PRISONS AND JAILS

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National Fire Protection Association
Fire Analysis and Research Division

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Abstract

NFPA estimates that an average of 590 structure fires in prisons and jails per year were reported to U.S. fire departments during 2003-2007. These fires caused an estimated average of 37 civilian injuries and $2.0 million in direct property damage per year. There were no reported civilian deaths in these facilities. One of every four fires in these properties was intentionally set, which was the leading cause of civilian fire injuries and direct property damage.

Keywords: Fire statistics, jails, prisons

Acknowledgements

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We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

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 617-984-7450.

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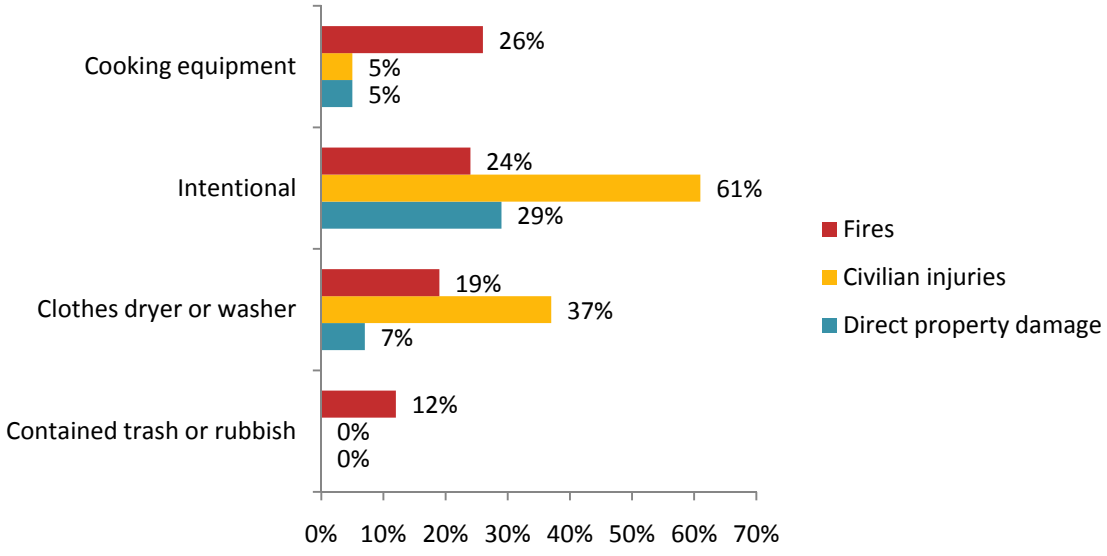
Prison and Jail Fires

During 2003-2007, municipal fire departments responded to an estimated average of **590 structure fires** in prisons and jail, annually. These fires resulted in an estimate annual average of 37 civilian fire injuries, $2.0 million in direct property damage. No civilian fire deaths in these properties were reported to NFIRS during this period.

- Since 1980, structure fires in prisons and jails have fallen 86%.
- January, February, and March were the peak months for reported prison and jail structure fires in 2003-2007
- Kitchens or cooking areas were the leading area of origin for structure fires in prisons and jails.
- Eighteen percent of the prison and jail structure fires reported during 2003-2007 started in bedrooms or cells and 11% originated in laundry rooms.
- One of every 4 structure fires in prisons and jails was intentional.
- When fires were not confined to cooking equipment or contained to trash or rubbish, mattresses and bedding materials were the leading items first ignited.

The Leading Causes of Structure Fires in Prisons and Jails



Structure Fires in Prisons and Jails

The category "prisons and jails" includes: prison cells or cell blocks; reformatories or juvenile detention homes; detention camps and police stations. Only fires reported to public fire departments are included in these statistics.

During 2003-2007, 590 structure fires per year, on average, were reported in prisons and jails.

During the five-year period of 2003-2007, an estimated average of 590 structure fires were reported in prisons and jails per year. These fires caused an annual average of 37 civilian injuries and $2.0 million in direct property damage. No civilian fire deaths in these properties were reported to NFIRS during this period. The table below provides a more detailed breakdown of losses by occupancy.

Table A.
Structure Fires in Prisons and Jails
2003-2007 Annual Averages

Property Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Jail or prison (not juvenile)	380	(64%)	0	N/A	29	(79%)	$1.2	(57%)
Reformatory, juvenile detention center	120	(21%)	0	N/A	5	(14%)	$0.3	(14%)
Police station	90	(15%)	0	N/A	3	(7%)	$0.6	(29%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

Source: NFIRS 5.0 and NPFA Survey

N/A- Not applicable because total is zero.

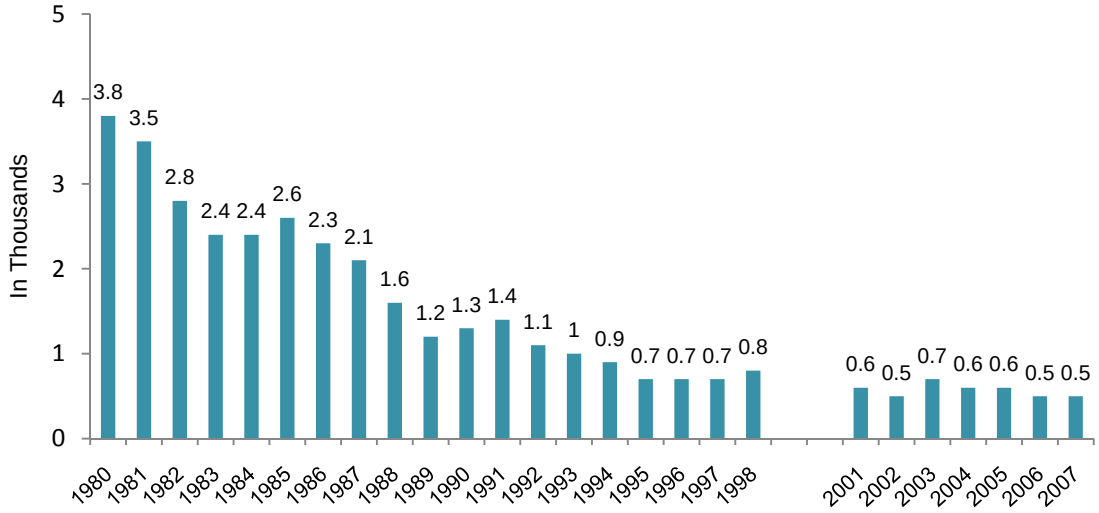
0.1% of all reported structure fires occurred in prisons and jails.

During 2003-2007, the 590 fires in prisons and jails per year accounted for 0.1% of the 522,200 structure fires, none of the 3,100 civilian fire deaths, 0.2% of the 15,230 civilian fire injuries, and 0.0% of the $9.2 billion in direct property loss in structure fires.

Since 1980, structure fires in prisons and jails fell 86%.

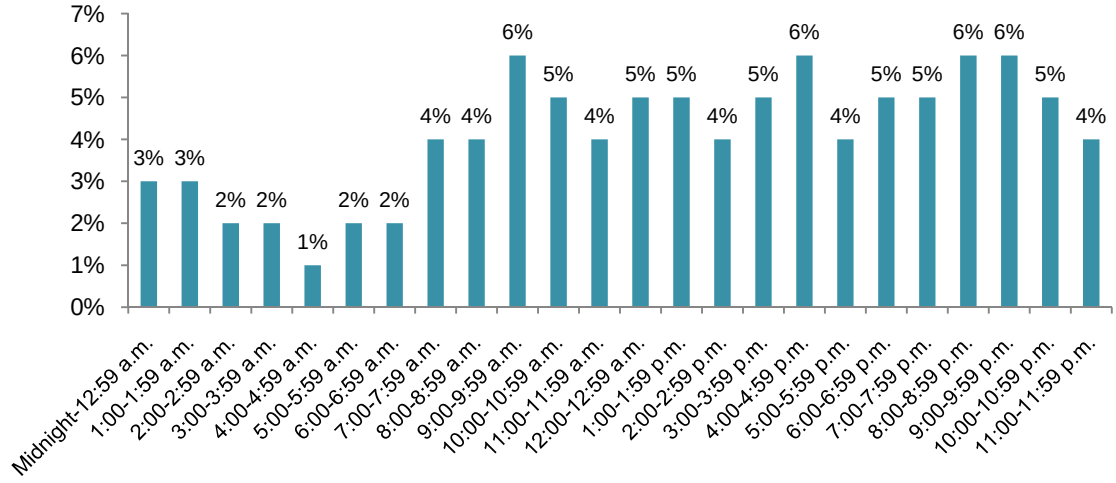
Table 1 and the graph on following page show that reported prison and jail fires fell 86% from 3,780 in 1980 to 520 in 2007. In comparison, structure fires of all types declined 50% from 1980 to 2007. From 2001 to 2007, structure fires in prisons and jails have not shown much variation, numbering between 520 and 720 fires per year.

