

**Vehicle Fires by Occupancy
2006-2010 Annual Averages**

**One Stop Data Shop
Fire Analysis and Research Division
National Fire Protection Association**

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For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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Fires by Occupancy

The collection of tables by occupancy shows the estimated average number of fires, associated civilian deaths and civilian injuries, and direct property damage resulting from fires per year for incidents reported to local U.S. fire departments during 2006-2010. These estimates were derived from Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the National Fire Protection Association's (NFPA's) annual fire department experience survey. Fires reported to federal, state or industrial fire brigades are not included in these statistics.

Statistics are provided for three general groups of fires.

- Structure fires. Any fire in or on a building or other structure is considered a structure fire even if the structure itself was not damaged. Mobile property used as a fixed structure, such as manufactured homes and portable buildings, are considered structures. A vehicle that burns inside a structure with the fire limited to the vehicle only is, however, considered a vehicle fire.
- Vehicle fires. Vehicles include highway-type vehicles such as cars, trucks, recreational vehicles, buses, and motorcycles, as well as aircraft, rail vehicles, boats or water vehicles, and industrial, agricultural, home, garden, and construction vehicles.
- Outside and other fires. This category includes any fire that is not a structure or vehicle fire, including:
 - Outside grass, brush, forest, crop or other vegetation fires;
 - Outside trash fires;
 - Outside fire involving property of value, such as storage or equipment; and
 - Unclassified fires

The occupancies shown are based on the choices in the property use field in NFIRS 5.0. The numeric NFIRS 5.0 property use codes are shown next to the brief definitions. Categories are generally presented in the order of the code choices. Fires in which the property use was coded as other, none, undetermined, or not reported were grouped together as "unclassified, unreported or unknown." More detailed definitions are available in the *National Fire Incident Reporting System 5.0 Complete Reference Guide*, available at <http://www.nfirs.fema.gov/documentation/reference/>.

Note that the occupancy categories do not correspond exactly to definitions used by NFPA codes and standards or to the North American Industry Classification System (NAICS).

**Vehicle Fires by Occupancy
2006-2010 Annual Averages**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Public Assembly	2,730	1.1%	3	0.9%	17	1.2%	\$14.5	1.0%
110 - Fixed use recreation places, other	90	0.0%	0	0.0%	1	0.1%	\$0.5	0.0%
111 - Bowling alley	30	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
112 - Billiard center, pool hall	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
113 - Electronic amusement center	10	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
114 - Ice rink: indoor, outdoor	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
115 - Roller rink: indoor or outdoor	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
116 - Swimming facility: indoor or outdoor	10	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
120 - Variable use amusement, recreation places	60	0.0%	1	0.3%	0	0.0%	\$0.4	0.0%
121 - Ballroom, gymnasium	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
122 - Convention center, exhibition hall	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
123 - Stadium, arena	40	0.0%	0	0.1%	0	0.0%	\$0.2	0.0%
124 - Playground	100	0.0%	0	0.0%	1	0.1%	\$1.0	0.1%
129 - Amusement center: indoor/outdoor	30	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
130 - Places of worship, funeral parlors	30	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
131 - Church, mosque, synagogue, temple, chapel	350	0.1%	0	0.1%	2	0.1%	\$1.0	0.1%
134 - Funeral parlor	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
140 - Clubs, other	50	0.0%	0	0.0%	0	0.0%	\$0.4	0.0%
141 - Athletic/health club	50	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
142 - Clubhouse	40	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
143 - Yacht Club	20	0.0%	0	0.0%	1	0.1%	\$3.1	0.2%
144 - Casino, gambling clubs	70	0.0%	0	0.1%	0	0.0%	\$0.2	0.0%
150 - Public or government, other	160	0.1%	0	0.1%	1	0.1%	\$0.7	0.0%
151 - Library	30	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
152 - Museum	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
154 - Memorial structure, including monuments & statues	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
155 - Courthouse	20	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%

