

Portable Heater Fires in Residential Buildings (2008–2010)

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- An estimated 900 portable heater fires in residential buildings are reported to U.S. fire departments each year and cause an estimated 70 deaths, 150 injuries, and \$53 million in property loss.
- Only 2 percent of heating fires in residential buildings involved portable heaters; however, portable heaters were involved in 45 percent of all fatal heating fires in residential buildings.
- Portable heater fires in residential buildings peaked in January (26 percent).
- Fifty-two percent of portable heater fires in residential buildings occurred because the heat source was too close to combustibles.
- Thirty-eight percent of portable heater fires in residential buildings originated in bedrooms. In these fires, bedding, such as blankets, sheets, and comforters, was the leading item first ignited by portable heaters at 25 percent.

From 2008 to 2010, portable heater fires in residential buildings—a subset of heating fires in residential buildings—accounted for an estimated average of 900 fires in the United States each year.^{1,2} These fires resulted in an annual average of approximately 70 deaths, 150 injuries, and \$53 million in property loss.³ The term “portable heater fires” applies to those fires that are caused by catalytic heaters, oil-filled heaters, or other heaters that are designed to be carried or moved for use in a variety of locations.⁴ Portable heaters are a subset of *space heaters*—small heaters designed to heat specific areas or rooms of a building.⁵

While portable heater fires in residential buildings were small in number, representing only 2 percent of all heating fires in residential buildings, their consequences were substantial: they accounted for 45 percent of fatal heating fires in residential buildings. Moreover, many of these fires were preventable as human error—placing the heater too close to combustible items or leaving the heater unattended—was a contributing factor to the fire.

This topical report addresses the characteristics of portable heater fires in residential buildings reported to the National Fire Incident Reporting System (NFIRS) from 2008 to 2010. For a broader overview of heating fires, see the companion topical report, “Heating Fires in Residential Buildings (2008-2010)” (Volume 13, Issue 8).

For the purpose of this report, the term “portable heater fires” is synonymous with “portable heater fires in residential buildings.” “Portable heater fires” is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, “portable heater fires in residential buildings.”

Type of Fire

Building fires are divided into two classes of severity in NFIRS: “confined fires,” which are fires confined to certain types of equipment or objects, and “nonconfined fires,” which are not. Confined building fires are small fire incidents that are limited in extent, staying within pots, fireplaces, or certain other noncombustible containers.⁶ Confined fires rarely result in serious injury or large content losses and are expected to have no significant accompanying property losses due to flame damage.⁷ For these reasons, NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires are not required and, as a result, are often not reported.

Very few portable heater fires were confined fires—only 1 percent. The few fire incident records coded as “confined” portable heater fires in NFIRS had sufficient data to be included in the overall analyses. As a result, the remainder of this report addresses all portable heater fires in residential buildings and does not distinguish between confined and nonconfined fires.

Table 1 presents losses, averaged over the 3-year period from 2008 to 2010, of reported portable heater fires and heating fires in residential buildings (i.e., excluding portable heater fires).⁸ All of the loss measures for portable heater fires were substantially higher than the same loss measures for all other heating fires in residential buildings. As discussed, portable heater fires are mostly nonconfined

fires (99 percent). As expected, their associated loss measures are higher since nonconfined fires are generally larger fires resulting in serious injury and more content losses. It is also expected that the loss measures for all other heating fires in residential buildings are lower as most are confined fires which are smaller and rarely result in serious injury or large content losses.⁹

Table 1. Loss Measures for Portable Heater Fires in Residential Buildings (3-year average, 2008–2010)

Measure	Portable Heater Fires in Residential Buildings	Heating Fires in Residential Buildings (Excluding Portable Heater Fires)
Average Loss:		
Fatalities/1,000 Fires	40.1	0.8
Injuries/1,000 Fires	112.2	6.6
Dollar Loss/Fire	\$34,910	\$3,380

Source: NFIRS 5.0.

Notes: 1) Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed *per fire* and is rounded to the nearest \$10.

2) When calculating the average dollar loss per fire for 2008–2010, the 2008 and 2009 dollar-loss values were adjusted to their equivalent 2010 dollar-loss values to account for inflation.

Where Portable Heater Fires in Residential Buildings Occur

One- and two-family residences were disproportionately represented in portable heater fires (Table 2).¹⁰ One- and two-family residences accounted for 89 percent of portable heater fires—yet they represented only 66 percent

of residential building fires.¹¹ Multifamily dwellings accounted for an additional 8 percent of portable heater fires. Multifamily dwellings, especially older apartments, condominiums, and the like, often have building-wide heating systems and the need for portable heaters may be less, perhaps accounting for the differences in portable heater fire incidence.