Figure 1.
Structure Fires in Prisons and Jails
by Year: 1980-2007



Structure fires in these properties were slightly more common on Mondays and Tuesdays. Tables 2, 3, and 4 show reported structure fires in these properties by month, day of week and alarm time, respectively. January, February, and March were the peak months for reported prison and jail structure fires in 2003-2007. The smallest number of these fires occurred in August; June ranked second lowest. Slightly more structure fires occurred in prisons and jails on Mondays and Tuesdays. Figure 2 shows that two of every three structure fires in prisons and jails occur between the hours of 9 a.m. and 10 p.m. Fewer fires are reported between the hours of midnight and 7 a.m.

Figure 2.
Structure Fires in Prisons and Jails by Alarm Time
2003-2007 Annual Averages



One of every 4 structure fires in prisons and jails was intentional.
Table 5 shows the leading causes of fires in these properties with data summarized from several NFIRS fields. In some cases, the equipment involved in ignition is most relevant; heat source, the field "cause," and factor contributing to ignition also provide relevant information. The causes shown in this table are not mutually exclusive when they have been pulled from different fields. More detailed information on equipment involved in ignition may be found in Table 6; more information on heat source is in Table 7.

Twenty-four percent of the structure fires reported in prison and jails during 2003-2007 were intentionally set. This is three times the share of intentional fires in non-home properties overall. Intentional structure fires also caused 61% of the civilian fire injuries and 29% of the direct property damage from fires in these properties. Cooking equipment was listed as the equipment involved in ignition in 4% of these fires; an additional 22% were confined cooking fires. Overall cooking equipment was involved in 26% of the fires in these properties. Nineteen percent were started by clothes dryers or washers and contained trash or rubbish was involved in 12%. Heating equipment was involved in 7% of fires, followed by electrical distribution or lighting equipment which was involved in 6%. Someone playing with fire started 4% and smoking materials were involved in 3% of these fires as were torches, burners, or soldering irons.

Kitchens or cooking areas were the leading area of origin for structure fires in prisons and jails.
Eighteen percent of the prison and jail structure fires reported during 2003-2007 started in bedrooms or cells and 11% originated in laundry rooms. Area of origin is generally not collected for confined fires but it is probable that most of the confined cooking fires (22%) started in a kitchen or cooking area. Combined with the fires that were specifically identified as starting in the kitchen or cooking area (4%), overall, 26% of structure fires in prisons and jails began in a kitchen or cooking area. (See Table 8.)

When fires were not confined to cooking equipment or contained to trash or rubbish, mattresses and bedding materials were the leading items first ignited.
A mattress or bedding was the item first ignited in 9% of the reported structure fires in prisons and jails during 2003-2007. Electrical wire or cable insulation was first ignited in 5% of the fires; another 5% began with clothing. Cooking materials, including foods, were first ignited in 2%, and presumably most of the confined cooking fires (22%), also began with food or cooking materials. Rubbish, trash or waste was identified as the item first ignited in 3% of the fires, and was presumably the item first ignited in the contained trash or rubbish fires (12%). Item first ignited is not routinely captured for confined for contained fires. (See Table 9.)

Most fires in these properties were small.
Thirty-nine percent of the reported structure fires in prisons and jails in 2003-2007 were confined or contained fires. Version 5.0 of NFIRS introduced shorter reporting for cooking fires confined to the vessel, fires confined to chimney or flues, to incinerators, fuel burners or boilers, and to contained trash or rubbish fires with no flame damage to the structure. In addition to the 39% of contained or confined fires, 44% were confined to the object of origin. Only 4% spread beyond the room of origin. (See Table 10.)

Half of 2003-2007 fires in prisons or jails reported sprinklers present at time of fire.
In 1994-1998, 19% of reported prison/jail fires showed some type of automatic extinguishing equipment present. By 2003-2007, that was up to 51%. Ninety-eight percent of the 2003-2007 automatic extinguishing equipment reported was sprinklers (87% wet pipe, 10% dry pipe, 2% other), so 50% of 2003-2007 fires reported sprinklers present. The other 2% of equipment was mostly dry (or

wet) chemical systems. See NFPA's report, *U.S. Experience with Sprinklers and Other Automatic Fire Extinguishing Equipment* (2010) for more information.

Prisons and jails pose unique fire safety challenges.
The deadliest U.S. fire in this property class was the 1930 Ohio State Penitentiary Fire in Columbus, Ohio that killed 320 people. One problem, unique to this property class, has been the challenge to establish and implement adequate procedures for moving prisoners to alternate secure areas when necessary. Misplaced keys, for example, were critical in at least one deadly fire. Some structures did not have fixed fire protection systems. Fire hazards were also associated with mattresses and synthetic foams in padded cells. Control of potential heat sources and ignitable items in cells and the flammability of upholstered furnishings is essential to reduce the risk of fires. ASTM F1870-05 is the Standard Guide for Selection of Fire Test Methods for the Assessment of Upholstered Furnishings in Detention and Correctional Facilities. Systems and plans must be in place to react to these fires when they do occur.

400 outside fires and 100 vehicle fires were reported per year on these properties.
In 2003-2007, an estimated annual average of 400 outside and other fires on prison and jail properties resulted in an annual average of three civilian injuries and $211,000 in direct property damage; 100 vehicle fires, on average, caused an average of $294,000 in direct property damage per year. No civilian deaths from outside fires and no civilian deaths or civilian injuries from vehicle fires reported on these properties were reported to NFIRS during this time.

The Ohio State Penitentiary fire in 1930 was the deadliest prison fire in U.S. history.
Three hundred and twenty people died in the Ohio State Penitentiary fire on April 21, 1930. This was the deadliest prison fire in U.S. history. A list of the deadliest prison and jail fires in U.S. history is available at www.NFPA.org/Research under fire statistics, deadliest/large-loss fires.

Additional information sources
Section 20, Chapter 14 "Detention and Correctional Facilities" by Thomas W. Jaeger in the 20th edition of the NFPA *Fire Protection Handbook,* describes some of the special fire safety concerns for these properties.

Table 1.
Structure Fires in Prisons and Jails
by Year: 1980-2007

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions) As Reported	Direct Property Damage (in Millions) In 2007 Dollars
1980	3,780	0	183	$2.3	$5.8
1981	3,530	5	409	$11.3	$20.6
1982	2,870	8	163	$4.2	$9.0
1983	2,360	0	258	$5.7	$11.9
1984	2,420	0	121	$2.6	$5.4
1985	2,570	2	75	$1.2	$2.4
1986	2,340	0	96	$2.8	$5.4
1987	2,120	0	66	$4.7	$8.9
1988	1,620	0	134	$3.6	$6.6
1989	1,190	3	68	$1.5	$2.6
1990	1,290	0	70	$4.1	$6.9
1991	1,420	0	104	$2.8	$4.4
1992	1,120	0	49	$1.1	$1.7
1993	1,020	1	67	$6.1	$9.0
1994	880	0	171	$2.3	$3.3
1995	720	0	46	$1.3	$1.8
1996	720	0	35	$0.9	$1.2
1997	730	0	32	$5.3	$6.9
1998	750	0	36	$1.3	$1.7
1999	680	0	0	$1.6	$2.0
2000	540	0	0	$1.2	$1.4
2001	590	0	20	$3.9	$4.6
2002	540	0	25	$0.5	$0.6
2003	720	0	21	$2.8	$3.2
2004	630	0	64	$1.2	$1.3
2005	590	0	41	$3.7	$3.9
2006	480	0	13	$1.0	$1.0
2007	520	0	47	$1.5	$1.5

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars

Source: NFIRS and NFPA survey. Inflation adjustments were based on the consumer price index found in the U.S. Census Bureau's *Statistical Abstract of the United States: 2006* , "Table 705, Purchasing Power of the Dollar."

