

# **HOME FIRES INVOLVING HEATING EQUIPMENT**

**John R. Hall, Jr.**

**November 2011**



**National Fire Protection Association  
Fire Analysis and Research Division**

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## **Abstract**

In 2009, heating equipment was involved in an estimated 58,900 reported home structure fires, 480 civilian deaths, 1,520 civilian injuries, and \$1.1 billion in direct property damage. Fires, injuries, and damages were all lower than in 2008 (and deaths were virtually unchanged) and 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 2005-2009, most home heating fire deaths (79%) and injuries (66%) and half (52%) 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.

## **Acknowledgements**

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

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

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## Executive Summary

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In 2009, heating equipment was involved in an estimated 58,900 reported U.S. home structure fires, with associated losses of 480 civilian deaths, 1,520 civilian injuries, and \$1.1 billion in direct property damage. The estimated home heating fire total was down 11% from the previous year and 75% from 1980. Associated deaths were up 1% from 2008 but down 53% from 1980. Associated civilian injuries were down by 8% compared to 2008 and by 57% from 1980. Direct property damage adjusted for inflation was down by 3% from 2008 and by 47% from 1980. “Homes” refers to one- and two-family homes (which include manufactured homes) and apartments (which include townhouses).

Overall in 2009, these incidents accounted for 18% of all reported home fires (second highest after cooking), 22% of home fire deaths (second highest after smoking), 13% of home civilian injuries (second highest after cooking), and 12% of the direct property damage (highest share) resulting from home fires. These statistics are estimates derived from Version 5.0 of the U.S. Fire Administration’s National Fire Incident Reporting System and NFPA’s annual fire department experience survey.

Stationary (fixed) and portable space heaters, excluding fireplaces, chimneys, and chimney connectors, but including wood stoves, accounted for one-third (32%) of reported 2005-2009 U.S. home heating fires, four out of five (79%) associated civilian deaths, nearly two-thirds (66%) of associated civilian injuries, and half (52%) of associated direct property damage.

Creosote is a sticky, oily, combustible substance created when wood does not burn completely. It rises into the chimney as a liquid and deposits on the chimney wall. A conservative best estimate of creosote fires would combine failure-to-clean fires that were confined to chimney or flue or involved solid-fueled space heaters, fireplaces, chimneys and chimney connectors. This produces estimates of 14,190 reported creosote fires (22% of all home heating fires) per year with associated losses of four civilian deaths, 11 civilian injuries, and \$35 million in direct property damage per year.

The leading factors contributing to ignition in home heating equipment fires were failure to clean (26%), heat source too close to combustibles (14%), and unclassified mechanical failure or malfunction (12%). Heat source too close to combustibles accounted for (53%) of associated deaths.

The leading items first ignited for home heating equipment fires were unclassified item (16%), flammable or combustible gas or liquid (15%), structural member or framing (8%), unclassified organic material (6%), and wire or cable insulation (6%).

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

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

- Among central heating equipment, liquid-fueled units show a higher rate of civilian fire deaths per user household. However, low usage of this equipment means that this rate is highly variable year-to-year. In 2003-2007, liquid-fueled equipment had the lowest rate.
- Liquid-fueled units also have the highest risk of fires and civilian injuries.
- Electric-powered units have the highest risk of direct property damage.

Among space heating equipment, risks are highest for liquid-fueled devices for all four measures of loss. However, usage of liquid-fueled space heaters is so low that the rates for such devices can and do vary substantially, even for five-year averages. Portable electric devices have higher risk than fixed electric devices.

Water heaters show very large differences with gas-fueled equipment showing higher rates per million population than electric-powered equipment for fires (68 vs. 60), civilian fire deaths (0.6 vs. 0.0), and civilian fire injuries (3.8 vs. 1.1), and a higher rate per person for direct property damage (\$1.7 vs. \$0.5).

Home heating fires peak in period from late afternoon to late evening. Home heating fires are less common during midnight to 6:00 a.m. This could reflect the practice in many homes of turning down the heat overnight, allowing blankets and bedding to compensate, and of relying less on heating equipment in the middle of the day, when temperatures are at their daily highs and occupants are least likely to be at home (during school and work hours). It also reflects the fact that sleeping occupants are not actively interacting with the equipment, which is how most fires begin.

Gas-fueled heating devices, particularly space heaters, pose a higher risk of death due to non-fire carbon monoxide poisoning, accounting for 59 of 68 deaths per year involving carbon monoxide poisoning by home heating equipment in 2003-2007. Heating equipment accounted for 61,930 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.

### **Safe Heating Behaviors**

- 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.
- Install stationary space heating equipment, water heaters or central heating equipment according to the local codes and manufacturer's instruction. 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 inside your home to provide early warning of carbon monoxide.
- Maintain heating equipment and chimneys by having them cleaned and inspected annually by a qualified professional.

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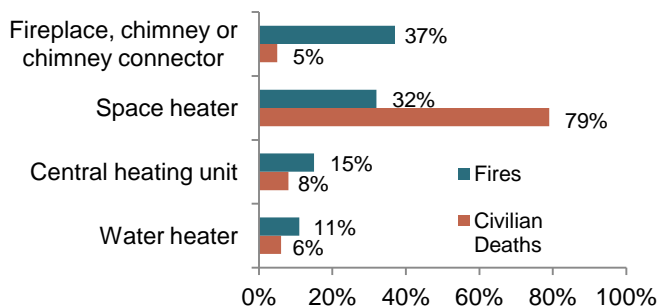


## U.S. Home Heating Equipment Fires Fact Sheet

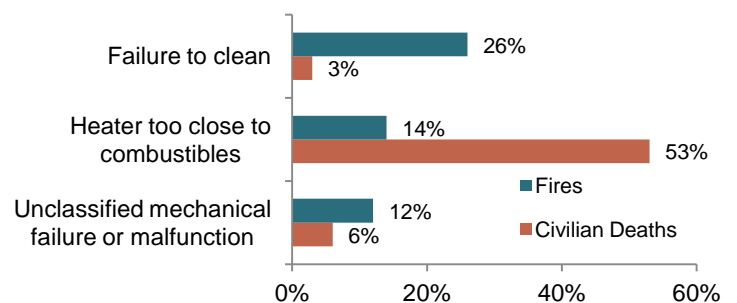
In 2009, U.S. fire departments responded to **58,900** home<sup>1</sup> structure fires that involved heating equipment. These fires caused

- 480 civilian fire deaths
  - 1,520 civilian fire injuries
  - \$1.1 billion in direct property damage
- Heating equipment fires accounted for 18% of all reported home fires in 2009 (second behind cooking) and 22% of home fire deaths.
  - In 2005-2009, the leading factor contributing to home heating fires (26%) was failure to clean, principally creosote from solid-fueled heating equipment, primarily chimneys.
  - The leading factor contributing to ignition for home heating fire deaths (53%) was heating equipment too close to things that can burn, such as upholstered furniture, clothing, mattress, or bedding.
  - In 2005-2009, most home heating fire deaths (79%) involved stationary or portable space heaters.
  - Half (49%) of all home heating fires occurred in December, January and February in 2005-2009.
  - Home heating fires peak during 6:00 to 8:00 p.m., and associated deaths peak during 12:00 to 2:00 a.m.

**U.S. Home Heating Fires by Equipment Involved: 2005-2009**



**Leading Factors in Home Heating Fires 2005-2009**



- Creosote is estimated to be involved in 14,190 home heating fires per year, or 22% of total home heating fires in 2005-2009.
- Creosote fires are estimated to involve 4 civilian deaths, 11 civilian injuries, and \$35 million in direct property damage per year.

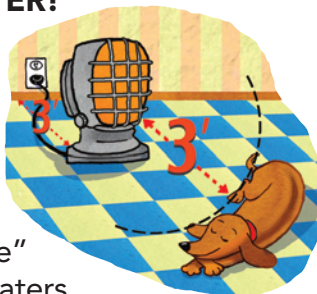
<sup>1</sup>Homes are dwellings, duplexes, manufactured homes, apartments, townhouses, rowhouses and condominiums.

# Heating Safety

There is something about the winter months and curling up with a good book by the fireplace. But did you know that heating equipment is a leading cause of home fire deaths? With a few simple safety tips and precautions you can prevent most heating fires from happening.

## BE WARM AND SAFE THIS WINTER!

- »» Keep anything that can burn at least three-feet away from heating equipment, like the furnace, fireplace, wood stove, or portable space heater.
- »» Have a three-foot "kid-free zone" around open fires and space heaters.
- »» Never use your oven to heat your home.
- »» Have a qualified professional install stationary space heating equipment, water heaters or central heating equipment according to the local codes and manufacturer's instructions.
- »» Have heating equipment and chimneys cleaned and inspected every year by a qualified professional.
- »» Remember to turn portable heaters off when leaving the room or going to bed.
- »» Always use the right kind of fuel, specified by the manufacturer, for fuel burning space heaters.
- »» Make sure the fireplace has a sturdy screen to stop sparks from flying into the room. Ashes should be cool before putting them in a metal container. Keep the container a safe distance away from your home.
- »» Test smoke alarms monthly.



## Heating Equipment Smarts

**Install** wood burning stoves following manufacturer's instructions or have a professional do the installation. All fuel-burning equipment should be vented to the outside to avoid carbon monoxide (CO) poisoning.

**Install** and maintain CO alarms to avoid the risk of CO poisoning. If you **smell** gas in your gas heater, do not light the appliance. Leave the home immediately and call your local fire department or gas company.



## FACT

Half of home heating fires are reported during the months of **December, January, and February.**



Your Source for **SAFETY** Information

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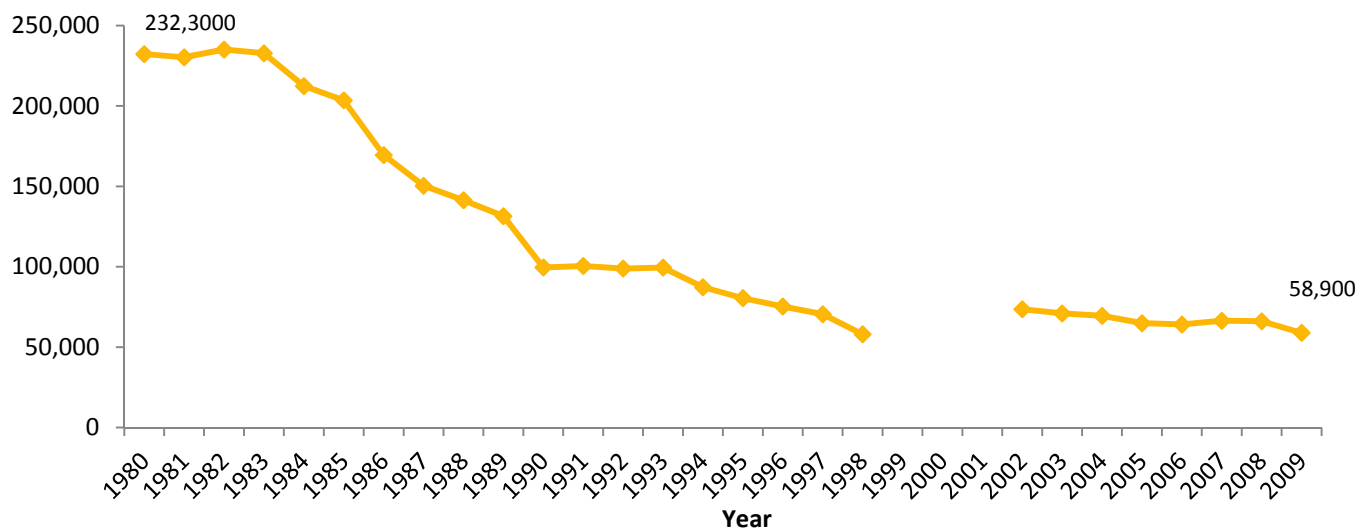
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## Section 1. Overview of Heating Equipment Fires

**In 2009, heating equipment was involved in an estimated 58,900 reported U.S. home structure fires, with associated losses of 480 civilian deaths, 1,520 civilian injuries, and \$1.1 billion in direct property damage.**

The home heating fire total was down 11% from the previous year and 75% from 1980. (See Figure 1.1.) Associated deaths were nearly unchanged from 2008 but down 53% from 1980. (See Table 1.1.) Associated civilian injuries were down 8% compared to 2008 and by 57% from 1980. Direct property damage adjusted for inflation was down 3% from 2008 and by 47% from 1980. “Homes” refers to one- and two-family homes (which include manufactured homes) and apartments (which include townhouses), including owner-occupied (condominium) and rented apartments.

**Figure 1.1. Home Fires Involving Heating Equipment, 1980-2009, by Year**



Note and Source: See Table 1.1.

**In 2009, heating equipment fires accounted for more than one-sixth (18%) of all reported home fires, ranking second to cooking equipment among major causes.**

This was down from a one-third (34%) share fairly consistently during 1980-85 and a one-fourth share (26%) as recently as 1989. These fires also accounted for 22% of the associated civilian deaths (second highest after smoking) and 12% of the direct property damage (highest share), also much lower than the shares in the first half of the 1980's. Heating equipment fires accounted for 13% of home fire civilian injuries (second highest after cooking).

Heating equipment has not been the leading cause of reported home fires since 1990. The roughly one-fourth decline from 1989 to 1990 dropped it behind cooking. Cooking equipment has been the leading cause of home fires ever since.

## Data Sources, Definitions and Conventions Used in this Report

The fire statistics in this analysis 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. These estimates are projections based on the detailed information collected in Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the NFPA's annual fire department experience survey. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are typically rounded to the nearest ten, civilian deaths and civilian injuries are typically expressed to the nearest one, and property damage is rounded to the nearest million dollars.

In the NFIRS 5.0 codes for equipment involved in ignition, heating equipment accounts for most but not all of the types of equipment in the range of Equipment Involved in Ignition 100-152, which collectively comprises the heating, ventilation, and air conditioning (HVAC) group. A companion NFPA report – *Home Fires Involving Air Conditioning, Fans or Related Equipment*, by John R. Hall, Jr. – provides analyses of equipment related to air conditioning and fans, (codes 111-117) including heat pumps, which may be used for heating and/or cooling in a home. Fires with equipment involved in ignition 100 – unclassified heating, ventilation, or air conditioning equipment – are treated as unknowns and proportionally allocated over all known types of HVAC equipment, including the heating equipment group (codes 120-152).

NFIRS incident type codes for structure fires include six types of confined fires – confined to chimney or flue (code 114), confined to fuel burner or boiler (code 116), confined to cooking vessel (code 113), confined to incinerator or commercial compactor (codes 115 and 117), and confined to trash (code 118). Reporting of most details is optional for confined fires. Therefore, the standard NFPA analysis practice of proportional allocation of unknowns in all fields produces more volatile results for confined fires, which have much larger unknown shares.

The first two listed types of confined fires seem clearly related to heating equipment, and those fires are all included in this analysis of heating equipment, even if they are reported with no equipment or non-heating equipment involved in ignition. The other four listed types of confined fires are not included, even if they are reported with heating equipment as equipment involved in ignition.

The estimates reflect a proportional share of home fires with equipment involved in ignition unknown. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated.

Unless otherwise specified, property damage has not been adjusted for inflation. Additional details on the methodology used may be found in Appendix A. Our analysis methods are continually being refined, and previous estimates updated.

NFIRS 5.0, first introduced 1999, brought major changes to fire incident data, including changes in some definitions and coding rules. Because of these changes, caution should be used when comparing data before 1998 with data from 1999 on.

**Fireplaces, chimneys, and chimney connectors accounted for the largest share (37%) of 2005-2009 home heating equipment fires. Space heaters accounted for the second largest share of fires, for most associated civilian deaths and injuries, and for half of associated direct property damage.**

Table 1.A includes water heaters, heat lamps, and heat tape as types of heating equipment. Heat pumps are not included in this report but are grouped for analysis in NFPA's report, *Home Fires Involving Air Conditioning, Fans or Related Equipment*.

**Table 1.A. Home Fires Involving Heating Equipment, by Type of Equipment  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

	<b>Fires</b>	<b>Civilian Deaths</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions)</b>
Fireplace, chimney, or chimney connector	23,700 (37%)	26 (5%)	112 (7%)	\$219 (24%)
Space heater	21,580 (32%)	448 (79%)	1,061 (66%)	\$467 (52%)
Central heating unit	9,900 (15%)	43 (8%)	112 (7%)	\$65 (7%)
Water heater	7,100 (11%)	36 (6%)	287 (18%)	\$127 (14%)
Heat lamp	450 (1%)	9 (2%)	19 (1%)	\$16 (2%)
Heat tape	280 (0%)	2 (0%)	6 (0%)	\$9 (1%)
Steamline or hot air duct	50 (0%)	0 (0%)	0 (0%)	\$1 (0%)
Confined to boiler or fuel burner but coded as non-heating equipment involved	1,550 (2%)	0 (0%)	11 (1%)	\$0 (0%)
Confined to chimney or flue but coded as no equipment or non-heating equipment involved	530 (1%)	0 (0%)	7 (0%)	\$0 (0%)
<i>All non-confined fires</i>	<i>27,140</i>	<i>563</i>	<i>1,514</i>	<i>\$893</i>
<i>All fires confined to boiler or fuel burner</i>	<i>13,900</i>	<i>1</i>	<i>65</i>	<i>\$3</i>
<i>All fires confined to chimney or flue</i>	<i>23,090</i>	<i>0</i>	<i>35</i>	<i>\$8</i>
<b>Total</b>	<b>64,130 (100%)</b>	<b>564 (100%)</b>	<b>1,614 (100%)</b>	<b>\$904 (100%)</b>

Note: These are national estimates of fire reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 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. Also, fires reported as confined to chimney/flue or fuel burner/boiler but with no equipment involved in ignition are assumed to be fires in the chimney or furnace enclosures and are allocated to chimneys and central heating units, respectively. Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

In this report, sections are grouped as follows and sequenced as shown here:

- Space heaters, including wood and other heating stoves; catalytic, oil-filled, and other heaters; fireplaces with inserts; and local furnaces
  - Subdivided for some analyses by gas, liquid, solid, and electric;
- Central heating units, including furnaces and boilers
  - Subdivided for some analyses by gas, liquid, and electric;
- Water heaters
  - Subdivided for some analyses by gas and electric;
- Fireplaces, chimneys, and chimney connectors
  - Subdivided for some analyses by gas and solid;
- Heat tape and heat lamps; steamlines and heat pipes do not have enough fires to justify detailed examination.

Some fires are difficult to assign for analysis purposes. These include fires coded as confined to a type of heating equipment – boiler or fuel burner (incident type 116) or chimney or flue (incident type 114) – but not having heating equipment as equipment involved in ignition. Table 1.B shows these two types of confined fires with equipment involved in ignition coded either as none or as some type of specific equipment other than heating equipment.

**Table 1.B. Home Structure Fires Reported as  
Confined to Boiler, Fuel Burner, Chimney or Flue, by Equipment Involved in Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Equipment Involved in Ignition	Confined to Boiler or Fuel Burner Code 116		Confined to Chimney or Flue Code 114		Combined	
Heating equipment	11,980	(86%)	9,370	(41%)	21,350	(58%)
No equipment	380	(3%)	13,190	(57%)	13,560	(37%)
Specific equipment other than heating equipment	1,550	(11%)	530	(2%)	2,070	(6%)
<b>Total</b>	<b>13,900</b>	<b>(100%)</b>	<b>23,090</b>	<b>(100%)</b>	<b>36,990</b>	<b>(100%)</b>

Note: These are national estimates of fire reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. National estimates are projections. Fires are rounded to the nearest ten. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown 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.

Over half (57%) of the confined chimney or flue fires are coded as no equipment involved. This suggests the heat of ignition came from a fire in a fireplace or wood or coal stove, ignited using a match or lighter (hence no equipment heat source), which became an unwanted and uncontrolled fire when it ignited something in the chimney, most likely creosote. These fires are relevant to the fire safety of the chimney and are included in chimney fires analyzed in this report.

An estimated 2,070 fires reported per year as confined to chimney, flue, fuel burner or boiler are reported as involving equipment other than heating equipment. The leading types of such equipment were clothes dryers (460 fires per year), ranges (340 fires per year), and grills (150 fires per year).

There are also appliances that can be used for both heating and cooking. These appliances may account for the 780 cooking equipment fires per year confined to chimney, flue, fuel burner or boiler, as well as the 11,330 confined cooking vessel fires per year with heating stove as equipment involved in ignition. There are available appliances designed for dual use as heating stoves and cooking stovetops, but these devices are in very limited use. Alternatively, there may be considerable use of heating equipment for cooking purposes. It is also possible that many stovetop fires on ranges are being coded under heating stoves (or fireplace, insert or stove) because the word “stove” is part of the names for those codes and is not part of the name of any code for cooking equipment.

There is better information available on the reverse phenomenon, which is the use of cooking equipment (specifically the range) for heating. In 2009, 0.1% of occupied housing units had cooking stove as main heating equipment, and 0.1% listed cooking stove as secondary heating equipment, for a combined total of 150,000 housing units.<sup>1</sup> A 2005 survey of assistance recipients for the Low Income Home Energy Association Program found that 24% said they used their stove or oven for heat, including 2% who did so almost every month.<sup>2</sup> In the 2009 survey, 33% said they used their store or oven for heat, including 2% who did so almost every month.<sup>3</sup>

Regionally in 2009, the percent using stove or oven for heat varied little, from a low of 30% in the Midwest region to a high of 38% in the West region.

Excluding the confined cooking fires involving heating stoves and fires confined to chimney, flue, fuel burner, or boiler, there were an estimated 840 heating equipment confined fires (560 confined to trash, 200 confined to incinerator or commercial compactor, and 80 confined to cooking vessel).

### **Fixed (stationary) and portable space heaters accounted for 32% of reported 2005-2009 U.S. home heating fires (including fires reported as confined fires).**

The term “space heater” is used to describe equipment intended to heat one room or similar space. As used here, “space heater” includes wood stoves but excludes fireplaces, chimneys and chimney connectors. Space heaters also accounted for 79% of associated civilian deaths, 66% of associated civilian injuries, and 52% of associated direct property damage.

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<sup>1</sup> *American Housing Survey for the United States: 2009*, U.S. Department of Housing and Urban Development and U.S. Department of Commerce, March 2011, Table 2-4.

<sup>2</sup> National Energy Assistance Directors' Association. *2005 National Energy Assistance Survey: Final Report*, September 2005. Accessed online at [http://www.NEADA.org/comm/surveys/NEADA 2005 National Energy Assistance pdf](http://www.NEADA.org/comm/surveys/NEADA%2005%20National%20Energy%20Assistance%20pdf), March 15, 2006.

<sup>3</sup> “Use of Unvented Residential Heating Appliances – 1988-1994,” *MMWR*, December 26, 1997, 46, pp. 1221-1224, <http://www.cdc.gov/mmwr/preview/mmwrhtml/00050535.htm>. National Energy Assistance Directors' Association, 2009 *National Energy Assistance Survey/Final Report*, April 2009. Accessed at <http://www.neada.org/communications/press/NEADA%202009%20Survey%20Report%20204-16-10.pdf.November1.2011>.

In 2005-2009, the central heating shares were 15% of reported U.S. home heating fires, 8% of associated civilian deaths, 7% of associated civilian injuries, and 7% of associated direct property damage.

### **The special problem of identifying chimney fires related to wood stoves**

These are the specific types of equipment that are assigned National Fire Incident Reporting System (NFIRS) codes for Equipment Involved in Ignition in the range that includes fireplaces, chimneys, and chimney connectors:

- Code 120 – Fireplace, chimney, other
- Code 121 – Fireplace, masonry
- Code 122 – Fireplace, factory-built
- Code 123 – Fireplace, insert/stove
- Code 124 – Stove, heating
- Code 125 – Chimney connector, vent connector
- Code 126 – Chimney: brick, stone, masonry
- Code 127 – Chimney: metal. Includes stovepipes and flues.

The name of NFIRS code 120 says it contains “other” (which should mean unclassified and could be interpreted to include unknown-type) equipment that belongs with fireplaces (code 121 or 122) or chimneys (code 126 or 127). However, it is not clear whether code 120 also relates to fireplace with insert (code 123), which is normally considered a type of space heater rather than a type of decorative fireplace; chimney connector (code 125), which is part of a chimney system; and heating stove (code 124), because code 120 suggests a partial unknown that should be allocated to all of the devices with codes in the 121-129 range. Heating stove is the only code in that group that does not have a name containing “fireplace” or “chimney”, but many heating stoves vent through a chimney.

Notwithstanding these considerations, this report introduces the use of a “fireplace and chimney” category, defined by NFIRS codes 120, 121, 122, 125, 126, and 127. If code 120 is being used to capture some unknown-type heating equipment related to fireplaces with inserts or heating stoves, then this approach will understate the number of fires related to wood stoves as compared with other types of space heaters. In 1980-1998, when chimney was also a code under area of origin, there were twice as many chimney-area fires involving space heaters as chimney-area fires involving fireplaces. In 2005-2009, for fires confined to chimney or flue, fires involving wood stoves or fireplaces with inserts outnumber fires involving masonry or factory-built fireplaces by more than 2-to-1, but more fires are coded as chimney, chimney connector or unclassified fireplace or chimney, and far more are coded as no equipment involved, a scenario that seems more likely with a decorative fireplace than with a fireplace with insert, wood stove, or other space heater.

It seems clear we are missing a large number of fires (though not much associated loss) related to solid-fueled space heaters, but we have no good options to estimate how many such fires are missing. Instead, there is discussion at points in the report, where this omission is particularly important, especially in the comparative risk analysis.

**Relative to central heating units, space heaters have a risk per million effective user households that is seven times as high for reported fires, 54 times as high for civilian deaths, 31 times as high for civilian injuries, and 25 times as high for direct damage.**

Table 1.2 provides statistics on 2005-2009 primary and secondary usage of different types of central or space heating equipment, calculated as averages of statistics from the 2005 and 2009 Residential Energy Consumption Surveys.

In order to calculate relative to usage, the figures in Table 1.2 must be translated into estimated effective usage for each type of heating equipment, which involves answering these questions:

- How should secondary use be weighted against primary use? Secondary use presumably involves fewer usage-hours of equipment. The Residential Energy Consumption Survey asked what fraction of heating – all or nearly all, roughly three-fourths, roughly half, or none – is provided by primary heating equipment. On average, primary heating equipment provides roughly 95% of home heating and secondary equipment provides 5%. Because 95% is 19 times 5%, the main estimate divides the number of secondary usage households by a factor of 19 and calculates “effective” user households with these discounted totals for secondary usage.
- Should unspecified “other” devices be treated as central or space heating equipment? The main estimate treats “other” or unspecified devices as space heating equipment. A sensitivity analysis checks the effect on the comparison of treating these devices as central heating equipment.
- How should electric heat pumps be treated? Fires started by heat pumps are not included in this report but are included instead in NFPA’s report, *Home Fires Involving Air Conditioning, Fans, or Related Equipment*. In 2009 12% of occupied housing units had heat pumps as main heating equipment and 0.1% had heat pumps as secondary heating equipment.<sup>4</sup> The use of heat pumps varied greatly by region from 2-3% of occupied housing units in the Northeast and Mideast to 6% in the West to 26% in the South.

Table 1.C shows the results and comparisons for all central heating vs. all space heating, and Tables 1.D to 1.E compare risks by type of fuel or power for space heaters and central heating equipment, respectively. The ranges for portable and fixed electric devices represent the range of assigning all or none of the “other” devices to portable vs. fixed.

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

- Among central heating equipment, liquid-fueled units show a higher rate of civilian fire deaths per user household. However, low usage of this equipment means that this rate is highly variable year-to-year. In 2003-2007, liquid-fueled equipment had the lowest rate.
- Liquid-fueled units also have the highest risk of fires and civilian injuries.
- Electric-powered units have the highest risk of direct property damage.

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<sup>4</sup> *American Housing Survey for the United States: 2009*, U.S. Department of Housing and Urban Development and U.S. Department of Commerce, March 2011, Table 2-4.

Among space heating equipment, risks are highest for liquid-fueled devices for all four measures of loss. However, usage of liquid-fueled space heaters is so low that the rates for such devices can and do vary substantially, even for five-year averages. Portable electric devices have higher risk than fixed electric devices.

Water heaters show very large differences, with gas-fueled equipment showing higher rates per million population than electric-powered equipment for fires (68 vs. 60), civilian fire deaths (0.6 vs. 0.0), civilian fire injuries (3.8 vs. 1.1), and direct property damage (\$1.7 vs. \$0.5).

**Table 1.C. Comparative Risk of Central and Space Heating Equipment  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Space Heating</b>	<b>Central Heating</b>	<b>How Much Higher Is Space Heating Risk Than Central Heating Risk?</b>
Fires (per million user households)	826	120	7 times
Civilian deaths (per million user households)	18.0	0.3	54 times
Civilian injuries (per million user households)	42.6	1.4	31 times
Direct property damage (per user household)	\$18.8	\$0.8	25 times

Note: 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.

**Table 1.D. Comparative Risk of Space Heating Equipment  
for Different Types of Fuel or Power  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Electric-Powered</b>			<b>Liquid-Fueled</b>	<b>Solid-Fueled</b>	<b>Gas-Fueled</b>
	<b>Portable</b>	<b>Fixed</b>	<b>Combined</b>	<b>(Kerosene or Fuel Oil)</b>	<b>(Wood or Coal)</b>	<b>(LP or Natural)</b>
Fires (per million user household)	1,195	733	842	2,131	852	593
Civilian deaths (per million user households)	45	4	14	48	25	15
Civilian injuries (per million user households)	107	45	59	84	18	29
Direct property damage (per user household)	\$43	\$13	\$20	\$30	\$18	\$15

Note: 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.

**Table 1.E. Comparative Risk of Central Heating Equipment  
for Different Types of Fuel or Power  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Liquid-Fueled (Fuel Oil)</b>	<b>Electric-Powered</b>	<b>Gas-Fueled (Natural or LP)</b>
Fires (per million user households)	468	201	51
Civilian deaths (per million user households)	0.7	0.2	0.3
Civilian injuries (per million user households)	1.9	1.5	1.3
Direct property damage (per million user households)	\$0.9	\$1.0	\$0.7

Note: 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.

**Dramatically higher heating costs or reduced fuel availability can induce shifts in equipment usage that can affect home heating fire risks.**

In 1940, 77% of the nation’s housing units were heated using solid fuels, with coal and coke outnumbering wood by more than two to one. By 1950, the percentage of homes using solid fuels had fallen to 45%, and wood now outnumbered coal and coke by more than three to one.<sup>5</sup> By 1960, the percentage share for solid fuels had fallen to 17%, and by 1970 it fell below 5%.

Then came the dramatic price increase in petroleum and natural gas products in the 1970’s. From 1970 to 1975, just after the first Arab oil embargo in 1973-1974, the overall consumer price index rose 38.6%, but the index for home fuel oil rose 111.0% or more than doubled. The percentage shares of household heating fuels and power sources showed a 7.8 percentage point shift away from fuel oil and kerosene and a 2.5 percentage point shift away from natural, bottled, tank, and LP- (liquefied petroleum) gas. Electricity use for heating went up a corresponding 10.6 percentage points.

The average price of leaded regular gasoline more than doubled from 1978 to 1981.<sup>6</sup> Some NFIRS data is available beginning in 1977, and that data indicates a roughly 35,000-fire increase in one- and two-family home heating fires from 1979 to 1980 alone.<sup>7</sup> (In general, NFPA does not calculate national estimates prior to 1980 because NFIRS participation was still low in those years.) Nearly all of this increase in fires was associated with a switch to wood stoves, resulting in a jump in fires involving solid-fueled fixed space heaters and associated chimneys and chimney connectors, as well as a jump in fireplace fires, which may have reflected the use of inserts to convert decorative fireplaces into true space heaters. (Decorative fireplaces are not designed for extended use as a heating device. Fireplace inserts, like a metal box, provide a structure that can safely absorb heat from extended use and will efficiently generate convected heat when so heated.)

