U.S. FIREFIGHTER INJURIES - 2010

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October 2011

National Fire Protection Association
Fire Analysis and Research Division

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Abstract
NFPA estimates that 71.875 firefighter injuries occurred in the line of duty in 2010. An estimated 32,675 or two-fifths (45.4%) of the all firefighter injuries occurred during fireground operations. An estimated 14,190 occurred during other on duty activities, while 13,355 occurred at nonfire emergency incidents. The leading type of injury received during fireground operations was strain, sprain or muscular pain (52.8%), followed by wound, cut, bleeding, bruise (14.2%). 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
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The authors 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 processing survey forms and typing this report.

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Overview of 2010 Firefighter Injuries

- 71,875 firefighter injuries occurred in the line of duty in 2010, a decrease of 8.0%.

- In addition to injuries, there were 11,200 exposures to infectious diseases, and 25,700 exposures to hazardous conditions.

- 32,675 or 45.4% of all firefighter injuries occurred during fireground operations. An estimated 13,355 occurred at nonfire emergency incidents, 4,380 while responding/returning from an incident, 7,275 during training activities, and 14,190 occurred during other on duty activities.

- 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 (52.8%); wound, cut, bleeding, bruise (14.2%); burns (5.9%). Strains, sprains, and muscular pain accounted for 59.0% of all nonfireground injuries.

- The leading causes of fireground injuries were overexertion, strain (25.7%) and fall, slip, jump (22.5%).

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 72 firefighters died on duty (See, "2010 Firefighter Fatalities ", NFPA Journal July/August).

This report addresses 2010 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 (2010). An earlier report 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[1].

This year's report includes among its results:

- An estimate of the total number of 2010 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 71,875 firefighter injuries occurred in the line of duty in 2010. This is a decrease of 8.0% from a year ago, and the lowest it's been for the 1981 to 2010 period. 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 11,200 exposures to infectious diseases (e.g., hepatitis, meningitis, HIV, others) in 2010. This amounts to 0.6 exposures per 1,000 emergency medical runs by fire departments in 2010.

The NFPA estimates that there were 25,700 exposures to hazardous conditions (e.g., asbestos, radioactive materials, chemicals, fumes, other) in 2010. This amounts to 24.2 exposures per 1,000 hazardous condition runs in 2010.

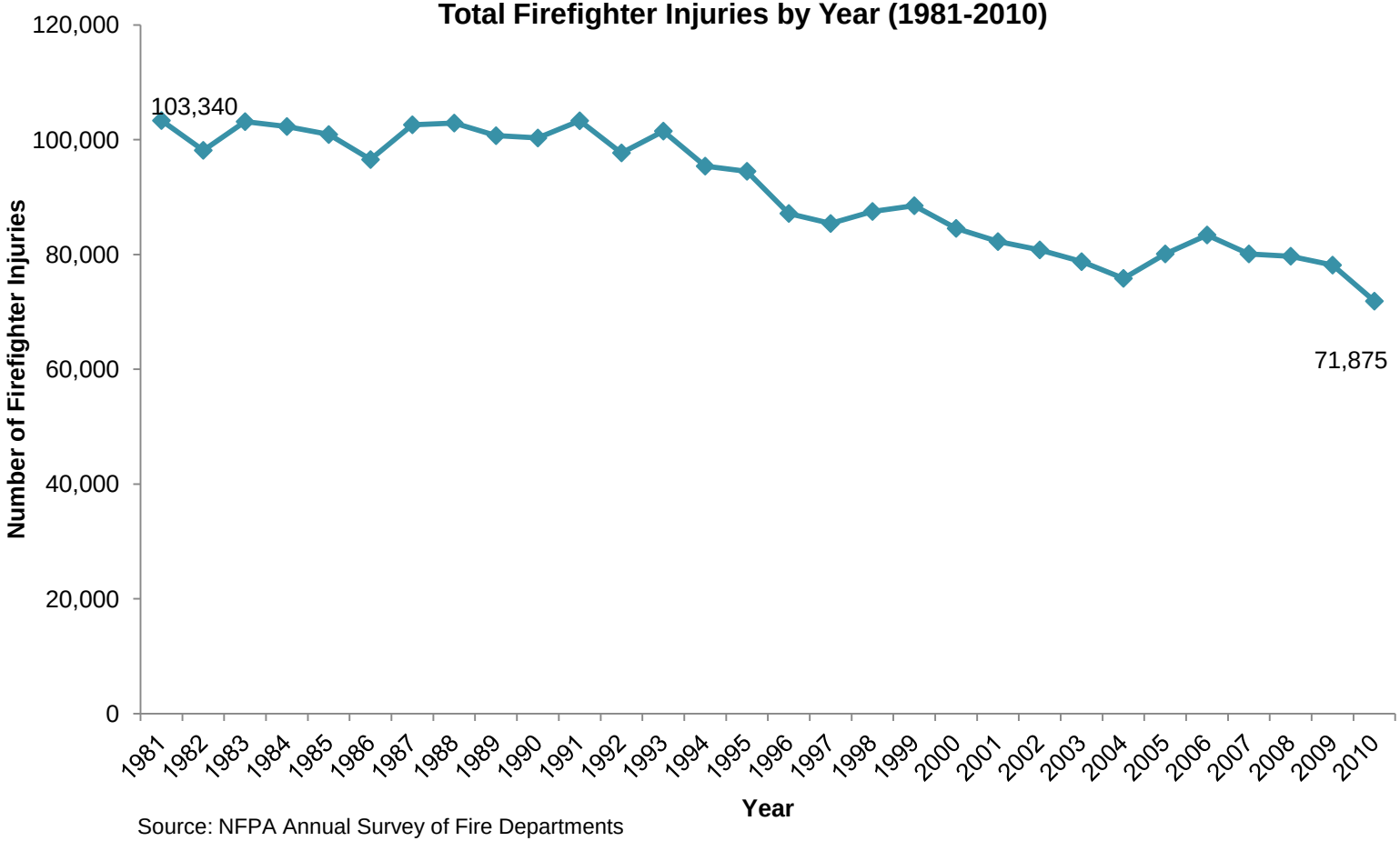
An estimated 15,000 injuries or 20.8% of all firefighter injuries resulted in lost time in 2010.

