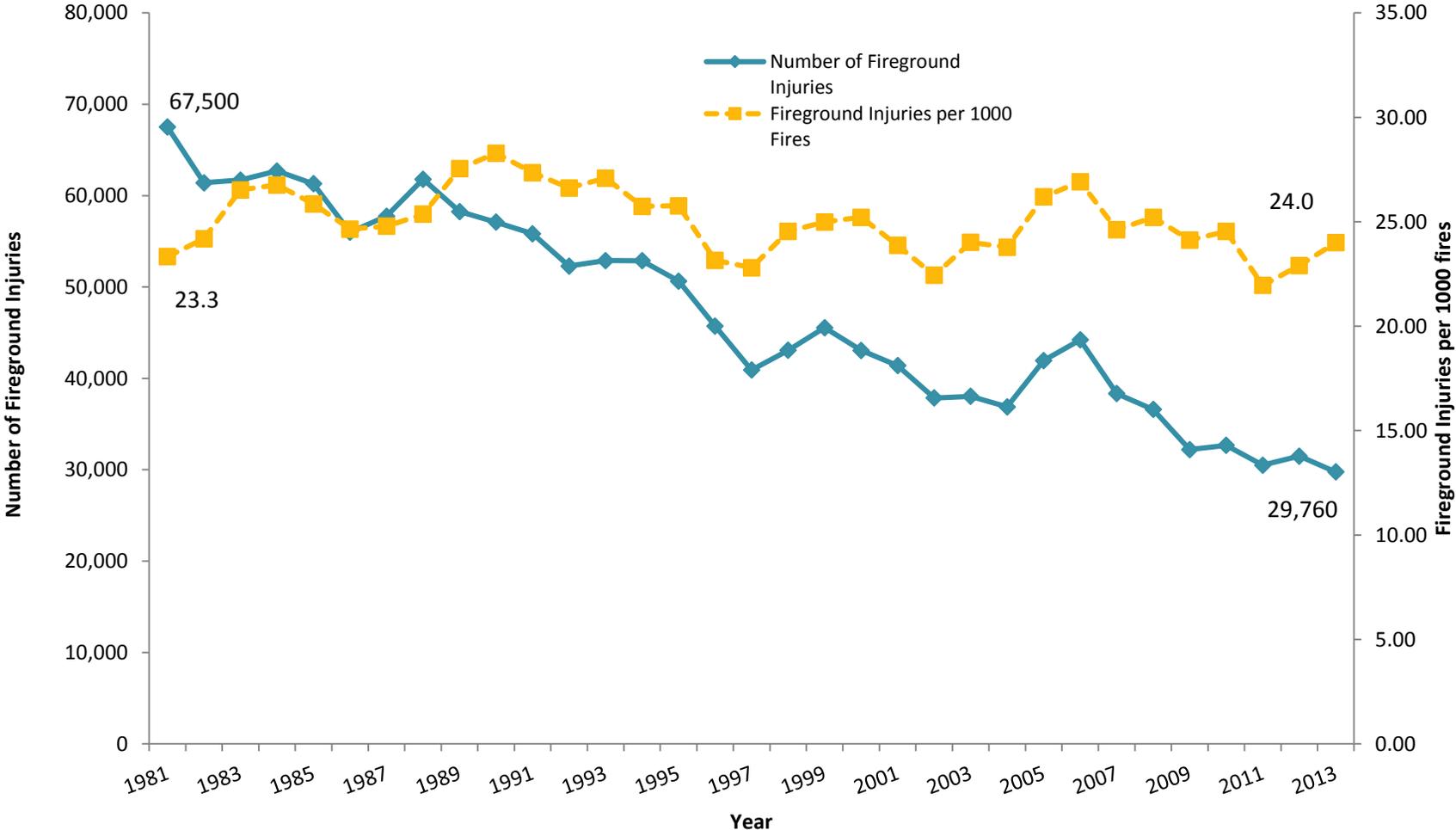
Because fireground injuries are of particular concern their causes were examined (see Figure 5). The definition of cause here refers to the initial circumstance leading to the injury.