<sup>5</sup> *Statistical Abstract of the United States 1975*, Washington: U.S. Department of Commerce, Bureau of the Census, 1975, Table 1234.

<sup>6</sup> “Gasoline Retail Prices,” *World Almanac 2005*, World Almanac Books, New York, p.71.

<sup>7</sup> *Fire in the United States*, 3<sup>rd</sup> edition, Federal Emergency Management Agency, 1982, Figures 14-15.

Overall, solid fuel usage as a primary heating fuel continued to decline, from 4.6% of all occupied housing units to 4.0% in 1980, but this masked two different patterns – a doubling of the wood share, from 1.7% to 3.4%, and a decline of coal and coke into insignificance, from 2.9% to 0.6%. Thus, while the renewed growth in use of wood as a fuel probably began in the mid-1970's, it was not until roughly 1980 that there was a turnaround for the trend in all solid fuels, as the continued upward trend in wood usage finally overtook the decline in coal usage.

And the millions of new users of wood heating in the late 1970's would have been inexperienced in its use and so more likely to have fires. From 1980 to 1983, usage of solid fuel for primary heating was up from 4.0% of occupied housing units to 5.5%, but wood usage outnumbered coal usage by ten-to-one.

Increased usage of portable kerosene heaters, which occurred in the early 1980s, may seem surprising, because kerosene was one of the fuels leading the price increases. The attraction here is the opportunity for savings from compartmentalized heating, i.e., savings from heating only the spaces that are in use. Estimates by the U.S. Consumer Product Safety Commission (CPSC) indicate the period of most growth in use of portable kerosene heaters was 1980-1982.<sup>8</sup> Toward the end of this period, three states – California, Massachusetts, and Wisconsin – banned home use of portable kerosene heaters.

Another point of interest is the prominent role of heating fires in explaining the typically higher fire death rate in rural areas and the South. An early 1980's analysis at the National Institute of Standards and Technology (NIST) of late 1970's death certificate data from six southern states found that the overall fire death rate per million persons for rural areas was 2.5 times the rate for non-rural areas. The study showed that this separated into a 4.2 ratio for heating fire deaths versus only a 1.5 ratio for fire deaths due to all other known causes (and a 4.2 ratio for deaths in unknown-cause fires).<sup>9</sup>

Another report on the same data, by Gomberg and Clark, provides more details.<sup>10</sup> Rural fires started by heating equipment had a fire death rate of 13.8 deaths per million population, four times the non-rural heating equipment death rate of 3.3.

The heating equipment fire death rate was roughly 50% higher for rural areas in high death rate states than for rural areas in low death rate states. In other words, living in a southeastern state and living in a rural area each was associated with an increase in the risk of death from a home heating equipment fire, and the increases were at least somewhat independent.

The South has a higher percentage of its population in rural areas than any other region, which may explain why the states of the South often had heating fires rather than the national leader –

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<sup>8</sup> Beatrice Harwood, Deborah Kale, and Sheila Kelly, "Hazards Involving Kerosene Heaters," Washington: U.S. Consumer Product Safety Commission, Directorate for Epidemiology, May 1983, Table 16.

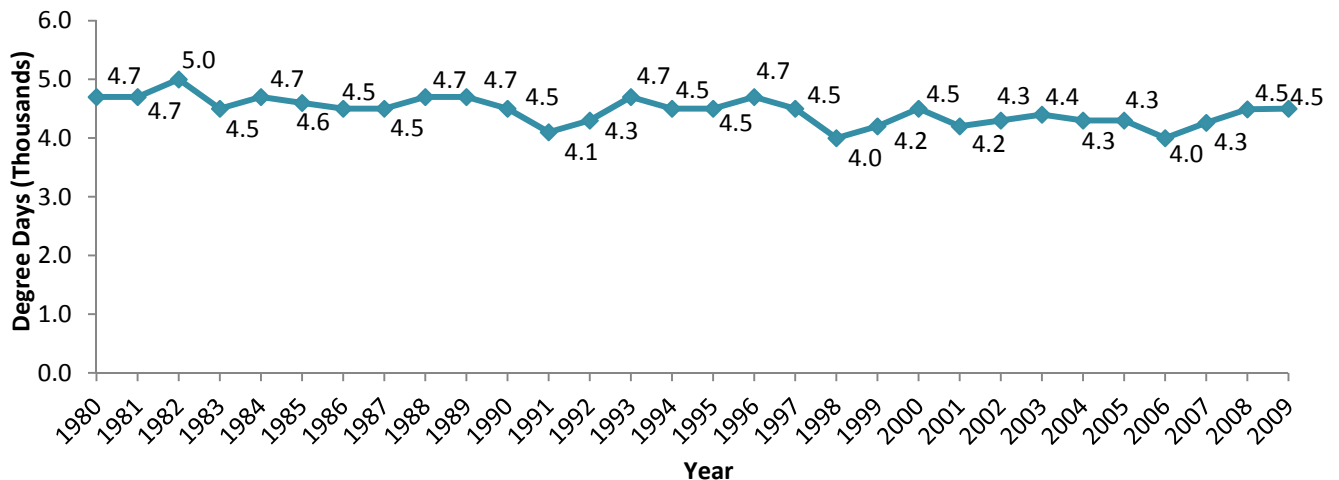
<sup>9</sup> Alan Gomberg and John R. Hall, "Space Heater – Rural Death Link," *Fire Service Today*, September, pp. 18-21, Figure 2.

<sup>10</sup> A. Gomberg and L.P. Clark, *Rural and Non-Rural Civilian Residential Fire Fatalities in Twelve States*, NBSIR 82-2519, Center for Fire Research, National Bureau of Standards, Washington, June 1982.

smoking-material fires – as the leading cause of fire deaths early in the 1980s.<sup>11</sup> A more recent study confirmed that the heating equipment share of home fire deaths continues to be much higher in the South than in other regions.<sup>12</sup>

It may be conjectured from these distinctive patterns in the South that space heater usage is fed by both problems in affording heating and reduced demand for heating. In the poor areas of the South, affordability problems and reduced heating demand are both phenomena of long standing. In the rest of the country, recurrent price shocks and warmer winters can create the same combination, and if the price increases are sufficiently dramatic (or the supply interruptions are sufficiently widespread) and the warmer winters go on long enough to seem like a new norm, there may be a change in people’s choices of home heating equipment (which is a long-term decision, involving a capital purchase in most cases) or in their usage of such equipment (e.g., shifting emphasis to what had been auxiliary heating equipment). Recent usage data (for 2009) indicates that the split between central heating and space heating equipment for main heating equipment is more shifted toward space heating in the West (3.1 occupied housing units using central heating for every one using space heating, excluding heat pumps) and South (5.6) than in the Midwest (11.7) and Northeast (8.9), primarily because of the extensive use of heat pumps. If heat pumps are treated as space heating, then the ratio is lowest in the South.<sup>13</sup>

**Figure 1.2. U.S. Demand for Heating in Thousands of Heating Degree Days 1980-2009**



Source: National Oceanic and Atmospheric Administration website, <http://www.ncdc.noaa.gov>.

<sup>11</sup> See for example, “Preview: Residential Fire in the United States 1979,” Washington: Federal Emergency Management Agency, undated; and *Fire in the United States*, Fifth Edition, prepared for the Federal Emergency Management Agency by the National Fire Protection Association, 1984.

<sup>12</sup> Michael J. Karter, Jr., *U.S. Fire Experience by Region, 2002-2006*, NFPA Fire Analysis and Research Division, April 2008, Table 11.

<sup>13</sup> U.S. Departments of Commerce and Housing and Urban Development, *American Housing Survey for the United States: 2009*, March 2011, Table 2-4.

**The decline in home heating fires since 1980 may be partly attributable to the slight and inconsistent decline in annual heating degree days.**

The best available measure of the demand for home heating is the National Climatic Center’s annual total of “heating degree days.” Heating degree days are computed as follows: For each day with average temperature below 65°F, assigned a number of degree days equal to the difference between the average temperature and 65°F. For example, a day with an average temperature of 70°F would register no degree days, a day with an average temperature of 60°F would register five degree days, and a day with an average temperature of 50°F would register 15 degree days. Sum degree days for all days in the year, and you have an annual total. National heating-degree day statistics are estimated from individual measurement stations weighted by the population in the areas nearest those stations. Figure 1.2 shows the history of heating degree days for the contiguous 48 states.

**The leading factor contributing to ignition in 2005-2009 home heating equipment fires is failure to clean, which presumably refers primarily to creosote build-up.**

Failure to clean was cited for 16,420 home heating fires per year in 2005-2009, or 26% of all home heating fires. (See Table 1.F.)

The second leading factor was heat source too close to combustibles, cited in 9,020 home heating fires per year, or 14% of all home heating fires, and 53% of associated deaths. This is why the need to keep at least a 3-foot separation between combustibles and heating equipment features prominently in the list of safe heating rules (shown at end of section text).

**Table 1.F. Leading Factors Contributing to Ignition for Home Heating Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

<b>Factor</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Failure to clean	16,420	(26%)	15	(3%)	32	(2%)	\$39	(4%)
Heat source too close to combustibles	9,020	(14%)	301	(53%)	543	(34%)	\$293	(32%)
Unclassified mechanical failure or malfunction	7,780	(12%)	33	(6%)	126	(8%)	\$95	(11%)
Equipment unattended	3,080	(5%)	23	(4%)	229	(14%)	\$92	(10%)
Unclassified factor	2,550	(4%)	23	(4%)	58	(4%)	\$38	(4%)

Note and Source: See Table 1.3.

**Creosote and Chimney Fires**

Creosote is a sticky, oily combustible substance created when wood does not burn completely. It rises into the chimney as a liquid and deposits on the chimney wall. A fire starting in creosote can appropriately be reported as a fire with failure to clean as Factor Contributing to Ignition and film or residue as Item First Ignited. The former appears to be used more consistently in fire incident reports.

A conservative best estimate of creosote fires would be failure-to-clean fires confined to chimney or flue or involving solid-fueled space heaters, fireplaces, chimneys and chimney connectors. **This produces 2005-2009 estimates of 14,190 reported creosote fires (22% of all home heating fires) per year with associated losses of four civilian deaths, 11 civilian injuries, and \$35 million in direct property damage per year in 2005-2009.**

Some analysts prefer the simplicity of estimating creosote fires by total confined chimney or flue fires – 23,100 fires, no deaths, 35 civilian injuries, and \$8 million in direct property

The third leading factor was unclassified mechanical failure or malfunction, cited in 7,780 home heating fires per year, or 12% of all home heating fires. Following manufacturer’s instructions and code requirements is essential. Good inspections by professionals when equipment is installed can address a wide range of such problems.

Table 1.3 shows a longer list of factors contributing to ignition for all heating equipment fires. Equipment unattended is another high-ranking factor (5% of home heating equipment fires) that, like heat source too close to combustibles, can be addressed by safe heating rules, which direct users to turn off certain space heaters when leaving a room or going to sleep. Improper fueling technique (2% of home heating equipment fire deaths) also leads directly to a safe heating rule.

Table 1.4 shows the human factors contributing to ignition for non-confined home heating equipment fires. The leading factor is unattended or unsupervised person (reported for 4% of fires). It is possible that there is in practice some blurring of the distinction between unattended person as a human factor and unattended equipment as a factor contributing to ignition.

**Only 6% of 2005-2009 home heating fires, including confined fires, began with ignition of film or residue, including creosote.**

The leading item first ignited – unclassified item first ignited (16%) – also could refer to creosote (See Table 1.G.) The second leading item – flammable or combustible gas or liquid (15%) – primarily consists of fires confined to boiler of fuel burner and so would fit with a confined furnace blowback scenario. Table 1.5 shows a more complete list of items first ignited.

**Table 1.G. Leading Items First Ignited for Home Heating Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

<b>Item First Ignited</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Unclassified item	10,480	(16%)	17	(3%)	65	(4%)	\$35	(4%)
Flammable or combustible gas or liquid	9,800	(15%)	72	(13%)	320	(20%)	\$72	(8%)
Structural member or framing	5,080	(8%)	56	(10%)	92	(6%)	\$228	(25%)
Unclassified organic material	4,060	(6%)	7	(1%)	3	(0%)	\$6	(1%)
Wire or cable insulation	3,930	(6%)	11	(2%)	61	(4%)	\$22	(2%)

Note and Source: See Table 1.5.

**One-third (36%) of reported home heating fires began in and were confined to a chimney or flue.**

The share of fires that began in a chimney or flue may be significantly understated because chimney is not a choice for area of origin, which means all the non-confined home heating fires beginning in chimneys must be coded as a space like chimney (e.g., unclassified area), a space that contains a chimney (e.g., living room, family room or den), or a space adjacent to a chimney. (See Table 1.H.) The living room, family room, or den accounted for the largest share (33%) of home heating equipment civilian fire deaths. (See Table 1.6.)

**Table 1.H. Leading Areas of Origin for Home Heating Fires**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Confined chimney or flue fire	23,090 (36%)	0 (0%)	35 (2%)	\$8 (1%)
Confined fuel burner or boiler fire	13,900 (22%)	1 (0%)	65 (4%)	\$3 (0%)
Kitchen	5,590 (9%)	62 (11%)	427 (26%)	\$97 (11%)
Heating equipment room or area	3,900 (6%)	24 (4%)	184 (11%)	\$90 (10%)
Living room, family room, or den	2,540 (4%)	188 (33%)	200 (12%)	\$111 (12%)

Note and Source: See Table 1.6

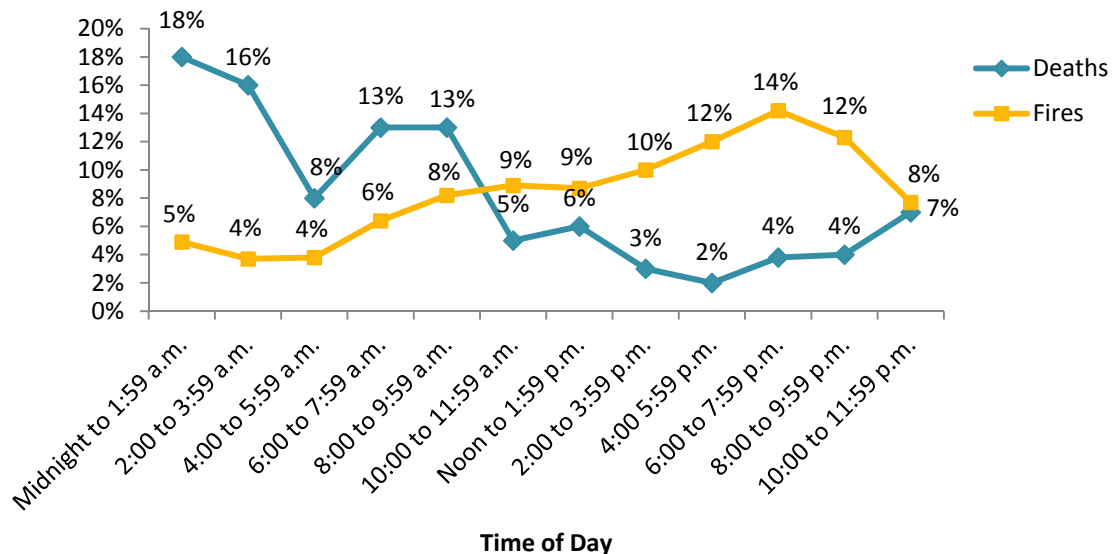
**Two-thirds of non-fatal victims are in the area of fire origin when fire begins.**

Table 1.7 shows victim location relative to the point of fire origin. More than half the fatal victims were considered to have been involved in the ignition, whether inside or outside the area of origin where fire began, but a majority were located outside the area of origin when fire began, whether involved in ignition or not.

**Home heating fires (including fires reported as confined fires) peak in the mid-evening (6:00 to 8:00 pm) while associated deaths peak just after midnight (12:00 to 2:00 am).**

Home heating fires are less common between midnight and 6:00 a.m. This could reflect the practice in many homes of turning down the heat overnight, allowing blankets and bedding to compensate, and of relying less on heating equipment in the middle of the day, when temperatures are at their daily highs and occupants are least likely to be at home (during school and work hours).

**Figure 1.3. Home Heating Fires, by Time of Day, 2005-2009**

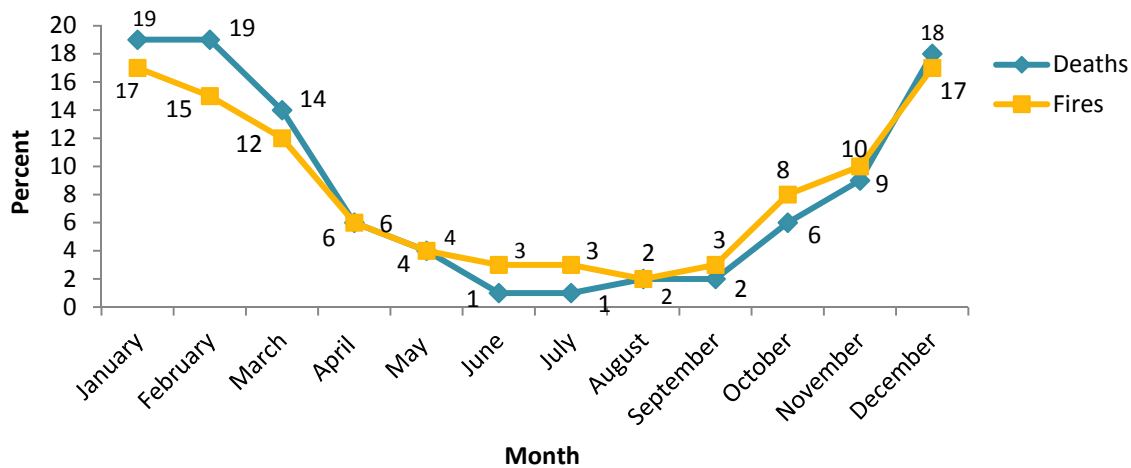


Source: Data from NFIRS Version 5.0 and NFPA survey

**Fireplaces and chimneys have the shortest season of usage, based on fire incidence.**

If any group of fires occurred evenly throughout the year, then every month would have 8.3% (1 in 12) of those fires. As Table 1.8 shows, water heater fires come close to matching that pattern of no seasonal variation, while all other heating equipment show more seasonality. For all heating equipment combined, the three peak months of December, January, and February account for 49% of the fires (compared to 25% if every block of three months had an equal share of fires). The December to February share is 42% for central heating units and 47% for space heaters, but it is 59% for fireplaces, chimneys and chimney connectors. As Figure 1.4 shows, the seasonality is even more pronounced for home heating fire deaths, with December through February accounting for 56% of those fire deaths.

**Figure 1.4. Home Heating Fires and Fire Deaths, by Month, 2005-2009**



Source: Table 1.9.

**Home heating fire deaths show more younger and older victims than total home fire deaths .**

Children under age 5 and older adults age 65 and older have the highest risk of fire death for home heating equipment fire deaths and for all fire deaths, and both groups have higher relative risk (compared to other age groups) for heating equipment than for all causes combined. Relative risk is measured by percent of fire deaths divided by percent of population. Risk by age group (of those shown) for non-fatal injuries are nearly the same for home heating equipment fires. (See Table 1.I.)

**Table 1.I. Age Distribution of Victims of Home Heating Fires, 2005-2009**

**A. Civilian Deaths**

Age Group	Percent Home Heating Fire Deaths	Percent All Fire Deaths	Percent Population
Under 5	12%	8%	7%
5-14	6%	7%	13%
15-34	13%	14%	28%
35-64	35%	41%	39%
65 and over	34%	30%	13%

**Table 1.I. Age Distribution of Victims of Home Heating Fires, 2005-2009 (Continued)**

**B. Civilian Injuries**

Age Group	Percent Home Heating Fire Injuries	Percent All Fire Injuries	Percent Population
Under 5	5%	4%	7%
5-14	6%	6%	13%
15-34	31%	32%	28%
35-64	45%	44%	39%
65 and over	14%	13%	13%

Source: Data from NFIRS Version 5.0 and NFPA survey

**Gas-fueled heating devices pose a higher risk of death due to non-fire carbon monoxide poisoning.<sup>14</sup>**

Studies by the U.S. Consumer Product Safety Commission (CPSC) provide 1980-2007 estimates of non-fire deaths due to carbon monoxide poisoning from home heating equipment, which occurs when carbon monoxide produced by burning fuel is allowed to build up in a confined, occupied space (see Table 1.9). Gas-fueled heating equipment accounted for most of these deaths (59 of 68 per year in 2003-2007). Electric-powered heating units do not have this risk because carbon monoxide is produced when fuel is burned. Between 1980-1984 and 2003-2007, the annual average number of deaths due to carbon monoxide poisoning has declined substantially, for all heating equipment (from 247 to 68) and for gas-fueled heating equipment specifically (from 216 to 59).

**Heating equipment accounted for 61,930 injuries (not limited to fire and burn injuries) reported to hospital emergency rooms in 2010.**

Fireplaces and chimneys accounted for 26% of the injuries, followed by space heaters (21%), ductwork for heating and/or cooling (15%), and furnaces (13%). (See Table 1.J.) Smaller shares involved water heaters (8%), manufactured outdoor patio heaters and firepits (4%), heat lamps (0%), and heat tape (0%). Unclassified or unknown-type heating equipment accounted for 14% of the injuries.<sup>15</sup>

Thermal burns and anoxia combined accounted for 35% of the injuries, while lacerations accounted for 32%. Anoxia means a lack of oxygen, which may occur in a fire-affected atmosphere or, more often, when carbon monoxide from malfunctioning equipment crowds out oxygen. Thermal burns can be caused by a fire or by contact with a hot object.

**CPSC’s National Electronic Injury Surveillance System**

The CPSC’s National Electronic Injury Surveillance System (NEISS) collects information about all injuries seen in a weighted statistical sample of hospital emergency rooms. Information about the injury cause is obtained from the patient. No allocation of unknown data was done for the NEISS results presented here. No filters on property use location of victim were used.

<sup>14</sup> Matthew V. Hnatov, “Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products,” U.S. Consumer Product Safety Commission, [www.cpsc.gov](http://www.cpsc.gov), July 8, 2008, Table 1, and previous reports in series.

<sup>15</sup> On-line queries of National Electronic Injury Surveillance system (NEISS) at [www.cpsc.gov](http://www.cpsc.gov).

**Table 1.J. Injuries Reported to Hospital Emergency Rooms and Involving Heating Equipment, 2010**

	<b>Total</b>	<b>Thermal Burns</b>	<b>Anoxia</b>	<b>Lacerations</b>
Fireplace or chimney	16,000	1,150	640	8,870
Space heater	12,900	6,000	2,110	2,290
Ductwork for heating or cooling	8,980	60	20	4,500
Furnace	7,750	640	4,660	230
Water heater	4,730	940	520	940
Manufactured outdoor patio heater or firepit	2,670	1,120	0	420
Heat lamp	250	180	70	0
Heat tape	20	0	0	20
Unclassified or unknown-type heating equipment	8,630	2,210	950	2,500
<b>Total</b>	<b>61,930</b>	<b>12,910</b>	<b>8,970</b>	<b>19,750</b>

Source: CPSC's National Electronic Injury Surveillance System

**Injuries involving patio heaters and firepits have been growing rapidly.**

Manufactured outdoor patio heaters and firepits accounted for only 4% of injuries reported to hospital emergency rooms but for 13% of the thermal burn injuries. More importantly, the number of total outdoor patio heater or firepit injuries has doubled (from 1,330 to 2,670) in the four years (2006 to 2010), since this relatively new type of equipment was first separately identified in the NEISS data. All of the sample NEISS incidents checked by the author specifically involved firepits.

The author was not able to find any statistics on the number of households that have installed firepits. However, it seems likely that the rate of reported emergency room thermal burn injuries for this product, relative to usage, if it could be calculated, would be much higher than the rates for any other heating-related equipment and probably among the highest rates for any product.

The sample incidents examined by the author showed that many burn injuries began with a trip and fall near the firepit. It appears that firepits provide little protection against unintentional contact with hot surfaces. In view of the apparently high risk of firepits and the apparent rapid rise in installations in recent years, it might be appropriate to explore increased attention to firepits in home burn safety education and in firepit design standards.

**Gas explosions with no after-fire add very few incidents and deaths to the structure fires estimated for gas-fueled home heating equipment.**

The author conducted an unpublished special analysis of 1988-1992 data and estimated that home natural gas explosions with no after-fire averaged 340-420 incidents and 2-3 civilian deaths per year, while home LP-gas explosions averaged 110-140 incidents and 2-3 civilian deaths per year. (If an explosion resulted in a structure fire, it should be coded as a structure fire.) These figures represented 2-3% of the fires and fire deaths associated with gas-fueled home heating equipment and a much smaller fraction of the fires and fire deaths associated with all types of gas-fueled home equipment.

## **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, wood/oil stoves or other space heaters are being used. Use a sturdy metal screen around the appliance to prevent contact 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 stationary space heating equipment, water heaters or 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 inside your home to provide early warning of carbon monoxide.
- Maintain heating equipment and chimneys by having them cleaned and inspected annually by a qualified professional.

### **Portable electric space heaters**

- Turn heaters off when you go to bed or leave the room.
- Use and purchase portable space heaters with an auto shut off so if they're tipped over they will shut off.
- Place space heater on solid, flat surface.
- Plug power cords directly into outlets and never into an extension cord.
- Inspect for cracked or damaged, broken plugs or loose connections. Replace before using.

### **Fuel burning space heaters**

- Always use the proper fuel as specified by the manufacturer.
- When refueling, allow the appliance to cool and refuel outside or in a well-ventilated area.
- When using the heater, open a window to ensure adequate venting.
- In portable kerosene or other liquid-fueled space heaters always use the proper grade of the proper fuel.
- All new unvented gas-fired space heaters have an oxygen depletion sensor that detects a reduced level of oxygen in the area where the heater is operating and shuts off the heater

before a hazardous level of carbon monoxide accumulates. If you have an older heater without this feature, replace it.

- If the pilot light of your gas heater goes out, allow 5 minutes or more for the gas to go away before trying again, do not allow gas to accumulate, and light the match before you turn on the gas to the pilot to avoid risk of flashback.
- If you small gas in your gas heater, do not light the appliance. Leave the building immediately and call 9-1-1, the fire department, or gas company.

### **Wood burning stoves**

- Install the stove, chimney connectors and chimneys following manufacturer's instructions or have a professional do the installation.
- Wood stoves should bear the label of a recognized testing laboratory.
- In wood stoves, burn only dry, seasoned wood. In pellet stoves, burn only dry, seasoned wood pellets.
- Start the fire with newspaper, kindling, or fire starter. Never use a flammable liquid, such as lighter fluid, kerosene or gasoline to start a fire.
- Keep the doors of your wood stove closed unless loading or stoking the live fire.
- Allow ashes to cool before disposing. Dispose of ashes in a tightly covered metal container and keep the ash container at least 10 feet away from the home and any other nearby buildings. Douse and saturate with water. Chimneys and vents need to be cleaned and inspected at least once a year.

### *Additional safety tips for heating*

- Check for product recalls at [www.cpsc.gov](http://www.cpsc.gov).
- Do not position electric-powered space heaters near water or where there is danger of water being spilled, to avoid serious risk of electric shock.
- For wood-fueled equipment, burn only wood that has been split, stacked, and allowed to dry for 12 months. Do not use green wood, trash, or any other combustibles that could burn unevenly, resulting in flare-ups, or burn incompletely, resulting in deposits of creosote, an oily, sticky, combustible byproduct of incomplete burning of wood. When adding wood to a working fire, wear only short, tight-fitting sleeves to reduce the risk of igniting your clothing if the fire flares up during the refueling.
- For wood-fueled equipment, the annual inspection needs to address potential build-up of creosote in heating equipment and associated chimneys and chimney connectors.
- Do not use or store flammable or combustible liquid near or in rooms with heaters, in order to avoid a vapor ignition and possible flash fire.
- The annual inspection can best be timed for just before the beginning of a new heating season. 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.
- Check whether the manufacturer has information relating the size space you intend to heat with the choice of space heater.

**Table 1.1 U.S. Home Heating Fire Problem  
Structure Fires Reported to U.S. Fire Departments**

<b>Year</b>	<b>Fires</b>	<b>Civilian Deaths</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions of Current Dollars)</b>	<b>Direct Property Damage (in Millions of 2009 Dollars)</b>
1980	232,300	1,020	3,550	\$766	\$1,997
1981	230,300	990	3,030	\$624	\$1,470
1982	235,100	1,190	3,480	\$851	\$1,891
1983	232,800	1,120	3,710	\$848	\$1,825
1984	212,400	870	2,880	\$786	\$1,622
1985	203,500	1,190	3,260	\$892	\$1,776
1986	169,500	810	2,710	\$700	\$1,372
1987	150,400	850	2,860	\$662	\$1,250
1988	141,400	920	3,440	\$824	\$1,496
1989	131,500	800	2,970	\$838	\$1,452
1990	99,600	810	2,470	\$749	\$1,232
1991	100,500	670	2,570	\$1,006*	\$1,585*
1992	98,900	650	2,570	\$721	\$1,104
1993	99,500	680	2,910	\$729	\$1,082
1994	87,300	620	2,290	\$738	\$1,069
1995	80,500	570	2,120	\$747	\$1,052
1996	75,300	810	2,070	\$843	\$1,154
1997	70,500	580	1,590	\$756	\$1,011
1998	58,000	500	1,720	\$664	\$875
1999	78,700 (45,200)	180 (180)	2,080 (2,080)	\$813 (\$756)	\$1,047 (\$973)
2000	72,500 (40,300)	810 (810)	1,980 (1,890)	\$929 (\$908)	\$1,159 (\$1,132)
2001	71,900 (35,600)	410 (410)	1,670 (1,580)	\$849 (\$830)	\$1,030 (\$1,007)
2002	73,600 (35,100)	660 (660)	1,580 (1,550)	\$1,310 (\$1,288)	\$1,563 (\$1,537)
2003	71,000 (29,100)	550 (550)	1,750 (1,620)	\$961 (\$940)	\$1,120 (\$1,095)
2004	69,500 (27,600)	670 (670)	1,660 (1,520)	\$922 (\$907)	\$1,046 (\$1,029)
2005	64,900 (27,700)	730 (730)	1,630 (1,510)	\$966 (\$943)	\$1,062 (\$1,036)
2006	64,100 (27,000)	540 (540)	1,400 (1,300)	\$943 (\$937)	\$1,003 (\$997)
2007	66,400 (28,800)	580 (580)	1,850 (1,710)	\$608 (\$601)	\$629 (\$622)
2008	66,100 (28,800)	480 (480)	1,660 (1,570)	\$1,090 (\$1,081)	\$1,085 (\$1,076)
2009	58,900 (23,500)	480 (480)	1,520 (1,470)	\$1,053 (\$1,043)	\$1,053 (\$1,043)

\* 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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 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 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2009) and from NFPA survey.