Injuries by Type of Duty

Estimates of firefighter injuries by type of duty are displayed in Figure 2. 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 (1981-2010)



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (1981-2010)

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: 32,675 or 45.4% of all firefighter injuries in 2010, and a slight increase of 1.4% from last year. Table 1 displays firefighter injuries at the fireground and injury rates for the 1981-2010 period. Injuries at the fireground decreased from their high of 67,500 in 1981 to 32,675 in 2010 for a decrease of 51.6%. The number of fires also declined steadily for an overall decrease of 54.0%. 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 2010 period, the number of injuries at nonfire emergencies increased from 9,600 in 1981 to 13,355 in 2010 for an overall increase of 39%. For the same period, the number of nonfire emergencies increased a substantial 247% 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 0.50 in 2010 (Figure 3), because the number of nonfire emergencies increased at a higher rate than the number of injuries at nonfire emergencies.

Also in 2010, 4,380 firefighter injuries occurred while responding or returning from an incident, 7,275 occurred during training activities, and 14,190 occurred during other on-duty activities.

Nature of Fireground Injuries

Estimates of 2010 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 (52.8%); wound, cut, bleeding, bruise (14.2%); thermal stress (7.2%); burns (5.9%).

Results were fairly consistent during all non-fireground activities, with strains, sprains, and muscular pain accounting for 59.0% of all non-fireground injuries, and wound, cut, bleeding, bruise accounting for 16.5%.

Causes of Fireground Injuries

Because fireground injuries are of particular concern their causes were examined (see Figure 4). The definition of cause here refers to the initial circumstance leading to the injury. Overexertion, strain (25.7%) and fall, jump, slip (22.5%) were the leading causes of fireground injuries. Other major causes were contact with object (12.4%); and exposure to fire products (9.0%).

Table 1
Firefighter Injuries at the Fireground, and at Nonfire Emergencies, 1981-2010

	At the Fireground		At Nonfire Emergencies	
Year	**Injuries**	**Injuries per 1,000 Fires**	**Injuries**	**Injuries per 1,000 Incidents**
1981	67,500	23.3	9,600	1.24
1982	61,400	24.2	9,385	1.17
1983	61,700	26.5	11,105	1.29
1984	62,700	26.8	10,600	1.21
1985	61,300	25.9	12,500	1.38
1986	55,900	24.7	12,545	1.30
1987	57,755	24.8	13,940	1.41
1988	61,790	25.4	12,325	1.13
1989	58,250	27.5	12,580	1.11
1990	57,100	28.3	14,200	1.28
1991	55,830	27.3	15,065	1.20
1992	52,290	26.6	18,140	1.43
1993	52,885	27.1	16,675	1.25
1994	52,875	25.7	11,810	0.84
1995	50,640	25.8	13,500	0.94
1996	45,725	23.1	12,630	0.81
1997	40,920	22.8	14,880	0.92
1998	43,080	24.5	13,960	0.82
1999	45,500	25.0	13,565	0.76
2000	43,065	25.2	13,660	0.73
2001	41,395	23.9	14,140	0.73
2002	37,860	22.4	15,095	0.77
2003	38,045	24.0	14,550	0.70
2004	36,880	22.1	13,150	0.62
2005	41,950	26.2	12,250	0.56
2006	44,210	26.9	13,090	0.57
2007	38,340	24.6	15,435	0.65
2008	36,595	25.2	15,745	0.66
2009	32,205	24.1	15,455	0.62
2010	32,675	24.5	13,355	0.50

Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1981-20010)

