

# **HOME FIRES INVOLVING HEATING EQUIPMENT**

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National Fire Protection Association**

**November 2007**



**National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471  
[www.nfpa.org](http://www.nfpa.org)**



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## **Abstract**

In 2005, heating equipment was involved in an estimated 62,200 reported home structure fires, 670 civilian deaths, 1,550 civilian injuries, and \$909 million in direct property damage.

In 2005, most home heating fire deaths (73%), injuries (64%), and direct property damage (57%) involved stationary or portable space heaters. Chimneys and chimney connectors accounted for the largest share of home heating fires (36%).

Space heating poses a much higher risk of fire, death, injury, and loss per million users than central heating. Comparisons of risk among different types of space heaters or different types of central heating show no clear, consistent, significant differences.

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

## **Acknowledgements**

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## Executive Summary

In 2005, heating equipment was involved in an estimated 62,200 reported U.S. home structure fires, with associated losses of 670 civilian deaths, 1,550 civilian injuries, and \$909 million in direct property damage. The estimated home heating fire total is roughly one-fourth (26%) the size of its peak in 1982, and associated deaths are down by 44% from their 1982 peak. “Homes” refers to one- and two-family dwellings (which include manufactured homes) and apartments (which include townhouses). Associated civilian injuries are down by 58% from their 1983 peak and direct property damage adjusted for inflation is down by one-half from the 1980 peak.

Prior to 1990, heating equipment was the leading cause of home fires. The roughly one-fourth decline from 1989 to 1990 dropped it behind cooking, which itself had seen a significant decline in home fires. Cooking equipment has been the leading cause of home fires ever since. In 2005 heating equipment fires accounted for one-sixth (16%) of all reported home fires.

Fixed (stationary) and portable space heaters, excluding fireplaces, chimneys, and chimney connectors, accounted for one-third (32%) of reported 2005 U.S. home heating fires, three-fourths (73%) of associated civilian deaths, two-thirds (64%) of associated civilian injuries, and more than half (57%) of associated direct property damage. In 2005, the central heating shares were one-fifth (18%) of reported U.S. home heating fires, one-seventh (15%) of associated civilian deaths, one-eleventh (9%) of associated civilian injuries, and one-twelfth (8%) of associated direct property damage.

Chimneys and chimney connectors accounted for the largest share of fire incidents (36% in 2005), because of the impact of confined fires. Confined fires accounted for 93% of total 2005 home chimney or chimney connector fires. Excluding confined fires, chimneys and chimney connectors accounted for only 6% of 2005 home heating fires.

Gas-fueled heating devices, particularly space heaters, pose a higher risk of death due to non-fire carbon monoxide poisoning. In 1995-1998 and 2000-2003, there were 2.7 electrocution deaths per year involving electric water heaters and 1.8 electrocution deaths per year involving electric furnaces. Heating equipment accounted for more than 53,000 injuries reported to hospital emergency rooms in 2004, including roughly 12,000 thermal burns. Space heaters accounted for 36% of the injuries and more than two-thirds of the thermal burns.

The decline in home heating fires since 1980 has been more consistent and more dramatic than the general decline in heating demand that resulted from a historically atypical string of warmer winters.

The leading factor contributing to ignition in non-confined home heating equipment fires is heat source too close to combustibles, which contributed to 27% of the home heating fires (excluding confined fires) and 53% of associated deaths. Failure to clean accounted for 64% of home heating equipment fires confined to chimney or flue. This means failure to clean is by far the leading factor for all home heating equipment fires combined.

Excluding confined fires, structural member or framing accounts for the largest share of items first ignited (17%), followed by cooking materials (9%).

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

### **Comparative Risk of Central and Space Heating Equipment**

#### **A. When Secondary Uses of Equipment Are Included as User Households**

<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)	269	23	7 times
Civilian deaths (per million user households)	9.5	0.2	36 times
Civilian injuries (per million user households)	18.0	1.3	12 times
Direct property damage (per user household)	\$10.1	\$1.1	8 times

#### **B. When Secondary Uses of Equipment Are Not Included as User Households**

<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 household)	400	25	12 times
Civilian deaths (per million user households)	14.2	0.3	58 times
Civilian injuries (per million user households)	26.7	1.5	20 times
Direct property damage (per user household)	\$15.0	\$1.2	14 times

Comparisons of different fuel or power options within central or space heating equipment do not show any types to be clearly better or clearly worse.

- Among central heating equipment, gas-fueled and electric-powered units show a higher rate of fire deaths per user household, but gas-fueled equipment would be clearly the highest if non-fire deaths due to unvented carbon monoxide were included, and electric-powered equipment would be clearly the lowest if electric heat pumps – which have their own NFIRS code, listed with air conditioning and fans, but which have a large number of user households as heating equipment – were included.

- Gas-fueled equipment is clearly lowest among central heating equipment for fire incident rates and property damage rates.
- Liquid-fueled equipment is clearly lowest among central heating equipment for death and injury rates but is clearly highest for property damage rates and would not be lowest for death rates if electric heat pumps were included with electric-powered heating equipment.
- Among space heating equipment, there are no clear differences for fire incident or property damage rates. Gas-fueled units rank low for death rates but would be clearly highest if non-fire deaths due to unvented carbon monoxide were included. Solid-fueled units rank among the lowest-risk units for injury rates but would not if non-fire contact burn injuries reported to hospital emergency rooms were included for all equipment. Liquid-fueled units rank high for death and injury rates but would not be highest for deaths if non-fire deaths due to unvented carbon monoxide were included.

Water heaters show a very large difference in risk for fires, deaths, injuries, and damages, with gas-fueled equipment showing a higher risk than electric-powered equipment.

The large share for cooking materials seems inconsistent with the usual designed use of the equipment – most heating devices are designed and marketed solely for heating – but there is also a possible explanation in terms of data accuracy. The substantive interpretation is that there is considerable use of heating equipment for cooking purposes. The data interpretation is 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.

Excluding confined fires, the leading area of origin for home heating fires is the kitchen (18%), followed by heating room or area (16%) and living room, family room or den (10%).

Home heating fires peak in the early evening. Home heating fires are less common during midnight to 8:00 a.m. This could reflect the practice in many homes of turning down the heat overnight, allowing blankets and bedding to compensate.

### **Safe Heating Behaviors**

- Select and install heating equipment for safety and effectiveness.
- Use heating equipment safely, in accordance with manufacturer’s instructions.
- Keep adequate clearance between heating equipment and any combustibles, both fixed, installed combustibles and moveable contents and furnishings. “Adequate” clearance is typically defined in applicable NFPA codes and standards. A clearance of 3 feet (roughly 1 meter, in metric terms) should be used if the size of the clearance is not set in codes and standards.
- Inspect and maintain heating equipment regularly for safety.

- Make sure your heating equipment has the label showing that it is listed by a recognized testing laboratory.

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