**Table 1.2. Estimates of Average 2005 and 2009 U.S. Primary and Secondary Usage of All Major Home Heating Devices**

<b>Device</b>	<b>Fuel or Power</b>	<b>Primary Use (Millions of Households)</b>	<b>Secondary Use (Millions of Households)</b>
Central heating unit	Gas	56.1 Natural gas/warm air-44.5 Natural gas/piped steam or hot water-7.6 LP gas/warm air-4.0	1.1 Natural gas/secondary use/central warm air-1.1
Central heating unit	Liquid	7.1 Fuel oil/warm air-2.8 Fuel oil/piped steam or hot water-4.3	0.0
Central heating unit	Electricity	17.6 Warm air-17.6	1.6
Water heater	Gas	62.7 Natural gas – 58.6 LP gas – 4.1	1.6 Natural gas – 1.3 LP gas – 0.3
Water heater	Electricity	44.9	1.6
Space heater	Gas	6.6 Natural gas /primary use/room heater-2.2 LP gas/primary use/room heater-0.4 Natural gas/primary use/floor, wall, or pipeless furnace-1.8 LP gas/primary use/“other” device-1.3 Natural gas/primary use/“other” device-0.9	3.9 LP gas/secondary use/all devices-2.6 Natural gas/secondary use/“other” device-1.1 Natural gas/secondary use/room heater-0.2
Space heater	Liquid	0.9 Kerosene heater/primary use-0.6 Fuel oil/primary use/“other” device-0.3	1.3 Kerosene heater/secondary use-0.9 Fuel oil /secondary use/all devices-0.4
Space heater	Solid	5.3 Wood/primary use/all devices-2.9 Wood/secondary use/heating stove-2.4	6.6 Secondary use/fireplace-6.6
Space heater	Electricity	10.4 “Other” device/primary use-1.4 Built-in units/primary use-5.4 Built-in unit/secondary use-2.2 Portable heater/primary use 1.4	20.6 “Other” device/secondary use-1.2 Portable heater/secondary use-19.4

Source: 2005 and 2009 Residential Energy Consumption Survey, Table HC5.4 and Table HC2.8, from U.S. Department of Energy web site, <http://www.eia.doe.gov/emeu/recs>.

**Table 1.3. Home Heating Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Failure to clean	16,420	(26%)	15	(3%)	32	(2%)	\$39	(4%)
Heat source too close to combustibles	9,020	(14%)	301	(53%)	543	(34%)	\$293	(32%)
Unclassified mechanical failure or malfunction	7,780	(12%)	33	(6%)	126	(8%)	\$95	(11%)
Equipment unattended	3,080	(5%)	23	(4%)	229	(14%)	\$92	(10%)
Unclassified factor	2,550	(4%)	23	(4%)	58	(4%)	\$38	(4%)
Installation deficiency	2,500	(4%)	15	(3%)	28	(2%)	\$53	(6%)
Automatic control failure	2,390	(4%)	12	(2%)	11	(1%)	\$13	(1%)
Leak or break	2,300	(4%)	42	(7%)	85	(5%)	\$48	(5%)
Unclassified electrical failure or malfunction	2,180	(3%)	30	(5%)	43	(3%)	\$40	(4%)
Unclassified misuse of material or product	2,080	(3%)	26	(5%)	91	(6%)	\$27	(3%)
Worn out	1,900	(3%)	4	(1%)	25	(2%)	\$20	(2%)
Unclassified operational deficiency	1,720	(3%)	11	(2%)	20	(1%)	\$25	(3%)
Unspecified short circuit arc	1,600	(3%)	15	(3%)	34	(2%)	\$24	(3%)
Backfire	1,390	(2%)	0	(0%)	12	(1%)	\$2	(0%)
Construction deficiency	1,110	(2%)	4	(1%)	7	(0%)	\$27	(3%)
Equipment not being operated properly	1,040	(2%)	4	(1%)	56	(3%)	\$19	(2%)
Abandoned or discarded material or product	930	(1%)	7	(1%)	45	(3%)	\$16	(2%)
Unintentionally turned on or not turned off	890	(1%)	0	(0%)	62	(4%)	\$22	(2%)
Improper fueling technique	700	(1%)	10	(2%)	24	(2%)	\$6	(1%)
Unclassified design, manufacturing, or installation deficiency	660	(1%)	0	(0%)	11	(1%)	\$15	(2%)
Unclassified fire spread or control factor	610	(1%)	4	(1%)	11	(1%)	\$9	(1%)
Improper startup	600	(1%)	3	(1%)	17	(1%)	\$4	(0%)
Design deficiency	540	(1%)	5	(1%)	6	(0%)	\$6	(1%)
Arc or spark from operating equipment	500	(1%)	3	(1%)	11	(1%)	\$6	(1%)
Flammable liquid or gas spilled	490	(1%)	17	(3%)	60	(4%)	\$25	(3%)
Short circuit arc from defective or worn insulation	470	(1%)	5	(1%)	11	(1%)	\$7	(1%)
Unclassified natural condition	460	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Equipment overloaded	440	(1%)	0	(0%)	7	(0%)	\$6	(1%)
Improper container or storage	390	(1%)	4	(1%)	12	(1%)	\$10	(1%)

**Table 1.3. Home Heating Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

<b>Factor</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Other known factor	2,650	(4%)	19	(3%)*	106	(7%)	\$44	(5%)
Total fires	64,130	(100%)	564	(100%)	1,614	(100%)	\$904	(100%)
Total factor entries	69,390	(108%)	633	(112%)	1,784	(111%)	\$1,035	(114%)

\* Leading factor not shown is collision, knockdown, or overturn (5% of deaths).

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 1.4. Home Heating Fires, by Human Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

<b>Human Factor</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Unattended or unsupervised person	2,730	(4%)	29	(5%)	140	(9%)	\$56	(6%)
Asleep	1,620	(3%)	171	(30%)	208	(13%)	\$63	(7%)
Age was a factor	600	(1%)	52	(9%)	77	(5%)	\$15	(2%)
Possibly impaired by alcohol or drugs	300	(0%)	44	(8%)	56	(3%)	\$9	(1%)
Multiple persons involved	290	(0%)	40	(7%)	44	(3%)	\$5	(1%)
Physically disabled	140	(0%)	36	(6%)	16	(1%)	\$5	(1%)
Possibly mentally disabled	140	(0%)	5	(1%)	9	(1%)	\$3	(0%)
No human factor	58,860	(92%)	307	(54%)	1,173	(73%)	\$767	(85%)
<b>Total fires</b>	<b>64,130</b>	<b>(100%)</b>	<b>564</b>	<b>(100%)</b>	<b>1,614</b>	<b>(100%)</b>	<b>\$904</b>	<b>(100%)</b>
<b>Total factor entries</b>	<b>64,690</b>	<b>(101%)</b>	<b>684</b>	<b>(121%)</b>	<b>1,722</b>	<b>(107%)</b>	<b>\$923</b>	<b>(102%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 human factor contributing to ignition listed as unknown, blank or not reported 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 1.5. Home Heating Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified item	10,480	(16%)	17	(3%)	65	(4%)	\$35	(4%)
Flammable or combustible gas or liquid	9,800	(15%)	72	(13%)	320	(20%)	\$72	(8%)
Structural member or framing	5,080	(8%)	56	(10%)	92	(6%)	\$228	(25%)
Unclassified organic material	4,060	(6%)	7	(1%)	3	(0%)	\$6	(1%)
Wire or cable insulation	3,930	(6%)	11	(2%)	61	(4%)	\$22	(2%)
Film or residue, including creosote	3,760	(6%)	0	(0%)	7	(0%)	\$2	(0%)
Cooking materials	3,050	(5%)	10	(2%)	295	(18%)	\$49	(5%)
Pipe, duct, conduit or hose	1,810	(3%)	0	(0%)	5	(0%)	\$4	(0%)
Appliance housing or casing	1,610	(3%)	4	(1%)	31	(2%)	\$11	(1%)
Trash or waste	1,570	(2%)	3	(1%)	11	(1%)	\$3	(0%)
Interior wall covering	1,470	(2%)	18	(3%)	49	(3%)	\$59	(7%)
Unclassified structural component or finish	1,270	(2%)	7	(1%)	19	(1%)	\$54	(6%)
Clothing	1,250	(2%)	49	(9%)	94	(6%)	\$30	(3%)
Dust, fiber, or lint	1,210	(2%)	0	(0%)	4	(0%)	\$4	(0%)
Floor covering	1,200	(2%)	53	(9%)	58	(4%)	\$40	(4%)
Heavy vegetation including trees	1,020	(2%)	0	(0%)	0	(0%)	\$1	(0%)
Papers	890	(1%)	21	(4%)	25	(2%)	\$10	(1%)
Insulation within structural area	870	(1%)	0	(0%)	24	(1%)	\$16	(2%)
Mattress or bedding	810	(1%)	96	(17%)	90	(6%)	\$32	(4%)
Exterior wall covering	770	(1%)	0	(0%)	13	(1%)	\$20	(2%)
Chips, including wood chips	770	(1%)	0	(0%)	2	(0%)	\$1	(0%)
Multiple items first ignited	750	(1%)	19	(3%)	36	(2%)	\$22	(2%)
Cabinetry	720	(1%)	0	(0%)	37	(2%)	\$33	(4%)
Box or bag	570	(1%)	0	(0%)	45	(3%)	\$19	(2%)
Upholstered furniture	560	(1%)	37	(7%)	46	(3%)	\$29	(3%)
Ceiling covering	510	(1%)	14	(3%)	12	(1%)	\$20	(2%)
Unclassified soft goods or clothing	470	(1%)	12	(2%)	33	(2%)	\$17	(2%)
Unclassified furniture or utensil	420	(1%)	17	(3%)	29	(2%)	\$16	(2%)
Household utensil	370	(1%)	0	(0%)	16	(1%)	\$3	(0%)
Pipe, duct, conduit, or hose covering	370	(1%)	0	(0%)	1	(0%)	\$2	(0%)
Light vegetation including grass	360	(1%)	3	(1%)	3	(0%)	\$3	(0%)
Other known item	2,350	(4%)	39	(7%)*	87	(5%)	\$41	(4%)
<b>Total fires</b>	<b>64,130</b>	<b>(100%)</b>	<b>564</b>	<b>(100%)</b>	<b>1,614</b>	<b>(100%)</b>	<b>\$904</b>	<b>(100%)</b>

\* Other leading items for deaths not shown above include curtain or drape (5% of deaths).

**Table 1.5. Home Heating Fires, by Item First Ignited  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 1.6. Home Heating Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Confined chimney or flue fire	23,090	(36%)	0	(0%)	35	(2%)	\$8	(1%)
Confined fuel burner or boiler fire	13,900	(22%)	1	(0%)	65	(4%)	\$3	(0%)
Kitchen	5,590	(9%)	62	(11%)	427	(26%)	\$97	(11%)
Heating equipment room or area	3,900	(6%)	24	(4%)	184	(11%)	\$90	(10%)
Living room, family room, or den	2,540	(4%)	188	(33%)	200	(12%)	\$111	(12%)
Bedroom	2,070	(3%)	140	(25%)	197	(12%)	\$83	(9%)
Wall assembly or concealed space	1,750	(3%)	3	(1%)	29	(2%)	\$77	(9%)
Crawl space or substructure space	1,170	(2%)	35	(6%)	54	(3%)	\$49	(5%)
Laundry room or area	1,110	(2%)	5	(1%)	74	(5%)	\$23	(3%)
Attic or other space above top story	1,100	(2%)	2	(0%)	17	(1%)	\$62	(7%)
Unclassified function area	1,100	(2%)	37	(7%)	71	(4%)	\$46	(5%)
Bathroom	810	(1%)	2	(0%)	51	(3%)	\$17	(2%)
Garage*	780	(1%)	0	(0%)	69	(4%)	\$57	(6%)
Duct for HVAC, cable, exhaust, heating or air conditioning	720	(1%)	3	(0%)	18	(1%)	\$18	(2%)
Closet	710	(1%)	2	(0%)	11	(1%)	\$11	(1%)
Ceiling/floor assembly or space between stories	570	(1%)	7	(1%)	8	(1%)	\$21	(2%)
Unclassified structural area	510	(1%)	15	(3%)	7	(0%)	\$30	(3%)
Exterior wall surface	360	(1%)	0	(0%)	6	(0%)	\$12	(1%)
Other known area	2,330	(4%)	37	(7%)	92	(6%)	\$89	(10%)
<b>Total fires</b>	<b>64,130</b>	<b>(100%)</b>	<b>564</b>	<b>(100%)</b>	<b>1,614</b>	<b>(100%)</b>	<b>\$904</b>	<b>(100%)</b>

\* Excludes dwelling garages coded as separate property.

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.

**Table 1.7. Home Heating Fire Deaths and Injuries, by Victim Location at Ignition and Major Equipment Group  
Percentage of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. Civilian Deaths**

<b>Victim Location at Ignition</b>	<b>All Heating Equipment</b>	<b>Central Heating</b>	<b>Water Heater</b>	<b>Space Heater</b>	<b>Fireplace, Chimney or Chimney Connector</b>
In area of origin and not involved	84 (15%)	5 (12%)	2 (7%)	78 (17%)	0 (0%)
Not in area of origin and not involved	164 (29%)	14 (33%)	8 (23%)	139 (31%)	3 (13%)
Not in area of origin but involved	150 (27%)	5 (13%)	5 (14%)	111 (25%)	23 (87%)
In area of origin and involved	164 (29%)	17 (42%)	21 (57%)	120 (27%)	0 (0%)
In area of origin	248 (44%)	22 (54%)	23 (63%)	198 (44%)	0 (0%)
Not in area of origin	315 (56%)	19 (46%)	13 (37%)	250 (56%)	26 (100%)
Involved in ignition	315 (56%)	19 (55%)	26 (70%)	231 (52%)	23 (87%)
Not involved in ignition	248 (44%)	23 (45%)	11 (30%)	217 (48%)	3 (13%)
Total	563 (100%)	42 (100%)	36 (100%)	448 (100%)	26 (100%)

**B. Civilian Injuries**

<b>Victim Location at Ignition</b>	<b>All Heating Equipment</b>	<b>Central Heating</b>	<b>Water Heater</b>	<b>Space Heater</b>	<b>Fireplace, Chimney or Chimney Connector</b>
In area of origin and not involved	408 (25%)	28 (25%)	60 (21%)	282 (27%)	29 (26%)
Not in area of origin and not involved	381 (24%)	31 (28%)	74 (26%)	235 (22%)	32 (28%)
Not in area of origin but involved	165 (10%)	11 (9%)	16 (5%)	129 (12%)	11 (10%)
In area of origin and involved	660 (41%)	42 (38%)	138 (48%)	415 (39%)	40 (36%)
In area of origin	1,068 (66%)	70 (62%)	198 (69%)	697 (66%)	69 (62%)
Not in area of origin	546 (34%)	42 (38%)	90 (31%)	364 (34%)	43 (38%)
Involved in ignition	825 (51%)	53 (47%)	154 (53%)	545 (51%)	51 (46%)
Not involved in ignition	789 (49%)	59 (53%)	134 (47%)	517 (49%)	60 (54%)
Total	1,614 (100%)	112 (100%)	287 (100%)	1,061 (100%)	112 (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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Home fire casualties involving indicated equipment with victim location unknown have been proportionally allocated. Totals may not equal sums because of rounding error. All home fireplace fire deaths had victim location unknown.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 1.8. Home Heating Fires, by Month and Major Equipment Group  
Percentage of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

	<b>All Heating Equipment</b>	<b>Central Heating</b>	<b>Water Heater</b>	<b>Space Heater</b>	<b>Fireplace, Chimney or Chimney Connector</b>
January	11,150 (17%)	1,570 (16%)	750 (11%)	3,370 (16%)	5,530 (23%)
February	9,580 (15%)	1,320 (13%)	560 (8%)	3,000 (15%)	4,120 (17%)
March	7,840 (12%)	1,200 (12%)	660 (9%)	2,420 (12%)	3,060 (13%)
April	4,080 (6%)	740 (7%)	520 (7%)	1,210 (6%)	1,570 (7%)
May	2,620 (4%)	470 (5%)	560 (8%)	930 (5%)	460 (2%)
June	1,940 (3%)	340 (3%)	620 (9%)	700 (3%)	160 (1%)
July	1,630 (3%)	270 (3%)	570 (8%)	590 (3%)	100 (0%)
August	1,490 (2%)	190 (2%)	580 (8%)	590 (3%)	80 (0%)
September	2,000 (3%)	350 (4%)	610 (9%)	690 (3%)	240 (1%)
October	4,820 (8%)	1,070 (11%)	580 (8%)	1,520 (7%)	1,350 (6%)
November	6,370 (10%)	1,070 (11%)	550 (8%)	2,180 (11%)	2,600 (11%)
December	10,620 (17%)	1,310 (13%)	530 (8%)	3,380 (16%)	4,450 (19%)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are estimated to the nearest ten.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 1.9. Estimated U.S. Non-Fire Deaths Due to Carbon Monoxide Poisoning, by Type of Heating Device**

<b>Heating Device</b>	<b>1980-1984 Average</b>	<b>1985-1989 Average</b>	<b>1990-1994 Average</b>	<b>1995-1999 Average</b>	<b>2000-2004 Average</b>
LP gas-fueled heating equipment	138	104	84	65	33
Natural gas-fueled heating equipment	64	61	50	47	36
Water heater (gas-fueled)	14	10	11	6	3
Liquid-fueled heating equipment	17	17	15	9	7
Solid-fueled heating equipment	14	5	17	6	4

<b>Heating Device</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2003-2007 Average</b>
LP gas-fueled heating equipment	28	28	44	24	33	24	21	30	26
Natural gas-fueled heating equipment	44	30	39	34	43	17	24	30	29
Water heater (gas-fueled)	3	0	1	7	2	6	4	3	4
Chimney for gas-fueled heating device	0	0	0	0	0	0	0	1	0
Liquid-fueled heating equipment	7	6	9	6	4	5	3	9	6
Solid-fueled heating equipment	2	5	4	2	4	7	0	0	3

Note: Data reanalyzed for 1990-1996 by CPSC in 1997; estimates prior to 1990 may not be comparable. Data reanalyzed for 2000 on by NFPA based on updated data published in 2011. Unspecified gas-fueled heating devices and unknown-type heating devices have been proportionally allocated.

Source: Matthew V. Hnatov, "Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products," U.S. Consumer Product Safety Commission, [www.cpsc.gov](http://www.cpsc.gov), January 2011, Table 1. Additional information from previous reports in this series.



## Section 2. Space Heaters

**In 2009, an estimated 18,200 reported home structure fires involving stationary or portable space heaters resulted in 400 civilian deaths, 1,100 civilian injuries, and \$513 million in direct property damage.**

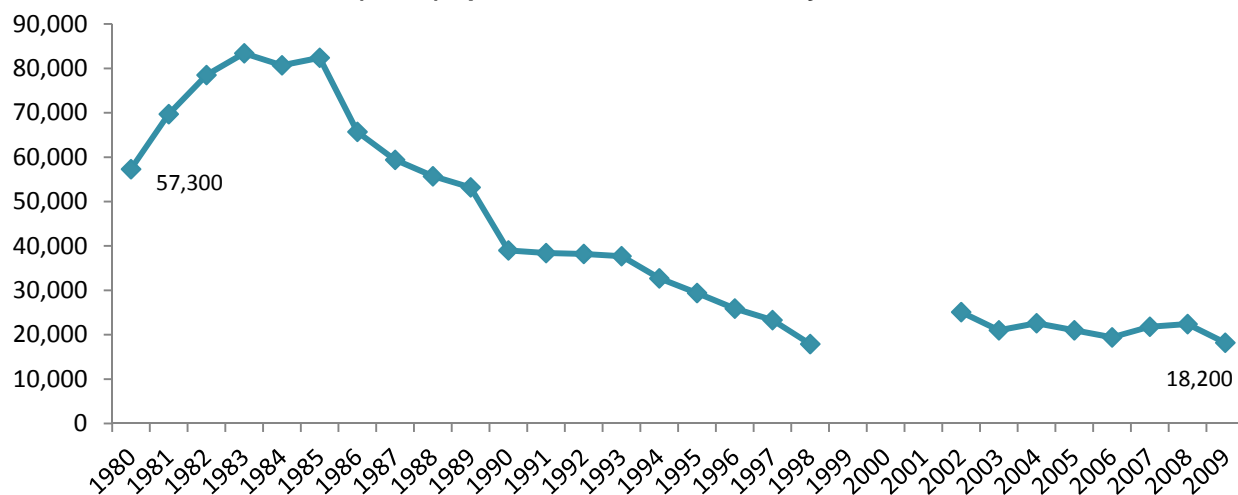
From 1980 to 2009, estimated fires declined by 68% but have shown no consistent trend up or down since 2003. (See Figure 2.1.) Civilian deaths decreased by 17% from 1980 to 2009. (See Table 2.1.) Civilian injuries decreased by 8% from 1980 to 2009. Direct property damage adjusted for inflation declined by 21% from 1980 to 2009.

Space heaters accounted for 32% of 2005-2009 reported home heating fires, 79% of home heating fire civilian deaths, 66% of home heating fire civilian injuries, and 52% of home heating fire direct property damage.

Space heaters can be portable or stationary (fixed) and can have any type of fuel or power. In this report, space heaters include the following NFIRS-defined types of equipment involved in ignition: (See Table 2.A):

- Heating stoves (such as wood stoves);
- Heaters (including portable kerosene heaters and portable electric heaters); oil-filled heaters and catalytic heaters can be distinguished, but because most reported home heater fires involve heaters other than oil-filled and catalytic, the three types of heaters are analyzed together everywhere else in this report;
- Local furnaces; and
- Fireplace inserts (which modify a decorative fireplace so that it can be safely used like a wood stove).

**Figure 2.1. Home Fires Involving Portable or Stationary (Fixed) Space Heaters, 1980-2009, by Year**



Note: See Table 2.1.

Source: Table 2.1.

**Table 2.A. Home Space Heater Fires, by Type of Device or Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
(Including Fires Reported as Confined Fires)**

**1. Type of Device**

<b>Device</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Heating stove	8,410	(41%)	161	(36%)	482	(45%)	\$155	(33%)
Heater (including catalytic and oil-filled)	5,960	(29%)	235	(53%)	434	(41%)	\$216	(46%)
Local furnace	3,870	(19%)	32	(7%)	91	(9%)	\$48	(10%)
Fireplace with insert	2,340	(11%)	19	(4%)	49	(5%)	\$48	(10%)
<b>Total</b>	<b>20,580</b>	<b>(100%)</b>	<b>448</b>	<b>(100%)</b>	<b>1,061</b>	<b>(100%)</b>	<b>\$467</b>	<b>(100%)</b>

**2. Type of Fuel or Power**

<b>Fuel or Power</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Electric-powered	9,670	(47%)	156	(35%)	683	(64%)	\$234	(50%)
<i>Stationary/fixed</i>	6,440	(31%)	35	(8%)	394	(37%)	\$118	(25%)
<i>Portable</i>	3,230	(16%)	121	(27%)	289	(27%)	\$115	(25%)
Solid-fueled	4,810	(23%)	141	(31%)	102	(10%)	\$101	(22%)
Gas-fueled	4,030	(20%)	104	(23%)	195	(18%)	\$104	(22%)
Liquid-fueled	2,060	(10%)	47	(10%)	81	(8%)	\$29	(6%)
<b>Total</b>	<b>20,580</b>	<b>(100%)</b>	<b>448</b>	<b>(100%)</b>	<b>1,061</b>	<b>(100%)</b>	<b>\$467</b>	<b>(100%)</b>

Note and Source: See Tables 2.2 and 2.3.

**Nearly half (47%) of home space heater fires in 2005-2009 involved electric-powered equipment.**

The electric space heater share is even larger for civilian injuries (64%) and direct property damage (50%) but not for civilian deaths (35%). (See Table 2.A and Tables 2.2 and 2.3.)

**Relative to central heating units, space heaters have a risk per million effective user households that is seven times higher for reported fires and 25-54 times higher for associated losses.**

Among space heating equipment, risks are highest for liquid-fueled devices for all four measures of loss. However, usage of liquid-fueled space heaters is so low that the rates for such devices can and do vary substantially, even for five-year averages. (See Tables 2.B and 2.C.) Portable electric devices have higher risk than fixed electric devices.

**Table 2.B. Comparative Risk of Central and Space Heating Equipment  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Space Heating</b>	<b>Central Heating</b>	<b>How Much Higher Is Space Heating Risk Than Central Heating Risk?</b>
Fires (per million user households)	826	120	7 times
Civilian deaths (per million user households)	18.0	0.3	54 times
Civilian injuries (per million user households)	42.6	1.4	31 times
Direct property damage (per user household)	\$18.8	\$0.8	25 times

Note: 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.

**Table 2.C. Comparative Risk of Space Heating Equipment  
For Different Types of Fuel or Power  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Electric-Powered</b>			<b>Liquid-Fueled (Kerosene or Fuel Oil)</b>	<b>Solid-Fueled (Wood or Coal)</b>	<b>Gas-Fueled (LP or Natural)</b>
	<b>Portable</b>	<b>Fixed</b>	<b>Combined</b>			
Fires (per million user household)	1,195	733	842	2,131	852	593
Civilian deaths (per million user households)	45	4	14	48	25	15
Civilian injuries (per million user households)	107	45	59	84	18	29
Direct property damage (per user household)	\$43	\$13	\$20	\$30	\$18	\$15

Note: 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.

**Two-fifths (41%) of home space heater fires involve devices coded as heating stoves.**

Heaters (including oil-filled or catalytic heaters) accounted for the largest share of associated civilian deaths (53%) and of direct property damage (46%). Heating stoves accounted for the largest share of civilian injuries (45%). (See Tables 2.2 and 2.3.)

*Heating stoves.* Half (51%) of home heating stove fires involved electric-powered equipment. Many electric-powered heating stoves are advertised for use in heating and cooking. Most fires involving heating stoves and cooking materials as item first ignited involved electric-powered devices and nearly all involved gas or electric units, which are the primary power types for cooking stoves but not for heating stoves. This suggests that a large share of the reported heating stove fires are a mix of stoves designed for heating or cooking and cooking stoves incorrectly reported as heating stoves.

Solid-fueled stoves accounted for 33% of home heating stove fires and 71% of associated deaths. The fuel is nearly always wood as opposed to coal.

Gas-fueled stoves accounted for 15% of home heating stove fires and 19% of associated deaths. The fuel is usually natural gas as opposed to LP-gas.

Liquid-fueled stoves accounted for 1% of home heating stove fires and 3% of associated deaths. Some of these fires may be miscoded portable kerosene heater fires, but there are too few of them for such miscodings to have much of an effect.

*Heaters.* Reported home fires starting with heaters, including oil-filled or catalytic heaters, break down as 65% electric-powered, 18% liquid-fueled (which nearly all involved kerosene, diesel fuel, or number 1 or 2 fuel oil), 16% gas-fueled (which involved both natural and LP-gas in significant shares of fires), and 1% solid-fueled.

Oil-filled heaters use oil as a heating medium but are actually electric-powered. However, reported home fires starting with oil-filled heaters are more often reported as liquid-fueled than electric-powered. This suggests that most reported oil-filled heaters are really miscoded liquid-fueled heaters. That possibility combined with the fact that very few fires are reported as catalytic heaters support the decision here to analyze fuel and power for all three heater types combined.

The rules for safe heating include emphasis on the importance of using the right grade of the right fuel for the device being used for heating. Gasoline should never be used to fuel a portable kerosene heater, but it should be noted that there are portable heaters available whose manufacturer's instructions permit use of some grades of gasoline.

*Local furnaces.* Reported home fires starting with local furnaces break down as 40% gas-fueled, 34% electric-powered, 24% liquid-fueled, and 2% solid-fueled. Among gas-fueled devices, fires involving natural-gas-fueled devices outnumbered fires involving LP-gas-fueled devices by about 3-to-2.

*Fireplaces with inserts.* Reported home fires starting with fireplaces with inserts break down as 82% solid-fueled (nearly always wood), 11% gas-fueled (usually natural gas rather than LP-gas), and 7% electric-powered.

**Nearly one-fourth (24%) of home space heater fires involve heat source too close to combustibles as a factor contributing to ignition.**

Table 2.D shows other leading factors, including failure to clean (12%), which is probably dominated by the creosote build-up in dirty chimneys supporting wood-fueled space heaters such as wood stoves and fireplaces with inserts.

Heat source too close to combustibles is also the leading factor contributing to ignition for associated deaths (58%), injuries (34%), and direct property damage (39%). (See Table 2.4, which includes breakdowns for fires and associated losses for all space heaters and for electric-powered, solid-fueled, gas-fueled, and liquid-fueled devices.)

**Table 2.D. Leading Factors Contributing to Ignition for Home Space Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	Percentage	Count	Percentage	Count	Percentage	Count	Percentage
Heat source too close to combustibles	4,850	(24%)	261	(58%)	359	(34%)	\$181	(39%)
Equipment unattended	2,810	(14%)	19	(4%)	232	(22%)	\$82	(18%)
Failure to clean	2,540	(12%)	15	(3%)	17	(2%)	\$14	(3%)
Unclassified mechanical failure or malfunction	2,260	(11%)	30	(7%)	60	(6%)	\$37	(8%)

Note and Source: See Table 2.4.

**The leading items first ignited in home space heater fires were cooking materials (15%) and flammable or combustible gas or liquid (12%).**

Table 2.E shows other leading items first ignited include unclassified item (8%) and structural member or framing (8%). The leading items first ignited for deaths from space heater fires were mattress or bedding (22% of deaths) and floor covering (13% of deaths). (See Table 2.5.)

Nearly all of the cooking material fires specifically involved heating stoves. These fires involve an unknown combination of heating stoves used for cooking, dual heating/cooking stoves used for cooking, and cooking stovetop fires miscoded under the only equipment code with “stove” in its name. A longer list of home space heater fires by item first ignited is shown in Table 2.5, which also includes breakdowns for electric-powered, solid-fueled, gas-fueled, and liquid-fueled devices.

**One-eighth (13%) of home space heater fires begin in a chimney or flue.**

The true share could be much higher, because NFIRS Version 5.0 has no code for chimney as an area of origin. Table 2.F shows that the leading area of origin as reported is kitchen (26%). Most home space heater fire deaths involve fires that began in the living room, family room, or den (40% of deaths and also 9% of fires) or bedroom (29% of deaths and also 9% of fires). A longer list of home space heater fires by area of origin is shown in

**Creosote and Chimney Fires**

Creosote is a sticky, oily combustible substance created when wood does not burn completely. It rises into the chimney as a liquid and deposits on the chimney wall. A fire starting in creosote can appropriately be reported as a fire with failure to clean as Factor Contributing to Ignition and film or residue as Item First Ignited. The former appears to be used more consistently in fire incident reports.

A conservative best estimate of creosote fires would combine failure-to-clean confined chimney or flue fires with failure-to-clean fires involving solid-fueled space heaters, fireplaces, chimneys and chimney connectors. **This produces 2005-2009 estimates of 14,190 reported creosote fires (22% of the total) per year with associated losses of four civilian deaths, 11 civilian injuries, and \$35 million in direct property damage per year in 2005-2009.**

Some analysts prefer the simplicity of estimating creosote fires by total confined chimney or flue fires – 23,100 fires, no deaths, 35 civilian injuries, and \$8 million in direct property damage per year.

Table 2.6, which includes breakdowns for electric-powered, solid-fueled, gas-fueled, and liquid-fueled devices.

**Table 2.E. Leading Items First Ignited for Home Space Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Cooking materials	3,010	(15%)	11	(2%)	303	(29%)	\$49	(11%)
Flammable or combustible gas or liquid	2,380	(12%)	23	(5%)	118	(11%)	\$22	(5%)
Unclassified item first ignited	1,740	(8%)	8	(2%)	32	(3%)	\$13	(3%)
Structural member or framing	1,660	(8%)	24	(5%)	46	(4%)	\$82	(18%)
Wire or cable insulation	900	(4%)	5	(1%)	30	(3%)	\$11	(2%)

Note and Source: See Table 2.5.