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

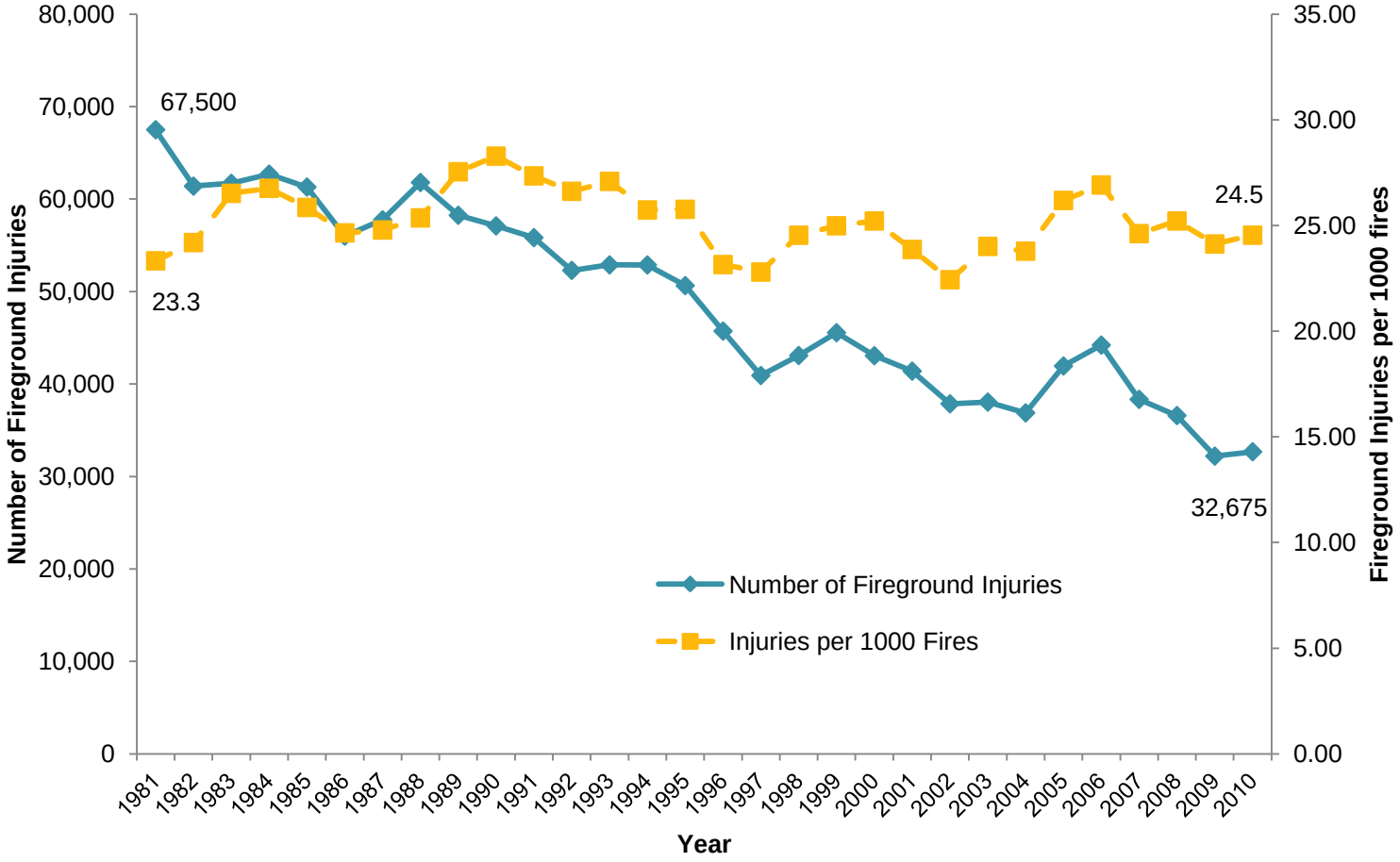


Figure 3. The Number of Injuries at Nonfire Emergencies and Injuries per 1000 Nonfire Emergencies