**Vehicle Fires by Occupancy
2006-2010 Annual Averages
(Continued)**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Public Assembly (continued)								
160 - Eating, drinking places	160	0.1%	0	0.0%	0	0.0%	\$0.3	0.0%
161 - Restaurant or cafeteria	840	0.3%	0	0.0%	3	0.2%	\$2.4	0.2%
162 - Bar or nightclub	130	0.1%	0	0.1%	2	0.2%	\$0.6	0.0%
170 - Passenger terminal, other	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
171 - Airport passenger terminal	90	0.0%	1	0.2%	0	0.0%	\$1.4	0.1%
173 - Bus station	40	0.0%	0	0.0%	0	0.0%	\$0.4	0.0%
174 - Rapid transit station	40	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
180 - Studio/theater, other	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
181 - Live performance theater	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
182 - Auditorium or concert hall	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
183 - Movie theater	30	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
185 - Radio, television studio	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
186 - Film/movie production studio	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
100 - Assembly, other	110	0.0%	0	0.0%	1	0.1%	\$0.4	0.0%
Educational								
	970	0.4%	0	0.1%	6	0.4%	\$4.1	0.3%
210 - Schools, non-adult	50	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
211 - Preschool	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
213 - Elementary school, including kindergarten	230	0.1%	0	0.1%	1	0.1%	\$0.9	0.1%
215 - High school/junior high school/middle school	410	0.2%	0	0.0%	5	0.3%	\$1.6	0.1%
241 - Adult education center, college classroom	130	0.1%	0	0.0%	0	0.0%	\$0.5	0.0%
250 - Care of the young (converted)	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
254 - Day care, in commercial property	50	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
255 - Day care, in residence, licensed	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
256 - Day care in residence, unlicensed.	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
200 - Educational, other	70	0.0%	0	0.0%	0	0.0%	\$0.6	0.0%

**Vehicle Fires by Occupancy
2006-2010 Annual Averages
(Continued)**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Health Care, Detention & Correction	660	0.3%	0	0.0%	3	0.2%	\$3.1	0.2%
311 - 24-hour care Nursing homes, 4 or more persons	110	0.0%	0	0.0%	0	0.0%	\$0.3	0.0%
321 - Mental retardation/development disability facility	20	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
322 - Alcohol or substance abuse recovery center	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
323 - Asylum, mental institution	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
331 - Hospital - medical or psychiatric	210	0.1%	0	0.0%	1	0.1%	\$1.4	0.1%
332 - Hospices	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
340 - Clinics, Doctors offices, hemodialysis centers	100	0.0%	0	0.0%	1	0.1%	\$0.4	0.0%
341 - Clinic, clinic-type infirmary	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
342 - Doctor, dentist or oral surgeon's office	50	0.0%	0	0.0%	1	0.0%	\$0.2	0.0%
343 - Hemodialysis unit	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
361 - Jail, prison (not juvenile)	40	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
363 - Reformatory, juvenile detention center	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
365 - Police station	50	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
300 - Health care, detention, & correction, other	30	0.0%	0	0.0%	0	0.0%	\$0.3	0.0%
Residential	15,580	6.5%	12	3.2%	139	9.7%	\$70.3	5.0%
419 - One- or two-family dwellings	12,220	5.1%	9	2.5%	117	8.2%	\$55.7	4.0%
429- Apartment or multi-family dwelling	1,730	0.7%	1	0.2%	11	0.8%	\$7.2	0.5%
439 - Boarding/Rooming House. Includes residential hotels and shelters	20	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
449 - Hotel or motel	210	0.1%	0	0.1%	0	0.0%	\$0.7	0.0%
459 - Residential board and care	20	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
460 - Dormitory type residence, other	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
462 - Sorority house, fraternity house	10	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
464 - Barracks, dormitory	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
400 - Residential, other	1,350	0.6%	2	0.4%	11	0.7%	\$6.6	0.5%