**Table 2.F. Leading Areas of Origin for Home Space Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Kitchen	5,310	(26%)	53	(12%)	410	(39%)	\$92	(20%)
Confined fuel burner or boiler fire	3,290	(16%)	0	(0%)	34	(3%)	\$1	(0%)
Confined chimney or flue fire	2,700	(13%)	0	(0%)	2	(0%)	\$1	(0%)
Bedroom	1,820	(9%)	129	(29%)	184	(17%)	\$74	(16%)
Living room, den, or family room	1,760	(9%)	179	(40%)	156	(15%)	\$74	(16%)

Note and Source: See Table 2.6.

**Space heaters accounted for 12,900 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.**

For specific devices, wood or coal stoves accounted for 6,900 injuries, electric baseboard heaters 1,750 injuries, other or unknown-type electric-powered heaters 1,390 injuries, other or unknown-type gas-fueled heaters 1,340 injuries, kerosene or oil heaters 1,210 injuries, portable electric heaters 1,080 injuries, portable natural or LP gas heaters 310 injuries, and floor furnaces 70 injuries.<sup>16</sup>

<sup>16</sup> All statistics from CPSC's National Electronic Injury Surveillance System, at [www.cpsc.gov](http://www.cpsc.gov).

## 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, wood/oil stoves, or other space heaters are being used. Use a sturdy metal screen around the appliance to prevent contact 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 stationary space 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 inside your home to provide early warning of carbon monoxide.
- Maintain heating equipment and chimneys by having them cleaned and inspected annually by a qualified professional.

### Portable electric space heaters

- Turn heaters off when you go to bed or leave the room.
- Use and purchase portable space heaters with an auto shut off so if they're tipped over they will shut off.
- Place space heater on solid, flat surface.
- Plug power cords directly into outlets and never into an extension cord.
- Inspect for cracked or damaged, broken plugs or loose connections. Replace before using.

### Fuel burning space heaters

- Always use the proper fuel as specified by the manufacturer.
- When refueling, allow the appliance to cool and refuel outside or in a well-ventilated area.
- When using the heater, open a window to ensure adequate venting.
- In portable kerosene or other liquid-fueled space heaters always use the proper grade of the proper fuel.
- All new unvented gas-fired space heaters have an oxygen depletion sensor that detects a reduced level of oxygen in the area where the heater is operating

and shuts off the heater before a hazardous level of carbon monoxide accumulates. If you have an older heater without this feature, replace it.

- If the pilot light of your gas heater goes out, allow 5 minutes or more for the gas to go away before trying again, do not allow gas to accumulate, and light the match before you turn on the gas to the pilot to avoid risk of flashback.
- If you smell gas in your gas heater, do not light the appliance. Leave the building immediately and call 9-1-1, the fire department or gas company.

### **Wood burning stoves**

- Install the stove, chimney connectors and chimneys following manufacturer's instructions or have a professional do the installation.
- Wood stoves, should bear the label of a professional testing laboratory.
- In wood stoves, burn only dry, seasoned wood. In pellet stoves, burn only dry, seasoned wood pellets.
- Start the fire with newspaper, kindling, or fire starter. Never use a flammable liquid, such as lighter fluid, kerosene or gasoline, to start a fire.
- Keep the doors of your wood stove closed unless loading or stoking the live fire.
- Allow ashes to cool before disposing. Dispose of ashes in a tightly covered metal container and keep the ash container at least 10 feet away from the home and any other nearby buildings. Douse and saturate with water. Chimneys and vents need to be cleaned and inspected at least once a year.

### *Additional safe behaviors for space heating.*

- Make sure your choice of heating equipment is permitted by law in your community. For example, kerosene heaters, chimineas, and firepits are not allowed in all communities.
- Select a space heater that is rated by the manufacturer for the size space you intend to heat.
- Check for product recalls at [www.cpsc.gov](http://www.cpsc.gov).
- Do not position electric-powered space heaters near water or where there is danger of water being spilled, to avoid serious risk of electric shock.
- For wood-fueled equipment, burn only wood that has been split, stacked, and allowed to dry for 12 months. Do not use green wood, trash, or any other combustibles that could burn unevenly, resulting in flare-ups, or burn incompletely, resulting in deposits of creosote, an oily, sticky, combustible byproduct of incomplete burning of wood. When adding wood to a working fire, wear only short, tight-fitting sleeves to reduce the risk of igniting your clothing if the fire flares up during the refueling.
- Do not use or store flammable or combustible liquids near or in rooms with heaters, in order to avoid a vapor ignition and possible flash fire.
- For wood-fueled equipment, the annual inspection needs to address potential build-up of creosote in heating equipment and associated chimneys and chimney connectors.

- 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 2.1. Home Fires Involving Portable or Stationary Space Heaters, by Year  
Structure Fires Reported to U.S. Fire Departments**

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property As Reported	Damage (in Millions) In 2009 Dollars
1980	57,300	480	1,190	\$249	\$649
1981	69,700	490	1,110	\$201	\$473
1982	78,500	650	1,410	\$352	\$783
1983	83,400	800	1,690	\$321	\$690
1984	80,700	550	1,270	\$307	\$633
1985	82,400	810	1,510	\$366	\$730
1986	65,700	570	1,250	\$279	\$547
1987	59,400	580	1,290	\$260	\$491
1988	55,700	680	1,590	\$330	\$599
1989	53,200	630	1,670	\$347	\$600
1990	39,000	520	1,170	\$272	\$448
1991	38,400	500	1,070	\$361*	\$569*
1992	38,200	400	1,260	\$312	\$477
1993	37,700	520	1,530	\$290	\$430
1994	32,700	450	1,050	\$317	\$459
1995	29,400	380	1,000	\$290	\$409
1996	25,900	540	1,010	\$348	\$476
1997	23,300	410	760	\$283	\$378
1998	17,900	320	790	\$247	\$326
1999	26,400 (19,500)	180 (180)	1,730 (1,730)	\$308 (\$306)	\$397 (\$394)
2000	26,800 (19,500)	490 (490)	1,250 (1,190)	\$430 (\$423)	\$536 (\$527)
2001	23,700 (16,700)	280 (280)	1,230 (1,180)	\$403 (\$400)	\$489 (\$485)
2002	25,100 (17,000)	590 (590)	1,140 (1,140)	\$854 (\$849)	\$1,018(\$1,012)
2003	21,000 (14,100)	400 (400)	1,010 (980)	\$432 (\$428)	\$503 (\$499)
2004	22,600 (14,200)	610 (610)	1,060 (1,030)	\$407 (\$404)	\$463 (\$458)
2005	21,000 (15,000)	530 (530)	1,020 (960)	\$509 (\$505)	\$559 (\$555)
2006	19,400 (14,000)	390 (390)	820 (800)	\$478 (\$477)	\$509 (\$508)
2007	21,800 (15,100)	490 (490)	1,180 (1,140)	\$330 (\$328)	\$341 (\$339)
2008	22,400 (15,900)	420 (420)	1,170 (1,120)	\$573 (\$572)	\$571 (\$569)
2009	18,200 (12,900)	400 (400)	1,100 (1,100)	\$513 (\$512)	\$513 (\$512)

\*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. 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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2009) and from NFPA survey.

**Table 2.2. Home Fires Involving Portable or Stationary Space Heaters,  
by Type of Device and Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
Percentages Shown by Type of Fuel or Power, for Each Type of Device**

**A. Fires**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	4,290	(44%)	3,890	(40%)	1,320	(14%)	170	(2%)	9,670	(100%)
Solid	2,790	(58%)	60	(1%)	70	(1%)	1,910	(40%)	4,810	(100%)
Gas	1,250	(31%)	960	(24%)	1,570	(39%)	260	(6%)	4,030	(100%)
Liquid	90	(4%)	1,050	(51%)	920	(45%)	0	(0%)	2,060	(100%)
Total	8,410	(41%)	5,960	(29%)	3,870	(19%)	2,340	(11%)	20,580	(100%)

**B. Civilian Deaths**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	10	(6%)	149	(94%)	0	(0%)	0	(0%)	156	(100%)
Solid	115	(83%)	5	(3%)	0	(0%)	19	(14%)	141	(100%)
Gas	31	(30%)	40	(39%)	32	(31%)	0	(0%)	104	(100%)
Liquid	6	(12%)	42	(88%)	0	(0%)	0	(0%)	47	(100%)
Total	161	(36%)	235	(53%)	32	(7%)	19	(4%)	448	(100%)

**C. Civilian Injuries**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	342	(50%)	311	(45%)	29	(4%)	3	(0%)	683	(100%)
Solid	58	(57%)	0	(0%)	1	(1%)	43	(42%)	102	(100%)
Gas	73	(39%)	65	(36%)	43	(23%)	3	(2%)	195	(100%)
Liquid	10	(13%)	58	(72%)	12	(15%)	0	(0%)	81	(100%)
Total	482	(45%)	434	(41%)	96	(9%)	49	(5%)	1,061	(100%)

**D. Direct Property Damage (in Millions)**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	\$64	(28%)	\$156	(67%)	\$9	(4%)	\$2	(1%)	\$234	(100%)
Solid	\$61	(59%)	\$2	(2%)	\$2	(2%)	\$38	(36%)	\$101	(100%)
Gas	\$27	(26%)	\$36	(35%)	\$33	(31%)	\$8	(8%)	\$104	(100%)
Liquid	\$3	(10%)	\$22	(76%)	\$4	(14%)	\$0	(0%)	\$29	(100%)
Total	\$155	(33%)	\$216	(46%)	\$48	(10%)	\$48	(10%)	\$467	(100%)

**Table 2.2. Home Fires Involving Portable or Stationary Space Heaters,  
by Type of Device and Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
Percentages Shown by Type of Fuel or Power, for Each Type of Device (Continued)**

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 unknown-type heating or air conditioning equipment. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home space heater fires with type of fuel or power unknown have also been allocated proportionally, and then fires have been allocated to specific types of space heaters. Fires by specific type of space heater include devices with known power source other than gas, liquid, solid or electric, and are calculated without the step of analysis by power type; for this reason, sums do not equal totals in column.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 2.3. Home Fires Involving Portable or Stationary Space Heaters,  
by Type of Fuel or Power and Type of Device  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
Percentages Shown by Type of Device, for Each Type of Fuel or Power**

**A. Fires**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	4,290	(51%)	3,890	(65%)	1,320	(34%)	170	(7%)	9,670	(47%)
Solid	2,790	(33%)	60	(1%)	70	(2%)	1,910	(82%)	4,810	(23%)
Gas	1,250	(15%)	960	(16%)	1,570	(40%)	260	(11%)	4,030	(20%)
Liquid	90	(1%)	1,050	(18%)	920	(24%)	0	(0%)	2,060	(10%)
All	8,410	(100%)	5,960	(100%)	3,870	(100%)	2,340	(100%)	20,580	(100%)

**B. Civilian Deaths**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	10	(6%)	149	(63%)	0	(0%)	0	(0%)	156	(35%)
Solid	115	(71%)	5	(2%)	0	(0%)	19	(100%)	141	(31%)
Gas	31	(19%)	40	(17%)	32	(100%)	0	(0%)	104	(23%)
Liquid	6	(3%)	42	(18%)	0	(0%)	0	(0%)	47	(10%)
All	161	(100%)	235	(100%)	32	(100%)	19	(100%)	448	(100%)

**C. Civilian Injuries**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	342	(71%)	311	(72%)	29	(30%)	3	(6%)	683	(64%)
Solid	58	(12%)	0	(0%)	1	(1%)	43	(87%)	102	(10%)
Gas	73	(15%)	65	(15%)	43	(44%)	3	(6%)	195	(18%)
Liquid	10	(2%)	58	(13%)	12	(13%)	0	(0%)	81	(8%)
All	482	(100%)	434	(100%)	96	(88%)	49	(100%)	1,061	(100%)

**D. Direct Property Damage (in Millions)**

Fuel or Power	Heating stove		Heater (including catalytic and oil-filled)		Local furnace		Fireplace with insert		All space heaters	
Electric	\$64	(41%)	\$156	(72%)	\$9	(19%)	\$2	(5%)	\$234	(50%)
Solid	\$61	(39%)	\$2	(1%)	\$2	(5%)	\$38	(79%)	\$101	(22%)
Gas	\$27	(17%)	\$36	(17%)	\$33	(68%)	\$8	(17%)	\$104	(22%)
Liquid	\$3	(2%)	\$22	(10%)	\$4	(8%)	\$0	(0%)	\$29	(6%)
All	\$155	(100%)	\$216	(100%)	\$48	(100%)	\$48	(100%)	\$467	(100%)

**Table 2.3. Home Fires Involving Portable or Stationary Space Heaters,  
by Type of Fuel or Power and Type of Device  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
Percentages Shown by Type of Device, for Each Type of Fuel or Power (Continued)**

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 unknown-type heating or air conditioning equipment. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Home space heater fires with type of fuel or power unknown have also been allocated proportionally, and then fires have been allocated to specific types of space heaters. Fires by specific type of space heater include devices with known power source other than gas, liquid, solid or electric, and are calculated without the step of analysis by power type; for this reason, sums do not equal totals in column.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Space Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	4,850	(24%)	261	(58%)	359	(34%)	\$181	(39%)
Equipment unattended	2,810	(14%)	19	(4%)	232	(22%)	\$82	(18%)
Failure to clean	2,540	(12%)	15	(3%)	17	(2%)	\$14	(3%)
Unclassified mechanical failure or malfunction	2,260	(11%)	30	(7%)	60	(6%)	\$37	(8%)
Unintentionally turned on or not turned off	820	(4%)	0	(0%)	52	(5%)	\$21	(4%)
Unclassified misuse of material or product	820	(4%)	14	(3%)	53	(5%)	\$14	(3%)
Unclassified electrical failure or malfunction	790	(4%)	21	(5%)	29	(3%)	\$20	(4%)
Installation deficiency	770	(4%)	7	(2%)	7	(1%)	\$22	(5%)
Unclassified factor	660	(3%)	12	(3%)	39	(4%)	\$20	(4%)
Abandoned or discarded material or product	650	(3%)	4	(1%)	37	(3%)	\$12	(3%)
Leak or break	510	(2%)	31	(7%)	33	(3%)	\$12	(3%)
Unspecified short circuit arc	490	(2%)	7	(2%)	21	(2%)	\$14	(3%)
Unclassified operational deficiency	430	(2%)	8	(2%)	17	(2%)	\$6	(1%)
Automatic control failure	390	(2%)	5	(1%)	6	(1%)	\$4	(1%)
Worn out	390	(2%)	4	(1%)	20	(2%)	\$5	(1%)
Backfire	370	(2%)	0	(0%)	10	(1%)	\$0	(0%)
Equipment not being operated properly	370	(2%)	4	(1%)	35	(3%)	\$13	(3%)
Flammable liquid or gas spilled	270	(1%)	4	(1%)	22	(2%)	\$7	(1%)
Improper fueling technique	250	(1%)	5	(1%)	17	(2%)	\$4	(1%)
Short circuit arc from defective or worn insulation	200	(1%)	5	(1%)	7	(1%)	\$4	(1%)
Unclassified design, manufacturing, or installation deficiency	190	(1%)	0	(0%)	8	(1%)	\$5	(1%)
Equipment overloaded	180	(1%)	0	(0%)	4	(0%)	\$4	(1%)
Improper startup	150	(1%)	3	(1%)	6	(1%)	\$3	(1%)
Construction deficiency	150	(1%)	4	(1%)	0	(0%)	\$7	(2%)
Design deficiency	140	(1%)	5	(1%)	6	(1%)	\$2	(0%)
Arc or spark from operating equipment	130	(1%)	3	(1%)	5	(1%)	\$3	(1%)
Unclassified fire spread or control factor	110	(1%)	4	(1%)	9	(1%)	\$2	(0%)
Equipment used for not intended purpose	110	(1%)	3	(1%)	0	(0%)	\$3	(1%)

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**A. All Space Heaters (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known factor	780	(4%)	19	(4%)	50	(5%)	\$19	(4%)
Total fires	20,580	(100%)	448	(100%)	1,061	(100%)	\$467	(100%)
Total factor entries	22,590	(110%)	495	(111%)	1,160	(109%)	\$540	(116%)

**B. Portable or Stationary Electric Space Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Heat source too close to combustibles	2,560	(26%)	108	(69%)	223	(33%)	\$93	(40%)
Equipment unattended	2,150	(22%)	11	(7%)	197	(29%)	\$54	(23%)
Unclassified mechanical failure or malfunction	750	(8%)	14	(9%)	38	(6%)	\$12	(5%)
Unclassified electrical failure or malfunction	680	(7%)	19	(12%)	27	(4%)	\$18	(8%)
Unintentionally turned on or not turned off	620	(6%)	0	(0%)	44	(6%)	\$15	(6%)
Abandoned or discarded material or product	490	(5%)	0	(0%)	31	(4%)	\$8	(3%)
Unspecified short circuit arc	460	(5%)	7	(4%)	19	(3%)	\$13	(6%)
Unclassified misuse of material or product	350	(4%)	0	(0%)	32	(5%)	\$7	(3%)
Unclassified factor	320	(3%)	0	(0%)	22	(3%)	\$5	(2%)
Failure to clean	280	(3%)	0	(0%)	2	(0%)	\$3	(1%)
Short circuit arc from defective or worn insulation	190	(2%)	4	(3%)	5	(1%)	\$4	(2%)
Equipment not being operated properly	170	(2%)	0	(0%)	33	(5%)	\$5	(2%)
Automatic control failure	140	(1%)	0	(0%)	2	(0%)	\$1	(1%)
Unclassified operational deficiency	140	(1%)	0	(0%)	11	(2%)	\$2	(1%)
Backfire	130	(1%)	0	(0%)	7	(1%)	\$0	(0%)
Flammable liquid or gas spilled	120	(1%)	0	(0%)	4	(1%)	\$3	(1%)
Worn out	110	(1%)	0	(0%)	4	(1%)	\$1	(0%)
Arc or spark from operating equipment	100	(1%)	0	(0%)	2	(0%)	\$2	(1%)
Equipment overloaded	90	(1%)	0	(0%)	4	(1%)	\$2	(1%)
Unclassified design, manufacturing or installation deficiency	70	(1%)	0	(0%)	2	(0%)	\$1	(0%)
Arc from faulty contact or broken conductor	70	(1%)	3	(2%)	2	(0%)	\$1	(1%)

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Portable or Stationary Electric Space Heaters (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Leak or break	60	(1%)	0	(0%)	6	(1%)	\$0	(0%)
Installation deficiency	60	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Short circuit arc from mechanical damage	50	(1%)	0	(0%)	7	(1%)	\$1	(1%)
Other known factor	390	(4%)	0	(0%)	21	(3%)	\$7	(3%)
Total fires	9,670	(100%)	156	(100%)	683	(100%)	\$234	(100%)
Total factor	10,540	(109%)	166	(106%)	745	(109%)	\$261	(112%)

**C. Wood Stoves, Fireplace Inserts, and Other Solid-Fueled Space Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Failure to clean	1,880	(39%)	4	(3%)	7	(7%)	\$11	(11%)
Heat source too close to combustibles	820	(17%)	63	(45%)	37	(36%)	\$33	(33%)
Installation deficiency	540	(11%)	4	(3%)	5	(5%)	\$18	(18%)
Unclassified mechanical failure or malfunction	230	(5%)	13	(9%)	3	(3%)	\$7	(7%)
Unclassified factor	200	(4%)	0	(0%)	4	(3%)	\$5	(5%)
Unclassified misuse of material or product	180	(4%)	16	(11%)	3	(3%)	\$2	(2%)
Equipment unattended	160	(3%)	9	(6%)	2	(2%)	\$9	(9%)
Unclassified operational deficiency	160	(3%)	9	(6%)	2	(2%)	\$4	(4%)
Leak or break	130	(3%)	0	(0%)	5	(5%)	\$4	(4%)
Equipment not being operated properly	120	(2%)	4	(3%)	2	(2%)	\$6	(6%)
Construction deficiency	120	(2%)	4	(3%)	0	(0%)	\$4	(4%)
Improper fueling technique	100	(2%)	0	(0%)	2	(2%)	\$1	(1%)
Design deficiency	100	(2%)	5	(4%)	6	(5%)	\$1	(1%)
Worn out	100	(2%)	0	(0%)	6	(6%)	\$4	(4%)
Unclassified design, manufacturing, or installation deficiency	80	(2%)	0	(0%)	2	(2%)	\$2	(2%)
Unclassified fire spread or control	70	(2%)	4	(3%)	2	(2%)	\$1	(1%)
Equipment overloaded	70	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Improper startup	40	(1%)	4	(3%)	0	(0%)	\$1	(1%)
Automatic control failure	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
High wind	30	(1%)	0	(0%)	2	(2%)	\$2	(2%)
Abandoned or discarded material or product	30	(1%)	4	(3%)	0	(0%)	\$1	(1%)

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Wood Stoves, Fireplace Inserts, and Other Solid-Fueled Space Heaters (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Flammable liquid used to kindle fire	20	(1%)	10	(7%)	11	(11%)	\$1	(1%)
Other known factor	160	(3%)	4	(3%)	4	(4%)	\$2	(2%)
Total fires	4,810	(100%)	141	(100%)	102	(100%)	\$101	(100%)
Total factor entries	5,380	(112%)	157	(112%)	102	(100%)	\$121	(120%)

**D. Gas-Fueled Space Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Heat source too close to combustibles	1,170	(29%)	58	(56%)	82	(42%)	\$44	(43%)
Unclassified mechanical failure or malfunction	620	(15%)	4	(4%)	4	(2%)	\$13	(12%)
Equipment unattended	390	(10%)	0	(0%)	30	(15%)	\$14	(14%)
Failure to clean	260	(6%)	11	(11%)	8	(4%)	\$1	(1%)
Leak or break	250	(6%)	27	(26%)	18	(9%)	\$6	(6%)
Unclassified misuse of material or product	220	(6%)	0	(0%)	12	(6%)	\$2	(2%)
Installation deficiency	180	(4%)	4	(4%)	2	(1%)	\$4	(4%)
Unintentionally turned on or not turned off	180	(4%)	0	(0%)	8	(4%)	\$5	(5%)
Worn out	130	(3%)	4	(4%)	11	(6%)	\$0	(0%)
Automatic control failure	120	(3%)	0	(0%)	4	(2%)	\$2	(2%)
Abandoned or discarded material or product	110	(3%)	0	(0%)	6	(3%)	\$2	(2%)
Unclassified factor	110	(3%)	12	(11%)	13	(7%)	\$9	(9%)
Unclassified operational deficiency	80	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Unclassified electrical failure or malfunction	70	(2%)	0	(0%)	0	(0%)	\$3	(3%)
Equipment not being operated properly	60	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Equipment used for not intended purpose	50	(1%)	3	(3%)	0	(0%)	\$1	(1%)
Flammable liquid or gas spilled	50	(1%)	0	(0%)	0	(0%)	\$2	(2%)
Unclassified design, manufacturing or installation deficiency	50	(1%)	0	(0%)	4	(2%)	\$2	(2%)
Improper startup	40	(1%)	0	(0%)	4	(2%)	\$2	(2%)

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Space Heaters (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Improper container or storage	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Construction deficiency	20	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Unclassified natural condition	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Playing with heat source	20	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Other known factor	200	(5%)	3	(3%)	10	(5%)	\$4	(4%)
Total fires	4,030	(100%)	104	(100%)	195	(100%)	\$104	(100%)
Total factors	4,460	(111%)	126	(121%)	219	(112%)	\$120	(116%)

**E. Liquid-Fueled Space Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	610	(30%)	0	(0%)	12	(14%)	\$3	(12%)
Heat source too close to combustibles	290	(14%)	25	(53%)	19	(23%)	\$12	(43%)
Backfire	270	(13%)	0	(0%)	0	(0%)	\$0	(0%)
Failure to clean	150	(7%)	0	(0%)	0	(0%)	\$0	(0%)
Automatic control failure	110	(5%)	7	(14%)	0	(0%)	\$0	(0%)
Improper fueling technique	110	(5%)	0	(0%)	10	(12%)	\$3	(12%)
Flammable liquid or gas spilled	100	(5%)	5	(11%)	19	(24%)	\$3	(9%)
Equipment unattended	80	(4%)	0	(0%)	2	(3%)	\$4	(16%)
Leak or break	80	(4%)	5	(11%)	6	(7%)	\$1	(4%)
Unclassified operational deficiency	60	(3%)	0	(0%)	2	(2%)	\$0	(0%)
Worn out	60	(3%)	0	(0%)	2	(2%)	\$0	(1%)
Unclassified misuse of material or product	50	(3%)	0	(0%)	6	(7%)	\$2	(6%)
Improper startup	50	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified factor	30	(2%)	0	(0%)	2	(2%)	\$0	(1%)
Equipment not being operated properly	30	(1%)	0	(0%)	0	(0%)	\$2	(7%)
Installation deficiency	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified electrical failure or malfunction	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper fuel used	10	(1%)	0	(0%)	2	(3%)	\$0	(1%)
Collision, knockdown or overturn	10	(1%)	5	(10%)	2	(3%)	\$0	(1%)

**Table 2.4. Home Space Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**E. Liquid-Fueled Space Heaters (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known factor	60	(3%)	0	(0%)	8	(9%)	\$3	(12%)
Total fires	2,060	(100%)	47	(100%)	81	(100%)	\$29	(100%)
Total factor entries	2,220	(107%)	47	(100%)	91	(112%)	\$36	(126%)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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. Home heating fires with type of heating equipment unknown are also allocated. Home solid-fueled space heater fires with 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 2.5. Home Space Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**  
**(Including Fires Reported as Confined to Chimney, Flue, Boiler or Fuel Burner)**

**A. All Space Heaters**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Cooking materials Flammable or combustible	3,010	(15%)	11	(2%)	303	(29%)	\$49	(11%)
gas or liquid	2,380	(12%)	23	(5%)	118	(11%)	\$22	(5%)
Unclassified item	1,740	(8%)	8	(2%)	32	(3%)	\$13	(3%)
Structural member or framing	1,660	(8%)	24	(5%)	46	(4%)	\$82	(18%)
Wire or cable insulation	900	(4%)	5	(1%)	30	(3%)	\$11	(2%)
Interior wall covering	770	(4%)	20	(4%)	25	(2%)	\$29	(6%)
Floor covering	740	(4%)	58	(13%)	42	(4%)	\$28	(6%)
Mattress or bedding	680	(3%)	100	(22%)	89	(8%)	\$28	(6%)
Appliance housing or casing	650	(3%)	4	(1%)	24	(2%)	\$7	(1%)
Clothing	610	(3%)	38	(9%)	53	(5%)	\$15	(3%)
Cabinetry	580	(3%)	0	(0%)	33	(3%)	\$31	(7%)
Unclassified organic material	530	(3%)	7	(2%)	0	(0%)	\$1	(0%)
Upholstered furniture	480	(2%)	40	(9%)	37	(3%)	\$26	(6%)
Film or residue, including creosote	430	(2%)	0	(0%)	3	(0%)	\$1	(0%)
Unclassified structural component or finish	390	(2%)	0	(0%)	14	(1%)	\$19	(4%)
Dust, fiber, or lint	390	(2%)	0	(0%)	2	(0%)	\$2	(0%)
Pipe, duct, conduit or hose	360	(2%)	0	(0%)	0	(0%)	\$1	(0%)
Trash or waste	350	(2%)	4	(1%)	3	(0%)	\$2	(1%)
Unclassified furniture or utensil	340	(2%)	18	(4%)	23	(2%)	\$12	(3%)
Papers	310	(2%)	19	(4%)	10	(1%)	\$6	(1%)
Box or bag	300	(1%)	0	(0%)	30	(3%)	\$7	(2%)
Household utensil	300	(1%)	0	(0%)	17	(2%)	\$2	(1%)
Exterior wall covering or finish	300	(1%)	0	(0%)	12	(1%)	\$11	(2%)
Multiple items first ignited	260	(1%)	18	(4%)	10	(1%)	\$10	(2%)
Insulation within structural area	250	(1%)	0	(0%)	10	(1%)	\$7	(2%)
Unclassified soft goods or clothing	220	(1%)	13	(3%)	23	(2%)	\$10	(2%)
Ceiling covering	220	(1%)	0	(0%)	4	(0%)	\$9	(2%)
Linen other than bedding	210	(1%)	0	(0%)	15	(1%)	\$3	(1%)
Curtain or drape	170	(1%)	26	(6%)	17	(2%)	\$6	(1%)
Heavy vegetation including trees	130	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified liquid, piping, or filter	120	(1%)	7	(2%)	10	(1%)	\$0	(0%)
Chips, including wood chips	120	(1%)	0	(0%)	2	(0%)	\$0	(0%)
Other known item	660	(3%)	5	(1%)	25	(2%)	\$12	(2%)
<b>Total fires</b>	<b>20,580</b>	<b>(100%)</b>	<b>448</b>	<b>(100%)</b>	<b>1,061</b>	<b>(100%)</b>	<b>\$467</b>	<b>(100%)</b>

**Table 2.5. Home Space Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Portable or Electric Space Heaters**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Cooking materials	2,600	(27%)	6	(4%)	257	(38%)	\$41	(18%)
Wire or cable insulation	760	(8%)	4	(3%)	31	(4%)	\$9	(4%)
Flammable or combustible gas or liquid	610	(6%)	0	(0%)	20	(3%)	\$4	(2%)
Mattress or bedding	590	(6%)	71	(46%)	81	(12%)	\$26	(11%)
Cabinetry	450	(5%)	0	(0%)	21	(3%)	\$26	(11%)
Clothing	430	(4%)	3	(2%)	27	(4%)	\$12	(5%)
Appliance housing or casing	390	(4%)	3	(2%)	23	(3%)	\$5	(2%)
Unclassified item	380	(4%)	0	(0%)	9	(1%)	\$6	(3%)
Floor covering	350	(4%)	18	(11%)	9	(1%)	\$11	(5%)
Structural member or framing	320	(3%)	0	(0%)	14	(2%)	\$15	(6%)
Upholstered furniture	310	(3%)	28	(18%)	25	(4%)	\$17	(7%)
Interior wall covering	280	(3%)	3	(2%)	14	(2%)	\$11	(5%)
Unclassified furniture or utensil	210	(2%)	0	(0%)	22	(3%)	\$9	(4%)
Household utensil	200	(2%)	0	(0%)	14	(2%)	\$2	(1%)
Box or bag	190	(2%)	0	(0%)	22	(3%)	\$4	(2%)
Unclassified soft goods or clothing	150	(2%)	3	(2%)	23	(3%)	\$6	(3%)
Dust, fiber, or lint	140	(1%)	0	(0%)	2	(0%)	\$1	(0%)
Linen other than bedding	130	(1%)	0	(0%)	12	(2%)	\$2	(1%)
Curtain or drape	120	(1%)	10	(6%)	14	(2%)	\$6	(3%)
Multiple items first ignited	120	(1%)	6	(4%)	3	(1%)	\$5	(2%)
Unclassified structural component or finish	110	(1%)	0	(0%)	5	(1%)	\$3	(1%)
Insulation within structural area	100	(1%)	0	(0%)	4	(1%)	\$1	(0%)
Papers	90	(1%)	0	(0%)	7	(1%)	\$2	(1%)
Unclassified organic material	80	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose	70	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Ceiling covering	60	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Other known item	430	(4%)	0	(0%)	24	(4%)	\$8	(3%)
<b>Total fires</b>	<b>9,670</b>	<b>(100%)</b>	<b>156</b>	<b>(100%)</b>	<b>683</b>	<b>(100%)</b>	<b>\$234</b>	<b>(100%)</b>

**Table 2.5. Home Space Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Wood Stoves, Fireplace Inserts, and Other Solid-Fueled Space Heaters**

Item First Ignited	Fires		Civilian		Civilian		Direct Property	
			Deaths	Injuries	Injuries	Damage (in Millions)		
Unclassified item	850	(18%)	0	(0%)	4	(4%)	\$4	(4%)
Structural member or framing	830	(17%)	12	(8%)	24	(24%)	\$39	(39%)
Unclassified organic material	440	(9%)	10	(7%)	0	(0%)	\$1	(1%)
Film or residue, including creosote	360	(8%)	0	(0%)	0	(0%)	\$1	(1%)
Trash or waste	270	(6%)	5	(4%)	2	(2%)	\$1	(1%)
Interior wall covering	250	(5%)	12	(8%)	7	(7%)	\$10	(10%)
Pipe, duct, conduit or hose	210	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified structural component or finish	170	(3%)	0	(0%)	0	(0%)	\$8	(8%)
Exterior wall covering	160	(3%)	0	(0%)	5	(5%)	\$7	(7%)
Papers	140	(3%)	5	(4%)	2	(2%)	\$1	(1%)
Ceiling covering	120	(2%)	0	(0%)	4	(4%)	\$5	(5%)
Floor covering	120	(2%)	45	(32%)	22	(21%)	\$5	(5%)
Heavy vegetation including trees	120	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Dust, fiber, or lint	110	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Insulation within structural area	90	(2%)	0	(0%)	3	(3%)	\$2	(2%)
Chips	80	(2%)	0	(0%)	2	(2%)	\$0	(0%)
Flammable or combustible gas or liquid	60	(1%)	5	(4%)	8	(8%)	\$2	(2%)
Multiple items first ignited	50	(1%)	14	(10%)	4	(4%)	\$2	(2%)
Exterior roof covering	50	(1%)	0	(0%)	0	(0%)	\$3	(3%)
Upholstered furniture	40	(1%)	0	(0%)	2	(2%)	\$3	(3%)
Box or bag	40	(1%)	0	(0%)	2	(2%)	\$1	(1%)
Appliance housing or casing	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose covering	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known item	210	(4%)	33	(23%)*	12	(12%)	\$3	(3%)
<b>Total fires</b>	<b>4,810</b>	<b>(100%)</b>	<b>141</b>	<b>(100%)</b>	<b>102</b>	<b>(100%)</b>	<b>\$101</b>	<b>(100%)</b>

\* Leading items first ignited shown above include unclassified furniture or utensil (14% of deaths), mattress or bedding (5%), and clothing (5%).