Table 2.
Structure Fires in Prisons and Jails, by Month
2003-2007 Annual Averages

Month	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
January	60	(10%)	0	N/A	4	(10%)	$0.6	(29%)
February	60	(10%)	0	N/A	1	(2%)	$0.1	(3%)
March	60	(10%)	0	N/A	6	(17%)	$0.2	(9%)
April	50	(9%)	0	N/A	3	(9%)	$0.0	(2%)
May	50	(8%)	0	N/A	1	(2%)	$0.3	(15%)
June	40	(7%)	0	N/A	7	(19%)	$0.1	(3%)
July	50	(8%)	0	N/A	0	(1%)	$0.1	(5%)
August	40	(6%)	0	N/A	5	(14%)	$0.1	(7%)
September	40	(8%)	0	N/A	1	(3%)	$0.1	(5%)
October	50	(8%)	0	N/A	0	(1%)	$0.1	(4%)
November	50	(8%)	0	N/A	6	(15%)	$0.2	(11%)
December	50	(8%)	0	N/A	2	(7%)	$0.1	(7%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)
Average	50	(8%)	0	N/A	3	(8%)	$0.2	(8%)

Table 3.
Structure Fires in Prisons and Jails, by Day of Week
2003-2007Annual Averages

Day	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Sunday	80	(14%)	0	N/A	5	(13%)	$0.3	(16%)
Monday	90	(15%)	0	N/A	3	(8%)	$0.1	(5%)
Tuesday	90	(15%)	0	N/A	16	(44%)	$0.6	(27%)
Wednesday	80	(14%)	0	N/A	3	(8%)	$0.6	(31%)
Thursday	80	(14%)	0	N/A	2	(5%)	$0.2	(12%)
Friday	80	(14%)	0	N/A	3	(9%)	$0.1	(5%)
Saturday	80	(14%)	0	N/A	5	(14%)	$0.1	(4%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)
Average	80	(14%)	0	N/A	5	(14%)	$0.3	(14%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Sums may not equal totals due to rounding errors.

Source: NFIRS and NFPA survey.

Table 4.
Structure Fires in Prisons and Jails, by Alarm Time
2003-2007 Annual Averages

Time	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight-12:59 a.m.	20	(3%)	0	N/A	0	(1%)	$0.1	(3%)
1:00-1:59 a.m.	20	(3%)	0	N/A	2	(5%)	$0.2	(11%)
2:00-2:59 a.m.	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
3:00-3:59 a.m.	10	(2%)	0	N/A	0	(0%)	$0.0	(1%)
4:00-4:59 a.m.	10	(1%)	0	N/A	0	(0%)	$0.1	(4%)
5:00-5:59 a.m.	10	(2%)	0	N/A	0	(0%)	$0.0	(1%)
6:00-6:59 a.m.	10	(2%)	0	N/A	0	(1%)	$0.0	(2%)
7:00-7:59 a.m.	20	(4%)	0	N/A	0	(0%)	$0.0	(1%)
8:00-8:59 a.m.	30	(4%)	0	N/A	5	(14%)	$0.0	(1%)
9:00-9:59 a.m.	30	(6%)	0	N/A	5	(14%)	$0.0	(1%)
10:00-10:59 a.m.	30	(5%)	0	N/A	2	(6%)	$0.4	(22%)
11:00-11:59 a.m.	30	(4%)	0	N/A	1	(3%)	$0.0	(1%)
12:00-12:59 p.m.	30	(5%)	0	N/A	3	(7%)	$0.0	(1%)
1:00-1:59 p.m.	30	(5%)	0	N/A	3	(7%)	$0.0	(2%)
2:00-2:59 p.m.	20	(4%)	0	N/A	0	(1%)	$0.0	(1%)
3:00-3:59 p.m.	30	(5%)	0	N/A	2	(7%)	$0.1	(4%)
4:00-4:59 p.m.	30	(6%)	0	N/A	0	(1%)	$0.2	(11%)
5:00-5:59 p.m.	30	(4%)	0	N/A	0	(0%)	$0.0	(0%)
6:00-6:59 p.m.	30	(5%)	0	N/A	2	(5%)	$0.5	(24%)
7:00-7:59 p.m.	30	(5%)	0	N/A	4	(10%)	$0.0	(1%)
8:00-8:59 p.m.	30	(6%)	0	N/A	0	(0%)	$0.0	(2%)
9:00-9:59 p.m.	30	(6%)	0	N/A	2	(6%)	$0.0	(2%)
10:00-10:59 p.m.	30	(5%)	0	N/A	1	(4%)	$0.1	(4%)
11:00-11:59 p.m.	30	(4%)	0	N/A	3	(7%)	$0.0	(2%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)
Average	20	(4%)	0	N/A	2	(4%)	$0.1	(4%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Sums may not equal totals due to rounding errors.

Source: NFIRS and NFPA survey.

Table 5.
Leading Causes of Structure Fires in Prisons and Jails
2003-2007 Annual Averages

Leading Causes	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Cooking equipment	150	(26%)	0	N/A	2	(5%)	$0.1	(5%)
Confined cooking equipment	*130*	*(22%)*	*0*	*N/A*	*2*	*(5%)*	*$0.0*	*(1%)*
Identified cooking equipment	*20*	*(4%)*	*0*	*N/A*	*0*	*(0%)*	*$0.1*	*(4%)*
Intentional	140	(24%)	0	N/A	23	(61%)	$0.6	(29%)
Clothes dryer or washer	110	(19%)	0	N/A	14	(37%)	$0.1	(7%)
Contained trash or rubbish fire	70	(12%)	0	N/A	0	(0%)	$0.0	(0%)
Heating equipment	40	(7%)	0	N/A	0	(0%)	$0.1	(5%)
Confined heating equipment	*20*	*(4%)*	*0*	*N/A*	*0*	*(0%)*	*$0.0*	*(0%)*
Identified heating equipment	*10*	*(3%)*	*0*	*N/A*	*0*	*(0%)*	*$0.1*	*(5%)*
Electrical distribution and lighting equipment	40	(6%)	0	N/A	5	(13%)	$0.0	(1%)
Playing with heat source	20	(4%)	0	N/A	0	(0%)	$0.0	(1%)
Smoking materials	20	(3%)	0	N/A	0	(0%)	$0.3	(15%)
Torch, burner or soldering iron	10	(3%)	0	N/A	10	(26%)	$1.0	(50%)

N/A- Not applicable because total is zero.

Note: These are the leading causes, obtained from the following list: intentional (from the NFIRS field "cause"); playing with fire (from factor contributing to ignition); confined heating (including confined chimney and confined fuel burner or boiler fires), confined cooking, and contained trash or rubbish) from incident type; identified heating, identified cooking, clothes dryer or washer , torch (including burner and soldering iron), electrical distribution and lighting equipment, medical equipment, and electronic, office or entertainment equipment (from equipment involved in ignition); smoking materials, candles, lightning, and spontaneous combustion or chemical reaction (from heat source), and mobile property involved (from mobile property involved in ignition). The statistics on smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Exposure fires include fires with an exposure number greater than zero, as well as fires identified by heat source or factor contributing to ignition when no equipment was involved in ignition and the fires were not intentionally set. Because contained trash or rubbish fires are a scenario without causal information, they are shown at the bottom of the table if they account for at least 2% of the fires. Casual information is not routinely collected for these incidents. The same fire can be listed under multiple causes, based on multiple data elements. Details on handling of unknowns, partial unknowns, and other underspecified codes may be found in the Appendix.

These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest hundred thousand. Property damage has not been adjusted for inflation.

Source: NFIRS and NFPA survey.