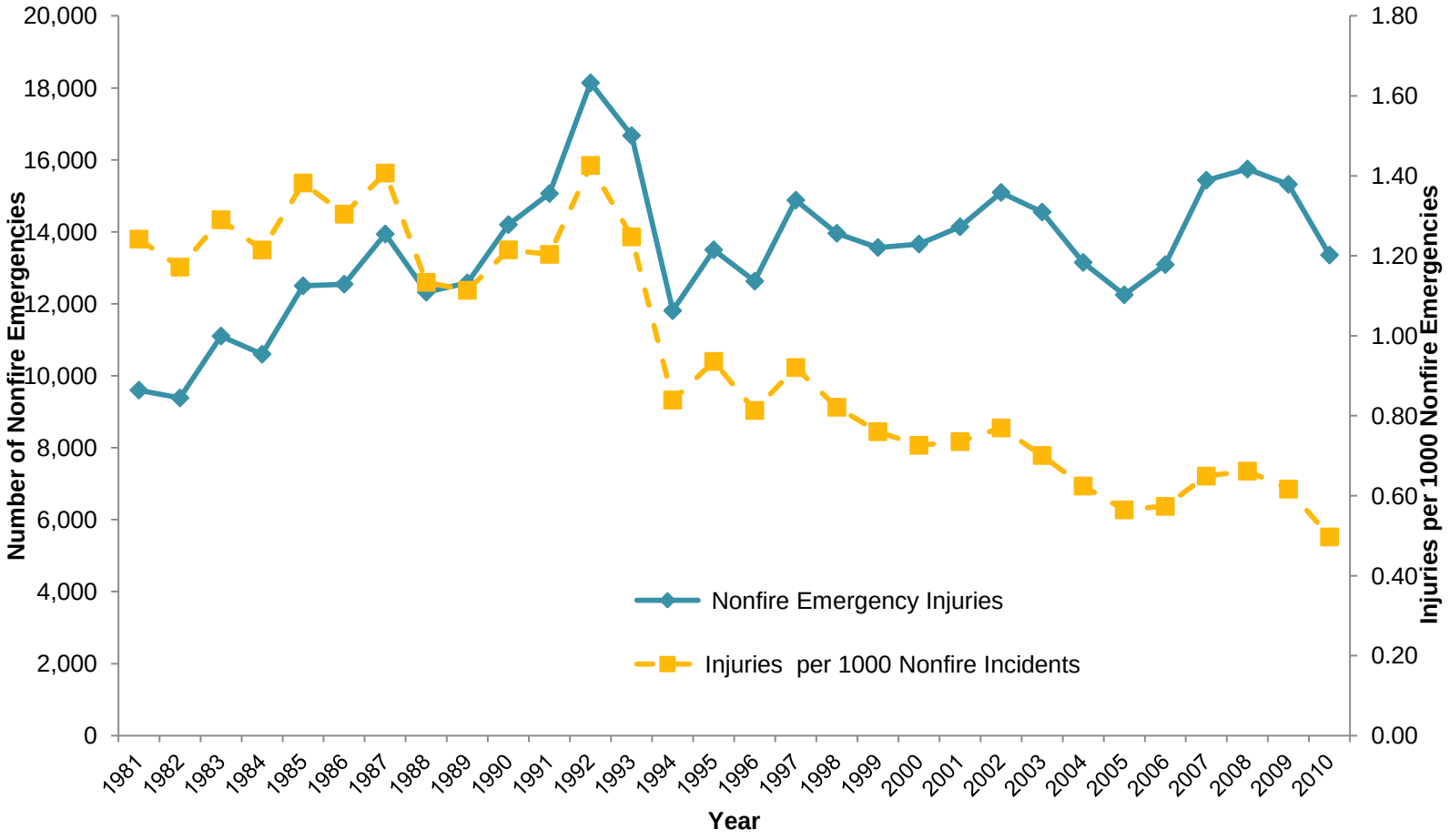
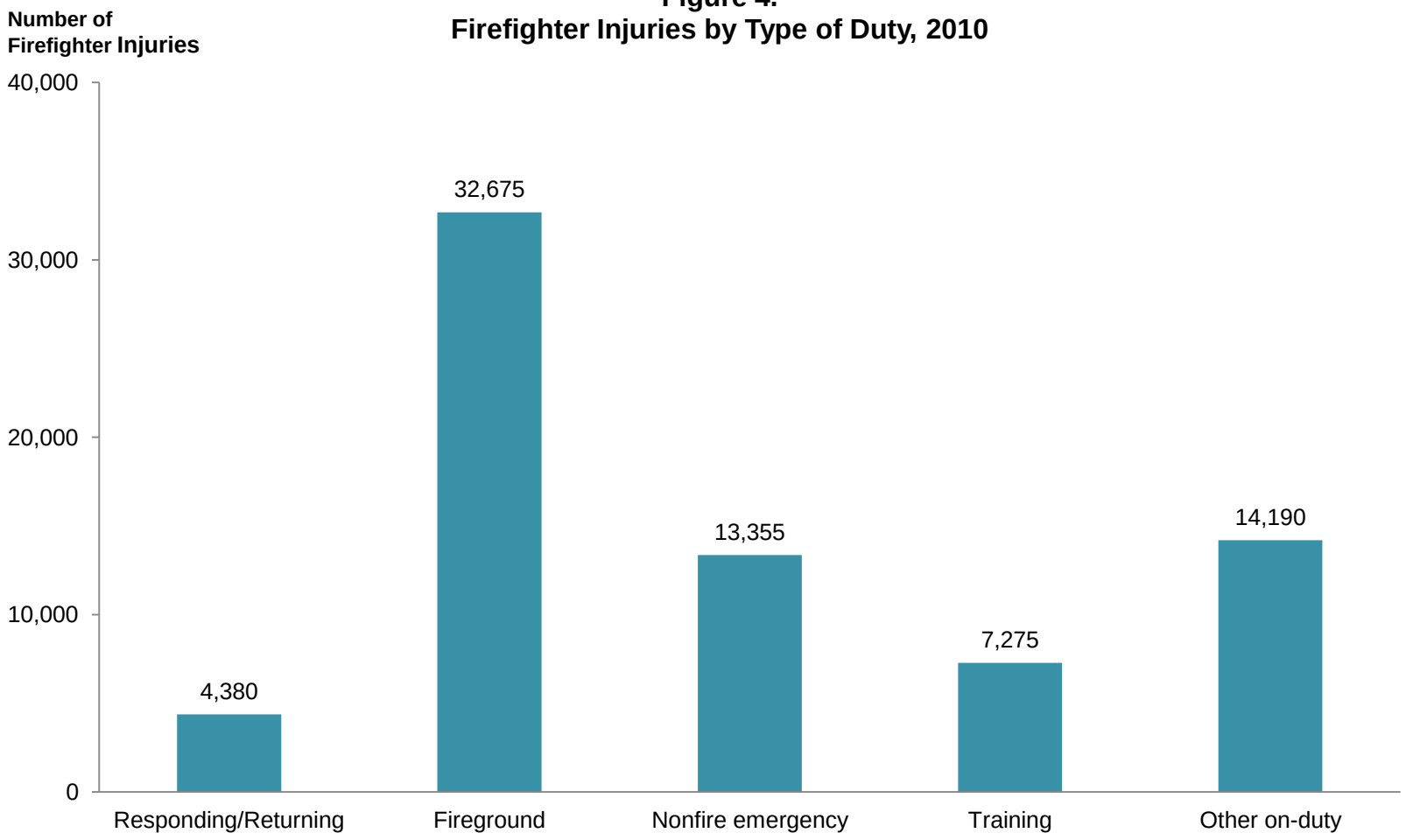