**Table 2.5. Home Space Heater Fires, by Item First Ignited  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Space Heaters**

Item First Ignited	Fires		Civilian		Civilian		Direct Property	
			Deaths		Injuries		Damage (in Millions)	
Flammable or combustible gas or liquid	540	(13%)	7	(7%)	41	(21%)	\$8	(8%)
Structural member or framing	460	(12%)	15	(15%)	8	(4%)	\$25	(25%)
Cooking materials	400	(10%)	4	(4%)	33	(17%)	\$7	(7%)
Unclassified item	310	(8%)	4	(4%)	15	(8%)	\$2	(1%)
Appliance housing or casing	200	(5%)	0	(0%)	2	(1%)	\$2	(1%)
Interior wall covering	200	(5%)	8	(7%)	5	(3%)	\$6	(6%)
Floor covering	180	(5%)	4	(4%)	9	(4%)	\$6	(6%)
Clothing	150	(4%)	25	(24%)	21	(11%)	\$3	(3%)
Dust, fiber or lint	150	(4%)	0	(0%)	0	(0%)	\$1	(1%)
Cabinetry	110	(3%)	0	(0%)	12	(6%)	\$5	(5%)
Unclassified structural component or finish	110	(3%)	0	(0%)	9	(5%)	\$7	(7%)
Wire or cable insulation	100	(3%)	0	(0%)	0	(0%)	\$3	(3%)
Upholstered furniture	90	(2%)	4	(3%)	4	(2%)	\$5	(5%)
Box or bag	80	(2%)	0	(0%)	7	(3%)	\$2	(2%)
Mattress or bedding	80	(2%)	3	(3%)	5	(3%)	\$2	(2%)
Papers	80	(2%)	4	(4%)	2	(1%)	\$3	(3%)
Unclassified furniture or utensil	70	(2%)	4	(4%)	0	(0%)	\$1	(1%)
Multiple items first ignited	70	(2%)	0	(0%)	2	(1%)	\$2	(2%)
Linen other than bedding	70	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Unclassified soft goods or clothing	60	(1%)	5	(4%)	0	(0%)	\$3	(3%)
Exterior wall covering	50	(1%)	0	(0%)	3	(2%)	\$1	(1%)
Insulation within structural area	50	(1%)	0	(0%)	0	(0%)	\$3	(3%)
Household utensil	50	(1%)	0	(0%)	3	(2%)	\$0	(0%)
Toy or game	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Curtain or drape	40	(1%)	14	(13%)	2	(1%)	\$0	(0%)
Ceiling covering	30	(1%)	0	(0%)	0	(0%)	\$2	(2%)
Trash or waste	30	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Unclassified organic material	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Film or residue, including creosote	20	(1%)	0	(0%)	3	(2%)	\$0	(0%)
Pipe, duct, conduit or hose	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known item	170	(4%)	5	(4%)	6	(3%)	\$2	(2%)
<b>Total fires</b>	<b>4,030</b>	<b>(100%)</b>	<b>104</b>	<b>(100%)</b>	<b>195</b>	<b>(100%)</b>	<b>\$104</b>	<b>(100%)</b>

**Table 2.5. Home Space Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**E. Liquid-Fueled Space Heaters**

Item First Ignited	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Flammable or combustible				
gas or liquid	1,190 (58%)	15 (32%)	54 (66%)	\$9 (32%)
Unclassified item	170 (8%)	0 (0%)	0 (0%)	\$0 (1%)
Floor covering	100 (5%)	0 (0%)	4 (4%)	\$4 (14%)
Unclassified liquid, piping, or filter	80 (4%)	8 (18%)	2 (2%)	\$0 (1%)
Structural member or framing	60 (3%)	0 (0%)	0 (0%)	\$3 (10%)
Upholstered furniture	50 (2%)	0 (0%)	4 (5%)	\$2 (7%)
Interior wall covering	50 (2%)	0 (0%)	0 (0%)	\$1 (5%)
Unclassified furniture or utensil	40 (2%)	0 (0%)	0 (0%)	\$1 (3%)
Wire or cable insulation	40 (2%)	0 (0%)	0 (0%)	\$0 (0%)
Exterior wall covering	30 (2%)	0 (0%)	4 (4%)	\$1 (5%)
Clothing	20 (1%)	5 (10%)	2 (2%)	\$0 (2%)
Appliance housing or casing	20 (1%)	0 (0%)	0 (0%)	\$0 (0%)
Multiple items first ignited	20 (1%)	0 (0%)	2 (2%)	\$2 (5%)
Mattress or bedding	20 (1%)	5 (10%)	2 (2%)	\$0 (1%)
Insulation within structural area	20 (1%)	0 (0%)	4 (4%)	\$1 (4%)
Trash or waste	10 (1%)	0 (0%)	0 (0%)	\$0 (1%)
Drive belt	10 (1%)	0 (0%)	0 (0%)	\$0 (0%)
Film or residue, including creosote	10 (1%)	0 (0%)	0 (0%)	\$0 (0%)
Pipe, duct, conduit or hose	10 (1%)	0 (0%)	0 (0%)	\$0 (0%)
Cabinetry	10 (1%)	0 (0%)	0 (0%)	\$1 (2%)
Ceiling covering	10 (1%)	0 (0%)	0 (0%)	\$0 (1%)
Other known item	80 (4%)	14 (30%)	6 (7%)	\$2 (7%)
<b>Total fires</b>	<b>2,060 (100%)</b>	<b>47 (100%)</b>	<b>81 (100%)</b>	<b>\$29 (100%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 2.6. Home Space Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Space Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	5,310	(26%)	53	(12%)	410	(39%)	\$92	(20%)
Confined fuel burner or boiler fire	3,290	(16%)	0	(0%)	34	(3%)	\$1	(0%)
Confined chimney or flue fire	2,700	(13%)	0	(0%)	2	(0%)	\$1	(0%)
Bedroom	1,820	(9%)	129	(29%)	184	(17%)	\$74	(16%)
Living room, family room, or den	1,760	(9%)	179	(40%)	156	(15%)	\$74	(16%)
Unclassified function area	750	(4%)	37	(8%)	63	(6%)	\$33	(7%)
Wall assembly or concealed space	680	(3%)	3	(1%)	16	(2%)	\$33	(7%)
Bathroom	590	(3%)	2	(1%)	36	(3%)	\$13	(3%)
Heating equipment room or area	580	(3%)	2	(1%)	19	(2%)	\$15	(3%)
Crawl space or substructure space	440	(2%)	15	(3%)	27	(3%)	\$22	(5%)
Garage*	340	(2%)	0	(0%)	40	(4%)	\$26	(6%)
Attic or other space above top story	290	(1%)	0	(0%)	7	(1%)	\$15	(3%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	250	(1%)	0	(0%)	11	(1%)	\$7	(2%)
Ceiling/floor assembly or space between stories	230	(1%)	2	(0%)	4	(0%)	\$6	(1%)
Unclassified structural area	220	(1%)	14	(3%)	3	(0%)	\$11	(2%)
Exterior wall surface	150	(1%)	0	(0%)	4	(0%)	\$4	(1%)
Laundry room or area	150	(1%)	0	(0%)	0	(0%)	\$5	(1%)
Unclassified area	150	(1%)	5	(1%)	3	(0%)	\$4	(1%)
Other known area	860	(4%)	5	(1%)	41	(4%)	\$33	(7%)
Total fires	20,580	(100%)	448	(100%)	1,061	(100%)	\$467	(100%)

\* Excludes dwelling garages coded as separate property.

**B. Portable or Stationary Electric Space Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	4,020	(42%)	15	(9%)	327	(48%)	\$65	(28%)
Bedroom	1,560	(16%)	79	(51%)	164	(24%)	\$60	(26%)

**Table 2.6. Home Space Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Portable or Stationary Electric Space Heaters (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	990	(10%)	0	(0%)	19	(3%)	\$0	(0%)
Living room, family room, or den	690	(7%)	45	(29%)	64	(9%)	\$26	(11%)
Bathroom	510	(5%)	0	(0%)	27	(4%)	\$10	(4%)
Unclassified function area	290	(3%)	5	(3%)	25	(4%)	\$12	(5%)
Heating equipment room or area	200	(2%)	0	(0%)	10	(2%)	\$5	(2%)
Wall assembly or concealed space	170	(2%)	0	(0%)	5	(1%)	\$17	(7%)
Confined chimney or flue fire	170	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Crawl space or substructure space	110	(1%)	2	(2%)	7	(1%)	\$4	(2%)
Garage*	110	(1%)	0	(0%)	10	(1%)	\$9	(4%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	100	(1%)	0	(0%)	2	(0%)	\$2	(1%)
Laundry room or area	90	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Unclassified structural area	80	(1%)	5	(3%)	0	(0%)	\$5	(2%)
Attic or other space above top story	80	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Ceiling/floor assembly or space between stories	60	(1%)	0	(0%)	3	(0%)	\$2	(1%)
Unclassified area	50	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Other known area	370	(4%)	5	(3%)	19	(3%)	\$12	(5%)
<b>Total fires</b>	<b>9,670</b>	<b>(100%)</b>	<b>156</b>	<b>(100%)</b>	<b>683</b>	<b>(100%)</b>	<b>\$234</b>	<b>(100%)</b>

\* Excludes dwelling garages coded as separate property.

**C. Wood Stoves, Fireplace Inserts, and Other Solid-Fueled Space Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined chimney or flue fire	2,370	(49%)	0	(0%)	2	(2%)	\$1	(1%)
Living room, family room, or den	450	(9%)	83	(59%)	32	(32%)	\$23	(22%)
Wall assembly or concealed space	360	(7%)	3	(2%)	9	(9%)	\$12	(12%)

**Table 2.6. Home Space Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Wood Stoves, Fireplace Inserts, and Other Solid-Fueled Space Heaters (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	260	(5%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified function area	190	(4%)	22	(16%)	10	(10%)	\$9	(9%)
Attic or other space above top story	180	(4%)	0	(0%)	7	(7%)	\$9	(9%)
Heating equipment room or area	110	(2%)	3	(2%)	0	(0%)	\$5	(5%)
Ceiling/floor assembly or space between stories	100	(2%)	0	(0%)	0	(0%)	\$3	(3%)
Garage*	100	(2%)	0	(0%)	3	(3%)	\$6	(6%)
Crawl space or substructure space	90	(2%)	3	(2%)	12	(11%)	\$8	(8%)
Kitchen	90	(2%)	13	(9%)	4	(4%)	\$3	(3%)
Unclassified structural area	90	(2%)	0	(0%)	1	(1%)	\$3	(3%)
Exterior wall surface	60	(1%)	0	(0%)	2	(2%)	\$3	(3%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	60	(1%)	0	(0%)	5	(5%)	\$3	(3%)
Unclassified area	40	(1%)	0	(0%)	2	(2%)	\$2	(2%)
Exterior roof surface	40	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Bedroom	30	(1%)	13	(10%)	6	(6%)	\$3	(3%)
Other known area	190	(4%)	0	(0%)	7	(7%)	\$7	(7%)
<b>Total fires</b>	<b>4,810</b>	<b>(100%)</b>	<b>141</b>	<b>(100%)</b>	<b>102</b>	<b>(100%)</b>	<b>\$101</b>	<b>(100%)</b>

\* Excludes dwelling garages coded as separate property.

**D. Gas-Fueled Space Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	1,060	(26%)	24	(23%)	64	(33%)	\$21	(20%)
Confined fuel burner or boiler fire	770	(19%)	0	(0%)	11	(6%)	\$0	(0%)
Living room, family room, or den	480	(12%)	30	(29%)	44	(23%)	\$19	(18%)
Heating equipment room or area	190	(5%)	0	(0%)	2	(1%)	\$4	(4%)
Bedroom	190	(5%)	20	(19%)	12	(6%)	\$11	(10%)
Unclassified function area	190	(5%)	8	(8%)	19	(10%)	\$6	(6%)
Crawl space or substructure space	150	(4%)	10	(10%)	4	(2%)	\$6	(6%)
Wall assembly or concealed space	150	(4%)	0	(0%)	3	(2%)	\$4	(4%)
Confined chimney or flue fire	150	(4%)	0	(0%)	0	(0%)	\$0	(0%)

**Table 2.6. Home Space Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Space Heaters (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Garage*	90	(2%)	0	(0%)	17	(9%)	\$8	(8%)
Bathroom	80	(2%)	2	(2%)	9	(5%)	\$3	(3%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	70	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Ceiling/floor assembly or space between stories	60	(2%)	2	(2%)	0	(0%)	\$1	(1%)
Hallway or corridor	50	(1%)	0	(0%)	0	(0%)	\$5	(5%)
Laundry room or area	40	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Unclassified structural area	40	(1%)	3	(2%)	1	(1%)	\$2	(2%)
Unclassified area	30	(1%)	5	(5%)	2	(1%)	\$0	(0%)
Attic or ceiling/roof assembly or concealed space	30	(1%)	0	(0%)	0	(0%)	\$4	(4%)
Exterior wall surface	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Lobby or entranceway	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known area	170	(4%)	0	(0%)	5	(2%)	\$5	(5%)
Total fires	4,030	(100%)	104	(100%)	195	(100%)	\$104	(100%)

\* Excludes dwelling garages coded as separate property.

**E. Liquid-Fueled Space Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	1,270	(62%)	0	(0%)	4	(5%)	\$0	(0%)
Living room, family room, or den	160	(8%)	25	(54%)	17	(21%)	\$7	(25%)
Unclassified function area	90	(4%)	0	(0%)	9	(11%)	\$2	(8%)
Heating equipment room	80	(4%)	0	(0%)	8	(10%)	\$2	(6%)
Crawl space or substructure space	80	(4%)	0	(0%)	3	(4%)	\$4	(13%)
Bedroom	70	(3%)	10	(22%)	4	(5%)	\$1	(5%)
Kitchen	60	(3%)	3	(6%)	9	(11%)	\$2	(7%)
Garage*	60	(3%)	0	(0%)	11	(13%)	\$3	(11%)
Exterior wall surface	20	(1%)	0	(0%)	1	(2%)	\$0	(1%)
Unclassified area	20	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	10	(1%)	0	(0%)	1	(2%)	\$1	(3%)
Ceiling/floor assembly or space between stories	10	(1%)	0	(0%)	1	(2%)	\$0	(1%)
Confined chimney or flue fire	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Hallway or corridor	10	(1%)	0	(0%)	3	(4%)	\$0	(0%)
Unclassified structural area	10	(1%)	8	(18%)	0	(0%)	\$1	(3%)

**Table 2.6. Home Space Heater Fires, by Area of Origin  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**E. Liquid-Fueled Space Heaters (Continued)**

Area of Origin	Fires		Civilian		Civilian		Direct Property	
			Deaths	Injuries	Injuries	Damage (in Millions)		
Other known area	100	(5%)	0	(0%)	9	(11%)	\$4	(15%)
Total fires	2,060	(100%)	47	(100%)	81	(100%)	\$29	(100%)

\* Excludes dwelling garages coded as separate property.

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.

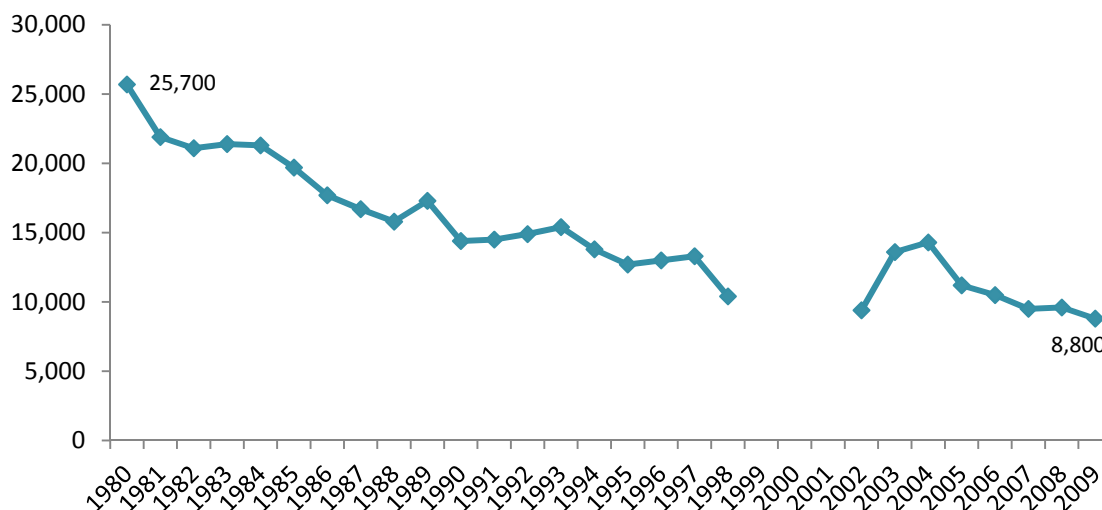
## Section 3. Central Heating Units

**In 2009, an estimated 8,800 reported home structure fires involving central heating units resulted in 30 civilian deaths, 120 civilian injuries and \$93 million in direct property damage.**

The number of fires declined sharply from 1980 to 1998. (See Figure 3.1.) Since 2004, there has been a new downward trend. (See Table 3.1.)

Central heating units accounted for 15% of 2005-2009 home heating fires, 8% of home heating fire civilian deaths, 7% of reported home heating fire civilian injuries, and 7% of reported home heating fire direct property damage.

**Figure 3.1. Home Fires Involving Furnaces, Boilers, or Other Central Heating Units, 1980-2009, by Year**



Note and Source: See Table 3.1.

**Of the 2005-2009 central heating unit fires, 36% involved electric-powered equipment, 34% liquid-fueled equipment, 29% gas-fueled equipment, and 2% solid-fueled equipment.**

For gas-fueled equipment fires, most involved natural gas rather than LP-gas. For solid-fueled equipment fires, which were comparatively few, most involved wood rather than coal. (See Table 3.A.)

**Table 3.A. Home Central Heating Equipment Fires, by Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments  
(Including Fires Reporting as Confined Fires)**

<b>Fuel or Power</b>	<b>Fires</b>	<b>Civilian Deaths</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions)</b>
Electric-powered	3,560 (36%)	3 (7%)	26 (24%)	\$18 (27%)
Liquid-fueled	3,320 (34%)	5 (12%)	13 (12%)	\$6 (10%)
Gas-fueled	2,850 (29%)	19 (45%)	72 (64%)	\$38 (58%)
Solid-fueled	160 (2%)	14 (34%)	0 (0%)	\$3 (5%)
<b>Total</b>	<b>9,900 (100%)</b>	<b>42 (100%)</b>	<b>112 (100%)</b>	<b>\$65 (100%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.

**Relative to central heating units, space heaters have a risk per million user households that is seven times as high for reported fires, 54 times as high for civilian deaths, 31 times as high for civilian injuries, and 25 times as high for direct damage.**

See Table 3.B.

**Table 3.B. Comparative Risk of Central and Space Heating Equipment  
Based on Average 2005 and 2009 Usage Estimate and Average 2005-2009 Reported Fires**

<b>Risk Measure</b>	<b>Space Heating</b>	<b>Central Heating</b>	<b>How Much Higher Is Space Heating Risk Than Central Heating Risk?</b>
Fires (per million user households)	826	120	7 times
Civilian deaths (per million user households)	18.0	0.3	54 times
Civilian injuries (per million user households)	42.6	1.4	31 times
Direct property damage (per user household)	\$18.8	\$0.8	25 times

Note: 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.

**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, liquid-fueled units show a higher rate of civilian fire deaths per user household. However, low usage of this equipment means that this rate is highly variable year-to-year. In 2005-2009, liquid-fueled equipment had the lowest rate.
- Liquid-fueled units also have the highest risk of fires and civilian injuries.
- Electric powered units have the highest risk of direct property damage.

**Table 3C. Comparative Risk of Central Heating Equipment for Different Types of Fuel or Power**  
Based on Average of 2005 and 2009 Usage Estimates and Average 2005-2009 Reported Fires

Risk Measure	Liquid-Fueled (Fuel Oil)	Electric-Powered	Gas Fueled
Fires (per million user household)	468	201	51
Civilian deaths (per million user households)	0.7	0.2	0.3
Civilian injuries (per million user households)	1.9	1.5	1.3
Direct property damage (per user household)	\$0.9	\$1.0	\$0.7

Note: 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 (15%) of all home central heating fires.**

Unclassified mechanical failure or malfunction was reported in 32% of all home central heating fires. (See Table 3.D.) See Table 3.2 for a longer list of leading factors contributing to ignition, including breakdowns for electric-powered, liquid-fueled, and gas-fueled units.

**Table 3.D. Leading Factors Contributing to Ignition for Home Central Heating Fires**  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments

Factor	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Unclassified mechanical failure or malfunction	3,150 (32%)	0 (0%)	19 (17%)	\$22 (34%)
Automatic control failure	1,480 (15%)	0 (0%)	6 (5%)	\$5 (8%)
Failure to clean	830 (8%)	0 (0%)	2 (2%)	\$1 (2%)
Backfire	770 (8%)	0 (0%)	0 (0%)	\$0 (0%)
Heat source too close to combustibles	550 (6%)	7 (17%)	26 (24%)	\$10 (16%)

Note and Source: See Table 3.2.

**Half (50%) 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.)

**Table 3.E. Leading Items First Ignited for Home Central Heating Fires  
Annual Average of 2005-2009 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	4,910 (50%)	12 (28%)	42 (38%)	\$9 (14%)
Wire or cable insulation	1,220 (12%)	5 (13%)	7 (6%)	\$4 (6%)
Unclassified item	1,130 (11%)	7 (17%)	5 (5%)	\$8 (12%)
Structural member or framing	390 (4%)	14 (34%)	5 (4%)	\$18 (28%)
Dust, fiber or lint	320 (3%)	0 (0%)	2 (1%)	\$2 (3%)

Note and Source: See Table 3.3.

Flammable or combustible liquid or gas accounted for a large share of central heating fires for all types of fuel or power but especially for liquid-fueled equipment (79% for liquid-fueled units, 47% for electric-powered units, and 20% for gas-fueled units). One-third (34%) of all associated deaths resulted from fires that began with ignition of structural member or framing. A longer list of leading items first ignited is shown in Table 3.3, which also includes breakdowns for gas-fueled, liquid-fueled, and electric-powered units.

**Nearly all home central heating fires either were confined to a fuel burner or boiler, presumably the central heating unit (73%), or began in a designated heating equipment room or area (12%).**

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 includes breakdowns for all central heating units and for gas-fueled, liquid-fueled, and electric-powered units.

**Table 3.F. Leading Areas of Origin for Home Central Heating Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Confined fuel burner or boiler fire	7,270 (73%)	1 (2%)	14 (12%)	\$2 (4%)
Heating equipment room or area	1,170 (12%)	18 (42%)	61 (55%)	\$23 (36%)
Duct for HVAC, cable, exhaust, heating or air conditioning	310 (3%)	3 (8%)	4 (4%)	\$6 (9%)
Confined chimney or flue fire	220 (2%)	0 (0%)	0 (0%)	\$0 (0%)
Crawl space or substructure space	170 (2%)	3 (7%)	7 (6%)	\$4 (7%)

Note and Source: See Table 3.4.

## **Central heating units accounted for 7,750 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.**

For specific equipment, furnaces with unknown fuel or power accounted for 3,930 injuries, oil-fueled furnaces 1,390 injuries, boilers 1,290 injuries, gas-fueled furnaces 1,070 injuries, coal-fueled furnaces 70 injuries, and electric-powered furnaces no injuries.<sup>17</sup> Another 8,980 injuries were associated with ductwork for heating or cooling.

### **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, wood/oil stoves or other space heaters are being used. Use a sturdy metal screen around the appliance to prevent contact 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 inside your home to provide early warning of carbon monoxide.
- Maintain heating equipment by having them cleaned and inspected annually by a qualified professional.

#### **Central heating**

- Furnaces and boilers 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.

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<sup>17</sup> All statistics from CPSC's National Electronic Injury Surveillance System, at [www.cpsc.gov](http://www.cpsc.gov).

*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 Deaths		Civilian Injuries		Direct Property Damage (in Millions)			
							As Reported		In 2009 Dollars	
1980	25,700		110		470		\$125		\$326	
1981	21,900		130		620		\$80		\$188	
1982	21,100		120		530		\$113		\$251	
1983	21,400		80		450		\$126		\$271	
1984	21,300		100		340		\$105		\$217	
1985	19,700		150		450		\$113		\$224	
1986	17,700		70		280		\$87		\$171	
1987	16,700		60		320		\$92		\$174	
1988	15,800		100		390		\$110		\$200	
1989	17,300		50		350		\$122		\$212	
1990	14,400		90		310		\$116		\$191	
1991	14,500		30		360		\$154*		\$243*	
1992	14,900		50		340		\$105		\$161	
1993	15,400		60		360		\$111		\$165	
1994	13,800		80		350		\$109		\$158	
1995	12,700		110		320		\$99		\$140	
1996	13,000		50		300		\$118		\$162	
1997	13,300		30		280		\$122		\$163	
1998	10,400		50		260		\$98		\$129	
1999	8,700	(6,200)	0	(0)	90	(90)	\$78	(\$76)	\$101	(\$98)
2000	6,200	(3,900)	40	(40)	30	(0)	\$76	(\$75)	\$94	(\$93)
2001	7,900	(3,600)	20	(20)	130	(90)	\$78	(\$77)	\$95	(\$93)
2002	9,400	(3,800)	20	(20)	120	(120)	\$128	(\$123)	\$152	(\$147)
2003	13,600	(3,400)	20	(20)	210	(130)	\$119	(\$115)	\$139	(\$134)
2004	14,300	(2,900)	30	(30)	210	(120)	\$129	(\$127)	\$147	(\$144)
2005	11,200	(2,600)	110	(110)	140	(130)	\$75	(\$71)	\$82	(\$79)
2006	10,500	(2,300)	50	(50)	110	(100)	\$53	(\$52)	\$57	(\$55)
2007	9,500	(2,400)	10	(10)	80	(80)	\$36	(\$35)	\$37	(\$36)
2008	9,600	(2,600)	0	(0)	130	(120)	\$82	(\$81)	\$82	(\$81)
2009	8,800	(2,200)	30	(30)	120	(70)	\$93	(\$90)	\$93	(\$90)

\* 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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2009) and from NFPA survey.