**Vehicle Fires by Occupancy
2006-2010 Annual Averages
(Continued)**

Property Use	Fires		Civilian		Civilian		Direct	
			Deaths	Injuries	Property Damage	(in Millions)		
Mercantile and Business	11,690	4.8%	5	1.3%	86	6.0%	\$47.9	3.4%
511 - Convenience store	1,300	0.5%	0	0.1%	5	0.3%	\$2.4	0.2%
519 - Food and beverage sales, grocery store	1,150	0.5%	0	0.1%	4	0.3%	\$2.6	0.2%
529 - Textile, wearing apparel sales	80	0.0%	0	0.0%	1	0.1%	\$0.3	0.0%
539 - Household goods, sales, repairs	150	0.1%	0	0.0%	0	0.0%	\$0.5	0.0%
549 - Specialty shop	380	0.2%	0	0.1%	4	0.3%	\$1.5	0.1%
557 - Personal service, including barber & beauty shops	60	0.0%	0	0.1%	0	0.0%	\$0.2	0.0%
559 - Recreational, hobby, home repair sales, pet store	100	0.0%	0	0.0%	0	0.0%	\$0.6	0.0%
564 - Laundry, dry cleaning	50	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
569 - Professional supplies, services	220	0.1%	0	0.0%	2	0.2%	\$1.9	0.1%
571 - Service station, gas station	2,600	1.1%	1	0.3%	21	1.5%	\$7.6	0.5%
579 - Motor vehicle or boat sales, services, repair	2,510	1.0%	1	0.4%	27	1.9%	\$17.5	1.3%
580 - General retail, other	480	0.2%	0	0.0%	4	0.3%	\$1.4	0.1%
581 - Department or discount store	510	0.2%	0	0.1%	2	0.2%	\$1.0	0.1%
592 - Bank	240	0.1%	0	0.0%	0	0.0%	\$0.4	0.0%
593 - Office: veterinary or research	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
596 - Post office or mailing firms	80	0.0%	0	0.0%	0	0.0%	\$0.5	0.0%
599 - Business office	590	0.2%	0	0.1%	5	0.4%	\$2.8	0.2%
500 - Mercantile, business, other	1,170	0.5%	0	0.1%	8	0.6%	\$6.6	0.5%
Industrial, Utility, Defense, Agriculture, Mining	3,160	1.3%	7	2.0%	13	0.9%	\$105.7	7.6%
610 - Energy production plant, other	10	0.0%	0	0.0%	0	0.0%	\$0.3	0.0%
614 - Steam or heat generating plant	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
615 - Electric generating plant	10	0.0%	0	0.0%	0	0.0%	\$0.5	0.0%
629 - Laboratory or science laboratory	20	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
631 - Defense, military installation	20	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
635 - Computer center	0	0.0%	0	0.0%	0	0.0%	\$0.0	0.0%
639 - Communications center	10	0.0%	0	0.0%	0	0.0%	\$0.1	0.0%
640 - Utility or Distribution system, other	40	0.0%	0	0.0%	0	0.0%	\$1.4	0.1%
642 - Electrical distribution	10	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
644 - Gas distribution, pipeline, gas distribution	70	0.0%	1	0.4%	1	0.1%	\$1.3	0.1%
645 - Flammable liquid distribution, pipeline, flammable	30	0.0%	0	0.0%	1	0.1%	\$7.2	0.5%
647 - Water utility	20	0.0%	0	0.0%	0	0.0%	\$0.6	0.0%
648 - Sanitation utility	100	0.0%	0	0.0%	1	0.1%	\$3.2	0.2%
655 - Crops or orchard	1,320	0.5%	3	0.9%	4	0.3%	\$20.8	1.5%
659 - Livestock production	290	0.1%	0	0.1%	1	0.1%	\$4.0	0.3%
669 - Forest, timberland, woodland	410	0.2%	2	0.6%	2	0.1%	\$10.3	0.7%
679 - Mine or quarry	120	0.0%	0	0.1%	2	0.1%	\$42.5	3.0%
600 - Utility, defense, agriculture, mining, other	660	0.3%	0	0.1%	1	0.1%	\$13.3	1.0%