Figure 4.
Firefighter Injuries by Type of Duty, 2010



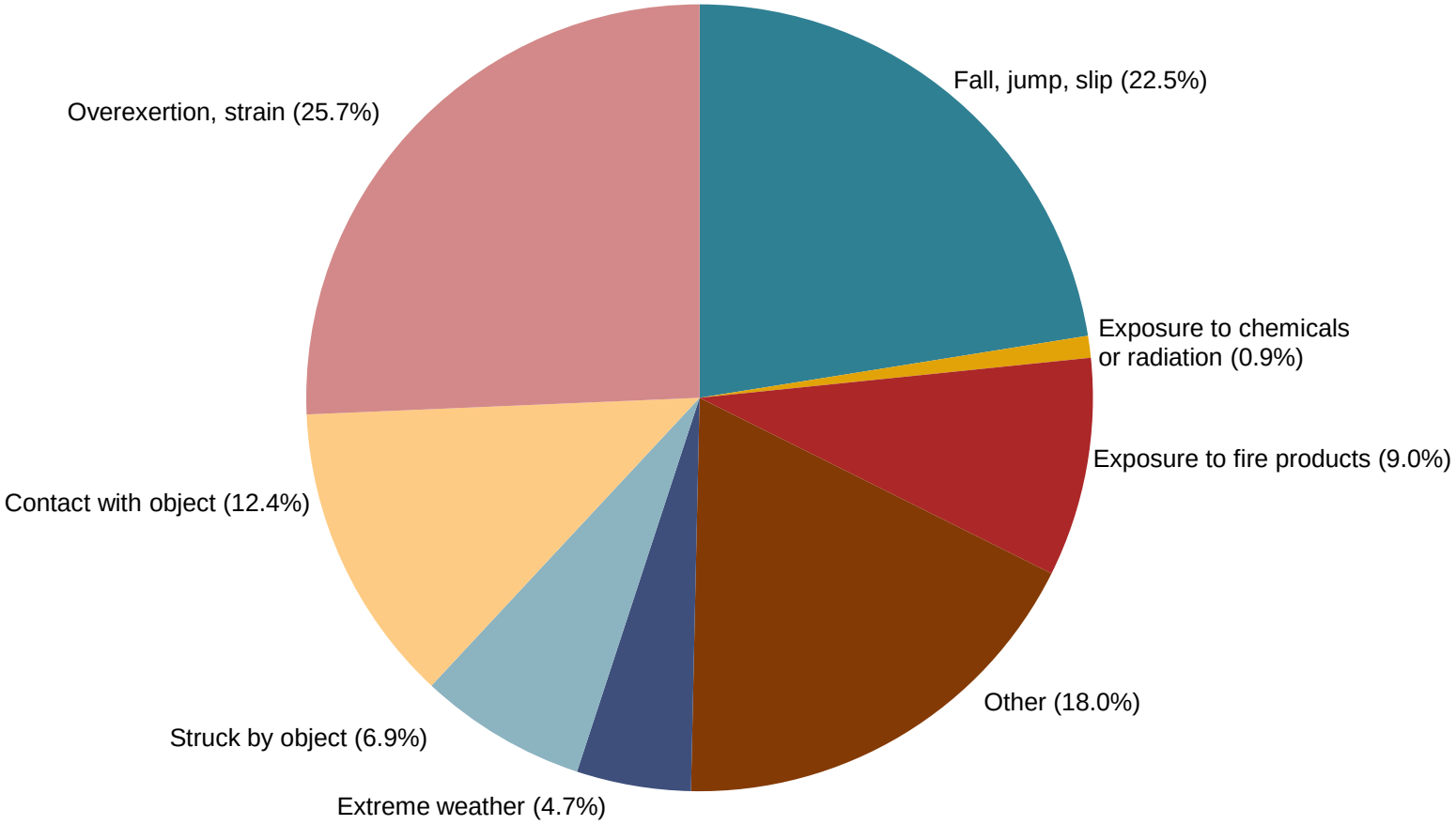
Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2010)

Table 2
Firefighter Injuries by Nature of Injury and Type of Duty, 2010

	Responding to or Returning from an Incident		Fireground		Nonfire Emergency		Training		Other on-duty		Total	
Nature of Injury	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Burns (Fire or Chemical)	50	1.1	1,940	5.9	90	0.7	205	2.8	300	2.1	2,585	3.6
Smoke or Gas Inhalation	20	0.5	1,220	3.7	115	0.9	50	0.7	95	0.7	1,500	2.1
Other Respiratory Distress	60	1.4	440	1.4	110	0.8	130	1.8	200	1.4	940	1.3
Burns and Smoke Inhalation	0	0	555	1.7	10	0.1	35	0.5	35	0.3	635	0.9
Wound, Cut, Bleeding, Bruise	655	15.0	4,650	14.2	1,845	13.8	1,320	18.1	2,640	18.6	11,110	15.5
Dislocation, Fracture	230	5.3	855	2.6	195	1.5	235	3.2	305	2.2	1,820	2.5
Heart Attack or Stroke	70	1.6	175	0.5	100	0.8	135	1.9	330	2.3	810	1.1
Strain, Sprain, Muscular Pain	2,705	61.8	17,250	52.8	8,650	64.8	4,255	58.5	7,525	53.0	40,385	56.2
Thermal Stress (frostbite, heat exhaustion)	205	4.7	2,350	7.2	140	1.1	380	5.2	120	0.9	3,195	4.5
Other	385	8.8	3,240	9.9	2,100	15.7	530	7.3	2,640	18.6	8,895	12.4
	4,380	100.0	32,675	100.0	13,355	100.0	7,275	100.0	14,190	100.0	71,875	100.0

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2010
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, 2010



Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2010)

Fire Department Vehicle Collisions

The NFPA reported earlier that 11 firefighters died in motor vehicle collisions in 2010. (See "2010 Firefighter Fatalities" July/August NFPA Journal).