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Central Heating**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	3,150	(32%)	0	(0%)	19	(17%)	\$22	(34%)
Automatic control failure	1,480	(15%)	0	(0%)	6	(5%)	\$5	(8%)
Failure to clean	830	(8%)	0	(0%)	2	(2%)	\$1	(2%)
Backfire	770	(8%)	0	(0%)	0	(0%)	\$0	(0%)
Heat source too close to combustibles	550	(6%)	7	(17%)	26	(24%)	\$10	(16%)
Worn out	500	(5%)	0	(0%)	2	(2%)	\$3	(5%)
Unclassified electrical failure or malfunction	470	(5%)	10	(23%)	9	(8%)	\$4	(6%)
Leak or break	420	(4%)	4	(9%)	11	(10%)	\$6	(10%)
Unclassified operational deficiency	380	(4%)	0	(0%)	2	(2%)	\$2	(3%)
Unspecified short circuit arc	360	(4%)	4	(9%)	2	(2%)	\$1	(2%)
Improper startup	230	(2%)	0	(0%)	7	(7%)	\$0	(1%)
Installation deficiency	190	(2%)	0	(0%)	2	(2%)	\$2	(2%)
Unclassified factor	150	(2%)	12	(27%)	4	(3%)	\$4	(6%)
Arc or spark from operating equipment	150	(1%)	0	(0%)	4	(3%)	\$1	(2%)
Unclassified misuse of material or product	140	(1%)	5	(12%)	4	(3%)	\$0	(0%)
Equipment not being operated properly	110	(1%)	0	(0%)	8	(7%)	\$2	(3%)
Short circuit arc from mechanical damage	90	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Short circuit arc from defective or worn insulation	60	(1%)	0	(0%)	2	(2%)	\$1	(1%)
Other known factor	590	(6%)	0	(0%)	17	(15%)	\$6	(9%)
Total fires	9,900	(100%)	42	(100%)	112	(100%)	\$65	(100%)
Total factor entries	10,620	(107%)	42	(100%)	126	(113%)	\$72	(110%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Electric-Powered Central Heating**

Factor	Fires		Civilian		Civilian		Direct Property	
			Deaths		Injuries		Damage (in Millions)	
Unclassified mechanical failure or malfunction	1,010	(28%)	0	(0%)	4	(15%)	\$5	(27%)
Automatic control failure	620	(18%)	0	(0%)	3	(13%)	\$3	(17%)
Unclassified electrical failure or malfunction	320	(9%)	0	(0%)	0	(0%)	\$2	(10%)
Failure to clean	280	(8%)	0	(0%)	0	(0%)	\$0	(0%)
Unspecified short circuit arc	260	(7%)	3	(100%)	2	(6%)	\$1	(6%)
Backfire	190	(5%)	0	(0%)	0	(0%)	\$0	(1%)
Worn out	160	(4%)	0	(0%)	0	(0%)	\$2	(11%)
Arc or spark from operating equipment	120	(3%)	0	(0%)	3	(13%)	\$1	(5%)
Unclassified operational deficiency	110	(3%)	0	(0%)	0	(0%)	\$0	(2%)
Short circuit arc from mechanical damage	90	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Heat source too close to combustibles	90	(2%)	0	(0%)	2	(7%)	\$1	(8%)
Leak or break	60	(2%)	0	(0%)	2	(7%)	\$0	(1%)
Unclassified factor	60	(2%)	0	(0%)	2	(6%)	\$1	(6%)
Short circuit arc from defective or worn insulation	40	(1%)	0	(0%)	2	(7%)	\$1	(3%)
Improper startup	40	(1%)	0	(0%)	3	(13%)	\$0	(1%)
Arc from faulty contact or broken conductor	30	(1%)	0	(0%)	0	(0%)	\$0	(2%)
Installation deficiency	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified misuse of material or product	30	(1%)	0	(0%)	2	(6%)	\$0	(0%)
Equipment not being operated properly	30	(1%)	0	(0%)	6	(21%)	\$0	(0%)
Unclassified natural condition	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Animal	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Construction deficiency	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Manual control failure	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Design deficiency	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Equipment used for not intended purpose	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known factor	80	(2%)	0	(0%)	2	(6%)	\$2	(9%)
Total fires	3,560	(100%)	3	(100%)	26	(100%)	\$18	(100%)
Total factor entries	3,790	(106%)	3	(100%)	32	(120%)	\$19	(111%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Liquid-Fueled Central Heating**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	1,130	(34%)	0	(0%)	2	(16%)	\$2	(27%)
Automatic control failure	670	(20%)	0	(0%)	0	(0%)	\$1	(19%)
Backfire	530	(16%)	0	(0%)	0	(0%)	\$0	(1%)
Failure to clean	370	(11%)	0	(0%)	4	(29%)	\$0	(7%)
Unintentionally turned on or or not turned off	150	(5%)	0	(0%)	0	(0%)	\$0	(1%)
Worn out	150	(4%)	0	(0%)	0	(0%)	\$0	(1%)
Leak or break	130	(4%)	0	(0%)	0	(0%)	\$1	(20%)
Improper startup	100	(3%)	0	(0%)	3	(26%)	\$0	(1%)
Heat source too close to combustibles	90	(3%)	5	(100%)	0	(0%)	\$1	(22%)
Unclassified misuse of material or product	50	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Unspecified short circuit arc	50	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified electrical failure or malfunction	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Equipment not being operated properly	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified factor	30	(1%)	0	(0%)	0	(0%)	\$0	(4%)
Water caused short circuit arc	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known factor	50	(2%)	0	(0%)	4	(29%)	\$1	(9%)
Total fires	3,320	(100%)	5	(100%)	13	(100%)	\$6	(100%)
Total factor entries	3,580	(108%)	5	(100%)	13	(100%)	\$7	(111%)

**D. Gas-Fueled Central Heating**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified mechanical failure or malfunction	930	(33%)	0	(0%)	11	(16%)	\$16	(41%)
Heat source too close to combustibles	360	(12%)	3	(17%)	26	(36%)	\$7	(18%)
Automatic control failure	230	(8%)	0	(0%)	2	(3%)	\$1	(3%)
Leak or break	220	(8%)	3	(18%)	9	(13%)	\$5	(13%)
Worn out	180	(6%)	0	(0%)	2	(3%)	\$1	(3%)
Failure to clean	140	(5%)	0	(0%)	0	(0%)	\$1	(2%)
Installation deficiency	130	(5%)	0	(0%)	0	(0%)	\$1	(3%)
Unclassified electrical failure or malfunction	100	(4%)	8	(43%)	9	(13%)	\$2	(6%)
Improper startup	90	(3%)	0	(0%)	2	(3%)	\$0	(0%)
Unclassified operational deficiency	90	(3%)	0	(0%)	2	(3%)	\$1	(3%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Central Heating (Continued)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Backfire	80	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified misuse of material or product	60	(2%)	4	(22%)	2	(2%)	\$0	(0%)
Equipment not being operated properly	60	(2%)	0	(0%)	2	(2%)	\$2	(6%)
Short circuit arc from defective or worn insulation	50	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Abandoned or discarded material or product	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified factor	40	(1%)	0	(0%)	0	(0%)	\$1	(3%)
Improper container or storage	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Washing part or painting with flammable liquid	30	(1%)	0	(0%)	4	(5%)	\$0	(0%)
Arc or spark from operating equipment	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
High water including floods	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Manual control failure	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Construction deficiency	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Storm	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unspecified short circuit arc	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Design deficiency	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper fueling technique	20	(1%)	0	(0%)	4	(5%)	\$0	(0%)
Flammable liquid or gas spilled	20	(1%)	0	(0%)	0	(0%)	\$1	(2%)
Other known factor	50	(2%)	0	(0%)	7	(10%)	\$1	(3%)
Total fires	2,850	(100%)	19	(100%)	72	(100%)	\$38	(100%)
Total factor entries	3,090	(108%)	19	(100%)	81	(113%)	\$42	(109%)

**Table 3.2. Home Central Heating Unit Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Central Heating**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable or combustible gas or liquid	4,910	(50%)	12	(28%)	42	(38%)	\$9	(14%)
Wire or cable insulation	1,220	(12%)	5	(13%)	7	(6%)	\$4	(6%)
Unclassified item	1,130	(11%)	7	(17%)	5	(5%)	\$8	(12%)
Structural member or framing	390	(4%)	14	(34%)	5	(4%)	\$18	(28%)
Dust, fiber, or lint	320	(3%)	0	(0%)	2	(1%)	\$2	(3%)
Pipe, duct, conduit, or hose	280	(3%)	0	(0%)	2	(2%)	\$1	(1%)
Appliance housing or casing	210	(2%)	0	(0%)	0	(0%)	\$1	(2%)
Multiple items first ignited	130	(1%)	0	(0%)	8	(7%)	\$3	(5%)
Pipe, duct, conduit or hose covering*	130	(1%)	0	(0%)	2	(1%)	\$2	(3%)
Filter	110	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Clothing	100	(1%)	3	(7%)	12	(10%)	\$2	(3%)
Insulation within structural area	100	(1%)	0	(0%)	3	(3%)	\$1	(1%)
Unclassified liquid, piping, or filter	100	(1%)	0	(0%)	3	(3%)	\$1	(1%)
Interior wall covering	80	(1%)	0	(0%)	0	(0%)	\$4	(6%)
Floor covering	80	(1%)	0	(0%)	0	(0%)	\$2	(3%)
Unclassified structural component or finish	70	(1%)	0	(0%)	0	(0%)	\$2	(2%)
Papers	70	(1%)	0	(0%)	5	(5%)	\$1	(1%)
Box or bag	60	(1%)	0	(0%)	6	(6%)	\$1	(2%)
Other known item	420	(4%)	1	(2%)	10	(9%)	\$4	(6%)
Total fires	9,900	(100%)	43	(100%)	112	(100%)	\$65	(100%)

**B. Electric-Powered Central Heating**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable or combustible gas or liquid	1,660	(47%)	0	(0%)	14	(52%)	\$1	(4%)
Wire or cable insulation	780	(22%)	3	(100%)	5	(17%)	\$3	(15%)
Unclassified item	410	(12%)	0	(0%)	2	(6%)	\$2	(11%)
Structural member or framing	140	(4%)	0	(0%)	2	(6%)	\$7	(41%)
Dust, fiber, or lint	80	(2%)	0	(0%)	2	(6%)	\$1	(7%)
Appliance housing or casing	60	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Filter, including evaporative cooler pads	60	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose	50	(1%)	0	(0%)	0	(0%)	\$0	(2%)

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Electric-Powered Central Heating**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Pipe, duct, conduit, or hose covering*	50	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Insulation within structural area	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Interior wall covering	30	(1%)	0	(0%)	0	(0%)	\$1	(5%)
Multiple items first ignited	30	(1%)	0	(0%)	0	(0%)	\$0	(2%)
Other known item	190	(5%)	0	(0%)	3	(13%)	\$2	(9%)
<b>Total fires</b>	<b>3,560</b>	<b>(100%)</b>	<b>3</b>	<b>(100%)</b>	<b>26</b>	<b>(100%)</b>	<b>\$18</b>	<b>(100%)</b>

**C. Liquid-Fueled Central Heating**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Flammable or combustible gas or liquid	2,620	(79%)	5	(100%)	4	(32%)	\$4	(69%)
Unclassified item	270	(8%)	0	(0%)	0	(0%)	\$0	(4%)
Wire or cable insulation	100	(3%)	0	(0%)	0	(0%)	\$0	(2%)
Pipe, duct, conduit or hose	90	(3%)	0	(0%)	2	(18%)	\$0	(0%)
Unclassified liquid, piping, or filter	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Structural member or framing	30	(1%)	0	(0%)	0	(0%)	\$1	(11%)
Appliance housing or casing	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified structural component or finish	20	(1%)	0	(0%)	0	(0%)	\$0	(4%)
Multiple items first ignited	20	(1%)	0	(0%)	4	(32%)	\$0	(1%)
Insulation within structural area	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known item	90	(3%)	0	(0%)	2	(18%)	\$1	(8%)
<b>Total fires</b>	<b>3,320</b>	<b>(100%)</b>	<b>5</b>	<b>(100%)</b>	<b>13</b>	<b>(100%)</b>	<b>\$6</b>	<b>(100%)</b>

\* Because of the large percentage of unknowns for confined fires, estimates of confined fires are highly variable. One effect is that the estimate of fires beginning with pipe, duct, conduit, or hose covering for all central heating is smaller than the sum of estimates for central heating by type of fuel or power.

**Table 3.3. Home Central Heating Unit Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Central Heating**

<b>Item First Ignited</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Flammable or combustible gas or liquid	580	(20%)	7	(34%)	24	(34%)	\$4	(12%)
Unclassified item	420	(15%)	7	(38%)	4	(5%)	\$6	(16%)
Wire or cable insulation	340	(12%)	3	(14%)	2	(2%)	\$1	(4%)
Dust, fiber or lint	230	(8%)	0	(0%)	0	(0%)	\$1	(2%)
Structural member or framing	210	(7%)	0	(0%)	3	(4%)	\$8	(22%)
Pipe, duct, conduit or hose	140	(5%)	0	(0%)	0	(0%)	\$0	(1%)
Appliance housing or casing	130	(5%)	0	(0%)	0	(0%)	\$1	(2%)
Clothing	90	(3%)	3	(15%)	10	(14%)	\$2	(5%)
Pipe, duct, conduit or hose covering*	90	(3%)	0	(0%)	2	(2%)	\$2	(5%)
Multiple items first ignited	70	(3%)	0	(0%)	5	(7%)	\$2	(6%)
Papers	70	(2%)	0	(0%)	3	(5%)	\$0	(1%)
Floor covering	60	(2%)	0	(0%)	0	(0%)	\$1	(4%)
Unclassified liquid, piping, or filter	50	(2%)	0	(0%)	2	(2%)	\$1	(2%)
Insulation within structural area	50	(2%)	0	(0%)	3	(5%)	\$0	(1%)
Filter, including evaporative cooler pad	40	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Box or bag	40	(1%)	0	(0%)	6	(9%)	\$1	(3%)
Interior wall covering	40	(1%)	0	(0%)	0	(0%)	\$2	(6%)
Unclassified structural component or finish	40	(1%)	0	(0%)	0	(0%)	\$1	(3%)
Unclassified soft goods or clothing	30	(1%)	0	(0%)	0	(0%)	\$1	(2%)
Linen other than bedding	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known item	130	(4%)	0	(0%)	8	(11%)	\$2	(4%)
<b>Total fires</b>	<b>2,850</b>	<b>(100%)</b>	<b>19</b>	<b>(100%)</b>	<b>72</b>	<b>(100%)</b>	<b>\$38</b>	<b>(100%)</b>

\* Because of the large percentage of unknowns for confined fires, estimates of confined fires are highly variable. One effect is that the estimate of fires beginning with pipe, duct, conduit, or hose covering for all central heating is smaller than the sum of estimates for central heating by type of fuel or power.

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Central Heating**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	7,270	(73%)	1	(2%)	14	(12%)	\$2	(4%)
Heating equipment room or area	1,170	(12%)	18	(42%)	61	(55%)	\$23	(36%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	310	(3%)	3	(8%)	4	(4%)	\$6	(9%)
Confined chimney or flue fire	220	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Crawl space or substructure space	170	(2%)	3	(7%)	7	(6%)	\$4	(7%)
Attic or other space above top story	130	(1%)	0	(0%)	0	(0%)	\$7	(11%)
Laundry room or area	90	(1%)	3	(8%)	10	(9%)	\$2	(3%)
Closet	70	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Ceiling/floor assembly or concealed space	50	(1%)	0	(0%)	0	(0%)	\$3	(4%)
Unclassified function area	50	(1%)	0	(0%)	3	(2%)	\$3	(5%)
Garage*	50	(1%)	0	(0%)	1	(1%)	\$4	(7%)
Other known area	320	(3%)	14	(33%)**	12	(10%)	\$9	(14%)
<b>Total fires</b>	<b>9,900</b>	<b>(100%)</b>	<b>43</b>	<b>(100%)</b>	<b>112</b>	<b>(100%)</b>	<b>\$65</b>	<b>(100%)</b>

\* Does not include garages coded as separate property.

\*\*Leading areas for fire deaths not shown above are hallway or corridor (23% of deaths) and bedroom (10%).

**B. Electric-Powered Central Heating**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	2,560	(72%)	0	(0%)	4	(15%)	\$0	(1%)
Heating equipment room or area	420	(12%)	3	(100%)	18	(69%)	\$5	(31%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	170	(5%)	0	(0%)	1	(5%)	\$3	(15%)
Attic or other space above top story	70	(2%)	0	(0%)	0	(0%)	\$3	(16%)
Crawl space or substructure space	60	(2%)	0	(0%)	0	(0%)	\$1	(7%)
Confined chimney or flue fire	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Closet	40	(1%)	0	(0%)	0	(0%)	\$0	(2%)

**Table 3.4. Home Central Heating Unit Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Electric-Powered Central Heating (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Ceiling/floor assembly or space between stories	30	(1%)	0	(0%)	0	(0%)	\$2	(11%)
Laundry room or area	20	(1%)	0	(0%)	1	(5%)	\$1	(4%)
Unclassified equipment or service area	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known area	130	(4%)	0	(0%)	1	(5%)	\$2	(13%)
<b>Total fires</b>	<b>3,560</b>	<b>(100%)</b>	<b>3</b>	<b>(100%)</b>	<b>26</b>	<b>(100%)</b>	<b>\$18</b>	<b>(100%)</b>

**C. Liquid-Fueled Central Heating**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	2,990	(90%)	0	(0%)	2	(16%)	\$0	(4%)
Heating equipment room or area	150	(5%)	5	(100%)	7	(53%)	\$4	(58%)
Confined chimney or flue fire	80	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Crawl space or substructure space	20	(1%)	0	(0%)	0	(0%)	\$0	(2%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	20	(1%)	0	(0%)	0	(0%)	\$0	(7%)
Other known area	60	(2%)	0	(0%)	4	(31%)	\$2	(27%)
<b>Total fires</b>	<b>3,320</b>	<b>(100%)</b>	<b>0</b>	<b>(100%)</b>	<b>13</b>	<b>(100%)</b>	<b>\$6</b>	<b>(100%)</b>

**D. Gas-Fueled Central Heating**

Confined fuel burner or boiler fire	1,670	(58%)	0	(0%)	7	(10%)	\$2	(5%)
Heating equipment room or area	570	(20%)	7	(38%)	36	(50%)	\$13	(34%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	120	(4%)	3	(15%)	3	(4%)	\$3	(7%)
Crawl space or substructure space	90	(3%)	3	(14%)	7	(10%)	\$3	(8%)
Attic or other space above top story	60	(2%)	0	(0%)	0	(0%)	\$4	(10%)
Laundry room or area	60	(2%)	3	(15%)	7	(10%)	\$1	(3%)
Closet	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Confined chimney or flue fire	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)

**Table 3.4. Home Central Heating Unit Fires, by Area of Origin  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**D. Gas-Fueled Central Heating (Continued)**

Garage*	30	(1%)	0	(0%)	0	(0%)	\$3	(9%)
Unclassified function area	30	(1%)	0	(0%)	3	(4%)	\$2	(6%)
Ceiling/floor assembly or space between stories	20	(1%)	0	(0%)	0	(0%)	\$1	(2%)
Unclassified storage area	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Living room, family room, or den	20	(1%)	0	(0%)	1	(2%)	\$1	(3%)
Unclassified equipment or service area	20	(1%)	0	(0%)	0	(0%)	\$1	(3%)
Other known area	90	(3%)	4	(19%)**	6	(9%)	\$3	(8%)
Total fires	2,850	(100%)	19	(100%)	72	(100%)	\$38	(100%)

\* Does not include dwelling garages coded as separate property.

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

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.

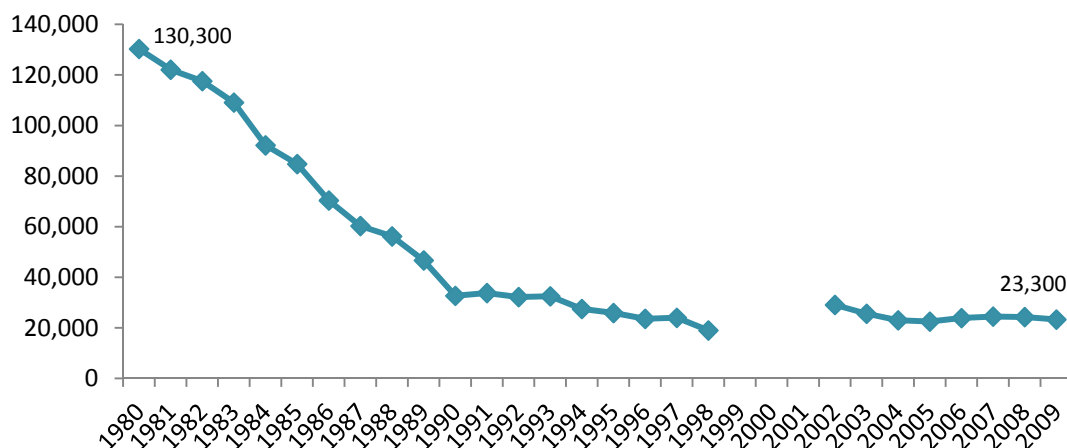
## Section 4. Fireplaces, Chimneys and Chimney Connectors

**In 2009, an estimated 23,300 reported home structure fires involving fireplaces, chimneys and chimney connectors resulted in 40 civilian deaths, 90 civilian fire injuries and \$290 million in direct property damage.**

Estimated fires declined sharply from the early 1980s to the early 1990s, then slowly through the 1990s, but there has been no clear trend up or down since 2003. (See Figure 4.1 and Table 4.1.)

Fireplaces, chimneys and chimney connectors accounted for 37% of 2005-2009 reported home heating fires, 5% of home heating fire civilian deaths, 7% of home heating fire civilian injuries, and 24% of home heating fire direct property damage.

**Figure 4.1. Home Fires Involving Fireplaces, Chimneys, and Chimney Connectors, 1980-2009, by Year**



Note and Source: See Table 4.1

In 2005-2009, including fires reported as confined fires, 94% of fireplace, chimney or chimney connector fires were reported to be in solid-fueled equipment (nearly all wood-burning rather than coal-burning), 4% were reported in gas-fueled equipment (mostly natural gas rather than LP-gas), 2% were reported in electric-powered fireplaces, and less than 1% were reported in liquid-fueled fireplaces. (See Table 4.A.)

**Table 4.A. Home Fireplace, Chimney, or Chimney Connector Fires, by Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Department**

<b>Fuel or Power</b>	<b>Fires</b>	<b>Civilian Deaths</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions)</b>
Solid-fueled	22,230 (94%)	26 (100%)	86 (78%)	\$184 (84%)
Gas-fueled	870 (4%)	0 (0%)	17 (16%)	\$25 (12%)
Electric-powered	490 (2%)	0 (0%)	0 (0%)	\$8 (4%)
Liquid-fueled	60 (0%)	0 (0%)	8 (7%)	\$1 (0%)
<b>Total</b>	<b>23,700 (100%)</b>	<b>26 (100%)</b>	<b>112 (100%)</b>	<b>\$219 (100%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 the equipment and type of fuel or power unknown have also been allocated proportionally.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Half (53%) of home fireplace, chimney and chimney connector fires involve failure to clean as a factor contributing to ignition.**

Table 4.B shows other leading factors could also include problems with creosote build-up including unclassified factor contributed to ignition (7%).

Heat source too close to combustibles is another leading factor contributing to ignition for home fireplace, chimney or chimney connector fires, with 6% of fires. Other leading factors are installation deficiency (5%) and construction deficiency (4%). (See Table 4.2, which has a longer list of leading factors and includes breakdowns for solid-fueled and gas-fueled equipment.)

Leading factors for fire deaths in fires involving fireplaces, chimney and chimney connectors are heat source too close to combustibles (49%), unclassified misuse of material or product (33%), improper fueling

**Creosote and Chimney Fires**

Creosote is a sticky, oily combustible substance created when wood does not burn completely. It rises into the chimney as a liquid and deposits on the chimney wall. A fire starting in creosote can appropriately be reported as a fire with failure to clean as Factor Contributing to Ignition and film or residue as Item First Ignited. The former appears to be used more consistently in fire incident reports.

A conservative best estimate of creosote fires would combine failure-to-clean confined chimney or flue fires with failure-to-clean fires involving solid-fueled space heaters, fireplaces, chimneys and chimney connectors. **This produces 2005-2009 estimates of 14,190 reported creosote fires (22% of all home heating fires) per year with associated losses of four civilian deaths, 11 civilian injuries, and \$35 million in direct property damage per year in 2005-2009.**

Some analysts prefer the simplicity of estimating creosote fires by total confined chimney or flue fires – 23,100 fires, no deaths, 35 civilian injuries, and \$8 million in direct property damage per year.

technique (20%), equipment unattended (16%), and unclassified operational deficiency (16%).

**Table 4.B. Leading Factors Contributing to Ignition for Home Fireplace, Chimney, and Chimney Connector Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Failure to clean	12,440	(53%)	0	(0%)	4	(4%)	\$23	(10%)
Unclassified factor	1,700	(7%)	0	(0%)	13	(12%)	\$10	(5%)
Heat source too close to combustibles	1,420	(6%)	13	(49%)	26	(23%)	\$48	(22%)
Installation deficiency	1,140	(5%)	0	(0%)	12	(10%)	\$25	(12%)
Construction deficiency	960	(4%)	0	(0%)	7	(7%)	\$20	(9%)

Note and Source: See Table 4.2.

**Most home fireplace, chimney, and chimney connector fires begin with ignition of something that could be creosote.**

Table 4.C shows 14% of fires began with ignition of film or residue, but another 15% began with unclassified organic material, 30% began with unclassified item first ignited, and 4% began with trash or waste. Any or all of these could be creosote or other forms of unburned fuel deposits associated with a dirty chimney.

**Table 4.C. Leading Items First Ignited for Home Fireplace, Chimney, and Chimney Connector Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Unclassified item	7,170	(30%)	0	(0%)	20	(18%)	\$9	(4%)
Unclassified organic material	3,510	(15%)	0	(0%)	2	(1%)	\$4	(2%)
Film or residue, including creosote	3,340	(14%)	0	(0%)	2	(2%)	\$1	(1%)
Structural member or framing	2,350	(10%)	7	(27%)	28	(25%)	\$113	(52%)
Trash or waste	920	(4%)	0	(0%)	0	(0%)	\$0	(0%)

Note and Source: See Table 4.3.

Table 4.3 provides a longer list of home fireplace, chimney or chimney connector fires by item first ignited and also includes breakdowns for solid-fueled and gas-fueled equipment. Ceiling coverings were the item first ignited for two out of five (41%) home fireplace, chimney or chimney connector fire deaths.

**Most home fireplace, chimney, and chimney connector fires begin in the chimney.**

Table 4.D shows 83% of these fires are reported as confined to chimney or flue, but the true share of fires beginning in the chimney could be even higher, because NFIRS Version 5.0 has no code for chimney as an area of origin. Fires reported as confined to chimney or flue tend to involve only minor damage. However, even minor damage to mortar, bricks, or other components of a chimney or flue can create openings or weak spots where smoke or fire can penetrate and spread in future uses of the chimney or flue. Any of the other leading areas of origin could be describing the room or space containing or adjacent to the chimney. A more detailed list of home fireplace, chimney and chimney connector fires by area of origin is shown in Table 4.4, which includes breakdowns for solid-fueled and gas-fueled equipment.

**Table 4.D. Leading Areas of Origin for Home Fireplace, Chimney, and Chimney Connector Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	Percentage	Count	Percentage	Count	Percentage	Count	Percentage
Confined chimney or flue fire	19,610	(83%)	0	(0%)	26	(24%)	\$6	(3%)
Wall assembly or concealed space	990	(4%)	0	(0%)	12	(10%)	\$42	(19%)
Living room, family room, or den	680	(3%)	6	(22%)	36	(32%)	\$35	(16%)
Attic or other space above top story	590	(2%)	3	(10%)	10	(9%)	\$38	(17%)
Ceiling/floor assembly or space between stories	230	(1%)	5	(20%)	4	(4%)	\$12	(5%)

Note and Source: See Table 4.4.

**Fireplaces, chimneys and chimney connectors accounted for 16,000 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.**

For specific devices, unspecified fireplaces accounted for 12,130 injuries, built-in fireplaces 2,890 injuries, metal chimneys 490 injuries, unspecified chimneys 340 injuries, factory-built gas-fueled fireplaces 320 injuries, factory-built wood-fueled fireplaces 170 injuries, factory-built electric-powered fireplaces 160 injuries, and brick or masonry chimneys 100 injuries.<sup>18</sup>

**Safe Heating Behaviors**

*Messages from NFPA Educational Messaging Advisory Committee*

**General heating-related messages**

- Have a three-foot kid-free zone around open fires.
- Supervise children when open fires are being used. Use a sturdy metal screen around the appliance to prevent contact burns which are even more common than fire injuries.

<sup>18</sup> Based on National Electronic Injury Surveillance System, at [www.cpsc.gov](http://www.cpsc.gov).

- All heaters need space. Keep things that can burn, such as paper, bedding or furniture, at least 3 feet away from heating 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 inside your home to provide early warning of carbon monoxide.
- Maintain heating equipment and chimneys by having them cleaned and inspected annually by a qualified professional.

## **Fireplaces**

- Allow ashes to cool before disposing. Dispose of ashes in a tightly covered metal container and keep the ash container at least 10 feet away from the home and any other nearby buildings. Douse and saturate with water. Chimneys and vents need to be cleaned and inspected at least once a year.
- Have a sturdy screen on a fireplace.
- Burn only dry, seasoned wood.
- Use artificial logs according to manufacturer's recommendations. Never burn more than one log at a time.
- Use only newspaper and kindling wood or fire starters to start a fire. Never use flammable liquids, such as lighter fluid, kerosene or gasoline to start a fire.
- Chimneys and vents need to be cleaned and inspected at least once a year.

### *Additional safe behaviors for fireplaces*

- Make sure your choice of heating equipment is permitted by law in your community. For example, chimineas and firepits are not allowed in all communities.
- Check for product recalls at [www.cpsc.gov](http://www.cpsc.gov).
- For wood-burning fireplaces, burn only wood that has been split, stacked, and allowed to dry for 12 months. Do not use green wood, trash, or any other combustibles that could burn unevenly, resulting in flare-ups, or burn incompletely, resulting in deposits of creosote, an oily, sticky, combustible byproduct of incomplete burning of wood. When adding wood to a working fire, wear only short, tight-fitting sleeves to reduce the risk of igniting your clothing if the fire flares up during the refueling.
- 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.
- For wood-burning fireplaces, the annual inspection needs to address potential build-up of creosote in heating equipment and associated chimneys and chimney connectors.

**Table 4.1. Home Fires Involving Fireplaces, Chimneys or Chimney Connectors, by Year  
Structure Fires Reported to U.S. Fire Departments**

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions) As Reported	In 2009 Dollars
1980	130,300	280	850	\$289	\$753
1981	122,100	300	460	\$256	\$603
1982	117,600	220	540	\$279	\$621
1983	109,100	150	490	\$261	\$562
1984	92,200	120	450	\$251	\$518
1985	84,800	140	400	\$291	\$580
1986	70,400	90	440	\$213	\$418
1987	60,300	100	310	\$207	\$392
1988	56,200	80	680	\$243	\$442
1989	46,700	60	310	\$250	\$433
1990	32,700	110	320	\$200	\$328
1991	33,800	60	290	\$289*	\$456*
1992	32,200	110	370	\$186	\$285
1993	32,500	30	240	\$195	\$290
1994	27,500	30	200	\$182	\$263
1995	25,900	30	220	\$225	\$317
1996	23,600	130	250	\$214	\$293
1997	22,400	40	210	\$193	\$258
1998	19,000	40	140	\$170	\$224
1999	35,100 (12,300)	0 (0)	90 (90)	\$338 (\$286)	\$436 (\$368)
2000	30,400 (8,700)	160 (160)	310 (310)	\$292 (\$278)	\$364 (\$347)
2001	28,800 (6,500)	90 (90)	60 (60)	\$223 (\$210)	\$270 (\$255)
2002	29,100 (6,200)	20 (20)	80 (50)	\$193 (\$181)	\$230 (\$216)
2003	25,600 (4,600)	90 (90)	120 (110)	\$255 (\$242)	\$297 (\$282)
2004	23,000 (3,800)	0 (0)	120 (100)	\$241 (\$235)	\$273 (\$266)
2005	22,500 (3,600)	20 (20)	120 (90)	\$217 (\$202)	\$238 (\$222)
2006	23,900 (3,900)	10 (10)	120 (80)	\$227 (\$223)	\$241 (\$238)
2007	24,500 (4,400)	50 (50)	150 (120)	\$148 (\$144)	\$153 (\$149)
2008	24,300 (4,500)	10 (10)	80 (50)	\$246 (\$241)	\$245 (\$240)
2009	23,300 (3,600)	40 (40)	90 (90)	\$290 (\$285)	\$290 (\$285)

\*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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2009) and from NFPA survey.

