

**HOME FIRES INVOLVING HEATING EQUIPMENT
CENTRAL HEATING UNITS**

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Abstract

In 2007, heating equipment was involved in an estimated 66,400 reported home structure fires, 580 civilian deaths, 1,850 civilian injuries, and \$608 million in direct property damage. The numbers of fires, deaths, and injuries were all higher than in 2006 but fit into a largely level trend over the past few years, coming after a sharp decline from the early 1980s to the late 1990s.

In 2003-2007, most home heating fire deaths (79%) and injuries (62%) and half (49%) of associated direct property damage involved stationary or portable space heaters.

Space heating poses a much higher risk of fire, death, injury, and loss per million users than central heating.

Keywords: Heating, space heater, water heater, furnace, wood stove, heat tape, fireplace, creosote, chimney, fire statistics, home fires, residential fires.

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

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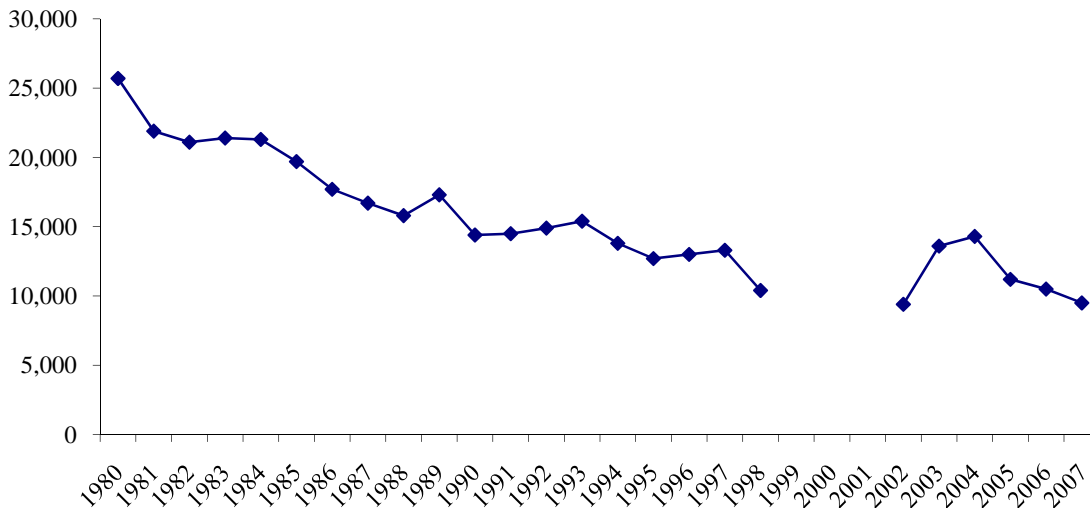
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Section 3. Central Heating Units

In 2007, an estimated 9,000 reported home structure fires involving central heating units resulted in 10 civilian deaths, 80 civilian injuries, and \$36 million in direct property damage.

The number of fires declined sharply from 1980 to 1998. (See Figure 3.1.) There is some evidence of a resumption of a downward trend since 2004. (See Table 3.1.)

Figure 3.1. Home Fires Involving Furnaces, Boilers, or Other Central Heating Units, 1980-2007, by Year



Note: Confined fires are fires reported as confined to chimney, flue, fuel burner, or boiler and involving heating equipment; they are analyzed separately but are included above. 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. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.*

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2007) and from NFPA survey.

Of the 2003-2007 central heating unit fires, including fires reported as confined fires, 40% involved liquid-fueled equipment, 31% electric-powered equipment, 28% gas-fueled equipment, and 1% solid-fueled equipment.

For gas-fueled equipment fires, natural gas outnumbered LP gas by nearly 8-to-1. For solid-fueled equipment fires, which were comparatively few, wood accounted for nearly all the non-confined fires and coal accounted for all the confined fires.

Central heating units accounted for 8,420 injuries reported to hospital emergency rooms in 2008.

For specific equipment, furnaces with unknown fuel or power accounted for 4,840 injuries, gas-fueled furnaces 1,270 injuries, oil-fueled furnaces 1,200 injuries, boilers 1,040 injuries, coal-fueled furnaces 70 injuries, and electric-powered furnaces no injuries.¹⁶ Another 7,510 injuries were associated with ductwork for heating or cooling. (See Table 3.A.)

¹⁶ All statistics from CPSC’s National Electronic Injury Surveillance System, at www.cpsc.gov.

**Table 3.A. Home Central Heating Equipment Fires, by Type of Fuel or Power
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Including Fires Reporting as Confined Fires)**

Fuel or Power	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Liquid-fueled	4,750 (40%)	0 (0%)	16 (11%)	\$11 (15%)
Electric-powered	3,670 (31%)	3 (7%)	39 (26%)	\$17 (22%)
Gas-fueled	3,260 (28%)	21 (48%)	89 (60%)	\$42 (56%)
Solid-fueled	150 (1%)	19 (43%)	4 (3%)	\$5 (7%)
Total	11,830 (100%)	45 (100%)	148 (100%)	\$76 (100%)

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 hundred, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating of air conditioning equipment type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and type of fuel or power unknown have also been allocated proportionally. Equipment powered by something other than gas, liquid, or solid fuel or electricity are not shown but are included in the totals.