In 2010, there were an estimated 14,200 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 28.2 million incidents in 2010 so that the number of collisions represents about one tenth of 1 percent of total responses. However, these collisions resulted in 775 firefighter injuries or 1.0% of all firefighter injuries.

Also, 1,000 collisions involving firefighters' personal vehicles occurred in 2010 while departments were responding to or returning from incidents. These collisions resulted in an estimated 75 injuries.

Table 3
Fire Department Vehicle Collisions and
Resulting Firefighter Injuries
While Responding to or Returning From Incidents, 1990-2010

	Involving Fire Department Emergency Vehicles		Involving Firefighters' Personal Vehicles	
Year	**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

Source: NFPA Survey of Fire Departments
for U.S. Fire Experience (1990-2010)

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 2010 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 81.0 for departments that protect communities of 500,000 to 999,999 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 3.1 for departments that protect communities 500,000 to 999,999 to a low of 1.4 for departments that protect communities of 2,500 to 4,999 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 2.3 injuries per 100 fires or 44% 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 500,000 to 999,999 having the highest rate with 7.2 injuries per 100 firefighters. As community size decreases, the rate drops quite steadily to a low of 0.9 for departments protecting less than 2,500 people. That is a more than an eight-to-one difference in risk of injury between communities of 500,000 to 999,999, 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 500,000 to 999,999 has, on average, more than 55 times as many firefighters than a department protecting a population of less than 2,500, the larger department attends more than 240 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, 2010

Population of Community Protected	Average Number of Fires	Average Number of Fireground Injuries	Number of Fire-ground Injuries Per 100 Fires	Number of Fire-ground Injuries Per 100 Firefighters
500,000 to 999,999	2,638.7	81.0	3.1	7.2
250,000 to 499,999	1,020.4	28.5	2.8	6.4
100,000 to 249,999	511.7	12.0	2.3	5.3
50,000 to 99,999	218.2	4.4	2.0	4.2
25,000 to 49,999	117.8	2.2	1.9	3.4
10,000 to 24,999	62.5	1.0	1.6	2.4
5,000 to 9,999	36.1	0.6	1.7	1.7
2,500 to 4,999	22.0	0.3	1.4	1.3
Under 2,500	10.6	0.2	1.9	0.9

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2010

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[3]. 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, 2010

Column 1: Average Reported Number of Fires
Column 2: Average Reported Number of Fireground Injuries
Column 3: Number of Fireground Injuries per 100 Fires

Population of Community Protected	Northeast			Midwest			South			West		
	Column 1	Column 2	Column 3	Column 1	Column 2	Column 3	Column 1	Column 2	Column 3	Column 1	Column 2	Column
250,000 or more	4,292.3	267.7	6.2	1,778.5	109.3	6.1	2,084.5	42.2	2.8	1,637.0	30.1	1.8
100,000 to 249,999	691.7	19.3	2.8	460.1	15.0	3.3	621.0	11.0	1.8	342.6	11.1	3.2
50,000 to 99,999	238.4	8.6	3.3	182.5	4.5	2.5	297.4	4.8	1.6	157.0	2.2	1.4
25,999 to 49,999	128.7	5.2	4.0	95.0	1.9	2.0	156.7	2.2	1.4	107.7	1.0	0.9
10,000 to 24,999	55.3	1.7	3.1	51.8	0.9	1.7	93.9	0.7	0.7	50.0	0.9	1.8
5,000 to 9,999	31.0	0.6	1.9	31.1	0.6	1.9	49.7	0.5	1.0	34.1	0.3	0.9
2,500 to 4,999	18.9	0.5	2.6	19.0	0.2	1.1	32.6	0.4	1.2	19.9	0.5	2.5
Under 2,500	9.0	0.4	4.4	9.2	0.1	1.1	17.4	0.2	1.1	7.4	0.1	1.4
Overall Regional Rate	49.9	2.0	4.0	38.1	0.9	2.4	65.3	0.9	1.3	62.3	1.2	1.9

Note that the results above do not include New York City. With New York the overall fireground injury rate for the Northeast would be 6.3.

Source: NFPA Survey of Fire Departments for U.S. Fire Experience, 2010

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, Emerrgency 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; NFPA1582, Standard on Comprehensive Occupational Medical Program for Fire Departments; NFPA1583, 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,®; 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 Exercies, 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 2,650 departments responded to the 2010 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., "2010 Fire Loss in the United States", *NFPA Journal*, Vol. 104, No. 5 (September 2011).

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 (2010), the NFPA is very confident that the actual number of firefighter injuries falls within the range of 68,275 to 75,475.

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

Structure Fire
A 45-year-old company officer with 22 years of service suffered burns to his legs after he fell into a burning cellar when the floor in a one-story, wood-frame, single-family home collapsed.

The victim responded on mutual aid to the fire, which began in the cellar. The incident commander ordered the officer and his company of five firefighters to deploy a cellar nozzle inside the front door. The crew was to enter a few feet inside the door, cut a hole in the floor, and place the nozzle into the basement to help extinguish the fire.

After checking the floor for stability, the officer took a few careful steps over the threshold. About 5 feet (1.5 meters) inside the structure, he felt the floor start to give way. He turned to escape, but it was too late. He slid down into the burning basement, flames shooting around him, as more than half the floor of the house collapsed into the basement.