**Table 4.2. Home Fireplace, Chimney and Chimney Connector Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Fireplaces, Chimneys and Chimney Connectors**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Failure to clean	12,440	(53%)	0	(0%)	4	(4%)	\$23	(10%)
Unclassified factor	1,700	(7%)	0	(0%)	13	(12%)	\$10	(5%)
Heat source too close to combustibles	1,420	(6%)	13	(49%)	26	(23%)	\$48	(22%)
Installation deficiency	1,140	(5%)	0	(0%)	12	(10%)	\$25	(12%)
Construction deficiency	960	(4%)	0	(0%)	7	(7%)	\$20	(9%)
Unclassified misuse of material or product	770	(3%)	9	(33%)	4	(4%)	\$5	(2%)
Leak or break	740	(3%)	4	(15%)	10	(9%)	\$18	(8%)
Unclassified operational deficiency	720	(3%)	4	(16%)	2	(2%)	\$15	(7%)
Worn out	650	(3%)	0	(0%)	0	(0%)	\$11	(5%)
Unclassified mechanical failure or malfunction	560	(2%)	0	(0%)	11	(10%)	\$16	(7%)
Unclassified fire spread or control factor	530	(2%)	0	(0%)	0	(0%)	\$5	(2%)
Equipment not being operated properly	470	(2%)	0	(0%)	5	(4%)	\$3	(1%)
Unclassified natural condition	430	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified design, manufacturing, or installation deficiency	370	(2%)	0	(0%)	0	(0%)	\$9	(4%)
Improper fueling technique	330	(1%)	5	(20%)	2	(2%)	\$1	(0%)
Design deficiency	320	(1%)	0	(0%)	0	(0%)	\$4	(2%)
Equipment overloaded	220	(1%)	0	(0%)	2	(2%)	\$2	(1%)
Animal	180	(1%)	0	(0%)	2	(2%)	\$1	(0%)
Abandoned or discarded material or product	180	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Manual control failure	150	(1%)	0	(0%)	6	(5%)	\$0	(0%)
Improper startup	140	(1%)	0	(0%)	2	(2%)	\$0	(0%)
Equipment unattended	130	(1%)	4	(16%)	2	(2%)	\$9	(4%)
Outside or open fire for warming or cooking	130	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Automatic control failure	120	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known factor	540	(2%)	0	(0%)	21	(18%)	\$23	(10%)
Total fires	23,700	(100%)	26	(100%)	112	(100%)	\$219	(100%)
Total factor entries	25,350	(107%)	39	(149%)	130	(116%)	\$250	(114%)

**Table 4.2. Home Fireplace, Chimney and Chimney Connector Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Solid-Fueled Fireplaces, Chimneys and Chimney Connectors**

Factor	Fires		Civilian		Civilian		Direct Property	
			Deaths	Injuries	Injuries	Damage (in Millions)		
Failure to clean	12,060	(54%)	0	(0%)	4	(5%)	\$24	(13%)
Unclassified factor	1,530	(7%)	0	(0%)	9	(10%)	\$10	(5%)
Heat source too close to combustibles	1,250	(6%)	15	(58%)	19	(22%)	\$31	(17%)
Installation deficiency	1,080	(5%)	0	(0%)	12	(14%)	\$25	(13%)
Construction deficiency	860	(4%)	0	(0%)	8	(9%)	\$19	(10%)
Unclassified operational deficiency	690	(3%)	0	(0%)	2	(2%)	\$15	(8%)
Leak or break	680	(3%)	5	(17%)	9	(10%)	\$16	(9%)
Unclassified misuse of material of product	680	(3%)	10	(40%)	0	(0%)	\$4	(2%)
Worn out	620	(3%)	0	(0%)	0	(0%)	\$12	(6%)
Unclassified fire spread or control factor	480	(2%)	0	(0%)	0	(0%)	\$3	(2%)
Unclassified mechanical failure or malfunction	470	(2%)	0	(0%)	0	(0%)	\$13	(7%)
Equipment not being operated properly	430	(2%)	0	(0%)	6	(7%)	\$3	(2%)
Unclassified natural condition	420	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Improper fueling technique	330	(1%)	6	(24%)	2	(2%)	\$1	(1%)
Design deficiency	330	(1%)	0	(0%)	0	(0%)	\$3	(2%)
Unclassified design, manufacturing, or installation deficiency	290	(1%)	0	(0%)	0	(0%)	\$8	(4%)
Equipment overloaded	230	(1%)	0	(0%)	2	(3%)	\$2	(1%)
Manual control failure	160	(1%)	0	(0%)	7	(8%)	\$0	(0%)
Equipment unattended	130	(1%)	5	(19%)	2	(2%)	\$9	(5%)
Animal	130	(1%)	0	(0%)	2	(3%)	\$1	(0%)
Other known factor	870	(4%)	0	(0%)	13	(15%)	\$16	(9%)
Total fires	22,230	(100%)	26	(100%)	86	(100%)	\$184	(100%)
Total factor entries	23,710	(107%)	41	(159%)	97	(112%)	\$213	(115%)

**Table 4.2. Home Fireplace, Chimney and Chimney Connector Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Gas-Fueled Fireplaces, Chimneys and Chimney Connectors**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified misuse of material or product	120	(14%)	0	(NA)	0	(0%)	\$1	(3%)
Failure to clean	110	(12%)	0	(NA)	0	(0%)	\$0	(0%)
Leak or break	110	(12%)	0	(NA)	2	(13%)	\$2	(9%)
Construction deficiency	100	(12%)	0	(NA)	0	(0%)	\$1	(3%)
Heat source too close to combustibles	90	(10%)	0	(NA)	2	(11%)	\$13	(51%)
Unclassified design, manufacturing, or installation deficiency	60	(7%)	0	(NA)	0	(0%)	\$2	(8%)
Installation deficiency	50	(6%)	0	(NA)	0	(0%)	\$2	(9%)
Unclassified mechanical failure or malfunction	50	(6%)	0	(NA)	13	(76%)	\$2	(7%)
Animal	50	(5%)	0	(NA)	0	(0%)	\$0	(0%)
Unclassified factor	40	(5%)	0	(NA)	0	(0%)	\$0	(1%)
Automatic control failure	40	(5%)	0	(NA)	0	(0%)	\$0	(0%)
Equipment unattended	10	(2%)	0	(NA)	0	(0%)	\$1	(4%)
Other known factor	70	(8%)	0	(NA)	2	(13%)	\$4	(17%)
Total fire	870	(100%)	0	(NA)	17	(100%)	\$25	(100%)
Total factor entries	920	(105%)	0	(NA)	20	(113%)	\$29	(113%)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 allocate. 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.

**Table 4.3. Home Fireplace, Chimney and Chimney Connector Fires, by Item First Ignited  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Fireplaces, Chimneys and Chimney Connectors**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified item	7,170	(30%)	0	(0%)	20	(18%)	\$9	(4%)
Unclassified organic material	3,510	(15%)	0	(0%)	2	(1%)	\$4	(2%)
Film or residue, including creosote	3,340	(14%)	0	(0%)	2	(2%)	\$1	(1%)
Structural member or framing	2,350	(10%)	7	(27%)	28	(25%)	\$113	(52%)
Trash or waste	920	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Heavy vegetation including trees	870	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose	820	(3%)	0	(0%)	0	(0%)	\$1	(1%)
Unclassified structural component or finish	650	(3%)	2	(9%)	3	(3%)	\$28	(13%)
Chips	640	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Interior wall covering	340	(1%)	0	(0%)	8	(7%)	\$14	(7%)
Exterior wall covering	320	(1%)	0	(0%)	0	(0%)	\$7	(3%)
Papers	320	(1%)	3	(10%)	8	(7%)	\$1	(0%)
Light vegetation including grass	310	(1%)	0	(0%)	3	(3%)	\$2	(1%)
Insulation within structural area	300	(1%)	0	(0%)	0	(0%)	\$6	(3%)
Flammable or combustible gas or liquid	270	(1%)	3	(13%)	11	(10%)	\$1	(1%)
Dust, fiber, or lint	220	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Ceiling covering	210	(1%)	11	(41%)	3	(3%)	\$6	(3%)
Multiple items first ignited	200	(1%)	0	(0%)	3	(3%)	\$4	(2%)
Exterior roof covering	170	(1%)	0	(0%)	0	(0%)	\$6	(3%)
Other known item	770	(3%)	0	(0%)	22	(20%)	\$14	(7%)
Total fires	23,700	(100%)	26	(100%)	112	(100%)	\$219	(100%)

**B. Solid-Fueled Fireplaces, Chimneys and Chimney Connectors**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified item	6,680	(30%)	0	(0%)	0	(0%)	\$5	(3%)
Film or residue, including creosote	3,360	(15%)	0	(0%)	2	(2%)	\$1	(1%)
Unclassified organic material	3,300	(15%)	0	(0%)	2	(2%)	\$4	(2%)
Structural member or framing	2,170	(10%)	7	(27%)	27	(31%)	\$102	(55%)
Trash or waste	880	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Heavy vegetation including trees	860	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose	820	(4%)	0	(0%)	0	(0%)	\$1	(1%)

**Table 4.3. Home Fireplace, Chimney and Chimney Connector Fires, by Item First Ignited  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Solid-Fueled Fireplaces, Chimneys and Chimney Connectors**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Papers	340	(2%)	3	(10%)	15	(17%)	\$1	(0%)
Interior wall covering	330	(1%)	0	(0%)	8	(9%)	\$7	(4%)
Exterior wall covering	320	(1%)	0	(0%)	0	(0%)	\$7	(4%)
Insulation within structural area	270	(1%)	0	(0%)	0	(0%)	\$6	(3%)
Ceiling covering	210	(1%)	11	(41%)	3	(4%)	\$6	(3%)
Dust, fiber, or lint	210	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Multiple items first ignited	210	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Light vegetation including grass	180	(1%)	0	(0%)	3	(4%)	\$2	(1%)
Flammable or combustible gas or liquid	170	(1%)	3	(13%)	10	(11%)	\$1	(0%)
Exterior roof covering	170	(1%)	0	(0%)	0	(0%)	\$7	(4%)
Other known item	550	(2%)	0	(0%)	14	(17%)	\$14	(7%)
Total fires	22,230	(100%)	26	(100%)	86	(100%)	\$184	(100%)

**C. Gas-Fueled Fireplaces, Chimneys and Chimney Connectors**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Structural member or framing	200	(23%)	0	(NA)	1	(8%)	\$10	(39%)
Unclassified item	180	(20%)	0	(NA)	13	(76%)	\$3	(10%)
Flammable or combustible gas or liquid	90	(10%)	0	(NA)	2	(9%)	\$0	(1%)
Light vegetation including grass	80	(9%)	0	(NA)	0	(0%)	\$0	(2%)
Unclassified organic material	70	(9%)	0	(NA)	0	(0%)	\$0	(1%)
Unclassified structural component or finish	40	(5%)	0	(NA)	0	(0%)	\$10	(38%)
Film or residue, including creosote	30	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Chips	30	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Pipe, duct, conduit, or hose covering	20	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Cabinetry	20	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Heavy vegetation including trees	20	(3%)	0	(NA)	0	(0%)	\$0	(0%)
Insulation within structural area	20	(2%)	0	(NA)	0	(0%)	\$0	(2%)
Exterior wall covering	20	(2%)	0	(NA)	0	(0%)	\$0	(1%)

**Table 4.3. Home Fireplace, Chimney and Chimney Connector Fires, by Item First Ignited  
Annual Average of 2004-2008 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Gas-Fueled Fireplaces, Chimneys and Chimney Connectors (Continued)**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known item	50	(6%)	0	(NA)	1	(8%)	\$1	(6%)
Total fires	870	(100%)	0	(NA)	17	(100%)	\$25	(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 fire reported only to Federal or state agencies or industrial fire brigades. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 4.4. Home Fireplace, Chimney and Chimney Connector Fires, by Area of Origin  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Fireplaces, Chimneys and Chimney Connectors**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined chimney or flue fire	19,610	(83%)	0	(0%)	26	(24%)	\$6	(3%)
Wall assembly or concealed space	990	(4%)	0	(0%)	12	(10%)	\$42	(19%)
Living room, family room, or den	680	(3%)	6	(22%)	36	(32%)	\$35	(16%)
Attic or other space above top story	590	(2%)	3	(10%)	10	(9%)	\$38	(17%)
Ceiling/floor assembly or space between stories	230	(1%)	5	(20%)	4	(4%)	\$12	(5%)
Unclassified structural area	200	(1%)	0	(0%)	0	(0%)	\$15	(7%)
Unclassified function area	190	(1%)	0	(0%)	0	(0%)	\$7	(3%)
Exterior wall surface	160	(1%)	0	(0%)	0	(0%)	\$5	(2%)
Crawl space or substructure space	140	(1%)	10	(38%)	4	(4%)	\$17	(8%)
Exterior roof surface	120	(1%)	0	(0%)	3	(3%)	\$5	(2%)
Duct for HVAC, cable exhaust, heating or air conditioning	120	(1%)	0	(0%)	3	(3%)	\$4	(2%)
Other known area	590	(3%)	3	(10%)*	13	(12%)	\$32	(15%)
<b>Total fires</b>	<b>23,700</b>	<b>(100%)</b>	<b>26</b>	<b>(100%)</b>	<b>112</b>	<b>(100%)</b>	<b>\$219</b>	<b>(100%)</b>

\* Leading area for fire deaths not shown above is unclassified area (13%).

**B. Solid-Fueled Fireplaces, Chimneys and Chimney Connectors**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined chimney or flue fire	18,600	(84%)	0	(0%)	13	(15%)	\$6	(3%)
Wall assembly or concealed space	910	(4%)	0	(0%)	12	(14%)	\$39	(21%)
Living room, family room, or den	590	(3%)	6	(24%)	31	(36%)	\$29	(15%)
Attic or other space above top story	570	(3%)	0	(0%)	10	(12%)	\$36	(20%)
Ceiling/floor assembly or space between stories	220	(1%)	6	(23%)	4	(5%)	\$12	(6%)
Unclassified structural area	170	(1%)	0	(0%)	0	(0%)	\$8	(4%)
Unclassified function area	160	(1%)	0	(0%)	0	(0%)	\$6	(3%)
Exterior wall surface	130	(1%)	0	(0%)	0	(0%)	\$5	(3%)
Crawl space or substructure space	130	(1%)	11	(43%)	1	(2%)	\$7	(4%)
Exterior roof surface	120	(1%)	0	(0%)	3	(4%)	\$4	(2%)

**Table 4.4. Home Fireplace, Chimney and Chimney Connector Fires, by Area of Origin  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Solid-Fueled Fireplaces, Chimneys and Chimney Connectors**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Other known area	600	(3%)	3	(11%)*	12	(14%)	\$33	(18%)
Total fires	22,230	(100%)	26	(100%)	86	(100%)	\$184	(100%)

\* Leading area of origin for fire deaths not shown above is unclassified area (11%).

**C. Gas-Fueled Fireplaces, Chimneys and Chimney Connectors**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Confined chimney or flue fire	550	(63%)	0	(NA)	13	(76%)	\$0	(1%)
Wall assembly or concealed space	100	(12%)	0	(NA)	0	(0%)	\$5	(20%)
Living room, family room, or den	70	(8%)	0	(NA)	1	(8%)	\$4	(17%)
Unclassified function area	20	(2%)	0	(NA)	0	(0%)	\$1	(2%)
Duct for HVAC, cable, exhaust, heating, or air conditioning	20	(2%)	0	(NA)	1	(8%)	\$1	(3%)
Ceiling/floor assembly or space between stories	20	(2%)	0	(NA)	0	(0%)	\$1	(4%)
Exterior wall surface	20	(2%)	0	(NA)	0	(0%)	\$0	(0%)
Unclassified structural area	10	(2%)	0	(NA)	0	(0%)	\$1	(2%)
Attic or other space above top story	10	(2%)	0	(NA)	0	(0%)	\$1	(3%)
Conduit, pipe, utility, or ventilation shaft	10	(1%)	0	(NA)	0	(0%)	\$1	(3%)
Other known area	40	(4%)	0	(NA)	2	(9%)	\$11	(44%)
Total fires	870	(100%)	0	(NA)	17	(100%)	\$25	(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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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. 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.

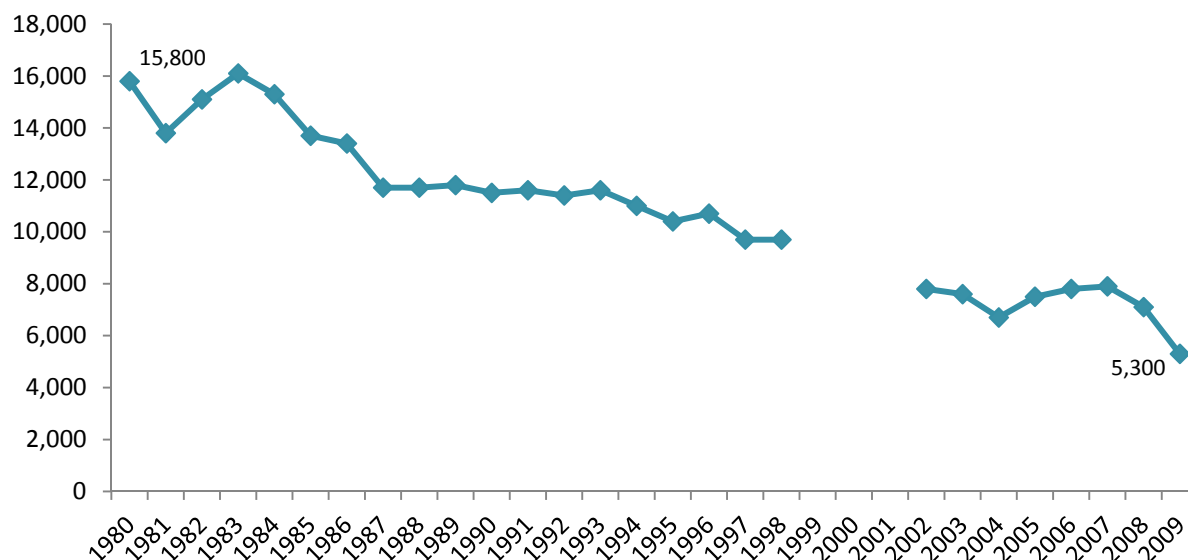
Source: Data from NFIRS Version 5.0 and NFPA survey.

## Section 5. Water Heaters

**In 2009, an estimated 5,300 reported home structure fires involving water heaters resulted in 190 civilian injuries and \$129 million in direct property damage. There were no reported civilian deaths.**

The number of fires and associated losses have declined substantially since 1980, but there has been no sustained, significant decline since 2000, although the large decline in 2009, following a decline in 2008 to roughly the previous low, could signal the start of a new decline. (See Figure 5.1 and Table 5.1.) Water heaters accounted for 11% of 2005-2009 reported home heating fires, 6% of home heating fire civilian deaths, 18% of home heating fire civilian injuries, and 14% of home heating fire direct property damage.

**Figure 5.1. Home Fires Involving Water Heaters, 1980-2009, by Year**



Note and Source: See Table 5.1.

**Three out of five (60%) home water heater fires in 2005-2009, including fires reported as confined fires, involved gas-fueled equipment.**

Another 38% involved electric-powered water heaters. Most gas-fueled equipment used natural gas rather than LP-gas. (See Table 5.A.)

**Water heaters show a very large difference in risk for fires, death, injuries and direct property damage, with gas-fueled equipment showing higher risk than electric-powered equipment.**

In 2005-2009, gas-fueled water heaters averaged 40% more users than electric-powered water heaters (62.8 million households vs. 45.0 million households). By contrast, gas-fueled water heaters had 1½ times as many 2005-2009 reported home fires, five times as much

direct property damage and five times as many civilian fire injuries. There were no reported civilian deaths in 2005-2009 electric water heater fires compared to 36 deaths per year in 2005-2009 gas water heater fires.

**Table 5.A. Home Water Heater Fires, by Type of Fuel or Power  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Department**

<b>Fuel or Power</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Gas-fueled	4,250	(60%)	36	(100%)	236	(82%)	\$106	(84%)
Electric-powered	2,700	(38%)	0	(0%)	49	(17%)	\$21	(16%)
Liquid-fueled	130	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Solid-fueled	0	(0%)	0	(0%)	3	(1%)	\$0	(0%)
<b>Total</b>	<b>7,100</b>	<b>(100%)</b>	<b>36</b>	<b>(100%)</b>	<b>287</b>	<b>(100%)</b>	<b>\$127</b>	<b>(100%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 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.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**One-quarter (24%) of home water heater fires had heat source too close to combustibles as a factor contributing to ignition.**

Heat source too close to combustibles accounted for 30% of associated civilian deaths and 38% of associated civilian injuries. (See Table 5.B.) Heat source too close to combustibles had a much larger share of home water heater fires for gas-fueled equipment (33%) than for electric-powered equipment (6%). (See Table 5.2, which includes a longer list of leading factors, as well as breakdowns for gas-fueled and electric-powered water heaters.)

**Table 5.B. Leading Factors Contributing to Ignition for Home Water Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

<b>Factor</b>	<b>Fires</b>		<b>Civilian Deaths</b>		<b>Civilian Injuries</b>		<b>Direct Property Damage (in Millions)</b>	
Heat source too close to combustibles	1,670	(24%)	11	(30%)	109	(38%)	\$40	(31%)
Unclassified mechanical failure	1,170	(17%)	3	(10%)	24	(8%)	\$19	(15%)
Unclassified electrical failure or malfunction	690	(10%)	0	(0%)	3	(1%)	\$4	(4%)
Unspecified short circuit arc	580	(8%)	0	(0%)	8	(3%)	\$7	(5%)
Leak or break	560	(8%)	3	(10%)	29	(10%)	\$12	(10%)

Note and Source: See Table 5.2

**One-fifth (19%) of home water heater fires began with ignition of flammable or combustible gas or liquid.**

This may often be the gas or liquid that fuels the equipment. (See Table 5.C)

The leading item first ignited was wire or cable insulation (21%). For gas-fueled equipment, flammable or combustible liquid or gas accounted for 27% of fires and 61% of associated civilian fire deaths, but they accounted for only 3% of fires for the electric-powered equipment. Wire or cable insulation accounted for 54% of the fires for electric-powered equipment but only 2% of the fires for gas-fueled equipment. Table 5.3 provides a longer list of water heater fires by item first ignited, including breakdowns for gas-fueled and electric-powered water heaters.

**Table 5.C. Leading Items First Ignited for Home Water Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Wire or cable insulation	1,510 (21%)	0 (0%)	19 (6%)	\$5 (4%)
Flammable or combustible gas or liquid	1,340 (19%)	22 (61%)	134 (47%)	\$41 (32%)
Appliance housing	580 (8%)	0 (0%)	6 (2%)	\$3 (3%)
Clothing	500 (7%)	7 (19%)	28 (10%)	\$11 (9%)
Unclassified item	460 (6%)	0 (0%)	0 (0%)	\$4 (3%)

Note and Source: See Table 5.3.

**Half (53%) of home water heater fires began in a designated heating equipment room or area (29%) or were confined to the equipment (24%).**

The other leading areas of origin were all popular locations for water heaters, including laundry room or areas (12%) and closets (8%). See Table 5.D and Table 5.4, which includes a longer list of home water heater fires by area of origin, including breakdowns for gas-fueled and electric-powered units.

**Table 5.D. Leading Areas of Origin for Home Water Heater Fires  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Heating equipment room	2,030 (29%)	5 (13%)	97 (34%)	\$44 (35%)
Confined fuel burner or boiler fire	1,710 (24%)	0 (0%)	6 (2%)	\$0 (0%)
Laundry room or area	850 (12%)	2 (6%)	64 (22%)	\$16 (12%)
Closet	560 (8%)	0 (0%)	9 (3%)	\$8 (7%)
Garage*	300 (4%)	0 (0%)	26 (9%)	\$22 (18%)

\* Excludes dwelling garages reported as separate properties

Note and Source: See Table 5.4.

**Water heaters accounted for 4,730 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.<sup>19</sup>**

For specific equipment, water heaters with unknown-type power or fuel accounted for 3,470 injuries, gas-fueled equipment 950 injuries, electric water heaters (excluding immersion heaters) 140 injuries, faucet water heaters 130 injuries, unclassified water heaters 20 injuries, and electric immersion heaters 20 injuries.

**Safe Heating Behaviors**

*Messages from NFPA Educational Messaging Advisory Committee*

**General heating-related messages**

- 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.
- Install water heaters according to the local codes and manufacturer's instructions. Have a qualified professional install the equipment.

*Additional safe behaviors for water heaters*

- 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.

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<sup>19</sup> All statistics from CPSC's National Electronic Injury Surveillance System, at [www.cpsc.gov](http://www.cpsc.gov).

**Table 5.1. Home Fires Involving Water Heaters, by Year  
Structure Fires Reported to U.S. Fire Departments**

Year	Fires	Civilian		Direct Property Damage (in Millions)	
		Deaths	Injuries	As Reported	In 2009 Dollars
1980	15,800	140	990	\$86	\$225
1981	13,800	50	800	\$77	\$180
1982	15,100	190	930	\$88	\$196
1983	16,100	70	1,010	\$113	\$243
1984	15,300	80	790	\$103	\$213
1985	13,700	80	820	\$101	\$200
1986	13,400	50	680	\$95	\$186
1987	11,700	30	890	\$81	\$154
1988	11,700	40	700	\$101	\$184
1989	11,800	30	550	\$90	\$156
1990	11,500	60	620	\$135	\$222
1991	11,600	70	770	\$170*	\$267*
1992	11,400	60	550	\$81	\$124
1993	11,600	50	670	\$97	\$144
1994	11,000	40	620	\$102	\$148
1995	10,400	30	510	\$97	\$137
1996	10,700	70	450	\$129	\$176
1997	9,700	60	300	\$118	\$158
1998	9,700	90	510	\$107	\$141
1999	6,100 (5,600)	0 (0)	170 (170)	\$67 (\$66)	\$86 (\$86)
2000	7,700 (7,300)	120 (120)	310 (310)	\$95 (\$95)	\$118 (\$118)
2001	8,800 (7,800)	20 (20)	240 (240)	\$106 (\$104)	\$129 (\$126)
2002	7,800 (7,100)	50 (50)	220 (220)	\$116 (\$116)	\$138 (\$138)
2003	7,600 (6,100)	40 (40)	360 (340)	\$121 (\$120)	\$141 (\$140)
2004	6,700 (5,800)	30 (30)	270 (270)	\$118 (\$118)	\$134 (\$133)
2005	7,500 (5,900)	80 (80)	320 (300)	\$149 (\$149)	\$164 (\$164)
2006	7,800 (5,800)	50 (50)	300 (300)	\$167 (\$166)	\$177 (\$177)
2007	7,900 (6,000)	30 (30)	340 (340)	\$75 (\$75)	\$78 (\$78)
2008	7,100 (5,100)	30 (30)	270 (270)	\$136 (\$136)	\$136 (\$136)
2009	5,300 (4,100)	0 (0)	190 (190)	\$129 (\$129)	\$129 (\$129)

\* 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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2009) and from NFPA survey.

**Table 5.2. Home Water Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Water Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	1,670	(24%)	11	(30%)	109	(38%)	\$40	(31%)
Unclassified mechanical failure or malfunction	1,170	(17%)	3	(10%)	24	(8%)	\$19	(15%)
Unclassified electrical failure or malfunction	690	(10%)	0	(0%)	3	(1%)	\$4	(4%)
Unspecified short circuit arc	580	(8%)	0	(0%)	8	(3%)	\$7	(5%)
Leak or break	560	(8%)	3	(10%)	29	(10%)	\$12	(10%)
Worn out	310	(4%)	0	(0%)	2	(1%)	\$1	(1%)
Installation deficiency	270	(4%)	7	(18%)	8	(3%)	\$3	(2%)
Improper container or storage	240	(3%)	0	(0%)	8	(3%)	\$8	(6%)
Automatic control failure	220	(3%)	7	(19%)	0	(0%)	\$4	(3%)
Unclassified misuse of material or product	210	(3%)	0	(0%)	30	(10%)	\$8	(6%)
Water caused short circuit arc	210	(3%)	0	(0%)	2	(1%)	\$0	(0%)
Flammable liquid or gas spilled	180	(2%)	12	(32%)	28	(10%)	\$17	(13%)
Unclassified factor	160	(2%)	0	(0%)	3	(1%)	\$4	(3%)
Arc or spark from operating equipment	130	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Unclassified operational deficiency	130	(2%)	0	(0%)	0	(0%)	\$2	(1%)
Short circuit arc from defective or worn insulation	120	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Failure to clean	100	(1%)	0	(0%)	5	(2%)	\$1	(1%)
Equipment not being operated properly	80	(1%)	0	(0%)	5	(2%)	\$1	(1%)
Arc from faulty contact or broken conductor	60	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Washing part or painting with flammable liquid	60	(1%)	0	(0%)	16	(6%)	\$3	(2%)
Abandoned or discarded material of product	50	(1%)	3	(9%)	8	(3%)	\$2	(1%)
Backfire	50	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified design, manufacturing or installation deficiency	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper fueling technique	40	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Other known factor	310	(4%)	0	(0%)	22	(7%)	\$5	(4%)
Total fires	7,100	(100%)	36	(100%)	287	(100%)	\$127	(100%)
Total factor entries	7,680	(108%)	46	(128%)	314	(109%)	\$144	(113%)

**Table 5.2. Home Water Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**B. Gas-Fueled Water Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	1,390	(33%)	11	(30%)	93	(39%)	\$36	(34%)
Unclassified mechanical failure or malfunction	480	(11%)	3	(10%)	19	(8%)	\$17	(16%)
Unclassified misuse of material or product	460	(11%)	0	(0%)	30	(13%)	\$8	(7%)
Leak or break	300	(7%)	3	(10%)	26	(11%)	\$12	(11%)
Unclassified factor	250	(6%)	0	(0%)	3	(1%)	\$4	(3%)
Improper container or storage	210	(5%)	0	(0%)	5	(2%)	\$7	(7%)
Worn out	190	(4%)	0	(0%)	2	(1%)	\$1	(1%)
Flammable liquid or gas spilled	160	(4%)	12	(32%)	27	(11%)	\$16	(15%)
Installation deficiency	150	(4%)	7	(18%)	8	(3%)	\$2	(2%)
Abandoned or discarded material or product	120	(3%)	3	(9%)	7	(3%)	\$1	(1%)
Flammable liquid used to kindle fire	100	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified operational deficiency	80	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Failure to clean	80	(2%)	0	(0%)	2	(1%)	\$1	(1%)
Cutting or welding too close to combustible	80	(2%)	0	(0%)	2	(1%)	\$0	(0%)
Automatic control failure	80	(2%)	7	(19%)	0	(0%)	\$3	(3%)
Washing part or painting with flammable liquid	60	(1%)	0	(0%)	16	(7%)	\$3	(3%)
Equipment not being operated properly	50	(1%)	0	(0%)	3	(1%)	\$1	(1%)
Unspecified short circuit arc	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified electrical failure or malfunction	40	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Manual control failure	30	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Improper fuel used	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Backfire	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Improper fueling technique	20	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Collision, knockdown or overturn	20	(1%)	0	(0%)	3	(1%)	\$0	(0%)
Unclassified design, manufacturing or installation deficiency	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known factor	200	(5%)	0	(0%)	10	(4%)	\$3	(2%)
Total fires	4,250	(100%)	36	(100%)	236	(100%)	\$106	(100%)
Total factor entries	4,660	(110%)	46	(128%)	259	(110%)	\$119	(112%)

**Table 5.2. Home Water Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**C. Electric-Powered Water Heaters**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Unclassified electrical failure or malfunction	680	(25%)	0	(NA)	6	(11%)	\$4	(22%)
Unspecified short circuit arc	570	(21%)	0	(NA)	10	(21%)	\$7	(33%)
Unclassified mechanical failure or malfunction	340	(13%)	0	(NA)	7	(13%)	\$2	(11%)
Water caused short circuit arc	220	(8%)	0	(NA)	2	(5%)	\$0	(2%)
Heat source too close to combustibles	170	(6%)	0	(NA)	15	(31%)	\$3	(14%)
Leak or break	170	(6%)	0	(NA)	1	(1%)	\$1	(3%)
Arc or spark from operating equipment	120	(5%)	0	(NA)	0	(1%)	\$1	(4%)
Short circuit arc from defective or worn insulation	120	(5%)	0	(NA)	0	(1%)	\$1	(5%)
Installation deficiency	70	(3%)	0	(NA)	0	(1%)	\$1	(6%)
Arc from faulty contact or broken conductor	50	(2%)	0	(NA)	0	(0%)	\$1	(3%)
Worn out	50	(2%)	0	(NA)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	40	(2%)	0	(NA)	0	(0%)	\$0	(2%)
Unclassified operational deficiency	30	(1%)	0	(NA)	0	(0%)	\$0	(0%)
Unclassified factor	30	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Improper container or storage	30	(1%)	0	(NA)	3	(7%)	\$0	(1%)
Automatic control failure	30	(1%)	0	(NA)	0	(0%)	\$0	(2%)
Failure to clean	20	(1%)	0	(NA)	3	(7%)	\$0	(0%)
Abandoned or discarded material or product	20	(1%)	0	(NA)	2	(4%)	\$0	(0%)
Unclassified misuse of material or product	20	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Storm	20	(1%)	0	(NA)	0	(0%)	\$0	(2%)
Cutting or welding too close to combustible	20	(1%)	0	(NA)	0	(0%)	\$0	(0%)
Other known factor	60	(2%)	0	(NA)	6	(11%)	\$2	(8%)
Total fires	2,700	(100%)	0	(NA)	49	(100%)	\$21	(100%)
Total factor entries	2,900	(107%)	0	(NA)	56	(115%)	\$24	(118%)

NA – Not applicable because total is zero.