Source: Data from NFIRS Version 5.0 and NFPA survey.

In 1998, 2000, 2001, and 2003, there were 1.8 electrocution deaths per year involving electric furnaces.¹⁷

These are the only years with separate statistics for water heaters and furnaces. In 1995-1997, statistics were provided for furnaces and water heaters together, and the combined average in those years was higher (5.0) than the combined average (4.3) in the four years cited.

Space heaters result in far more fires and losses than central heating devices and have higher risks relative to usage.

Fire risk is analyzed using a range of usage estimates. (See Tables 3.B.)

Comparisons of different fuel or power options within central heating equipment do not show any specific types to be clearly and consistently better or worse for all types of loss.

- Among central heating equipment, gas-fueled units show a higher rate of civilian fire deaths per user household but lower fire incident rates, civilian fire injuries, and property damage rates. (See Table 3.C.)
- Liquid-fueled equipment has the highest rates for fire incidents and direct property damage.

¹⁷ Risana T. Chowdbury, “2003 Electrocutions Associated with Consumer Products,” December 2006, Table 2, www.cpsc.gov, and previous reports in the series.

**Table 3.B. Comparative Risk of Central and Space Heating Equipment
Based on Range of 2005 Usage Estimate and Average 2003-2007 Reported Fires**

Risk Measure	Space Heating	Central Heating	How Much Higher Is Space Heating Risk Than Central Heating Risk?
Fires (per million user households)	394 - 589	131 - 145	3 - 4 times
Civilian deaths (per million user households)	9.0 - 13.5	0.5	18 - 25 times
Civilian injuries (per million user households)	19.0 - 28.4	1.7 - 1.8	11 - 16 times
Direct property damage (per user household)	\$7.8 - \$11.6	\$0.9	9 - 13 times

**Table 3C. Comparative Risk of Central Heating Equipment
for Different Types of Fuel or Power
Based on Range of 2005 Usage Estimates and Average 2003-2007 Reported Fires**

Risk Measure	Oil or Other Liquid-Fueled	Electric-Powered	Gas Fueled
Fires (per million user household)	579 - 633	191 - 230	52 - 56
Civilian deaths (per million user households)	0.0	0.2	0.3 - 0.4
Civilian injuries (per million user households)	1.9 - 2.1	2.1 - 2.4	1.4 - 1.5
Direct property damage (per user household)	\$1.4 - \$1.5	\$0.9 - \$1.1	\$0.7

Note: There is no “best” estimate within the ranges, because the ends primarily represent the inclusion or exclusion of statistics on usage of “other” heating devices that cannot be classified with confidence as central heating units vs. space heaters based on available data. Fires are analyzed by type of equipment and then for each device by type of equipment power; this is done separately for non-confined fires, fires confined to boiler or fuel burner, and fires confined to chimney or flue.

Automatic control failure was cited in one-seventh (14%) of all home central heating fires.

Backfire (9% was also a leading factor contributing to ignition. (See Table 3.D.)

Unclassified mechanical failure or malfunction was reported in 34% of all home central heating fires, 29% of the *non-confined* fires, and 11% of associated civilian deaths. Heat source too close to combustibles was reported in 16% of non-confined fires and 8% of associated civilian deaths. Automatic control failure was cited in 4% of non-confined home heating equipment fires compared to 9% of home fires confined to fuel burner of boiler, where it was the third leading factor contributing to ignition, behind unclassified mechanical failure or malfunction (35%) and backfire (10%). (See Table 3.2, which includes breakdowns for all central heating units and for gas-fueled, electric-powered, and liquid-fueled units.)

**Table 3.D. Leading Factors Contributing to Ignition for Home Central Heating Fires
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure	4,010	(34%)	5	(11%)	20	(14%)	\$28	(36%)
Automatic control failure	1,630	(14%)	0	(0%)	4	(3%)	\$3	(4%)
Backfire	1,060	(9%)	0	(0%)	12	(8%)	\$1	(2%)
Failure to clean	900	(8%)	0	(0%)	2	(1%)	\$7	(9%)
Heat source too close to combustibles	660	(6%)	3	(8%)	27	(18%)	\$12	(16%)
Total	11,830		45		148		\$76	

Note: Multiple entries are allowed, resulting in more factor entries than fires. 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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and factor contributing to ignition listed as unknown, unreported, none, or blank have also been allocated proportionally. Statistics are calculated separately for fires reported as non-confined fires and for fires reported as confined to fuel burner or boiler and with central heating equipment or no equipment involved in ignition.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Nearly half (45%) of home central heating fires began with ignition of flammable or combustible gas or liquid.

This may often be the gas or liquid that fuels the equipment, because most of these fires are reported as confined to the equipment. (See Table 3.E.)