**Table 1**  
**Total Firefighter Injuries at the Fireground, and**  
**at Nonfire Emergencies, 1981-2013**

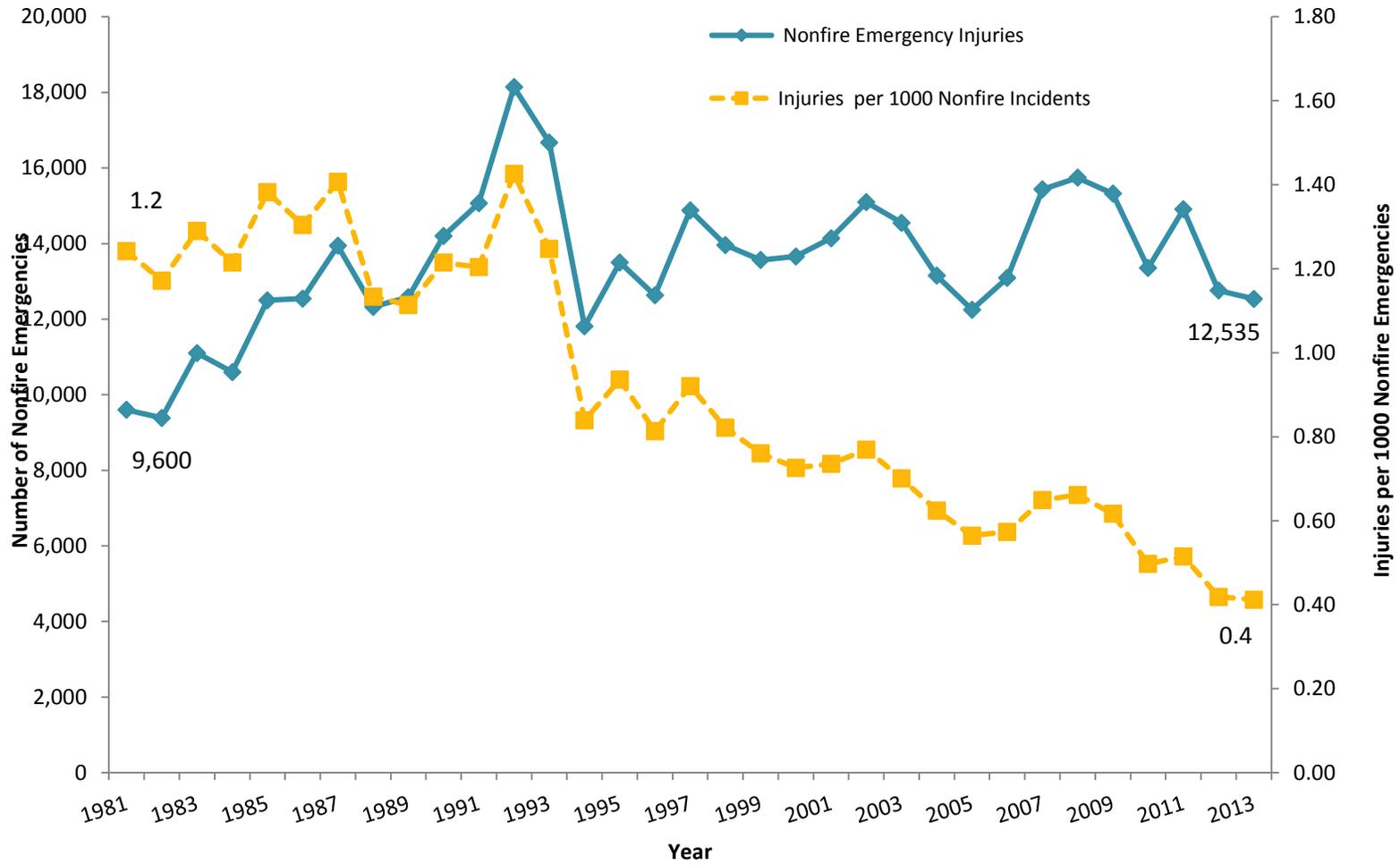
Year	Total Firefighter Injuries	Firefighter Injuries at the Fireground		Firefighter Injuries at Nonfire Emergencies	
		Injuries	Injuries per 1,000 Fires	Injuries	Injuries per 1,000 Incidents
1981	103,340	67,500	23.3	9,600	1.24
1982	98,150	61,400	24.2	9,385	1.17
1983	103,150	61,700	26.5	11,105	1.29
1984	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
2013	65,880	29,760	24.0	12,535	0.41