The officer's crew immediately sprayed him with water to protect him, while others reached down to try to get him out. Some members of the crew ran to the front yard and grabbed a roof ladder, which they placed into the flaming void. The officer, now in intense pain, felt the ladder hit him and heard yells from above telling him to climb. After climbing two rungs, he felt his crew dragging him out.

The department reported that a rapid intervention team was assembled at the scene. Because the victim rapidly extricated himself with help from his crew, however, they were not used as a primary means of rescue.

The victim, who was wearing a complete protective ensemble, suffered second- and third-degree burns to his legs and required several skin grafts. He returned to active firefighting activities four months after the fire.

Structure Collapse
Arriving at the scene of a three-story, wood-frame apartment building fire seven minutes after they received numerous phone calls reporting the blaze, firefighters found a large amount of fire visible on the upper floors and roof of the 10,000-square-foot (929-square-meter) structure.

They began offensive extinguishment operations, and a crew of five firefighters and a chief officer were deployed on the open-air stairs between the second- and third-floor landings. Shortly afterward, the building's lightweight truss roof collapsed into the stairs, hurling flaming debris over the crew. Over the next several chaotic minutes, three of the men managed to escape by jumping from the unstable structure. However, the other three were unaccounted for. Firefighters frantically searched for the three, finding and removing two from the structure within a few minutes. The third was found 20 stressful minutes later, away from the fire scene.

After the collapse, the incident commander decided to use exterior master streams to extinguish the fire. Five hours later, all units cleared the scene.

The fire started on a second-story balcony, possibly when carelessly discarded smoking materials ignited some unknown material. Two sprinklers operated in the apartment to which the balcony belonged, preventing the fire from spreading into the structure, but flames traveled up the exterior of the building into the eaves of the third floor and into the attic.

The building's detection system alerted the occupants, who escaped without injury.

The building, valued at $5 million, and its contents, valued at approximately $1 million, sustained a $2.75 million loss.

All the injured firefighters were wearing proper protective ensembles. Two suffered fractured legs and burns, and have not returned to duty. A third suffered a fractured wrist and burns, and has returned to firefighting activities. The three other victims suffered minor burns.

Fall from Apparatus

Firefighters were using a 1.125-inch (2.9-centimeter) hose line with Class A foam to extinguish hot spots at the scene of an outdoor fire that had burned for several days, when the 52-year-old engine operator fell backwards from the truck onto the pavement. He had climbed on top of the truck to add more foam into the water tank and lost his grip while climbing down off the rear of the engine.

The victim, who was wearing bunker pants and boots, was hospitalized for a day with head lacerations, a lower back injury, and a concussion. He returned to full duty three weeks after the incident.

Vehicle Fire

An engine company staffed solely by a fire captain responded to a vehicle fire in a rural area that was often used as dumping spot for stolen cars. On arrival, the captain found a car on fire, well off the road in an orchard.

As he began fire suppression operations, a second firefighter arrived in his own vehicle and began stretching a hose line towards the burning car. As the captain reached back to help him pull on the hose, he noticed a set of headlights bearing down on them at a high rate of speed. He yelled to his partner and tried to get out of the way, but it was too late. A white pickup truck struck the captain a glancing blow, tossing him aside. It then hit the firefighter from behind, carrying him on the hood for approximately 60 feet (18 meters) before swerving back towards the road, throwing him to the side before speeding from the scene.

The captain, who was wearing a protective ensemble without self-contained breathing apparatus, suffered back and leg injuries. He is currently performing restricted duty and still being treated for his injuries. The 56-year-old firefighter suffered severe trauma to his chest and legs. He is

still being treated for his injuries and is not yet able to walk. It is not known when either will return to firefighting duties.

Vehicle Fire
A 44-year-old firefighter suffered a head injury after she was struck by a hose while operating a mid-ship pump panel.

The victim was among those responding to a fire in a boat parked in the driveway of a home. As the firstarriving crew began extinguishment with a 250-foot (76-meter) booster line, a second engine company arrived on scene and established a water supply. Due to the large amount of fire, however, officers decided to deploy a larger hand line and began foam operations.

The pump operator climbed on top of the apparatus to retrieve three buckets of foam while other firefighters deployed a 1¾-inch (4.4-centimeter) hand line. After she climbed down from the apparatus, she returned to the mid-ship pump panel and waited to begin foam operations. When an officer signaled to charge the hand line, she immediately sent water through the hose line.

Unbeknownst to her, the hose was uncoupled and was not connected after the first 50-foot (15-meter) section. It began to swing wildly around, spewing water all over the scene, and struck the operator in the head, knocking her unconscious. The victim, who was not wearing a helmet or any protective clothing, suffered a severe head injury and is currently unable to perform firefighting duties.

The department indicated that the coupling hit the victim below where her helmet would have sat and that it might have deflected the blow, possibly minimizing her injuries, if it had been worn properly. They have since incorporated a mandatory helmet policy for apparatus operators into their standard operating procedures.

EMS Call
When the fire department received a call for an 81-yearold man who was unresponsive and not breathing, the closest engine company with advanced life support (ALS) capabilities was dispatched with an ambulance. Upon arrival, the crew knocked on the door but got no response. When they tried the front door, they discovered it was locked, so the officer entered the house through an open garage door. Inside, he met a woman in the staircase who told him that the patient was upstairs. The woman left the building through the garage. The officer went upstairs, unlocked the front door, and let the three firefighters in.

As they began to treat the unconscious patient, the men noticed a strange odor that none of them could place. The officer sent the apparatus operator to the truck to get air-monitoring equipment and began to investigate the building for the source.