One-third (34%) of home central heating *non-confined* fires began with ignition of either wire or cable insulation (18%) or structural member or framing (16%). Flammable or combustible liquid or gas accounted for a large share of non-confined central heating fires also (13% for all central heating units, 7% for electric-powered units, 14% for gas-fueled units, and 40% for liquid-fueled units). Half (48%) of all associated deaths resulted from fires that began with ignition of structural member or framing. (See Table 3.3, which includes breakdowns for all central heating units and for gas-fueled, electric-powered, and liquid-fueled units.)

More than half (58%) of home central heating fires began in a designated heating equipment room or area.

Many of the other fires began in a concealed or structure space, including crawl spaces and ducts. (See Tables 3.F and 3.4, which covers only non-confined fires and includes breakdowns for all central heating units and for gas-fueled, electric-powered, and liquid-fueled units.)

**Table 3.E. Leading Items First Ignited for Home Central Heating Fires
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable or combustible gas or liquid	5,320	(45%)	11	(24%)	61	(41%)	\$9	(11%)
Unclassified item first ignited	1,760	(15%)	7	(15%)	8	(5%)	\$6	(8%)
Wire or cable insulation	1,240	(10%)	3	(6%)	8	(6%)	\$3	(4%)
Unclassified or unknown-type liquid, piping or filter	460	(4%)	0	(0%)	3	(2%)	\$4	(6%)
Structural member or framing	450	(4%)	22	(48%)	4	(3%)	\$22	(28%)
Total	11,830		45		148		\$76	

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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and item first ignited listed as unknown have also been allocated proportionally. Statistics are calculated separately for fires reported as non-confined fires and for fires reported as confined to fuel burner or boiler and with central heating equipment or no equipment involved in ignition.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 3.F. Leading Areas of Origin for Home Central Heating Fires
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room	6,810	(58%)	15	(34%)	93	(63%)	\$33	(44%)
Duct for heating or air conditioning	1,010	(9%)	3	(7%)	13	(9%)	\$5	(7%)
Crawl or substructure space	780	(7%)	0	(0%)	8	(5%)	\$7	(10%)
Unclassified service or equipment area	610	(5%)	0	(0%)	2	(1%)	\$4	(5%)
Unclassified area of origin	390	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Total	11,830		45		148		\$76	

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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved to ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and area of origin unknown have also been allocated proportionally. Statistics are calculated separately for fires reported as non-confined fires and for fires reported as confined to fuel burner or boiler and with central heating equipment or no equipment involved in ignition.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Safe Heating Behaviors

Messages from NFPA Educational Messaging Advisory Committee

General heating-related messages

- Have a three-foot kid-free zone around open fires and heaters.
- Supervise children when open fires and space heaters are being used and install a non-combustible screen around the appliance to prevent burns which are even more common than fire injuries.
- All heaters need space. Keep things that can burn, such as paper, bedding or furniture, at least 3 feet away from heating equipment.
- Use heating equipment that has the label of a recognized testing laboratory.
- Never use your oven for heating.
- Install central heating equipment according to the local codes and manufacturer's instructions. Have a qualified professional install the equipment.
- Make sure all fuel-burning equipment is vented to the outside to avoid carbon monoxide poisoning. CO is created when fuels burn incompletely. CO poisoning can cause illness and even death. Make sure the venting for exhaust is kept clear and unobstructed. This includes removal of snow around the outlet to the outside.
- Install and maintain carbon monoxide alarms to avoid risk of carbon monoxide poisoning.
- Maintain heating equipment by having them cleaned and inspected annually by a qualified professional.
- For home energy assistance, contact the National Energy Assistance Referral line at 1-866-674-6327.

Central heating

- Furnaces need to be cleaned and inspected at least once a year by a qualified professional.
- Do not store things that can burn near the furnace and keep the furnace area clean and uncluttered.

Additional safe behaviors for central heating

- The annual inspection can best be timed for just before the beginning of a new heating season.
- Inspection is also warranted if you move into a new home or begin use of your equipment after a period of non-use.

**Table 3.1. Home Fires Involving Furnaces, Boilers, or Other Central Heating Units, by Year
Structure Fires Reported to U.S. Fire Departments**