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1981-2013)

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

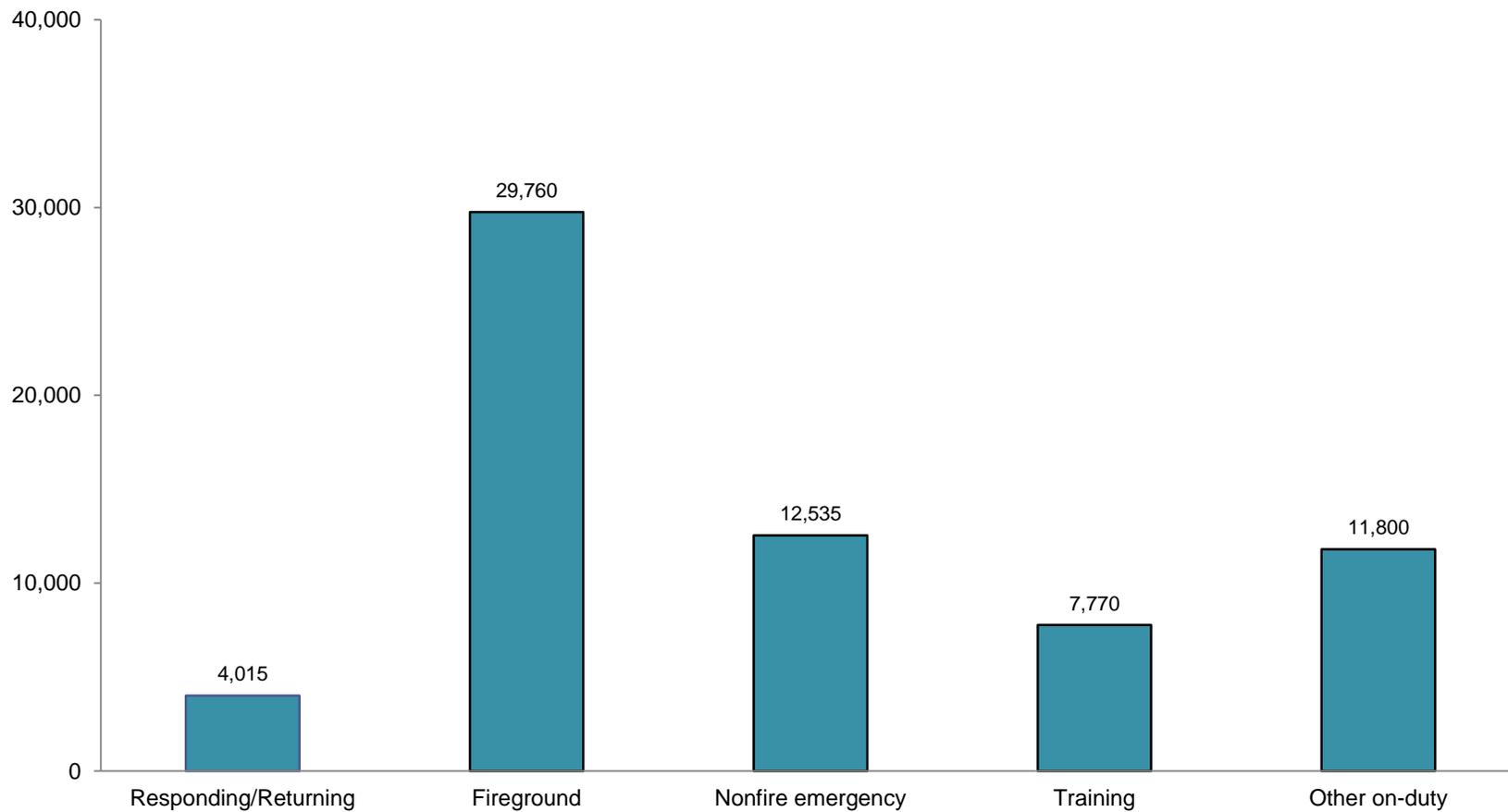


**Figure 3. The Number of Injuries at Nonfire Emergencies and Injuries per 1000 Nonfire Emergencies**



Number of Firefighter Injuries