Table 6.
Structure Fires in Prisons and Jails, by Equipment Involved in Ignition
2003-2007 Annual Averages

Equipment Involved in Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined cooking fire	130	(22%)	0	N/A	2	(5%)	$0.0	(1%)
Clothes dryer	100	(17%)	0	N/A	11	(31%)	$0.1	(7%)
No equipment involved	100	(17%)	0	N/A	7	(19%)	$0.4	(21%)
Contained trash or rubbish fire	70	(12%)	0	N/A	0	(0%)	$0.0	(0%)
Confined fuel burner or boiler fire	20	(3%)	0	N/A	0	(0%)	$0.0	(0%)
Fan	20	(3%)	0	N/A	0	(0%)	$0.0	(0%)
Torch	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Fixed wiring and related equipment	10	(2%)	0	N/A	5	(13%)	$0.0	(0%)
Lamp, bulb, or lighting	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified equipment involved in ignition	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Fixed or portable space heater	10	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Transformers and power supplies	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Microwave oven	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Central heat, furnace or boiler	10	(1%)	0	N/A	0	(0%)	$0.1	(4%)
Cord or plug	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Range or cooktop	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Washer/dryer combination (within one frame)	10	(1%)	0	N/A	2	(6%)	$0.0	(0%)
Confined chimney or flue fire	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Oven, rotisserie	0	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Computer monitor	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Confined incinerator overload or malfunction fire	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Transmitter	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Portable cooking or warming equipment	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Washing machine	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Other known equipment	30	(6%)	0	N/A	10	(26%)	$1.3	(63%)
Other confined fire	0	(0%)	0	N/A	0	(0%)	$0.0	(0%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Non-confined fires in which the equipment involved in ignition was unknown or not reported have been allocated proportionally among fires with known equipment involved. Sums may not equal totals due to rounding errors.

Source: NFIRS and NFPA survey.

Table 7.
Structure Fires in Prisons and Jails, by Heat Source
2003-2007 Annual Averages

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined cooking fire	130	(22%)	0	N/A	2	(5%)	$0.0	(1%)
Contained trash or rubbish fire	70	(12%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified heat from powered equipment	70	(12%)	0	N/A	2	(5%)	$0.2	(10%)
Arcing	50	(9%)	0	N/A	15	(41%)	$0.1	(4%)
Radiated, conducted heat from operating equipment	50	(9%)	0	N/A	2	(6%)	$0.1	(6%)
Lighter	40	(6%)	0	N/A	7	(18%)	$0.1	(4%)
Match	30	(5%)	0	N/A	2	(6%)	$0.0	(2%)
Unclassified hot or smoldering object	20	(4%)	0	N/A	3	(9%)	$0.0	(0%)
Spark, ember or flame from operating equipment	20	(3%)	0	N/A	0	(0%)	$0.0	(2%)
Confined fuel burner or boiler fire	20	(3%)	0	N/A	0	(0%)	$0.0	(0%)
Smoking materials	20	(3%)	0	N/A	0	(0%)	$0.3	(15%)
Unclassified heat source	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Heat or spark from friction	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Chemical reaction	10	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Hot ember or ash	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Incendiary device	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Confined chimney or flue fire	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Confined incinerator overload or malfunction fire	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Flame or torch used for lighting	0	(1%)	0	N/A	2	(5%)	$0.6	(31%)
Molten or hot material	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified chemical or natural heat source	0	(1%)	0	N/A	0	(0%)	$0.1	(7%)
Other known heat source	10	(1%)	0	N/A	2	(5%)	$0.3	(16%)
Other confined fire	0	(0%)	0	N/A	0	(0%)	$0.0	(0%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Non-confined and non-contained structure fires in which the heat source was unknown or not reported have been allocated proportionally among fires with known heat source. The statistics on matches, lighters, smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Totals may not equal sums due to rounding errors.

Source: NFIRS and NFPA survey.

Table 8.
Structure Fires in Prisons and Jails, by Area of Origin
2003-2007 Annual Averages

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined cooking fire	130	(22%)	0	N/A	2	(5%)	$0.0	(1%)
Bedroom	100	(17%)	0	N/A	21	(57%)	$0.3	(14%)
Contained trash or rubbish fire	70	(12%)	0	N/A	0	(0%)	$0.0	(0%)
Laundry room or area	60	(11%)	0	N/A	4	(10%)	$0.3	(12%)
Kitchen or cooking area	20	(4%)	0	N/A	3	(7%)	$0.6	(31%)
Confined fuel burner or boiler fire	20	(3%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified function area	10	(2%)	0	N/A	0	(1%)	$0.0	(1%)
Office	10	(2%)	0	N/A	0	(1%)	$0.1	(6%)
Lavatory, bathroom, locker room or check room	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified area	10	(2%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified equipment or service area	10	(2%)	0	N/A	0	(0%)	$0.0	(1%)
Exterior roof surface	10	(1%)	0	N/A	2	(5%)	$0.1	(3%)
Wall assembly or concealed space	10	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Duct for HVAC, cable, exhaust, heating, or AC	10	(1%)	0	N/A	0	(0%)	$0.0	(2%)
Common room, living room, family room, lounge or den	10	(1%)	0	N/A	1	(2%)	$0.2	(9%)
Confined chimney or flue fire	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Cell	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Conduit, pipe, utility, or ventilation shaft	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Computer room, control room or center	0	(1%)	0	N/A	0	(0%)	$0.1	(3%)
Storage of supplies or tools or dead storage	0	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Hallway, corridor, mall	0	(1%)	0	N/A	3	(7%)	$0.0	(0%)
Unclassified structural area	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Storage room, area, tank, or bin	0	(1%)	0	N/A	0	(1%)	$0.0	(1%)
Switchgear area or transformer vault	0	(1%)	0	N/A	0	(1%)	$0.0	(0%)
Attic or ceiling or roof assembly or concealed space	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Heating equipment room	0	(1%)	0	N/A	0	(0%)	$0.0	(2%)
Ceiling or floor assembly or concealed space	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Confined incinerator overload or malfunction fire	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified means of egress	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Unclassified service facility	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Closet	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Exterior wall surface	0	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Other known area	30	(6%)	0	N/A	1	(3%)	$0.2	(9%)
Other confined fire	0	(0%)	0	N/A	0	(0%)	$0.0	(0%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

Table 8.
Structure Fires in Prisons and Jails, by Area of Origin
2003-2007 Annual Averages
(Continued)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Non-confined and non-contained structure fires in which the area of origin was unknown or not reported have been allocated proportionally among fires with known area of origin. Totals may not equal sums due to rounding errors.

Source: NFIRS and NFPA survey.

Table 9.
Structure Fires in Prisons and Jails, by Item First Ignited
2003-2007 Annual Averages

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined cooking fire	130	(22%)	0	N/A	2	(5%)	$0.0	(1%)
Contained trash or rubbish fire	70	(12%)	0	N/A	0	(0%)	$0.0	(0%)
Mattress and bedding material	50	(9%)	0	N/A	8	(22%)	$0.1	(4%)
Electrical wire or cable insulation	30	(5%)	0	N/A	1	(2%)	$0.1	(3%)
Unclassified item first ignited	30	(5%)	0	N/A	1	(2%)	$0.0	(1%)
Clothing	30	(5%)	0	N/A	5	(13%)	$0.1	(3%)
Unclassified linen, other than bedding	20	(4%)	0	N/A	3	(8%)	$0.0	(1%)
Unclassified soft goods or wearing apparel	20	(4%)	0	N/A	1	(2%)	$0.2	(10%)
Confined fuel burner or boiler fire	20	(3%)	0	N/A	0	(0%)	$0.0	(0%)
Magazine, newspaper, or writing paper	20	(3%)	0	N/A	5	(13%)	$0.0	(0%)
Dust, fiber, lint, including sawdust or excelsior	20	(3%)	0	N/A	0	(0%)	$0.0	(1%)
Rubbish, trash, or waste	20	(3%)	0	N/A	1	(3%)	$0.0	(0%)
Cooking materials, including food	10	(2%)	0	N/A	0	(1%)	$0.2	(10%)
Structural member or framing	10	(2%)	0	N/A	0	(0%)	$0.1	(4%)
Flammable or combustible liquid or gas, filter or piping	10	(2%)	0	N/A	3	(8%)	$0.5	(22%)
Exterior roof covering or finish	10	(1%)	0	N/A	2	(5%)	$0.1	(3%)
Appliance housing or casing	10	(1%)	0	N/A	0	(1%)	$0.0	(0%)
Insulation within structural area	10	(1%)	0	N/A	0	(0%)	$0.3	(15%)
Unclassified structural component or finish	10	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Oily rags	10	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Multiple items first ignited	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Confined chimney or flue fire	10	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Rolled, or wound material	0	(1%)	0	N/A	4	(11%)	$0.0	(0%)
Box, carton, bag, basket, barrel	0	(1%)	0	N/A	0	(0%)	$0.0	(2%)
Unclassified general materials	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Exterior wall covering or finish	0	(1%)	0	N/A	0	(0%)	$0.0	(1%)
Confined incinerator overload or malfunction fire	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Book	0	(1%)	0	N/A	1	(2%)	$0.0	(0%)
Unclassified furniture, utensils	0	(1%)	0	N/A	0	(0%)	$0.1	(4%)
Packing or wrapping material	0	(1%)	0	N/A	0	(0%)	$0.0	(0%)
Other known item	30	(5%)	0	N/A	0	(1%)	$0.2	(12%)
Other confined fire	0	(0%)	0	N/A	0	(0%)	$0.0	(0%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Non-confined and non-contained structure fires in which the item first ignited was unknown or not reported have been allocated proportionally among fires with known item first ignited. Totals may not equal sums due to rounding errors.