**Table 5.2. Home Water Heater Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 5.3. Home Water Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Water Heaters**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	1,510	(21%)	0	(0%)	19	(6%)	\$5	(4%)
Flammable or combustible gas or liquid	1,340	(19%)	22	(61%)	134	(47%)	\$41	(32%)
Appliance housing or casing	580	(8%)	0	(0%)	6	(2%)	\$3	(3%)
Clothing	500	(7%)	7	(19%)	28	(10%)	\$11	(9%)
Unclassified item	460	(6%)	0	(0%)	0	(0%)	\$4	(3%)
Structural member or framing	430	(6%)	5	(13%)	10	(3%)	\$8	(6%)
Interior wall covering	250	(4%)	0	(0%)	16	(5%)	\$11	(9%)
Floor covering	220	(3%)	0	(0%)	4	(2%)	\$3	(2%)
Unclassified soft goods or clothing	180	(2%)	0	(0%)	10	(4%)	\$6	(4%)
Insulation within structural area	160	(2%)	0	(0%)	5	(2%)	\$1	(1%)
Multiple items first ignited	150	(2%)	0	(0%)	14	(5%)	\$5	(4%)
Unclassified structural component or finish	140	(2%)	2	(6%)	1	(1%)	\$4	(3%)
Box or bag	120	(2%)	0	(0%)	8	(3%)	\$9	(7%)
Dust, fiber, or lint	100	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Exterior wall covering	80	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Linen other than bedding	70	(1%)	0	(0%)	5	(2%)	\$1	(0%)
Papers	70	(1%)	0	(0%)	1	(0%)	\$1	(1%)
Unclassified storage supplies	60	(1%)	0	(0%)	0	(0%)	\$2	(2%)
Household utensil	60	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Trash or waste	60	(1%)	0	(0%)	6	(2%)	\$0	(0%)
Pipe, duct, conduit, or hose covering	50	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Pipe, duct, conduit or hose	50	(1%)	0	(0%)	3	(1%)	\$0	(0%)
Mattress or bedding	50	(1%)	0	(0%)	2	(1%)	\$1	(1%)
Cabinetry	40	(1%)	0	(0%)	3	(1%)	\$1	(1%)
Ceiling covering	40	(1%)	0	(0%)	1	(0%)	\$4	(3%)
Other known item	320	(4%)	0	(0%)	12	(4%)	\$3	(2%)
Total fires	7,100	(100%)	36	(100%)	287	(100%)	\$127	(100%)

**B. Gas-Fueled Water Heaters**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable or combustible gas or liquid	1,150	(27%)	22	(61%)	128	(54%)	\$40	(37%)
Clothing	430	(10%)	7	(19%)	23	(10%)	\$10	(10%)
Structural member or framing	350	(8%)	5	(13%)	9	(4%)	\$7	(7%)
Unclassified item	330	(8%)	0	(0%)	0	(0%)	\$3	(3%)
Floor covering	210	(5%)	0	(0%)	4	(2%)	\$2	(2%)

**Table 5.3. Home Water Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Gas-Fueled Water Heaters (Continued)**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Appliance housing or casing	210	(5%)	0	(0%)	4	(2%)	\$2	(2%)
Interior wall covering	190	(5%)	0	(0%)	14	(6%)	\$10	(9%)
Unclassified soft goods or clothing	140	(3%)	0	(0%)	10	(4%)	\$4	(4%)
Unclassified structural component or finish	110	(3%)	2	(6%)	2	(1%)	\$3	(3%)
Multiple items first ignited	110	(3%)	0	(0%)	5	(2%)	\$4	(4%)
Box or bag	100	(2%)	0	(0%)	8	(3%)	\$8	(8%)
Dust, fiber, or lint	90	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Insulation within structural area	80	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Wire or cable insulation	70	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Exterior wall covering	60	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Trash or waste	50	(1%)	0	(0%)	6	(3%)	\$0	(0%)
Pipe, duct, conduit or hose	50	(1%)	0	(0%)	3	(1%)	\$0	(0%)
Household utensil	50	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Papers	40	(1%)	0	(0%)	1	(1%)	\$1	(1%)
Unclassified storage supplies	40	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Linen other than bedding	40	(1%)	0	(0%)	5	(2%)	\$0	(0%)
Mattress or bedding	30	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Cabinetry	30	(1%)	0	(0%)	3	(1%)	\$1	(1%)
Ceiling covering	30	(1%)	0	(0%)	1	(1%)	\$4	(4%)
Unclassified organic materials	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Film or residue, including creosote	30	(1%)	0	(0%)	2	(1%)	\$0	(0%)
Other known item	190	(4%)	0	(0%)	8	(3%)	\$2	(2%)
Total fires	4,250	(100%)	36	(100%)	236	(100%)	\$106	(100%)

**C. Electric-Powered Water Heaters**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	1,450	(54%)	0	(NA)	18	(38%)	\$5	(26%)
Appliance housing or casing	360	(13%)	0	(NA)	2	(3%)	\$2	(8%)
Unclassified item	130	(5%)	0	(NA)	0	(0%)	\$1	(7%)
Insulation within structural area	80	(3%)	0	(NA)	5	(10%)	\$0	(0%)
Flammable or combustible gas or liquid	80	(3%)	0	(NA)	6	(11%)	\$1	(4%)
Structural member or framing	70	(3%)	0	(NA)	1	(3%)	\$1	(6%)
Clothing	70	(3%)	0	(NA)	3	(7%)	\$1	(6%)
Interior wall covering	60	(2%)	0	(NA)	2	(3%)	\$2	(9%)
Pipe, duct, conduit, or hose covering	50	(2%)	0	(NA)	0	(0%)	\$0	(0%)

**Table 5.3. Home Water Heater Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Electric-Powered Water Heaters (Continued)**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Multiple items first ignited	40	(1%)	0	(NA)	7	(15%)	\$1	(4%)
Unclassified soft goods or clothing	30	(1%)	0	(NA)	0	(0%)	\$1	(6%)
Unclassified structural component or finish	30	(1%)	0	(NA)	0	(0%)	\$1	(5%)
Filter, including evaporative cooler pad	30	(1%)	0	(NA)	0	(0%)	\$0	(0%)
Box or bag	20	(1%)	0	(NA)	0	(0%)	\$1	(6%)
Unclassified storage supplies	20	(1%)	0	(NA)	0	(0%)	\$1	(3%)
Mattress or bedding	20	(1%)	0	(NA)	2	(3%)	\$0	(1%)
Unclassified furniture or utensil	20	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Linen other than bedding	20	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Floor covering	10	(1%)	0	(NA)	0	(0%)	\$0	(2%)
Exterior wall covering	10	(1%)	0	(NA)	0	(0%)	\$0	(2%)
Other known item	100	(4%)	0	(NA)	3	(7%)	\$1	(4%)
<b>Total fires</b>	<b>2,700</b>	<b>(100%)</b>	<b>0</b>	<b>(NA)</b>	<b>49</b>	<b>(100%)</b>	<b>\$21</b>	<b>(100%)</b>

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimate. 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 5.4. Home Water Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

**A. All Water Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room or area	2,030	(29%)	5	(13%)	97	(34%)	\$44	(35%)
Confined fuel burner or boiler fire	1,710	(24%)	0	(0%)	6	(2%)	\$0	(0%)
Laundry room or area	850	(12%)	2	(6%)	64	(22%)	\$16	(12%)
Closet	560	(8%)	0	(0%)	9	(3%)	\$8	(7%)
Garage*	300	(4%)	0	(0%)	26	(9%)	\$22	(18%)
Crawl space or substructure space	270	(4%)	5	(13%)	11	(4%)	\$4	(3%)
Kitchen	210	(3%)	5	(13%)	17	(6%)	\$4	(3%)
Bathroom	150	(2%)	0	(0%)	9	(3%)	\$3	(2%)
Storage room or area	150	(2%)	2	(6%)	5	(2%)	\$3	(2%)
Unclassified storage area	110	(2%)	2	(6%)	7	(2%)	\$3	(2%)
Unclassified function area	100	(1%)	0	(0%)	5	(2%)	\$3	(2%)
Storage of supplies or tools	70	(1%)	2	(6%)	4	(1%)	\$6	(4%)
Attic or other space above top story	70	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Unclassified equipment or service area	60	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Bedroom	50	(1%)	0	(0%)	6	(2%)	\$1	(1%)
Unclassified structural area	50	(1%)	0	(0%)	3	(1%)	\$1	(1%)
Unclassified area	50	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Wall assembly or concealed space	40	(1%)	0	(0%)	1	(0%)	\$2	(1%)
Other known area	240	(3%)	12	(33%)**	14	(5%)	\$6	(5%)
<b>Total fires</b>	<b>7,100</b>	<b>(100%)</b>	<b>36</b>	<b>(100%)</b>	<b>287</b>	<b>(100%)</b>	<b>\$127</b>	<b>(100%)</b>

\* Excludes dwelling garages coded as separate property.

\*\* Leading areas for fire deaths not shown above are interior stairway (17% of deaths), lobby or entrance way (8%), and courtyard, terrace or patio (8%).

**B. Gas-Fueled Water Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heating equipment room or area	1,320	(31%)	5	(15%)	86	(36%)	\$35	(33%)
Confined fuel burner or boiler fire	850	(20%)	0	(0%)	0	(0%)	\$0	(0%)
Laundry room or area	610	(14%)	2	(6%)	49	(21%)	\$14	(13%)
Garage*	230	(5%)	0	(0%)	24	(10%)	\$22	(21%)

**Table 5.4. Home Water Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**B. Gas-Fueled Water Heaters (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Closet	210	(5%)	0	(0%)	6	(3%)	\$5	(5%)
Crawl space or substructure space	200	(5%)	5	(13%)	11	(5%)	\$3	(3%)
Kitchen	110	(3%)	5	(13%)	16	(7%)	\$3	(3%)
Storage room or area	90	(2%)	2	(6%)	6	(2%)	\$2	(2%)
Bathroom	90	(2%)	0	(0%)	6	(2%)	\$2	(1%)
Unclassified storage area	80	(2%)	2	(6%)	7	(3%)	\$2	(2%)
Unclassified function area	60	(1%)	0	(0%)	6	(2%)	\$2	(2%)
Storage of supplies or tools or dead storage	50	(1%)	2	(6%)	3	(1%)	\$5	(5%)
Attic or other space above top story	40	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Unclassified equipment or service area	40	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Unclassified structural area	30	(1%)	0	(0%)	3	(1%)	\$1	(1%)
Unclassified area	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Wall assembly or concealed space	20	(1%)	0	(90%)	0	(0%)	\$1	(1%)
Confined chimney or flue fire	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known area	160	(4%)	12	(33%)**	13	(6%)	\$6	(6%)
Total fires	4,250	(100%)	36	(100%)	236	(100%)	\$106	(100%)

\* Excludes dwelling garages coded as separate property.

\*\* Leading areas for fire deaths not shown above are interior stairway (17% of deaths), courtyard, terrace, or patio (8%), and lobby or entrance way (8%).

**C. Electric-Powered Water Heaters**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fuel burner or boiler fire	740	(27%)	0	(NA)	6	(13%)	\$0	(0%)
Heating equipment room or area	710	(26%)	0	(NA)	11	(23%)	\$7	(36%)
Closet	360	(13%)	0	(NA)	3	(6%)	\$4	(19%)
Laundry room or area	230	(9%)	0	(NA)	12	(24%)	\$2	(10%)
Kitchen	90	(4%)	0	(NA)	1	(3%)	\$0	(2%)
Garage*	70	(3%)	0	(NA)	3	(6%)	\$1	(4%)
Crawl space or substructure space	70	(3%)	0	(NA)	0	(0%)	\$1	(5%)
Storage room or area	60	(2%)	0	(NA)	0	(0%)	\$1	(3%)
Bathroom	60	(2%)	0	(NA)	3	(6%)	\$1	(6%)
Bedroom	40	(2%)	0	(NA)	6	(12%)	\$0	(2%)
Unclassified function area	40	(1%)	0	(NA)	0	(0%)	\$0	(0%)

**Table 5.4. Home Water Heater Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments (Continued)**

**C. Electric-Powered Water Heaters (Continued)**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Unclassified storage area	30	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Unclassified equipment or service area	30	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Storage or supplies or tools or dead storage	20	(1%)	0	(NA)	1	(3%)	\$0	(2%)
Unclassified structural area	20	(1%)	0	(NA)	0	(0%)	\$0	(2%)
Attic or other space above top story	20	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Wall assembly or concealed space	20	(1%)	0	(NA)	1	(3%)	\$0	(2%)
Unclassified area	20	(1%)	0	(NA)	0	(0%)	\$0	(1%)
Other known area	70	(3%)	0	(NA)	0	(0%)	\$0	(1%)
<b>Total fires</b>	<b>2,700</b>	<b>(100%)</b>	<b>0</b>	<b>(NA)</b>	<b>49</b>	<b>(100%)</b>	<b>\$21</b>	<b>(100%)</b>

NA - Not applicable because total is zero.

\* Excludes dwelling garages coded as separate property.

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.



## Section 6. Heat Tape and Heat Lamps

### A. Heat Tape

**In 2009, an estimated 200 reported home structure fires involving heat tape resulted in 10 civilian deaths, 13 civilian injuries, and \$6 million in direct property damage.**

In 2005-2009, there were an estimated two civilian deaths reported per year. (See Table 6.A.)

Heat tape is an electrical heating element in the form of an insulated wire or tape, typically used in contact with a pipe in order to maintain the temperature of the pipe and so its contents. It provides a means of preventing freezing of pipes that run through unheated spaces.

**Table 6.A. Home Fires Involving Heat Tape, by Year**

	<b>Fires</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions of Current Dollars)</b>	<b>Direct Property Damage (in Millions of 2009 Dollars)</b>
2002	700 (700)	12 (12)	\$9 (\$9)	\$10 (\$10)
2003	400 (400)	20 (20)	\$8 (\$8)	\$9 (\$9)
2004	500 (500)	0 (0)	\$13 (\$13)	\$15 (\$15)
2005	300 (300)	8 (8)	\$5 (\$5)	\$6 (\$6)
2006	300 (300)	0 (0)	\$2 (\$2)	\$2 (\$2)
2007	300 (300)	7 (7)	\$7 (\$7)	\$8 (\$8)
2008	300 (300)	0 (0)	\$26 (\$26)	\$26 (\$26)
2009	200 (200)	13 (13)	\$6 (\$6)	\$6 (\$6)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. There are too few civilian deaths reported to support meaningful estimates by individual year. Fires are rounded to the nearest hundred, civilian deaths and civilian injuries are expressed to the nearest one 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 unknown type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Inflation adjustment to 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 5.0 and NFPA survey.

The leading factors contributing to ignition for home heat tape fires are all types of electrical failures. (See Table 6.1.) The leading factor with failure mode details was short circuit arc from defective or worn insulation (14%).

Half of home heat tape fires began with ignition of insulation, either wire or cable insulation (33%) or thermal, acoustic, or other insulation in a structural area (12%). (See Table 6.2.)

The other leading item first ignited in home heat tape fires was structural member or framing (19%).

Half (48%) of home heat tape fires began in a crawl space or substructure space. (See Table 6.3.)

Heat tapes accounted for 20 injuries reported to hospital emergency rooms in 2010.<sup>20</sup>

## B. Heat Lamps

**In 2009, an estimated 400 reported home structure fires involving heat lamps resulted in 19 civilian injuries and \$20 million in direct property damage.**

There were no civilian deaths reported in 2009. In 2005-2009, there were an estimated nine civilian deaths per year.

The leading factor contributing to ignition for home heat lamp fires was heat source too close to combustibles (61%). (See Table 6.4.) The leading item first ignited was floor covering (13%), and the leading area of origin was bedroom (25%). (See Tables 6.5 and 6.6.)

**Table 6.B. Home Fires Involving Heat Lamp, by Year**

	<b>Fires</b>	<b>Civilian Injuries</b>	<b>Direct Property Damage (in Millions of Current Dollars)</b>	<b>Direct Property Damage (in Millions of 2009 Dollars)</b>
2002	300 (300)	12 (12)	\$7 (\$7)	\$9 (\$9)
2003	600 (500)	30 (30)	\$26 (\$26)	\$30 (\$30)
2004	500 (400)	0 (0)	\$10 (\$10)	\$11 (\$11)
2005	300 (300)	24 (24)	\$10 (\$10)	\$11 (\$11)
2006	600 (600)	21 (21)	\$14 (\$14)	\$15 (\$15)
2007	500 (500)	30 (30)	\$11 (\$11)	\$12 (\$12)
2008	400 (400)	0 (0)	\$26 (\$26)	\$26 (\$26)
2009	400 (400)	19 (19)	\$20 (\$20)	\$20 (\$20)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. There are too few civilian deaths reported to support meaningful estimates by individual year. Fires are rounded to the nearest hundred, civilian injuries are expressed to the nearest one 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 unknown type. Fires reported as “no equipment” but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated. Inflation adjustment to 2009 dollars is done using the consumer price index.

Source: Data from NFIRS Version 5.0 and NFPA survey.

<sup>20</sup> Statistics from National Electronic Injury Surveillance System at [www.cpsc.gov](http://www.cpsc.gov).

Heat lamps accounted for 250 injuries (not limited to fire or burn injuries) reported to hospital emergency rooms in 2010.<sup>21</sup>

### **Safe Use of Electrical Appliances, Including Heat Tape and Heat Lamps<sup>22</sup>**

- Select and install equipment for safety and effectiveness.
  - Use heat tape only in locations deemed appropriate by the manufacturer.
  - Make sure your heat tape has the label showing that it is listed by a recognized testing laboratory.
  - Check for product recalls at [www.cpsc.gov](http://www.cpsc.gov).
  - Install equipment according to the local codes and manufacturer's instructions.
- Use electric-powered equipment safely, in accordance with manufacturer's instructions.
  - Plug power cords only into outlets with sufficient capacity and never into an extension cord.
  - Do not position electric-powered equipment near water or where there is danger of water being spilled, to avoid serious risk of electric shock.
  - Do not use or store flammable or combustible liquids near or in rooms with energized equipment, in order to avoid a vapor ignition and possible flash fire.
- Inspect and maintain electric-powered equipment regularly for safety.
  - Inspect cords for cracking, loose connections, or broken plugs, and replace any damaged equipment before use.

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<sup>21</sup> Statistics from National Electronic Injury Surveillance System at [www.cpsc.gov](http://www.cpsc.gov).

<sup>22</sup> Not taken from messages from the Educational Messaging Advisory Committee.

**Table 6.1. Home Heat Tape Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified electrical failure or malfunction	60	(20%)	NA	(NA)	0	(0%)	\$1	(12%)
Unspecified short circuit arc	50	(16%)	NA	(NA)	4	(62%)	\$1	(12%)
Short circuit arc from defective or worn insulation	40	(14%)	NA	(NA)	2	(38%)	\$2	(22%)
Heat source too close to combustibles	40	(13%)	NA	(NA)	0	(0%)	\$2	(24%)
Unclassified mechanical failure or malfunction	30	(11%)	NA	(NA)	0	(0%)	\$1	(7%)
Unclassified misuse of material or product	10	(5%)	NA	(NA)	0	(0%)	\$0	(1%)
Installation deficiency	10	(4%)	NA	(NA)	0	(0%)	\$0	(5%)
Short circuit arc from mechanical damage	10	(3%)	NA	(NA)	0	(0%)	\$0	(2%)
Arc or spark from operating equipment	10	(3%)	NA	(NA)	0	(0%)	\$0	(0%)
Unintentionally turned on or not turned off	10	(3%)	NA	(NA)	0	(0%)	\$0	(5%)
Worn out	10	(3%)	NA	(NA)	0	(0%)	\$1	(7%)
Equipment not being operated properly	10	(2%)	NA	(NA)	0	(0%)	\$0	(4%)
Automatic control failure	10	(2%)	NA	(NA)	0	(0%)	\$0	(0%)
Unclassified operational deficiency	10	(2%)	NA	(NA)	0	(0%)	\$1	(6%)
Other known factor	20	(8%)	NA	(NA)	0	(0%)	\$2	(19%)
Total fires	280	(100%)	2	(100%)	6	(100%)	\$9	(100%)
Total factor entries	310	(109%)	NA	(NA)	6	(100%)	\$12	(125%)

NA – Not available because all deaths had unknown factor contributing to ignition.

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 heat tape 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 6.2. Home Heat Tape Fires, by Item First Ignited  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	90	(33%)	0	(0%)	3	(46%)	\$1	(12%)
Structural member or framing	60	(19%)	0	(0%)	2	(28%)	\$1	(12%)
Insulation within structural area	30	(12%)	0	(0%)	0	(0%)	\$0	(2%)
Pipe, duct, conduit, or hose covering	20	(6%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified item	20	(6%)	0	(0%)	0	(0%)	\$1	(10%)
Pipe, duct, conduit or hose	10	(4%)	0	(0%)	0	(0%)	\$0	(4%)
Exterior wall covering	10	(4%)	0	(0%)	0	(0%)	\$0	(1%)
Other known item	40	(15%)	2	(100%)*	1	(26%)	\$5	(58%)
Total fires	280	(100%)	2	(100%)	6	(100%)	\$9	(100%)

\* Leading item for deaths not shown is multiple items first ignited (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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 6.3. Home Heat Tape Fires, by Area of Origin  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Crawl space or substructure space	140	(48%)	0	(0%)	4	(74%)	\$1	(14%)
Ceiling/floor assembly or space between stories	20	(7%)	0	(0%)	0	(0%)	\$0	(3%)
Heating equipment room	10	(5%)	2	(100%)	0	(0%)	\$0	(2%)
Exterior roof surface	10	(4%)	0	(0%)	0	(0%)	\$4	(46%)
Unclassified area	10	(4%)	0	(0%)	0	(0%)	\$1	(7%)
Bedroom	10	(4%)	0	(0%)	0	(0%)	\$0	(2%)
Attic or other space above top story	10	(3%)	0	(0%)	0	(0%)	\$1	(8%)
Conduit, pipe, utility, or ventilation shaft	10	(3%)	0	(0%)	0	(0%)	\$0	(3%)
Garage*	10	(3%)	0	(0%)	0	(0%)	\$0	(4%)
Bathroom	10	(3%)	0	(0%)	0	(0%)	\$0	(3%)
Other known area	40	(15%)	0	(0%)	1	(26%)	\$1	(7%)
<b>Total fires</b>	<b>280</b>	<b>(100%)</b>	<b>2</b>	<b>(100%)</b>	<b>6</b>	<b>(100%)</b>	<b>\$9</b>	<b>(100%)</b>

\* Excludes dwelling garages reported as separate properties.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fire reported only to Federal or state agencies or industrial fire brigades. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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.

**Table 6.4. Home Heat Lamp Fires, by Factor Contributing to Ignition  
Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Department**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	280	(61%)	7	(75%)	17	(91%)	\$10	(65%)
Unclassified electrical failure or malfunction	30	(8%)	0	(0%)	0	(0%)	\$1	(7%)
Collision, knockdown or overturn	30	(6%)	0	(0%)	2	(9%)	\$2	(11%)
Equipment unattended	30	(6%)	0	(0%)	0	(0%)	\$0	(2%)
Unspecified short circuit arc	20	(4%)	2	(25%)	0	(0%)	\$1	(9%)
Animal	20	(4%)	0	(0%)	0	(0%)	\$0	(2%)
Unintentionally turned on or not turned off	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Short circuit arc from defective or worn insulation	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Installation deficiency	10	(2%)	0	(0%)	0	(0%)	\$0	(3%)
Equipment used for not intended purpose	10	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Unclassified factor	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Equipment overloaded	10	(2%)	0	(0%)	1	(7%)	\$0	(0%)
Other known factor	50	(11%)	0	(0%)	0	(0%)	\$1	(7%)
Total fires	450	(100%)	9	(100%)	19	(100%)	\$16	(100%)
Total factor entries	500	(111%)	9	(100%)	20	(108%)	\$17	(107%)

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 did react 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 6.5. Home Heat Lamp Fires, by Item First Ignited**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Departments**

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Floor covering	60	(13%)	0	(0%)	2	(10%)	\$3	(18%)
Mattress or bedding	40	(10%)	3	(34%)	2	(11%)	\$2	(13%)
Unclassified item	30	(8%)	0	(0%)	0	(0%)	\$1	(7%)
Wire or cable insulation	30	(7%)	0	(0%)	0	(0%)	\$0	(3%)
Structural member or framing	30	(6%)	0	(0%)	0	(0%)	\$0	(3%)
Unclassified organic material	20	(5%)	0	(0%)	2	(10%)	\$0	(3%)
Unclassified structural component or finish	20	(5%)	0	(0%)	0	(0%)	\$0	(2%)
Light vegetation including grass	20	(4%)	3	(33%)	0	(0%)	\$1	(5%)
Box or bag	20	(4%)	0	(0%)	0	(0%)	\$0	(1%)
Insulation within structural area	20	(4%)	0	(0%)	7	(36%)	\$0	(3%)
Clothing	20	(4%)	0	(0%)	0	(0%)	\$1	(7%)
Papers	10	(3%)	0	(0%)	0	(0%)	\$0	(2%)
Unclassified furniture or utensil	10	(3%)	0	(0%)	2	(11%)	\$1	(7%)
Cabinetry	10	(3%)	0	(0%)	0	(0%)	\$0	(3%)
Upholstered furniture	10	(3%)	0	(0%)	2	(11%)	\$0	(3%)
Exterior wall covering	10	(3%)	0	(0%)	0	(0%)	\$0	(2%)
Chips	10	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Interior wall covering	10	(2%)	0	(0%)	0	(0%)	\$0	(1%)
Other known item	60	(13%)	3	(34%)*	2	(11%)	\$2	(15%)
<b>Total fires</b>	<b>450</b>	<b>(100%)</b>	<b>9</b>	<b>(100%)</b>	<b>19</b>	<b>(100%)</b>	<b>\$16</b>	<b>(100%)</b>

\* Leading item for fire deaths not shown above is curtain or drape (34% of deaths).

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. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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 6.6. Home Heat Lamp Fires, by Area of Origin**  
**Annual Average of 2005-2009 Structure Fires Reported to U.S. Fire Department**

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Bedroom	110	(25%)	5	(50%)	7	(38%)	\$4	(26%)
Garage*	40	(9%)	0	(0%)	0	(0%)	\$2	(14%)
Living room, family room, or den	40	(9%)	0	(0%)	1	(8%)	\$1	(5%)
Bathroom	40	(8%)	0	(0%)	5	(25%)	\$1	(4%)
Exterior balcony or unenclosed porch	30	(7%)	0	(0%)	1	(8%)	\$1	(7%)
Unclassified outside area	20	(4%)	0	(0%)	0	(0%)	\$0	(0%)
Exterior wall surface	20	(4%)	0	(0%)	1	(7%)	\$1	(7%)
Kitchen	10	(3%)	2	(25%)	0	(0%)	\$0	(2%)
Unclassified storage area	10	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified function area	10	(3%)	0	(0%)	0	(0%)	\$1	(6%)
Ceiling/floor assembly or space between stories	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified structural area	10	(2%)	0	(0%)	1	(8%)	\$1	(6%)
Courtyard, terrace or patio	10	(2%)	0	(0%)	1	(7%)	\$1	(5%)
Attic or other space above top story	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified area	10	(2%)	0	(0%)	0	(0%)	\$0	(2%)
Lawn, field, or open area	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Closet	10	(2%)	0	(0%)	0	(0%)	\$0	(0%)
Crawl space or substructure space	10	(2%)	2	(25%)	0	(0%)	\$0	(3%)
Other known area	50	(10%)	0	(0%)	0	(0%)	\$2	(11%)
<b>Total fires</b>	<b>450</b>	<b>(100%)</b>	<b>9</b>	<b>(100%)</b>	<b>19</b>	<b>(100%)</b>	<b>\$16</b>	<b>(100%)</b>

\* Excludes dwelling garages reported as separate properties.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fire reported only to Federal or state agencies or industrial fire brigades. Analyses are done separately for fires not reported as confined fires, for fires reported as chimney or flue, and for fires reported as confined to fuel burner or boiler. Detailed reporting is not required for fires reported as confined fires, which means there are proportionally far more unknowns to allocate for confined fires. Fires reported as confined to cooking vessel, trash container, incinerator, or commercial compactor are not included in the estimates. 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

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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](http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf).

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

### **Methodology may change slightly from year to year.**

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

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

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

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

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit <http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf>.

### **Projecting NFIRS to National Estimates**

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

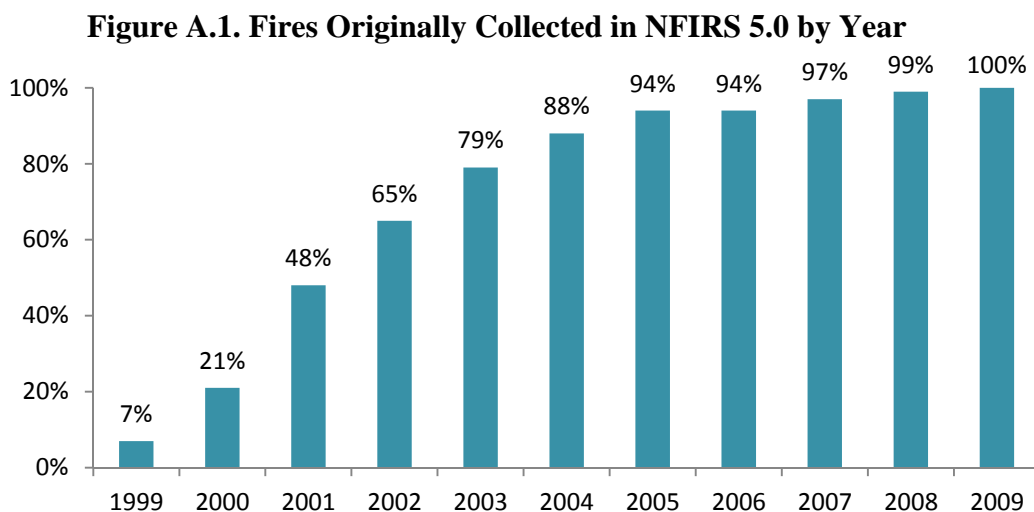
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific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

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and

Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at <http://www.nfpa.org/osds> or through NFPA's One-Stop Data Shop.

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

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



From 1999 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. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

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

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

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

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

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

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

of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

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

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

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

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
30. Electrical failure or malfunction, other.

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

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

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

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

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

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

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

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

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

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

**Code Grouping**

**EII 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	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector
	228	Battery charger or rectifier
	229	Battery (all types)
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight
	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast
	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
243	Decorative or landscape lighting – low voltage	

	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment
Portable cooking or warming equipm	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
641	Breadmaking machine	

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

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

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

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