**Figure 4**  
**Firefighter Injuries by Type of Duty, 2013**



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2013)

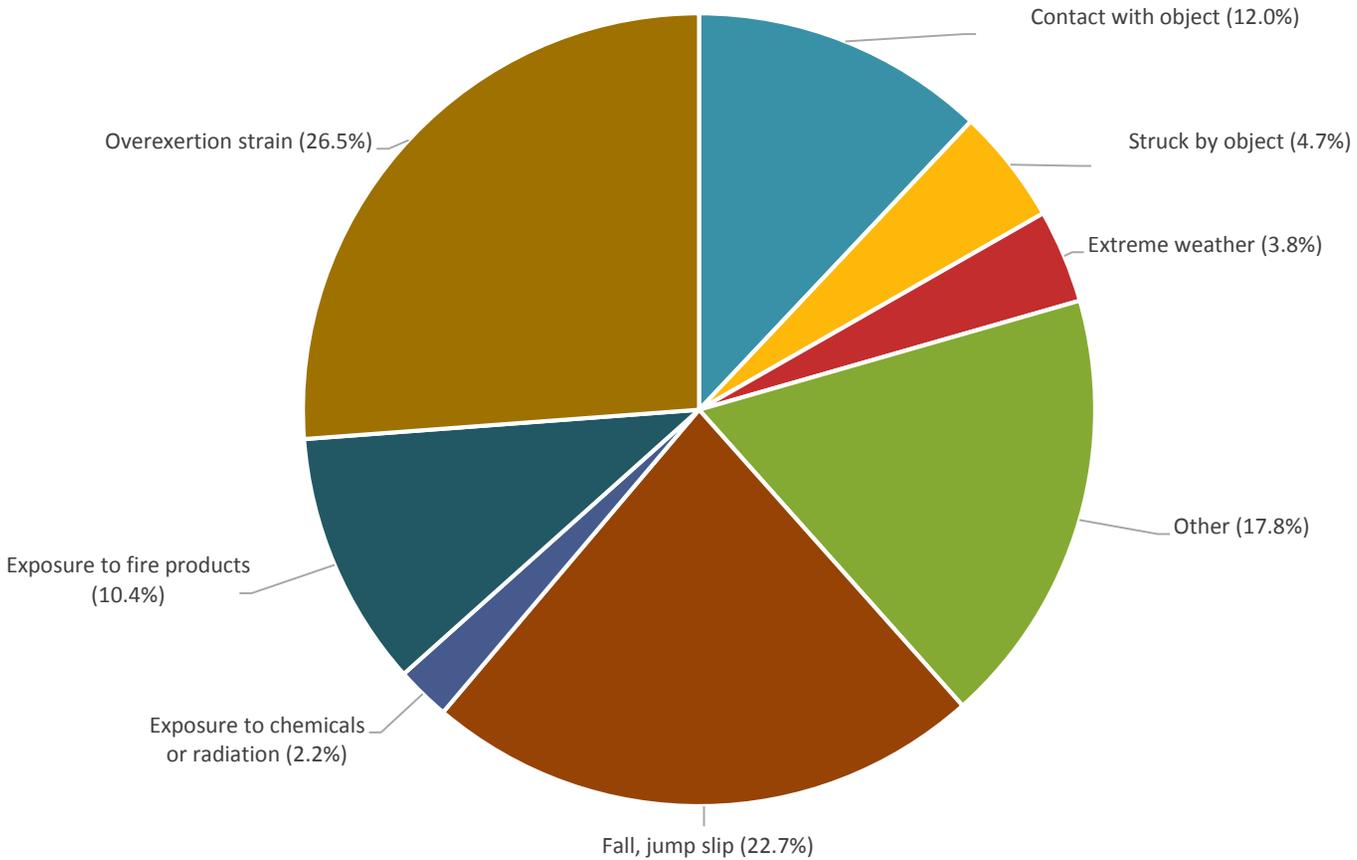
**Table 2. Firefighter Injuries by Nature of Injury and Type of Duty, 2013**