Year	Fires	Civilian		Civilian		Direct Property Damage (in Millions)			
		Deaths	Injuries	As Reported	In 2007 Dollars				
1980	25,700	110	470	\$125	\$315				
1981	21,900	130	620	\$80	\$181				
1982	21,100	120	530	\$113	\$243				
1983	21,400	80	450	\$126	\$262				
1984	21,300	100	340	\$105	\$210				
1985	19,700	150	450	\$113	\$217				
1986	17,700	70	280	\$87	\$165				
1987	16,700	60	320	\$92	\$168				
1988	15,800	100	390	\$110	\$193				
1989	17,300	50	350	\$122	\$205				
1990	14,400	90	310	\$116	\$184				
1991	14,500	30	360	\$154*	\$234*				
1992	14,900	50	340	\$105	\$155				
1993	15,400	60	360	\$111	\$160				
1994	13,800	80	350	\$109	\$153				
1995	12,700	110	320	\$99	\$135				
1996	13,000	50	300	\$118	\$157				
1997	13,300	30	280	\$122	\$158				
1998	10,400	50	260	\$98	\$125				
1999	8,700 (6,200)	0 (0)	90 (90)	\$78 (\$76)	\$97 (\$95)				
2000	6,200 (3,900)	40 (40)	30 (0)	\$76 (\$75)	\$91 (\$90)				
2001	7,900 (3,600)	20 (20)	130 (90)	\$78 (\$77)	\$92 (\$90)				
2002	9,400 (3,800)	20 (20)	120 (120)	\$128 (\$123)	\$147 (\$142)				
2003	13,600 (3,400)	20 (20)	210 (130)	\$119 (\$115)	\$134 (\$129)				
2004	14,300 (2,900)	30 (30)	210 (120)	\$129 (\$127)	\$142 (\$139)				
2005	11,200 (2,600)	110 (110)	140 (130)	\$75 (\$71)	\$80 (\$76)				
2006	10,500 (2,300)	50 (50)	110 (100)	\$53 (\$52)	\$55 (\$54)				
2007	9,500 (2,400)	10 (10)	80 (80)	\$36 (\$35)	\$36 (\$35)				

* All 1991 home fire property damage figures are inflated by estimation problems related to the handling of the Oakland fire storm.

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to chimney, flue, fuel burner, or boiler and involving heating equipment; they are analyzed separately. 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 hundred, civilian deaths and civilian injuries are expressed to the nearest ten and direct property damage is rounded to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Inflation adjustment to 2007 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2007) and from NFPA survey.

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)**

A. All Central Heating

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	790	(29%)	5	(11%)	6	(6%)	\$27	(37%)
Heat source too close to combustibles	440	(16%)	3	(8%)	27	(25%)	\$12	(16%)
Unclassified electrical failure or malfunction	220	(8%)	9	(20%)	11	(10%)	\$4	(5%)
Unspecified short circuit arc	180	(7%)	3	(8%)	2	(2%)	\$1	(1%)
Leak or break	150	(5%)	4	(8%)	8	(7%)	\$4	(5%)
Worn out	130	(5%)	0	(0%)	2	(2%)	\$2	(3%)
Failure to clean	130	(5%)	0	(0%)	2	(2%)	\$7	(9%)
Installation deficiency	120	(4%)	0	(0%)	2	(2%)	\$2	(2%)
Automatic control failure	110	(4%)	0	(0%)	4	(4%)	\$3	(4%)
Unclassified operational deficiency	70	(3%)	0	(0%)	2	(2%)	\$2	(3%)
Unclassified factor	70	(2%)	10	(24%)	11	(10%)	\$4	(6%)
Arc or spark from operating equipment	60	(2%)	0	(0%)	4	(4%)	\$2	(2%)
Equipment not being operated properly	60	(2%)	0	(0%)	7	(6%)	\$3	(4%)
Short circuit arc from defective or worn insulation	40	(2%)	0	(0%)	2	(2%)	\$0	(0%)
Backfire	40	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Unclassified misuse of material or product	30	(1%)	4	(10%)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper startup	20	(1%)	5	(11%)	9	(8%)	\$1	(2%)
Storm	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Arc from faulty contact or broken conductor	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper container or storage	20	(1%)	0	(0%)	7	(6%)	\$1	(1%)
Flammable liquid or gas spilled	20	(1%)	0	(0%)	5	(5%)	\$1	(1%)
Unclassified design, manufacturing or installation deficiency	20	(1%)	0	(0%)	0	(0%)	\$1	(2%)
Construction deficiency	20	(1%)	5	(11%)	0	(0%)	\$1	(1%)
Equipment overloaded	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Abandoned or discarded material or product	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unintentionally turned on or not turned off	20	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Washing part or painting with flammable liquid	20	(1%)	0	(0%)	4	(4%)	\$0	(0%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

A. All Central Heating (Continued)

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known factor	90	(3%)	0	(0%)	2	(2%)	\$2	(3%)
Total fires excluding confined fires	2,730	(100%)	44	(100%)	111	(100%)	\$73	(100%)
Total factor entries	2,980	(109%)	48	(111%)	117	(105%)	\$82	(112%)