Table 2. Portable Heater Fires in Residential Buildings by Property Use (2008–2010)

Property Use	Portable Heater Fires in Residential Buildings (Percent)
One- or two-family dwellings	89.3
Multifamily dwellings	7.5
Other residential buildings	3.2
Total	100.0

Source: NFIRS 5.0.

Most portable heater fires started in bedrooms (38 percent) or common rooms including dens, family rooms, living rooms,

and lounges (18 percent). Fires that started in other function or activity areas accounted for 7 percent of fires (Table 3).

Table 3. Leading Areas of Fire Origin in Portable Heater Fires in Residential Buildings (2008–2010)

Areas of Fire Origin	Percent of Portable Heater Fires in Residential Buildings (Unknowns Apportioned)
Bedrooms	37.5
Common room, den, family room, living room, lounge	17.6
Other function areas	7.0
Bathroom, checkroom, lavatory, locker room	5.6
Vehicle storage: garage, carport	5.4

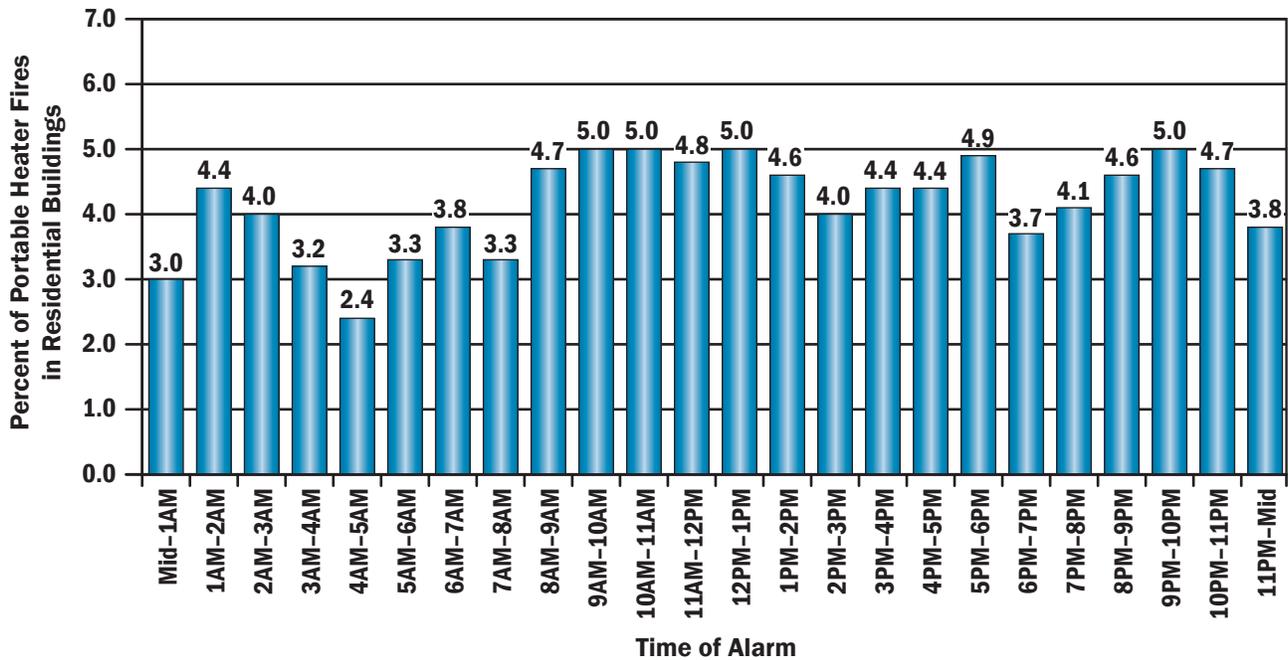
Source: NFIRS 5.0.

When Portable Heater Fires in Residential Buildings Occur

As shown in Figure 1, portable heater fires were relatively constant throughout the day with some variations. They

were generally at their lowest in the early morning hours, roughly between midnight and 8 a.m., and at their highest from 9 a.m. to 1 p.m. This latter 4-hour period accounted for 20 percent of portable heater fires.¹²

Figure 1. Portable Heater Fires in Residential Buildings by Time of Alarm (2008–2010)