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)	10	0.3	1,530	5.1	80	0.6	150	1.9	205	1.7	1,975	3.0
Smoke or Gas Inhalation	65	1.6	1,475	5.0	170	1.4	130	1.7	55	0.5	1,895	2.9
Other Respiratory Distress	20	0.5	425	1.4	175	1.4	160	2.1	135	1.1	915	1.4
Burns and Smoke Inhalation	0	0	135	0.5	5	0.0	35	0.5	20	0.2	195	0.3
Wound, Cut, Bleeding, Bruise	825	20.6	4,115	13.8	1,980	15.8	1,460	18.8	2,150	18.2	10,530	16.0
Dislocation, Fracture	240	6.0	825	2.8	185	1.5	300	3.9	350	3.0	1,900	2.9
Heart Attack or Stroke	65	1.6	220	0.7	95	0.8	45	0.6	195	1.7	620	0.9
Strain, Sprain, Muscular Pain	2,115	53.7	16,470	55.3	7,615	60.8	4,665	60.0	6,660	56.4	37,565	57.0
Thermal Stress (frostbite, heat exhaustion)	80	2.0	1,385	4.7	110	0.9	400	5.2	105	0.9	2,080	3.2
Other	555	13.8	3,180	10.7	2,120	16.9	425	5.5	1,925	16.3	8,205	12.5
<b>Total</b>	<b>4,015</b>	<b>100.0</b>	<b>29,760</b>	<b>100.0</b>	<b>12,535</b>	<b>100.0</b>	<b>7,770</b>	<b>100.0</b>	<b>11,800</b>	<b>100.0</b>	<b>65,880</b>	<b>100.0</b>

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2013

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, 2013**



Overexertion, strain (26.5%) and fall, jump, slip (22.7%) were the leading causes of fireground injuries. Other major causes were contact with object (12.0%); and exposure to fire products (10.4%).

### **Fire Department Vehicle Collisions**

The NFPA reported earlier that 10 firefighters died in motor vehicle collisions in 2013. (See “2013 Firefighter Fatalities” July/August *NFPA Journal* [www.nfpa.org/firefighterfatalities](http://www.nfpa.org/firefighterfatalities)).

In 2013, there were an estimated 12,350 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 31.7 million incidents in 2013 so that the number of collisions represents about one tenth of 1 percent of total responses. However, these collisions resulted in 730 firefighter injuries or 1.1% of all firefighter injuries.

Also, 830 collisions involving firefighters’ personal vehicles occurred in 2013 while departments were responding to or returning from incidents. These collisions resulted in an estimated 185 injuries.