B. Gas-Fueled Central Heating

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Unclassified mechanical failure or malfunction	390	(29%)	0	(0%)	6	(9%)	\$15	(36%)
Heat source too close to combustibles	310	(23%)	3	(14%)	20	(26%)	\$11	(26%)
Leak or break	100	(7%)	3	(14%)	6	(8%)	\$2	(6%)
Installation deficiency	70	(5%)	0	(0%)	0	(0%)	\$1	(3%)
Automatic control failure	60	(4%)	0	(0%)	2	(3%)	\$1	(2%)
Worn out	50	(4%)	0	(0%)	2	(3%)	\$1	(2%)
Unclassified electrical failure or malfunction	50	(4%)	8	(35%)	11	(15%)	\$2	(5%)
Unclassified operational deficiency	50	(4%)	0	(0%)	2	(3%)	\$1	(4%)
Unclassified factor contributed to ignition	50	(3%)	0	(0%)	7	(10%)	\$2	(5%)
Failure to clean	40	(3%)	0	(0%)	0	(0%)	\$1	(3%)
Unspecified short circuit arc	40	(3%)	0	(0%)	0	(0%)	\$0	(1%)
Equipment not being operated properly	40	(3%)	0	(0%)	0	(0%)	\$3	(6%)
Flammable liquid or gas spilled	20	(2%)	0	(0%)	5	(7%)	\$1	(2%)
Unclassified misuse of material or product	20	(2%)	4	(18%)	0	(0%)	\$0	(0%)
Improper container or storage	20	(2%)	0	(0%)	5	(6%)	\$1	(2%)
Arc or spark from operating equipment	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Washing part or painting with flammable liquid	20	(1%)	0	(0%)	4	(5%)	\$0	(0%)
Storm	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Abandoned or discarded material or product	10	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Unintentionally turned on or not turned off	10	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Improper startup	10	(1%)	4	(19%)	5	(6%)	\$0	(1%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

B. Gas-Fueled Central Heating (Continued)

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known factor	60	(5%)	0	(0%)	2	(3%)	\$2	(4%)
Total fires excluding confined fires	1,350	(100%)	21	(100%)	75	(100%)	\$41	(100%)
Total factor entries	1,450	(108%)	21	(100%)	77	(103%)	\$45	(109%)

C. Electric-Powered Central Heating

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Unclassified mechanical failure or malfunction	270	(26%)	0	(0%)	0	(0%)	\$5	(33%)
Unclassified electrical failure or malfunction	160	(16%)	0	(0%)	0	(0%)	\$2	(12%)
Unspecified short circuit arc	130	(13%)	3	(100%)	2	(9%)	\$1	(5%)
Worn out	70	(7%)	0	(0%)	0	(0%)	\$1	(8%)
Heat source too close to combustibles	60	(6%)	0	(0%)	2	(10%)	\$2	(11%)
Failure to clean	60	(5%)	0	(0%)	0	(0%)	\$0	(0%)
Automatic control failure	40	(4%)	0	(0%)	2	(10%)	\$1	(8%)
Arc or spark from operating equipment	40	(4%)	0	(0%)	4	(20%)	\$2	(10%)
Short circuit arc from defective or worn insulation	40	(4%)	0	(0%)	2	(10%)	\$0	(1%)
Installation deficiency	30	(3%)	0	(0%)	0	(0%)	\$0	(1%)
Short circuit arc from mechanical damage	20	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Arc from faulty contact or broken conductor	20	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Unclassified operational deficiency	20	(2%)	0	(0%)	0	(0%)	\$1	(5%)
Leak or break	20	(2%)	0	(0%)	2	(10%)	\$0	(0%)
Unclassified factor	20	(2%)	0	(0%)	2	(9%)	\$1	(6%)
Equipment overloaded	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Water caused short circuit arc	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified design, manufacturing or installation deficiency	10	(1%)	0	(0%)	0	(0%)	\$1	(4%)
Construction deficiency	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper startup	10	(1%)	0	(0%)	4	(20%)	\$1	(8%)
Storm	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

C. Electric-Powered Central Heating (Continued)

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified misuse of material or product	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Equipment not being operated properly	10	(1%)	0	(0%)	5	(21%)	\$0	(0%)
Manual control failure	10	(1%)	0	(0%)	0	(0%)	\$1	(8%)
Backfire	10	(1%)	0	(0%)	0	(0%)	\$1	(5%)
Other known factor	20	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Total fires excluding confined fires	1,010	(100%)	3	(100%)	22	(100%)	\$16	(100%)
Total factor entries	1,110	(110%)	3	(100%)	26	(120%)	\$21	(131%)

D. Liquid-Fueled Central Heating

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	130	(40%)	0	(NA)	0	(0%)	\$3	(29%)
Heat source too close to combustibles	50	(15%)	0	(NA)	4	(40%)	\$0	(4%)
Backfire	30	(9%)	0	(NA)	0	(0%)	\$0	(1%)
Leak or break	30	(8%)	0	(NA)	0	(0%)	\$1	(10%)
Installation deficiency	20	(7%)	0	(NA)	3	(30%)	\$0	(2%)
Failure to clean	10	(4%)	0	(NA)	3	(30%)	\$4	(43%)
Automatic control failure	10	(4%)	0	(NA)	0	(0%)	\$1	(7%)
Worn out	10	(4%)	0	(NA)	0	(0%)	\$0	(0%)
Equipment not being operated properly	10	(3%)	0	(NA)	0	(0%)	\$0	(1%)
Unspecified short circuit arc	10	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Unclassified operational deficiency	10	(2%)	0	(NA)	0	(0%)	\$0	(0%)
Unclassified electrical failure or malfunction	10	(2%)	0	(NA)	0	(0%)	\$0	(2%)
Other known factor	30	(10%)	0	(NA)	0	(0%)	\$0	(0%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

D. Liquid-Fueled Central Heating (Continued)

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Total fires excluding confined fires	320	(100%)	0	(NA)	10	(100%)	\$10	(100%)
Total factor entries	360	(111%)	0	(NA)	10	(100%)	\$10	(103%)

NA – Not applicable because total is zero.