Source: NFIRS and NFPA survey.

Table 10.
Structure Fires in Prison and Jails, by Extent of Flame Damage
2003-2007 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined or contained fire	230	(39%)	0	N/A	2	(5%)	$0.0	(1%)
Confined to object of origin	240	(40%)	0	N/A	13	(34%)	$0.2	(12%)
Confined to room of origin	90	(16%)	0	N/A	16	(42%)	$0.5	(24%)
Confined to floor of origin	10	(2%)	0	N/A	2	(5%)	$0.5	(25%)
Confined to building of origin	10	(2%)	0	N/A	5	(14%)	$0.8	(37%)
Beyond building of origin	0	(0%)	0	N/A	0	(0%)	$0.0	(1%)
Total	590	(100%)	0	N/A	37	(100%)	$2.0	(100%)

N/A- Not applicable because total is zero.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest hundred thousand dollars. Property damage has not been adjusted for inflation. Non-confined and non-contained structure fires in which the extent of flame damage was unknown or not reported have been allocated proportionally among fires with known extent of flame damage. Totals may not equal sums due to rounding errors.

Source: NFIRS and NFPA survey.

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.

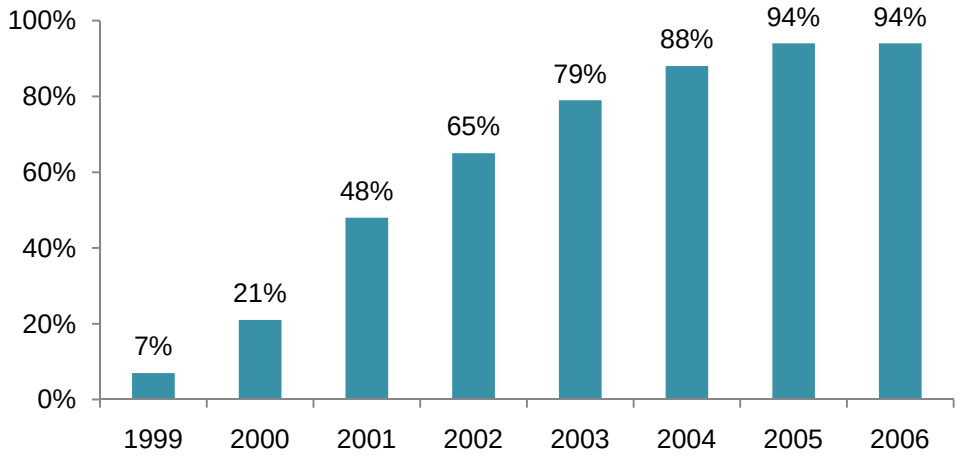
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific 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 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 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 1. Fires Originally Collected in NFIRS 5.0 by Year



For 2002 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 (typically 10-20%). 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 alls 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.

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, 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.

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 electrical failure or malfunction (factor contributing to ignition 30-39) are combined and shown as "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.

Type of Material First Ignited (TMI). This field is required only if the Item First Ignited falls within the code range of 00-69. NFPA has created a new code "not required" for this field that is applied when Item First Ignited is in code 70-99 (organic materials, including cooking materials and vegetation, and general materials, such as electrical wire, cable insulation, transformers, tires, books, newspaper, dust, rubbish, etc..) and TMI is blank. The ratio for allocation of unknown data is:

$$\frac{\text{(All fires – TMI Not required)}}{\text{(All fires – TMI Not Required – Undetermined – Blank)}}$$

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

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

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 as 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. (Confined fire incident types are not discussed here)

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	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
Wiring, switch or outlet	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	214	Wiring from meter box to circuit breaker
	216	Electrical branch circuit
	217	Outlet, receptacle
	218	Wall switch
Power switch gear or overcurrent protection device	215	Panel board, switch board, circuit breaker board
	219	Ground fault interrupter
	222	Overcurrent, disconnect equipment
	227	Surge protector
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

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."

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.

Inflation. Property damage estimates are not adjusted for inflation unless so indicated.

Appendix B.
Methodology and Definitions Used in "Leading Cause" Tables

The cause table reflects relevant causal factors that accounted for at least 2% of the fires in a given occupancy. Only those causes that seemed to describe a scenario are included. Because the causal factors are taken from different fields, some double counting is possible. Percentages are calculated against the total number of structure fires, including both confined and non-confined fires. Bear in mind that every fire has at least three "causes" in the sense that it could have been prevented by changing behavior, heat source, or ignitability of first fuel, the last an aspect not reflected in any of the major cause categories. For example, several of the cause categories in this system refer to types of equipment (cooking, heating, electrical distribution and lighting, clothes dryers and washers, torches). However, the problem may be not with the equipment but with the way it is used. The details in national estimates are derived from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS). This methodology is based on the coding system used in Version 5.0 of NFIRS. The *NFIRS 5.0 Reference Guide*, containing all of the codes, can be downloaded from http://www.nfirs.fema.gov/documentation/reference/.

Cooking equipment and heating equipment are calculated by summing fires identified by equipment involved in ignition and relevant confined fires. Confined fires will be shown if they account for at least 1% of the incidents. **Confined cooking fires** (cooking fires involving the contents of a cooking vessel without fie extension beyond the vessel) are identified by NFIRS incident type 113;

Confined heating equipment fires include **confined chimney or flue fires (**incident type 114) and **confined fuel burner or boiler** fires (incident type 116). The latter includes delayed ignitions and incidents where flames caused no damage outside the fire box. The two types of confined heating fires may be combined or listed separately, depending on the numbers involved.

Contained trash or rubbish fires with no flame damage to structure or its contents are identified by incident type 118. No cause can be ascertained for these incidents, but they account for a substantial share of the incidents in some occupancies. When appropriate, these fires are generally shown at the bottom of a cause table.

Confined or contained fires (incident type 113-118) are excluded from the remaining estimates. Unknown data is allocated proportionally among non-confined fires.

Intentional fires are identified by fires with a "1" (intentional) in the field "cause." The estimate includes a proportional share of fires in which the cause was undetermined after investigation, under investigation, or not reported. All fires with intentional causes are included in this category regardless of the age of the person involved. Earlier versions of NFIRS included codes for incendiary and suspicious; both convert to intentional. Intentional fires were deliberately set; they may or may not be incendiary in a legal sense. No age restriction is applied.

Fires caused by **playing with heat source** (typically matches or lighters) are identified by code 19 in the field "factor contributing to ignition." Because of conversion issues, only data originally collected in Version 5.0 of NFIRS is used in the initial calculation. It appears that "none" is often being used in place of "unknown." Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally. Because factor contributing to ignition is not required for intentional fires, the share unknown, by these definitions, is somewhat larger than it should be. After the Version 5.0 only data has been run for non-confined fires and the unknown data allocated, percentages are calculated for each code of Version 5.0 non-confined fires. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates. The final percentage of fires is calculated by dividing these estimates by the total number of confined and non-confined fires from all versions.

The heat source field is used to identify fires started by: **smoking materials** (cigarette, code 61; pipe or cigar, code 62; and heat from undetermined smoking material, code 63); **candles** (code 66), **lightning** (code 73); and **spontaneous combustion or chemical reaction** (code 72). Fires started by heat from unclassified open flame or smoking materials (code 60) are allocated proportionally among the "other open flame or smoking material" codes (codes 61-69) in an allocation of partial unknown data. This includes smoking materials and candles. This approach results in any true unclassified smoking or open flame heat sources such as incense being inappropriately allocated. However, in many fires, this code was used as an unknown.