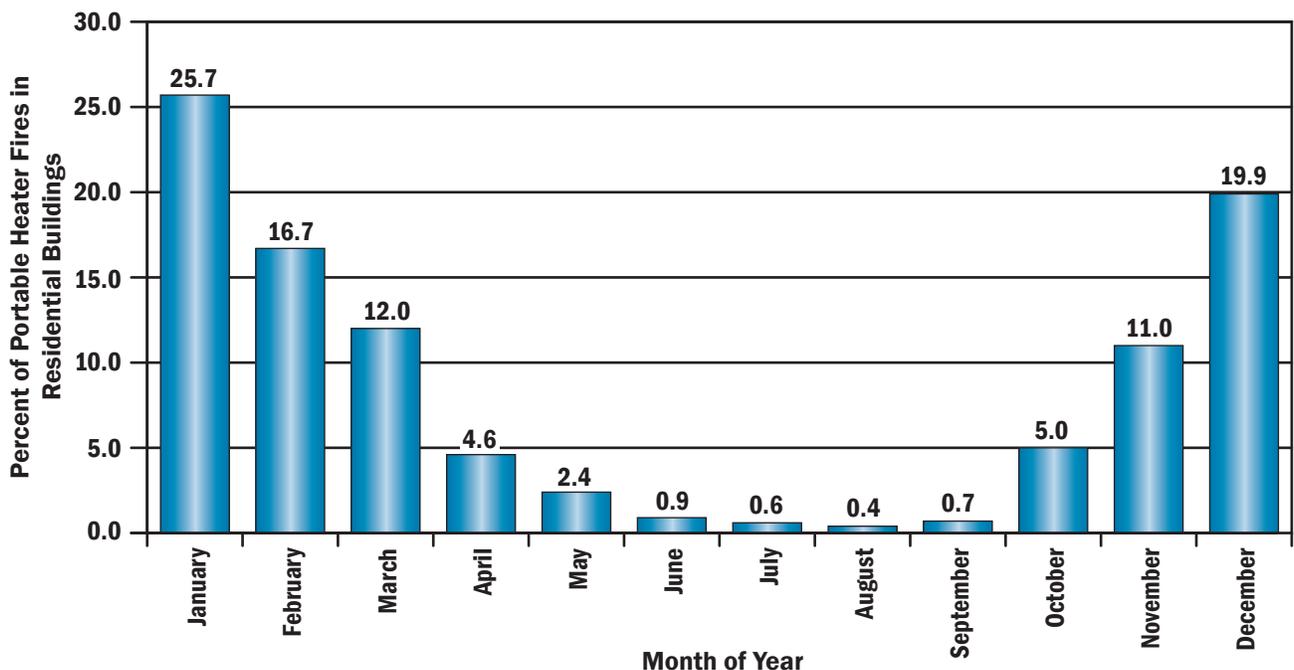
Source: NFIRS 5.0.

Note: Total does not add to 100 percent due to rounding.

Figure 2 shows the pattern of portable heater fires reported to NFIRS throughout the year. As expected, the number of portable heater fires increased during the late fall and winter months (November through March), peaking in January

(26 percent). From April to September, fire incidence declined from 5 percent to less than 1 percent. This is not surprising as the use of portable heaters is less common during the spring, summer, and early fall months.

Figure 2. Portable Heater Fires in Residential Buildings by Month (2008–2010)



Source: NFIRS 5.0.

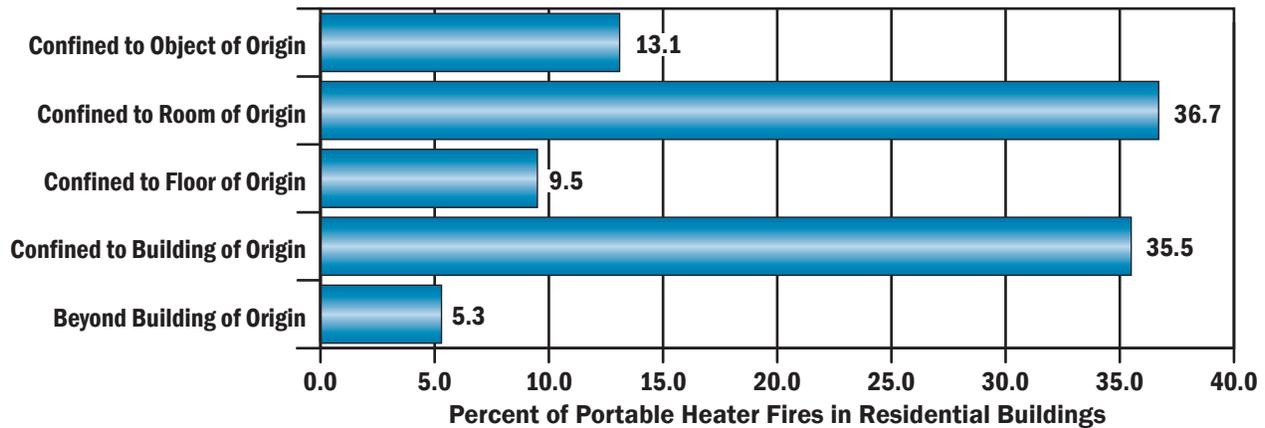
Note: Total does not add to 100 percent due to rounding.