When the officer went downstairs, he found the woman outside next to a running car. He evaluated her and requested another ambulance to treat her for undisclosed symptoms. The officer then went back inside, where he found two emergency medical technicians from the

ambulance treating the patient. The two firefighters were now outside, feeling ill. Everyone was ordered to evacuate the building, and the officer requested appropriate resources for further treatment and mitigation.

The 81-year-old man died, and the woman was treated at the hospital and released. The responding firefighters were all treated for carbon monoxide toxicity and returned to full duty the following day.

Investigators determined that an overheated catalytic converter from a running car in the garage caused the toxic atmosphere.

Vehicle Fire

A 29-year-old firefighter was severely injured when he was struck by a speeding car while operating a pump at a vehicle fire on an interstate highway. He stepped out of the enclosed cab to disconnect a hose when a car traveling at a high rate of speed lost control and hit him.

He is currently unable to perform firefighting duties, but he is able to walk again. The department did not provide any details on protective measures or scene safety.

Fire Prevention Duty

A 36-year-old firefighter suffered burns while setting up for the community's annual fireworks display. He was one of eight firefighters who were participating, all of whom were required to wear protective clothing without selfcontained breathing apparatus during setup.

The firework rounds had been placed on top of the tubes, and the victim was beginning to connect the fuses and drop the rounds into the tubes. As he connected the fuses, the friction between the synthetic shirt he was wearing under his turnout gear and the gear itself created an electrical spark that ignited the round. The fire then spread to the entire arsenal of fireworks.

All eight firefighters were able to get to safety without major injuries. Two who took cover behind a vehicle were dazed but uninjured after a round exploded near them. They did not require treatment. The firefighter who created the spark suffered minor burns to his hand and face. He was wearing eye protection at the time. He was able to return to firefighting duties 15 days later.

The department has modified its standard operating procedures to ensure that clothing made of synthetic fibers is not allowed under turnout clothing.

Training Incident

A three-person engine company was performing unspecified on-duty training when one firefighter was injured. The officer and a firefighter stepped off the vehicle as the driver placed the apparatus in reverse. At that moment, the driver suffered an unspecified medical emergency causing him to lose consciousness. As he lost consciousness his foot pushed the accelerator and

the truck began to move. The apparatus proceeded to back up at a high rate of speed down the road approximately 50 feet (15 m) and made a sharp left turn. It traveled approximately another 50 feet (15 m) and turned again, coming to rest against an occupied house. The officer and firefighter ran after the vehicle and immediately provided aid.

The driver did not suffer any injuries from the crash. He was wearing his seatbelt at the time of his medical emergency. He has still not returned to firefighting activities and his medical condition is being evaluated.

The truck caused structural damage to the home, destroyed fences and shrubs, and damaged landscaping.

Training

An instructor for the fire department's new recruit class was seriously injured when he fell off the roof of an acquired building during a training evolution.

The victim, a 50-year-old company officer, was performing ladder evolutions alone on the medium-pitched roof, which was covered with snow. He felt it would be safer to clear the roof before continuing the evolutions, so he asked a student to retrieve a squeegee from the apparatus so he could wipe approximately ¾ of an inch (1.9 centimeters) of snow off. He had cleared approximately 10 square feet (1 square meter) of shingles when his left foot slipped, and he fell approximately 16 feet (5 meters) to the cement driveway.

The veteran officer, who landed on both feet and fell backwards, suffered severe back injuries, fractured heels, and a head injury.

Station Duty Apparatus Check

Several firefighters suffered electrical shock injuries while performing apparatus checks in the rear of the fire station.

As a firefighter knelt next to the truck, checking on some power saws, the apparatus operator checked the truck's aerial by raising the aerial to about 75 degrees, fully extending the ladder, and rotating it to the officer's side of the truck. When he lowered the ladder, he unintentionally struck a 230,000-volt transmission line, energizing the fire truck. There was an explosion, and electricity was transmitted through the ladder and outriggers into the fire station.

The firefighter kneeling next to the truck ran to a safe location when the concrete beneath him began spalling, and, encouraged by other members of the station, the operator on the turntable jumped off and away from the apparatus. All members retreated to a safe training area in the rear of the station.

The station and apparatus were damaged, although the department did not identify how much the damage cost. Three firefighters suffered electrical shock injuries, but all were able to return to firefighting activities. They had all worn protective clothing appropriate to the tasks they were performing.

Responding
Two firefighters suffered severe injuries after the apparatus they were riding was involved in a crash while responding to a reported structure fire. The apparatus was one of two apparatus responding together.

As they approached an intersection, both trucks opted to switch lanes into the oncoming travel lane to avoid traffic. At the time, there was no oncoming traffic. When the lead truck returned to the proper lane of travel, the operator of the second truck continued against traffic, driving parallel to the first truck. At the next traffic light, both pieces of apparatus failed to stop before turning left at 35 miles (56.3 kilometers) per hour. The driver of the second truck lost control of the vehicle, and it overturned onto its side, narrowly missing the first truck and a passenger vehicle.

The company officer, who was not wearing a seatbelt, suffered bilateral shoulder injuries and is still recuperating. The other firefighter, whose riding position was unknown, suffered a fractured neck and could not perform firefighting activities for 170 days.

The department concluded that excessive speed, poor judgment, lack of seat belt use, and lack of proper supervision by a company officer were contributing factors in the crash. Mechanical failure, weather, and road conditions did not play a role. The call they were responding to turned out to be an investigation, not a fire.