**Table 3**  
**Fire Department Vehicle Collisions and**  
**Resulting Firefighter Injuries**  
**While Responding to or Returning From Incidents, 1990-2013**

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
2013	12,350	730	830	185

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1990-2013)

## 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 2013 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 120.1 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 3.0 for departments that protect communities 250,000 to 499,999 to a low of 1.3 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 2.0 injuries per 100 fires or 25% 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 6.8 injuries per 100 firefighters. As community size decreases, the rate drops quite steadily to a low of 1.0 for departments protecting less than 2,500 people. That is a more than a six-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 21 times as many firefighters than a department protecting a population of less than 2,500, the larger department attends more than 98 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, 2013**

<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*	4,574.3	120.1	2.6	5.5
500,000 to 999,999	2,258.8	42.5	1.9	3.7
250,000 to 499,999	982.1	29.5	3.0	6.8
100,000 to 249,999	479.0	8.7	1.8	3.8
50,000 to 99,999	190.2	3.2	1.7	3.1
25,000 to 49,999	105.3	2.4	2.3	3.9
10,000 to 24,999	57.7	0.9	1.6	2.1
5,000 to 9,999	31.9	0.4	1.3	1.3
2,500 to 4,999	20.6	0.3	1.5	1.1
Under 2,500	10.0	0.2	2.0	1.0

\*Excludes New York City

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2013

## **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, 2013**

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	1,140.3	36.0	3.2	2,743.5	59.0	2.2	1,698.9	39.2	2.3	1,929.1	48.1	2.5
100,000 to 249,999	1,247.7	19.3	1.5	429.6	7.7	1.8	512.4	8.9	1.7	366.4	7.9	2.2
50,000 to 99,999	276.4	9.1	3.3	144.5	2.7	1.9	231.5	2.5	1.1	164.0	2.3	1.4
25,999 to 49,999	129.9	5.4	4.2	82.4	2.1	2.5	132.0	1.6	1.2	96.8	1.3	1.3
10,000 to 24,999	54.6	1.6	2.9	47.4	0.7	1.5	72.1	0.7	1.0	63.5	1.0	1.6
5,000 to 9,999	28.8	0.8	2.8	27.7	0.4	1.4	40.2	0.2	0.5	35.0	0.2	0.6
2,500 to 4,999	16.7	0.4	2.4	18.3	0.3	1.6	28.1	0.2	0.7	26.1	0.5	1.9
Under 2,500	10.9	0.1	0.9	7.7	0.1	1.3	15.3	0.2	1.3	9.9	0.3	3.0
Overall Regional Rate	34.0	0.9	2.6	33.3	0.6	1.8	47.2	0.6	1.3	41.5	0.7	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 4.8.

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2013

## 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 2,637 departments responded to the 2013 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., "2013 Fire Loss in the United States", *NFPA Journal*, Vol. 107, No. 5 (September 2014).
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 (2013), the NFPA is very confident that the actual number of firefighter injuries falls within the range of 62,280 to 69,480.
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)

### **Struck by vehicle at non-fire emergency**

At approximately 5 a.m. on a cold, rainy morning, the fire department was dispatched to the highway for a motor vehicle crash with reported entrapment. A ladder company with an officer and three firefighters arrived at the scene on the westbound side of the highway within five minutes and found a car resting on its side on the median, sticking out into both the east- and westbound high-speed lanes.

The police department had already blocked the high-speed lane on the westbound side of the road, so the driver of the ladder company blocked off a second westbound lane to establish a protected work zone for emergency personnel. The company officer asked the police to shut down the eastbound side of the highway to establish a second safety zone.

Several minutes after the firefighters' arrival, a pickup truck traveling eastbound lost control on the slick roads and slammed into the car involved in the original crash. The truck overturned onto its passenger side and came to rest in the high-speed lane next to the original crash site.

The company officer left the safe area of the median to check on the driver of the overturned truck and was standing behind the vehicle when a third car lost control and slammed into the pickup. The force of the collision pushed the pickup truck into the officer, tossing him backwards several yards onto the snow-covered median. The pickup truck came to rest on top of the median next to him, barely missing him.