Note: Multiple entries are allowed, resulting in more factor entries than fires. 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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and factor contributing to ignition listed as unknown, unreported, none, or blank have also been allocated proportionally. Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)**

A. All Central Heating

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Fires	(%)	Deaths	(%)	Injuries	(%)	Damage	(%)
Wire or cable insulation	500	(18%)	3	(6%)	5	(5%)	\$3	(4%)
Structural member or framing	440	(16%)	22	(50%)	4	(4%)	\$22	(29%)
Flammable or combustible gas or liquid	360	(13%)	10	(23%)	35	(31%)	\$8	(11%)
Unclassified item	220	(8%)	7	(16%)	8	(7%)	\$5	(7%)
Dust, fiber, or lint	120	(4%)	0	(0%)	0	(0%)	\$1	(1%)
Insulation within structural area	110	(4%)	0	(0%)	3	(3%)	\$1	(1%)
Clothing	110	(4%)	3	(6%)	13	(12%)	\$4	(5%)
Interior wall covering	100	(4%)	0	(0%)	2	(2%)	\$3	(4%)
Unclassified structural component or finish	90	(3%)	0	(0%)	2	(2%)	\$4	(5%)
Floor covering	90	(3%)	0	(0%)	2	(2%)	\$2	(3%)
Pipe, duct, conduit, hose, or hose covering	70	(3%)	0	(0%)	6	(5%)	\$1	(1%)
Interior ceiling covering	50	(2%)	0	(0%)	4	(4%)	\$6	(8%)
Appliance housing or casing	50	(2%)	0	(0%)	2	(2%)	\$1	(1%)
Box or bag	50	(2%)	0	(0%)	6	(5%)	\$1	(2%)
Multiple items first ignited	50	(2%)	0	(0%)	4	(4%)	\$4	(5%)
Filter including evaporative cooler pad	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified soft goods or clothing	30	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Unclassified liquid, piping, or filter	30	(1%)	0	(0%)	3	(3%)	\$4	(5%)
Papers	20	(1%)	0	(0%)	3	(3%)	\$0	(1%)
Exterior wall covering	20	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Trash or waste	20	(1%)	0	(0%)	2	(2%)	\$0	(0%)
Mattress or bedding	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Linen other than bedding	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified furniture or utensil	10	(1%)	0	(0%)	2	(2%)	\$0	(0%)
Fabric not made up	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified storage supplies	10	(1%)	0	(0%)	2	(2%)	\$0	(1%)
Other known items	90	(3%)	0	(0%)	0	(0%)	\$1	(1%)
Total fires excluding confined fires	2,730	(100%)	44	(100%)	111	(100%)	\$73	(100%)

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

B. Gas-Fueled Central Heating

Item First Ignited	Fires		Civilian		Civilian		Direct Property	
			Deaths	Injuries	Injuries	Damage (in Millions)		
Structural member or framing	260	(19%)	0	(0%)	2	(3%)	\$11	(27%)
Flammable or combustible gas or liquid	180	(14%)	11	(51%)	23	(30%)	\$4	(11%)
Wire or cable insulation	130	(9%)	0	(0%)	2	(2%)	\$0	(1%)
Clothing	100	(7%)	3	(14%)	12	(16%)	\$4	(10%)
Unclassified item	90	(7%)	8	(35%)	4	(5%)	\$3	(8%)
Floor covering	60	(4%)	0	(0%)	0	(0%)	\$2	(5%)
Interior wall covering	60	(4%)	0	(0%)	0	(0%)	\$3	(7%)
Insulation within structural area	50	(4%)	0	(0%)	4	(5%)	\$0	(1%)
Unclassified structural component or finish	50	(3%)	0	(0%)	2	(3%)	\$1	(3%)
Dust, fiber or lint	40	(3%)	0	(0%)	0	(0%)	\$1	(1%)
Box or bag	40	(3%)	0	(0%)	6	(8%)	\$1	(3%)
Multiple items first ignited	30	(2%)	0	(0%)	2	(2%)	\$4	(10%)
Unclassified soft goods or clothing	20	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Appliance housing or casing	20	(2%)	0	(0%)	2	(3%)	\$1	(2%)
Pipe, duct, conduit or hose	20	(2%)	0	(0%)	4	(6%)	\$0	(1%)
Papers	20	(1%)	0	(0%)	2	(2%)	\$0	(1%)
Linen other than bedding	20	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Interior ceiling covering	20	(1%)	0	(0%)	2	(3%)	\$0	(1%)
Exterior wall covering	20	(1%)	0	(0%)	2	(2%)	\$0	(1%)
Trash or waste	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose covering	10	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Filter including evaporative cooler pad	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Fabrics not made up	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified storage supplies	10	(1%)	0	(0%)	2	(3%)	\$0	(1%)
Mattress or bedding	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified liquid, piping, or filter	10	(1%)	0	(0%)	2	(2%)	\$1	(2%)
Unclassified furniture or utensil	10	(1%)	0	(0%)	2	(3%)	\$0	(0%)
Other known item	50	(3%)	0	(0%)	0	(0%)	\$1	(2%)
Total fires excluding confined fires	1,350	(100%)	21	(100%)	75	(100%)	\$41	(100%)