**Vehicle Fires by Occupancy
2006-2010 Annual Averages
(Continued)**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
700 - Manufacturing, processing	890	0.4%	0	0.1%	9	0.6%	\$12.3	0.9%
Storage	4,540	1.9%	3	0.8%	60	4.2%	\$54.1	3.9%
807 - Outside material storage area	310	0.1%	0	0.0%	2	0.2%	\$4.2	0.3%
808 - Outbuilding or shed	310	0.1%	0	0.0%	7	0.5%	\$2.1	0.2%
816 - Grain elevator, silo	20	0.0%	0	0.0%	0	0.0%	\$0.7	0.0%
819 - Livestock, poultry storage	30	0.0%	0	0.0%	0	0.0%	\$0.3	0.0%
839 - Refrigerated storage	20	0.0%	0	0.1%	0	0.0%	\$0.4	0.0%
849 - Outside storage tank	10	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
880 - Vehicle storage, other	1,370	0.6%	1	0.2%	11	0.8%	\$12.8	0.9%
881 - Parking garage, (detached residential garage)	530	0.2%	0	0.1%	7	0.5%	\$3.9	0.3%
882 - Parking garage, general vehicle	860	0.4%	0	0.0%	5	0.4%	\$5.6	0.4%
888 - Fire station	160	0.1%	0	0.0%	2	0.1%	\$1.3	0.1%
891 - Warehouse	360	0.1%	0	0.1%	1	0.1%	\$5.5	0.4%
898 - Dock, marina, pier, wharf	250	0.1%	1	0.3%	15	1.1%	\$14.1	1.0%
899 - Residential or self storage units	80	0.0%	0	0.0%	3	0.2%	\$0.6	0.0%
800 - Storage, other	240	0.1%	0	0.0%	5	0.3%	\$2.4	0.2%
Outside or special property	177,520	73.6%	301	82.3%	1,018	71.3%	\$957.4	68.8%
919 - Dump, sanitary landfill	310	0.1%	0	0.0%	1	0.1%	\$7.9	0.6%
921 - Bridge, trestle	230	0.1%	1	0.3%	1	0.1%	\$1.0	0.1%
922 - Tunnel	30	0.0%	0	0.0%	0	0.0%	\$0.2	0.0%
926 - Outbuilding, protective shelter	140	0.1%	0	0.1%	4	0.2%	\$1.1	0.1%
931 - Open land or field	8,060	3.3%	24	6.4%	47	3.3%	\$135.9	9.8%
935 - Campsite with utilities	260	0.1%	1	0.4%	6	0.4%	\$2.8	0.2%
936 - Vacant lot	2,520	1.0%	4	1.1%	11	0.8%	\$15.7	1.1%
937 - Beach	90	0.0%	1	0.3%	5	0.4%	\$0.5	0.0%
938 - Graded and cared-for plots of land	1,960	0.8%	4	1.0%	17	1.2%	\$13.4	1.0%
940 - Water area, other	270	0.1%	1	0.4%	13	0.9%	\$6.5	0.5%
941 - Open ocean, sea or tidal waters	100	0.0%	0	0.0%	8	0.5%	\$4.2	0.3%
946 - Lake, river, stream	360	0.1%	0	0.1%	20	1.4%	\$4.5	0.3%
951 - Railroad right of way	670	0.3%	2	0.6%	4	0.3%	\$14.2	1.0%
952 - Railroad yard	230	0.1%	0	0.1%	1	0.1%	\$4.7	0.3%
960 - Street, other	18,640	7.7%	24	6.5%	74	5.2%	\$66.1	4.7%
961 - Highway or divided highway	43,090	17.9%	144	39.4%	248	17.4%	\$246.8	17.7%
962 - Residential street, road or residential driveway	44,750	18.5%	51	13.9%	255	17.9%	\$163.1	11.7%
963 - Street or road in commercial area	12,890	5.3%	13	3.6%	69	4.8%	\$49.5	3.6%
965 - Vehicle parking area	37,990	15.7%	20	5.3%	204	14.3%	\$151.2	10.9%
972 - Aircraft runway	70	0.0%	2	0.6%	4	0.3%	\$15.0	1.1%

**Vehicle Fires by Occupancy
2006-2010 Annual Averages
(Continued)**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
973 - Aircraft taxi-way	60	0.0%	1	0.2%	2	0.1%	\$12.7	0.9%
974 - Aircraft loading area	110	0.0%	1	0.2%	1	0.1%	\$2.3	0.2%
981 - Construction site	370	0.2%	0	0.1%	1	0.1%	\$9.3	0.7%
982 - Oil or gas field	40	0.0%	0	0.1%	1	0.1%	\$2.0	0.1%
983 - Pipeline, power line or other utility right of way	100	0.0%	0	0.1%	0	0.0%	\$1.4	0.1%
984 - Industrial plant yard - area	290	0.1%	1	0.3%	2	0.2%	\$6.7	0.5%
900 - Outside or special property, other	3,880	1.6%	5	1.4%	19	1.3%	\$18.8	1.4%
Unclassified, unreported and unknown	23,560	9.8%	34	9.4%	76	5.3%	\$122.8	8.8%
Totals	241,300	100.0%	366	100.0%	1,428	100.0%	\$1,392.2	100.0%

Appendix A. How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit <http://www.nfirs.fema.gov/>. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.

NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.

Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4)

information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit <http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf>.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

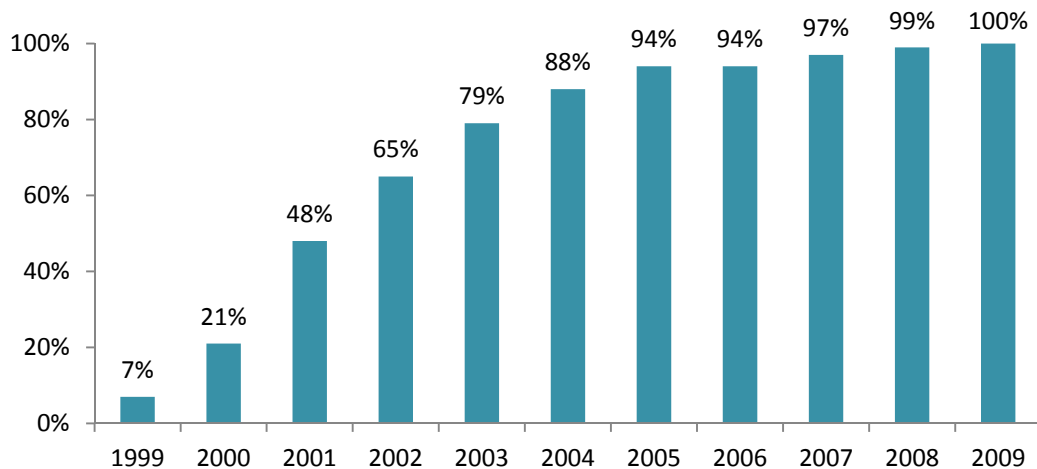
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at <http://www.nfpa.org/osds> or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections
NFIRS totals (Version 5.0)

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types.

Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term “all fires” refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Cause of Ignition: This field is used chiefly to identify intentional fires. “Unintentional” in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or “other” (unclassified).” The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

Factor Contributing to Ignition: In this field, the code “none” is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for “not reported” when no factors are recorded. “Not reported” is treated as an unknown, but the code “none” is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, “mechanical failure or malfunction.” This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;
26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.

Entries in “electrical failure, malfunction” (factor contributing to ignition 30-39) may also be combined into one entry, “electrical failure or malfunction.” This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;

- 35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
- 36. Arc or spark from operating equipment, switch, or electric fence;
- 37. Fluorescent light ballast; and
- 30. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: “Heat from open flame or smoking material, other.” NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

- 61. Cigarette;
- 62. Pipe or cigar;
- 63. Heat from undetermined smoking material;
- 64. Match;
- 65. Lighter: cigarette lighter, cigar lighter;
- 66. Candle;
- 67 Warning or road flare, fuse;
- 68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
- 69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping “smoking materials” includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

$$\frac{\text{All fires}}{(\text{All fires} - \text{blank} - \text{undetermined} - [\text{fires in which EII} = \text{NNN and heat source} <> 40-99])}$$

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

Code Grouping	EII Code	NFIRS definitions
Central heat	132	Furnace or central heating unit
	133	Boiler (power, process or heating)
Fixed or portable space heater	131	Furnace, local heating unit, built-in
	123	Fireplace with insert or stove
	124	Heating stove
	141	Heater, excluding catalytic and oil-filled
	142	Catalytic heater
	143	Oil-filled heater
Fireplace or chimney	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector
	228	Battery charger or rectifier
	229	Battery (all types)
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight

	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast
	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
	243	Decorative or landscape lighting – low voltage
	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment
Portable cooking or warming equipment	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
	641	Breadmaking machine

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.

Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as “mattresses and bedding.” In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as “clothing.” In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply “bedroom.” Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.