The equipment involved in ignition field is used to find several cause categories. This category includes equipment that functioned properly and equipment that malfunctioned.

Identified cooking equipment refers to equipment used to cook, heat or warm food (codes 600, 620-649 and 654). Fire in which ranges, ovens or microwave ovens, food warming appliances, fixed or portable cooking appliances, deep fat fryers, open fired charcoal or gas grills, grease hoods or ducts, or other cooking appliances) were involved in the ignition are said to be caused by cooking equipment. Food preparation devices that do not involve heating, such as can openers or food processors, are not included here. Unclassified kitchen and cooking equipment (code 600) is included here because a larger share of the whole category involved cooking rather than kitchen equipment.

Identified heating equipment (codes 100 and 120-199) includes central heat, portable and fixed heaters (including wood stoves), fireplaces, chimneys, hot water heaters, and heat transfer equipment such as hot air ducts or hot water pipes. Heat pumps are not included. Unclassified heating, ventilation and air condition equipment (code 100) is included here because a larger share of the whole category involved heating rather than air conditioning or ventilation equipment.

Electrical distribution and lighting equipment (codes 200-299) include: fixed wiring; transformers; associated overcurrent or disconnect equipment such as fuses or circuit breakers; meters; meter boxes; power switch gear; switches, receptacles and outlets; light fixtures, lamps, bulbs or lighting; signs; cords and plugs; generators, transformers, inverters, batteries and battery charges.

Torch, burner or soldering iron (codes 331-334) includes welding torches, cutting torches, Bunsen burners, plumber furnaces, blowtorches, and soldering equipment.

Clothes dryer or washer (codes 811, 813 and 814) includes clothes dryers alone, washer and dryer combinations within one frame, and washing machines for clothes.

Electronic, office or entertainment equipment (codes 700-799) includes: computers and related equipment; calculators and adding machines;, telephones or answering machines; copiers; fax machines; paper shredders; typewriters; postage meters; other office equipment; musical instruments; stereo systems and/or components; televisions and cable TV converter boxes,, cameras, excluding professional television studio cameras, video equipment and other electronic equipment. Older versions of NFIRS had a code for electronic equipment that included radar, X-rays, computers, telephones, and transmitter equipment. Because this code was so broad, it unfortunately converts to equipment involved undetermined.

Shop tools and industrial equipment excluding torches, burners or soldering irons (codes 300-330, 335-399) includes power tools; painting equipment; compressors; atomizing equipment; pumps; wet/dry vacuums; hoists, lifts or cranes; powered jacking equipment; water or gas drilling equipment; unclassified hydraulic equipment; heat-treating equipment; incinerators, industrial furnaces, ovens or kilns; pumps; compressors; internal combustion engines; conveyors; printing presses; casting, molding; or forging equipment; heat treating equipment; tar kettles; working or shaping machines; coating machines; chemical process equipment; waste recovery equipment; power transfer equipment; power takeoff; powered valves; bearings or brakes; picking, carding or weaving machines; testing equipment; gas regulators; separate motors; non-vehicular internal combustion engines; and unclassified shop tools and industrial equipment.

Medical equipment (codes 410-419) includes: dental, medical or other powered bed, chair or wheelchair; dental equipment; dialysis equipment; medical monitoring and imaging equipment; oxygen administration equipment; radiological equipment; medical sterilizers, therapeutic equipment and unclassified medical equipment.

Mobile property (vehicle) describes fires in which some type of mobile property was involved in ignition, regardless of whether the mobile property itself burned. Mobile property includes: highway-type vehicles such as cars, trucks, recreational vehicles, and motorcycles; trains, trolleys and subways; boats and ships; aircraft; industrial, agricultural and construction vehicles; and riding lawn mowers, snow removal vehicles and tractors. Because of conversion issues, only data originally collected in Version 5.0 of NFIRS is used in the initial calculation. The data was obtained by first running Version 5.0 non confined fires only to identify vehicles that were involved in ignition whether or not they burned themselves (mobile property involved codes 2 and 3). After the unknown data was allocated, percentages are calculated for each code of Version 5.0 non-confined fires.

Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates. The final percentage of fires is calculated by dividing these estimates by the total number of confined and non-confined fires from all versions.

Exposures are fires that are caused by the spread of or from another fire. These include fires in which the exposure number is greater than 0; the factor contributing to ignition is property too close (code 71); or heat source is heat spreading from another fire via direct flame or convection current (code 80-89). Because exposures are identified by the older hierarchical sort, all non-confined fires with exposure number greater than zero are counted as exposures, but those identified by heat source and factor contributing to ignition include only fires that were not grouped in other categories such as cooking or heating equipment.

Appendix C.
Selected Published Incidents

The following are selected published incidents involving prisons and jails. Included are short articles from the "Firewatch" or "Bi-monthly" columns in *NFPA Journal* or it predecessor *Fire Journal* and incidents from either the large-loss fires report or catastrophic fires report.

It is important to remember that this is anecdotal information. Anecdotes show what can happen; they are not a source to learn about what typically occurs.

NFPA's Fire Incident Data Organization (FIDO) identifies significant fires through a clipping service, the Internet and other sources. Additional information is obtained from the fire service and federal and state agencies. FIDO is the source for articles published in the "Firewatch" column of the *NFPA Journal* and many of the articles in this report.

Sprinkler Controls Fire in Detention Facility, Washington
A single sprinkler extinguished a fire in the laundry room of a juvenile detention facility that began when grease-laden rags stored in a burlap bag spontaneously ignited. Although the waterflow alarm sounded, the facility's security staff delayed notifying the fire department, and firefighters finally arrived on the scene in response to a neighbor's 10:03 p.m. call to 911.

The fire occurred in a single-story steel-framed building that was detached from the detention areas, and the laundry shared the space with the maintenance department. It was 80 feet (24 meters) long and 40 feet (12 meters) wide, with metal-framed walls covered in gypsum board. Although the building had a wet-pipe sprinkler system that provided full coverage, its fire detection system only provided a local alarm and didn't automatically alert the fire department.

The fire department arrived a minute after the neighbor's call to find light smoke coming from the building. As the first-arriving crews advanced a 1 3/4-inch hose line into the building, other companies established a water supply and set up ventilation fans. By the time firefighters reached the laundry room, however, the sprinkler system had extinguished the flames.

Damage to the building and its contents came to $500. There were no injuries.

Kenneth J. Tremblay, 2003, "Firewatch", *NFPA Journal*, May/June, 14.

Sprinkler Extinguishes Detention Center Blaze, North Carolina
A detention center inmate who was protesting the center's no smoking policy started a blaze in his eight-person cell by piling up paper, blankets, and a mattress and lighting them with a match. Heat from the flames activated the cell's sidewall sprinkler, which extinguished the blaze.

The two-story, irregularly shaped, 39,426-square-foot detention center was constructed of concrete and reinforced steel. It contained an automatic detection system, a full-coverage, wet-pipe sprinkler system, a smoke evacuation system, and portable fire extinguishers.

Two engines, a truck company, a squad, and a command vehicle responded to a water flow alarm at the center. An engine company and the squad investigated to find the blaze already extinguished. The truck company ventilated the building and conducted salvage operations, and the second engine supported the sprinkler system.

The property had a combined value of $9.5 million. Damage to the structure was estimated at $300 and to the contents at $150. No one was injured.

Kenneth J. Tremblay, 1997, "Firewatch", *NFPA Journal*, January/February, 27.

Sprinkler Controls Incendiary Fire in Juvenile Detention Center, Pennsylvania

Residents of a juvenile detention center allegedly started a fire by spraying a roll of toilet paper with hair spray and igniting it with matches. The youths then threw the burning paper into a laundry chute, where it ignited clothing and bedding in the basement. The blaze spread up the chute to the second floor and through an open chute door, activating a single sprinkler in the hallway.

The three-story juvenile detention center, which measured 76 by 56 feet, was constructed of a wood-framed roof and floors, concrete walls, a brick veneer, and a slate roof. Sleeping rooms and bathrooms were located on the second and third floors, and living areas, the kitchen and cafeteria, and offices were on the first floor. Recreation, utility, laundry, and storage rooms were in the basement. A laundry chute that started in a laundry/storage room on the third floor led to the basement laundry room.