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

C. Electric-Powered Central Heating

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	360	(36%)	3	(100%)	3	(14%)	\$2	(10%)
Structural member or framing	120	(12%)	0	(0%)	1	(7%)	\$4	(28%)
Unclassified item	100	(9%)	0	(0%)	2	(8%)	\$2	(10%)
Dust, fiber, or lint	70	(7%)	0	(0%)	0	(0%)	\$0	(3%)
Flammable or combustible gas or liquid	70	(7%)	0	(0%)	10	(47%)	\$1	(5%)
Insulation within structural area	50	(5%)	0	(0%)	0	(0%)	\$0	(3%)
Interior wall covering	30	(3%)	0	(0%)	0	(0%)	\$0	(1%)
Appliance housing or casing	20	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Pipe, duct, conduit or hose	20	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Filter including evaporative cooler pads	20	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Floor covering	20	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Interior ceiling covering	20	(2%)	0	(0%)	0	(0%)	\$4	(24%)
Pipe, duct, conduit, or hose covering	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified structural component or finish	10	(1%)	0	(0%)	0	(0%)	\$0	(2%)
Multiple items first ignited	10	(1%)	0	(0%)	2	(10%)	\$0	(1%)
Papers	10	(1%)	0	(0%)	2	(8%)	\$0	(1%)
Unclassified furniture or utensil	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Drive belt	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known item	50	(5%)	0	(0%)	2	(8%)	\$1	(7%)
Total fires excluding confined fires	1,010	(100%)	3	(100%)	22	(100%)	\$16	(100%)

D. Liquid-Fueled Central Heating

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable or combustible gas or liquid	130	(40%)	0	(NA)	3	(27%)	\$4	(36%)
Structural member or framing	40	(13%)	0	(NA)	0	(0%)	\$1	(10%)
Unclassified structural component or finish	30	(10%)	0	(NA)	0	(0%)	\$1	(10%)
Unclassified item	30	(9%)	0	(NA)	0	(0%)	\$0	(3%)
Unclassified liquid, piping, or filter	10	(4%)	0	(NA)	0	(0%)	\$3	(31%)
Floor covering	10	(4%)	0	(NA)	3	(29%)	\$0	(0%)

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

D. Liquid-Fueled Central Heating (Continued)

Insulation within structural area	10	(4%)	0	(NA)	0	(0%)	\$0	(0%)
Interior ceiling covering	10	(3%)	0	(NA)	0	(0%)	\$0	(4%)
Wire or cable insulation	10	(2%)	0	(NA)	0	(0%)	\$0	(2%)
Interior wall covering	10	(2%)	0	(NA)	0	(0%)	\$0	(3%)
Clothing	10	(2%)	0	(NA)	0	(0%)	\$0	(0%)
Other known item	20	(7%)	0	(NA)	4	(44%)	\$0	(0%)
Total fires excluding confined fires	320	(100%)	0	(NA)	10	(100%)	\$10	(100%)

NA – 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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and item first ignited unknown have also been allocated proportionally. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Table 3.4. Home Central Heating Unit Fires, by Area of Origin
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

A. All Central Heating

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room or area	1,320	(48%)	15	(35%)	64	(58%)	\$32	(44%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	340	(12%)	3	(7%)	11	(9%)	\$5	(7%)
Crawl space or substructure space	220	(8%)	0	(0%)	5	(5%)	\$7	(9%)
Attic or other space above top story	140	(5%)	0	(0%)	0	(0%)	\$5	(6%)
Laundry room or area	100	(4%)	3	(7%)	7	(7%)	\$3	(4%)
Unclassified function area	70	(3%)	0	(0%)	7	(6%)	\$3	(4%)
Unclassified equipment or service area	70	(2%)	0	(0%)	2	(2%)	\$4	(5%)
Ceiling/floor assembly or space between stories	60	(2%)	0	(0%)	0	(0%)	\$2	(3%)
Closet	50	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Garage*	40	(2%)	0	(0%)	1	(1%)	\$3	(4%)
Living room, family room, or den	40	(2%)	5	(11%)	1	(1%)	\$2	(3%)
Wall assembly or concealed space	30	(1%)	4	(10%)	0	(0%)	\$0	(1%)
Unclassified storage area	30	(1%)	0	(0%)	2	(2%)	\$0	(1%)
Unclassified structural area	30	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Other known area of origin	190	(7%)	13	(30%)**	10	(9%)	\$6	(8%)
Total fires excluding confined fires	2,730	(100%)	44	(100%)	111	(100%)	\$73	(100%)

* Excludes dwelling garages coded as separate property.