The company officer sustained multiple fractures, abrasions, and contusions, and was treated at the scene before he was transported to the nearest Level 1 trauma facility.

At the time of crash, the officer was wearing his structural firefighting gear, including his helmet, and the department credits his protective clothing, especially the helmet, with minimizing his injuries.

### **Injured while fighting structure fire**

A chief officer assigned to oversee an interior firefighting crew was seriously injured after exhausting his air supply and becoming disoriented. The fire that the crew was fighting began in the basement of a two-story, multi-family house of ordinary construction when a portable space

heater ignited combustibles that had been placed too close to it.

The firefighters had spent approximately five minutes searching for fire on the second floor when the fire intensified below them, spreading from the basement to the first floor. Recognizing the severity of the situation, the incident commander ordered all companies to evacuate the house and establish a defensive operation. The interior chief, who was a 22-year veteran, acknowledged the order, but notified command moments later that he was running out of air.

With his air supply nearly exhausted, the chief became lost and disoriented while searching for a way out. He found a window and quickly scrambled out of it and onto a ground ladder that had been raised up to it. He slipped and toppled down the ladder, falling onto another firefighter who was climbing up the ladder to help him out the window.

The chief, who was wearing a full structural firefighting protective ensemble with an integrated personal alert safety system (PASS) device on his self-contained breathing apparatus (SCBA), was hospitalized for seven days with smoke inhalation and respiratory burns. He has not returned to firefighting activities.

A firefighter suffered contusions and muscle sprains when he was struck by the chief as he fell down the ladder. Another firefighter sprained his ankle post-incident. Both returned to firefighting activities in less than a month.

### **Falling down a fire pole**

A 51-year-old firefighter remains unable to perform firefighting duties nearly a year after falling down a fire pole, sustaining serious knee and back injuries as well as contusions and some sprains and strains. He has been rehabilitating his knee and back injuries by participating in a work hardening program.

The victim, who has been a member of the department for 23 years, stood up from a table in the sitting room and was talking to another member when he stepped back and fell down the hole for the fire pole. It is unknown why the safety bar surrounding the hole was not closed. Fellow firefighters watched him fall down the hole and immediately reacted. Several of them rushed to the apparatus floor to render aid, while another requested an ALS ambulance that responded within four minutes.

The firefighter who was standing next to the victim before he fell went to the hole expecting to

see the victim lying on the apparatus floor. When he opened the weight-actuated doors, however, he was surprised to find the victim hanging upside-down with his lower leg and knee caught on some pipes, trying to grab the pole with his hands.

The victim freed his leg and was able to swing himself around and fall onto his legs. He was transported to a hospital and treated for his injuries.

### **Struck by vehicle during non-fire emergency**

A 35-year-old engineer with 13 years of experience suffered a severe leg fracture that ultimately resulted in the amputation of his lower leg.

The victim was performing an emergency medical assessment of an injured person at the scene of a car crash on a divided highway. According to the fire department, scene safety measures were established, and three firefighters and two emergency medical personnel were operating alongside law enforcement. Just after the patient was loaded into the ambulance, a vehicle went around the barriers and drove through the scene, striking several firefighters and a medic from the ambulance.

The driver of the vehicle that struck and seriously injured the victim was apprehended and is currently facing charges of operating a vehicle under the influence of alcohol. The victim has not returned to the fire service. The other firefighter and medic suffered minor injuries and were treated at and released from the local emergency department.

### **Firefighter evaluated following fatal crash**

A company officer responding alone in a pumper to help a neighboring department with a car crash was driving down a straight stretch of two-lane road when a pickup truck traveling in the opposite direction suddenly veered into his lane. The apparatus operator turned and applied the brakes in an attempt to avoid the pickup, but could not avoid hitting the truck's passenger-side door. The driver of the pickup was killed.