The building was protected by a wet-pipe sprinkler system of unknown coverage and a combination smoke and heat detection system interconnected with manual pull stations that covered every room in the property. A central station alarm company monitored the sprinkler system. The building also contained a standpipe system and portable fire extinguishers.

Firefighters were alerted by the central station alarm company to a water flow alarm from the facility and responded at approximately 10:40 a.m. They found that the building had been evacuated and that smoke was coming from second-floor windows. Maintenance personnel had tried unsuccessfully to control the blaze with 20-pound dry chemical fire extinguishers, but the fire had continued to burn, held in check by the second-floor sprinkler.

An engine company supported the sprinkler system, and firefighters extended two 2-inch handlines, one to the basement and the other to the second floor. The sprinklers quickly controlled the blaze, and firefighters completed extinguishment.

Fire damage was limited to the laundry chute, but smoke damaged areas throughout the upper two floors. The first-floor dining room and a second-floor lounge sustained

minimal water damage. Damage to the property and its contents, valued at $1.1 million, was estimated at $7,000. A 23-year-old maintenance worker who tried to extinguish the fire was treated for smoke inhalation.

Investigators brought charges against one youth for starting the fire, but these were later dropped when witnesses changed their statements.

Kenneth J. Tremblay, 1995, "Firewatch", *NFPA Journal*, September/October, 33.

Inmate Ignites Fire in Correctional Facility, California
An incendiary fire that started on the roof of an operating correctional facility destroyed two sleeping barracks and damaged a third.

The facility, which was originally built as military barracks during World War II, was being used as a minimum security prison for 92 prisoners. The single-story buildings of unprotected, wood-frame construction with stucco walls measured 225 feet by 84 feet and were protected by a fire detection system. There were no sprinklers in the buildings.

An inmate who was working a night job smelled smoke and notified a guard at 1:30 a.m. According to news reports, the guard investigated the odor and, discovering a fire on the roof of one of the barracks, called the fire department. Inmates were evacuated to an open area away from the buildings.

The fire burned into a concealed, 8-inch ceiling/roof void that had been created when a new roof was built over the original roof. Fire destroyed the sleeping area of the barracks and spread to two other structures before it was extinguished.

Investigators determined that an inmate had used a match to ignite gasoline-soaked clothing on an exterior roof. Because the fire burned into the void space, the detection system did not operate until after the guard discovered the fire. All the prisoners were reportedly accounted for during the incident.

The combined loss to the facility, valued at $1 million, was estimated to be $335,000.

Kenneth J. Tremblay, 1993, "Firewatch", *NFPA Journal*, September/October, 36.

Inmates Ignite Fire in Detention Center; $4 Million Loss Results, Florida
Inmates of a detention center ignited a fire that resulted in $4 million in damage to the building and its contents.

The two-story, 30,000-square-foot building, which measured 200 feet by 150 feet, was of unprotected steel-frame construction. It had concrete-block walls and a concrete roof, but was not equipped with detection or suppression systems. The facility could house as many as 302 detainees.

While a disturbance was underway in another section of the facility, inmates used matches to ignite cardboard boxes in a first-floor dry-goods storage room. The guards storage room. The guards, distracted by the disturbance, did not detect the fire until it

had spread to combustibles in the room. Once the fire was detected, the staff began evacuating the building and the fire department was notified.

The fire consumed cardboard boxes containing food products and stored mattresses. Heat caused cans of meat products to expand and explode, and when grease and fat from the products came into contact with other stored goods, they accelerated the fire.

Guards attempted to extinguish the fire, but heat and smoke forced them from the area.

The combined loss to the detention center and its contents, valued at $6 million, was estimated at $4 million. No injuries were reported.

Kenneth J. Tremblay, 1993, "Firewatch", *NFPA Journal*, May/June, 33.

Missouri
September, 1991, 3:45 a.m., 4 deaths.

Number of Stories, Occupancy Type, Construction Type, Operating Status:
Prison for men and women; protected ordinary construction; 1 story.

Detection Systems and Suppression Systems:
Smoke detectors were present and operating until loss of electrical power. There were no other fire protection systems.

Fire Origin and Path:
The fire began in a wood shed containing the prison's backup generator. The cause of the fire is undisclosed due to pending litigation. Fueled by failed propane lines, flames impinged on the prison's wood roof. Smoke penetrated the fire-resistive cell block where prisoners were housed.

Contributing Factors and Victims Locations:
Primary and secondary electrical systems failed due to the shed fire. The electronic locking devices were rendered useless and hindered rescue attempts by guards and firefighters. Cell doors had to be opened manually to free trapped prisoners.

Alison L. Miller and Kenneth J. Tremblay, 1992, "342 Die in Catastrophic Fires in 1991" *NFPA Journal*, September/October 73.

Sprinklers Protect Retrofitted Detention Facility, Delaware
The sprinkler system at detention facility for boys quickly doused a fire after a resident intentionally ignited a combustible window curtain in a sleeping room. A lighter was used to set the fire, which burned u to the ceiling level before activation sprinklers.

The two-story, 75-100-foot brick building had wood floors and an asphalt-shingle-on-wood roof. It had been retrofitted with an approved sprinkler system after a serious fire in 1984 caused significant damage to the facility. A wet-pipe system protected the structure's cockloft. Sleeping rooms were protected with listed residential sprinklers.

By the time fire apparatus arrived, the 3:10 p.m. fire had been extinguished. Smoke detectors in hallways and individual rooms also reportedly performed satisfactorily.

Loss was estimated at only $1,500.

Neil Courtney, 1991, "Firewatch", *NFPA Journal*, May/June, 25.

Inmates Evacuated When Oil Burner Malfunctions, Maryland

Age and poor maintenance were cited as the reasons an oil burner malfunctioned and ignited at this correctional training center. The flame produced by the burner ignited leaking fuel oil and set the burner on fire.

The masonry-and-wood, single-story structure was 300 feet long and 35 feet wide. The built-up roof covering was supported by a metal deck, and the floor was made of concrete. The facility was protected by a standpipe system, as well as portable fire extinguishers. Smoke detectors were installed in the corridors, but there were none in the furnace room where the fire started.

Guards discovered the fire at 3:00 pm. After trying unsuccessfully to extinguish it with portable extinguishers for five minutes, they called the local fire department and began evacuating inmates to another area of the compound. When firefighters finally arrived, they were able to confine the blaze to the furnace room, extinguish it, and remove the heavy concentration of smoke from the area. Fire crews remained on the scene for an hour after the fire was put out, cleaning up an estimated 20 gallons of spilled fuel oil.

Both state and local fire officials expressed frustration at their inability to establish a standard operating procedure for reporting fires at this institution. Officials believe that the autonomous stance the correctional facility maintained and the lack of cooperation displayed by delaying notification of the fire department needlessly endangered personnel and inmates.

No injuries were reported, but damage was estimated at more than $15,000. The inmates were allowed to return to their living areas later that evening.

Neil Courtney, 1985, "Fire Record", *NFPA Journal*, September, 9.

State Prison Trusty Building, Oklahoma

A structure fire at the Oklahoma State Penitentiary ultimately destroyed the trusty building and its contents. The estimated total dollar loss was set at $1.5 million. Miraculously, none of the 118 inmates or correctional officers on duty was injured.

The one-story building had three wings. The south wing had an area of 212 by 31 feet and contained offices, classrooms, a lobby, and recreational areas. The north east and northwest wings each contained bedrooms and housed approximately 50 inmates. In the center of the building was a guard station and mess hall, which measured 117 by 30 feet. The building's exterior walls were brick, and its interior walls were made of plasterboard over wood studs. The ceilings were also covered with plasterboard, and the gabled roof was made of wood with an asphalt shingle covering. The floor was of concrete. Fire protection consisted of smoke detectors and portable extinguishers

located throughout the structure. A fire alarm system was being installed, but it was not yet in service at the time of the fire.

The fire was discovered at 8:50 p.m. by a correctional officer who smelled smoke and went to investigate. Looking into the attic through a crawl hole in the ceiling, he discovered heavy smoke and alerted the other officers, who evacuated the inmates from the building. Not until 9:15 p.m. did anyone notify the public fire department.

Arriving firefighters noted flames in the center of the roof. These flames soon spread horizontally to both bedroom wings through open attic space. Twenty minutes into suppression efforts, the fire was burning out of control, and firefighters implemented a defensive attack.