** Leading areas for fire deaths not shown above are hallway or corridor (21% of deaths) and bedroom (9%).

B. Gas-Fueled Central Heating

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room or area	650	(48%)	12	(54%)	36	(48%)	\$15	(36%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	150	(11%)	3	(14%)	11	(15%)	\$3	(8%)
Crawl space or substructure space	120	(9%)	0	(0%)	6	(7%)	\$6	(13%)

**Table 3.4. Home Central Heating Unit Fires, by Area of Origin
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

B. Gas-Fueled Central Heating (Continued)

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Laundry room or area	70	(5%)	3	(14%)	6	(8%)	\$2	(4%)
Attic or other space above top story	70	(5%)	0	(0%)	0	(0%)	\$2	(6%)
Unclassified function area	40	(3%)	0	(0%)	5	(7%)	\$2	(6%)
Garage*	30	(2%)	0	(0%)	0	(0%)	\$3	(6%)
Living room, family room, or den	30	(2%)	0	(0%)	0	(0%)	\$2	(4%)
Unclassified equipment or service area	20	(2%)	0	(0%)	2	(3%)	\$1	(4%)
Ceiling/floor assembly or space between stories	20	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified storage area	20	(1%)	0	(0%)	2	(3%)	\$0	(1%)
Closet	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known area of origin	110	(8%)	4	(18%)**	7	(9%)	\$4	(11%)
Total fires excluding confined fires	1,350	(100%)	21	(100%)	75	(100%)	\$41	(100%)

*Leading area for fire deaths not shown above is bedroom (21% of deaths).

** Leading area in fire deaths not shown above is bedroom (18% of deaths).

C. Electric-Powered Central Heating

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room or area	480	(47%)	3	(100%)	20	(93%)	\$8	(49%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	170	(17%)	0	(0%)	0	(0%)	\$2	(10%)
Attic or other space above top story	70	(7%)	0	(0%)	0	(0%)	\$2	(13%)
Crawl space or substructure space	60	(6%)	0	(0%)	0	(0%)	\$1	(6%)
Closet	30	(3%)	0	(0%)	0	(0%)	\$1	(4%)
Unclassified equipment or service area	30	(3%)	0	(0%)	0	(0%)	\$0	(1%)
Ceiling/floor assembly or space between stories	30	(2%)	0	(0%)	0	(0%)	\$0	(3%)
Unclassified function area	20	(2%)	0	(0%)	0	(0%)	\$1	(4%)
Laundry room or area	20	(2%)	0	(0%)	0	(0%)	\$1	(6%)

**Table 3.4. Home Central Heating Unit Fires, by Area of Origin
Annual Average of 2003-2007 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires) (Continued)**

C. Electric-Powered Central Heating (Continued)

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known area of origin	110	(11%)	0	(0%)	1	(7%)	\$1	(6%)
Total fires excluding confined fires	1,010	(100%)	3	(100%)	22	(100%)	\$16	(100%)

D. Liquid-Fueled Central Heating

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Heating equipment room or area	180	(54%)	0	(NA)	7	(71%)	\$5	(55%)
Crawl space or substructure space	40	(12%)	0	(NA)	0	(0%)	\$0	(2%)
Duct for HVAC, exhaust, heating, or air conditioning	20	(7%)	0	(NA)	0	(0%)	\$0	(2%)
Other known area of origin	90	(27%)	0	(NA)	3	(29%)	\$4	(41%)
Total fires excluding confined fires	320	(100%)	0	(NA)	10	(100%)	\$10	(100%)

NA – 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 to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as heating or air conditioning equipment of undetermined type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home heating fires with this equipment and area of origin unknown have also been allocated proportionally. Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 5.0 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.

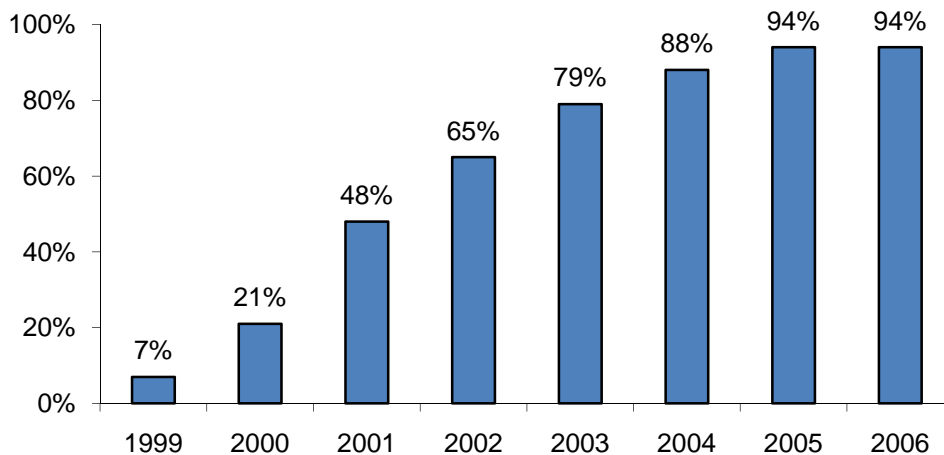
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific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

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

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 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.

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

All fires

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

Code Grouping	EII Co 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.