The company officer, an experienced apparatus driver, was wearing his protective trousers, coat, and boots, as well as his three-point seatbelt. A police investigation concluded that the nearly 20,000-pound (9,071-kilogram) pumper was traveling less than 55 miles (86 kilometers) per hour, the posted speed limit, and that there was nothing the officer could have done to prevent the crash.

Although the firefighter did not suffer any physical trauma, he was taken to a medical facility for precautionary reasons. The department also provided the company officer with counseling services.

### **Severely injured in apparatus crash**

At approximately 3 a.m., a fire department dispatched two engine companies and an ambulance to an interstate highway for a reported car crash. When one of the responding engines arrived at the scene, the officer in charge determined that the crew would be able to handle the incident without the second engine, which was approaching the scene on the opposite side of the highway.

A few seconds after the second engine acknowledged the cancellation, it was rear-ended by a tractor trailer carrying a load of rice. The engine, with its warning lights still active, spun 180 degrees and slammed into a jersey barrier, spewing chunks of concrete over several vehicles traveling in the opposite side of the interstate, before rolling onto its passenger side.

The crash seriously damaged the engine, the tractor trailer, and three cars. It also severed the arm of the 30-year-old firefighter, who was seated—without his seat belt on—in the jump seat behind the officer. Doctors were able to reattach the arm after hours of surgery, but the firefighter was hospitalized for several months and remains unable to perform firefighting duties. The company officer, the driver, and the firefighter sitting in the jump seat behind the driver of the stricken engine were all wearing their seatbelts and sustained only minor contusions and abrasions.

The operator of the tractor trailer was charged with numerous violations, including driving in a reckless and imprudent manner, failure to control vehicle speed, and failure to yield right of way for an emergency vehicle. Contributing to the crash were slippery road conditions resulting from a drizzle that had fallen during the night.

### **Gunshot during medical assistance alarm**

An ambulance dispatcher who received a medical assistance alarm received no answer when he twice tried to call the house where the call originated. When the ambulance crew arrived, they, too, were unable to rouse the inhabitants, so they asked the fire department to respond to forced entry into the single-family home.

An engine company staffed with three firefighters responded without lights or siren within five minutes, and the firefighters made their presence known by knocking and announcing

themselves in a loud voice. When one of the firefighters found a partially opened window near the front of the house, he raised the sash and stepped back, loudly telling everyone he had found an open window. As he reached inside to push up the blinds, he heard an alarm sound inside and heard a man yell “Hey!” The homeowner then fired a single shot out the window that struck the firefighter in the left thigh.

At that point, the company officer requested another medic unit and the police department, reporting he had shots fired and a firefighter down. The three firefighters and two medics then retreated to the ambulance and pulled it around the corner to a safe area.

The 33-year-old firefighter suffered minor injuries and was able to return to firefighting activities a day later. The fire department’s investigation report made several recommendations, telling crews to maintain situational awareness and unit accountability on all calls and to continuously announce their presence and intentions.

### **Injured while fighting structure fire**

Firefighters responding to a 7:45 a.m. 911 call to a fire in a two-story, wood-frame, single-family house found a large amount of fire and smoke throughout the structure. After assessing the conditions, they advanced the first hose line through a side door on the first floor and began extinguishing the blaze.

The company officer and two firefighters were operating the hose line when the officer’s SCBA face piece and helmet became dislodged. The three men retreated, backing out the same door they had entered approximately eight minutes after arriving on scene.

The three men, all of whom were wearing full structural firefighting protective ensembles, suffered thermal burns. The company officer suffered second-degree burns on his head, smoke inhalation, and respiratory burns. He was hospitalized for several days and was able to resume firefighting activities seven weeks after the incident. The two firefighters also suffered second-degree burns to their ears, necks, and wrists.

Damage to the house, valued at \$400,000, was assessed at about \$300,000. The home was equipped with smoke alarms that functioned properly, alerting the residents to the fire. The house also had a residential fire sprinkler system, but the owner had shut it off before the fire, due to a leak.