The cause of the fire could not be determined, although investigators did find an electrical wire that appeared to have short-circuited at a junction box and some inmates testified that they smelled gasoline before the fire. The fire's area of origin was determined to be the attic over the center portion of the building.

Two of the factors that made the loss so large were the delay in notifying the fire department and the lack of hydrants in the area.

Donald Redding and Anthony O'Brien, 1985, "Large-Loss Fires in the United States During 1984", *Fire Journal*, November, 72.

Maximum Security Prison, Washington
Rioters set four fires that severely damaged this penitentiary's kitchen and dining room facilities.

The fires were set in the kitchen, scullery, dining room, and food office. Rioters turned every heat-producing appliance on high and broke steam pipes in the basement. Ordinary paper combustibles and dishes, trays, and plastic dishwasher racks were used to fuel the fires. The first fire department personnel to arrive at the prison were positioned outside the prison walls until the areas were secured. After this five-minute delay, firefighters encountered locked doors, which resulted in further delays. The lack of readily available keys reportedly hampered ventilation and extinguishment operations, contributing to the intense heat experienced by the firefighters.

The amount of damage caused by these fires is of special interest. The building was basically constructed of masonry and reinforced concrete. An investigation determined that most of the fire damage to the recently remodeled dining facility was dining trays, dishes, and dishwasher racks burned with great intensity and produced severe heat and black smoke. These materials contributed to the intense fire in the scullery area. The fire in the kitchen area was fueled by napkins, paper towels, grease, and cooking oils. This fire intensified when the suspended ceiling either fell or was pulled down, exposing low-density cellulose ceiling tiles glued to the concrete ceiling.

Total loss was estimated at $1 million.

"Bimonthly Fire Record", 1982, *Fire Journal*, September, 27.

Fire Destroys Prison Buildings During Inmate Riot, Michigan
Firefighters responding to a fire at a state prison had to stand by for an hour until the prisoners were brought under control and they could enter the prison yard to begin fire-fighting operations.

The alarm, received at 8:15 pm, indicated that there was a fire and riot at the prison. Arriving units noticed smoke and fire coming from three prison buildings-a one-story service building, and two two-story buildings used for the prison's industrial and vocational-technical programs. The buildings, all of which were built prior to World War II, were of ordinary construction. Only the service building was protected by a wet-pipe sprinkler system.

Initially, the fire in the industrial building was fought from outside the prison walls by fire department personnel using snorkel lines. When they were allowed to enter the grounds, they fought the fires for more than 10 hours with the assistance of mutual-aid companies from surrounding towns and a nearby military installation.

Remarkably, only one firefighter was injured, when he fell through a hole in the floor of one of the buildings. Damage to the three buildings was extensive and was estimated at approximately $2 million. The service building was the only structure that escaped major fire damage, because of the sprinkler system that functioned normally.

"Bimonthly Fire Record", 1982, *Fire Journal*, January, 12.

Incendiary, One Dead, Louisiana
This two-story jail with metal walls, concrete flooring, and asphalt-on-steel roof was unsprinklered. The fire started on the second-floor, where prisoners used a cigarette lighter to ignite trash that they had piled up outside one cell. After igniting the trash, they placed a mattress on top of it.

The fire burned for about 20 minutes before it was discovered by sheriff's deputies in the building, who responded to shouts from the prisoners. One deputy called the fire department.

One of the jailers tried to unlock the door to the cellblock area, but was driven back by the smoke. Firefighters took the keys and entered the cellblock area wearing self-contained breathing apparatus to remove the prisoners. The fire caused very little damage to the facility, but resulted in very heavy smoke.

One of the prisoners died from smoke inhalation, and several others were hospitalized for the same reason. One firefighter was hospitalized from smoke inhalation when his breathing apparatus ran out of air.

"Bimonthly Fire Record", 1980, *Fire Journal*, September, 17.

Incendiary Fire in Padded Cell, California
This one-story, modern, combination detention facility and sheriff's office was constructed of concrete-block walls and concrete floors and ceilings. The 4,000-square-foot detention area was comprised of sixteen cells, (of which two were padded "safety and detoxification" cells and a third was a "holding cell"), plus activity areas. Other than the padding in the special cells, combustibles in the detention area consisted of cell mattress pads and blankets.

Exits from the detention area led to an exercise yard, a sallyport (vehicle transport area), and directly to the outside. A steel door led to the 2,000-square-foot office area, which was separated from the detention area by a concrete-block wall with wired-glass windows protected by shutters ton fusible links. Smoke detectors were provided throughout.

The fire occurred at approximately 8:45 pm. A jailer on duty heard cries and saw smoke coming from an occupied padded detoxification cell. Smoke detectors activated almost immediately. The jailer evacuated the five inmates in the facility to the sallyport while a dispatcher notified the fire department and patrolling deputies.

Fire units arrive within three minutes. Firefighters donned self-contained breathing apparatus and extinguished the small fire in the padded cell. A smoke ejector was used to ventilate the smoke from the detention area, but smoke accumulation was sufficient to warrant the transfer of prisoners to a neighboring detention facility.

One inmate with a history of heart trouble complained of chest pains and was transported to a nearby hospital. An hour later, the jailer collapsed and was transported to the hospital, along with the dispatcher and a firefighter. The jailer was admitted to the hospital; the other two men were treated and released. Five other firefighters experienced nausea, headaches, and/or dizziness after the fire, but were not treated.

It was determined that the occupant of the detoxification cell set fire to the 1 ½-inch-thick vinyl-sheathed polyurethane mattress. Half of the mattress was consumed by the fire. The hot mattress fire melted and charred a 4-foot-by-4-foot area of the foam-padded floor and walls I the corner of the cell.

Bimonthly Fire Record", 1979, *Fire Journal*, September, 12.

Prisoner Ignites Mattresses, One Dead, Georgia

The police desk officer left the city lockup for about 15 minutes to get some papers next door. While he was out, the sole occupant of one of the two four-bunk cells stacked all four mattresses on one of the bunks and applied a match to them. Three of the mattresses were made of polyurethane; the other one was made of cotton with regular ticking. The polyurethane mattresses were covered with flame-retardant covers.

By the time the officer returned to the lockup, it was heavily charged with smoke. He attempted unsuccessfully to unlock the cell and release the prisoner. Then he telephoned the fire department, which extinguished the fire with a booster line about three minutes after arrival. The police officer had already used two dry chemical extinguishers on the fire.

The prisoner who set the fire was dead. Property damage amounted to only $450.

Bimonthly Fire Record", 1978, *Fire Journal*, January, 12.

Pre-Emergency Training Effective, Maryland

At about 10:20 am, prison guards discovered a fire burning in a cell on the first floor of this two-and-a-half story prison. The fire was typical of other penal institution fires investigated by the NFPA in that inmates had apparently ignited several mattresses in their cells. The construction of

this penal institution was also typical of that normally encountered in such fires: fire-resistive, with several subdivisions (in this case, three sections). However, this incident differed from those in the other NFPA investigations, because there were no fatalities.

The security guards in this institution had undergone pre-emergency training with the County fire department, during which they were instructed in the proper use of self-contained breathing apparatus and the prison's standpipe hoselines. After they discovered the fire, the guards put their training into immediate use. One guard pulled the standpipe hoseline, while another started opening cells, and several others donned self-contained breathing apparatus. The fire department was notified immediately and responded within minutes. Firefighters and the guards wearing self-contained breathing apparatus then relieved the guards making the initial hose attack and completed the release of the inmates in the first-floor cells. As the prisoners left their cells and went outside, they were watched by other security guards; those who were security risks were handcuffed to a fence. Although each cell had two locks on its doors, the evacuation proceeded quickly because the keys to the cells had been arranged on the guard's keyring n the same order as the cells, allowing the guards to use the keys easily without looking at them. The expedient evacuation was a significant factor in preventing fatal smoke inhalation injuries.

By stuffing wet towels along the bottom of the steel doors that separated the fire area from the other sections of the institution, the guards prevented smoke from spreading into the adjacent areas and eliminated the need to evacuate those areas.

The firefighters and correctional officers shared their self-contained breathing apparatus with the prisoners. Despite this, 20 firefighters, 9 guards, and 6 inmates suffered minor smoke inhalation injuries. One inmate was seriously burned by the original mattress fire in his cell.

Bimonthly Fire Record", 1977, *Fire Journal*, July, 28.