Fire Spread in Portable Heater Fires in Residential Buildings

Fifty percent of portable heater fires remained confined to the object or room of origin (Figure 3). When compared to other residential heating-related fires, portable heater fires tended to spread further through the home. Fifty percent of

portable heater fires spread beyond the room of fire origin. By contrast, only 38 percent of nonconfined heating fires (excluding portable heater fires) in residential buildings spread beyond the room of origin. This increased fire spread may be, in part, why portable heater fires tended to be more serious as evidenced in the loss measures shown in Table 1.

Figure 3. Extent of Fire Spread in Portable Heater Fires in Residential Buildings (2008–2010)



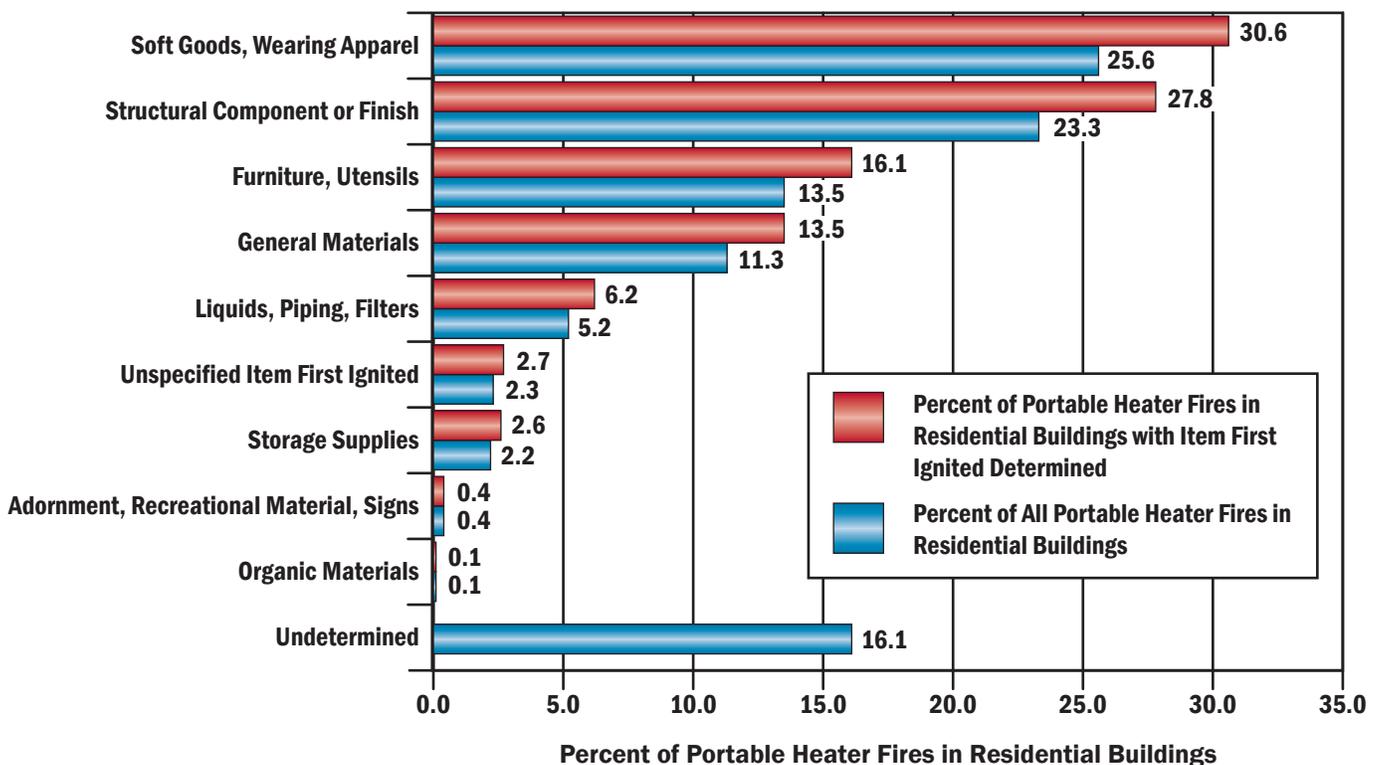
Source: NFIRS 5.0.
 Note: Total does not add to 100 percent due to rounding.

What Ignites First in Portable Heater Fires in Residential Buildings

Thirty-one percent of items first ignited in portable heater fires fell under the “soft goods, wearing apparel” category

(Figure 4). This category includes bedding, curtains, and clothing. The next leading category, “structural component or finish,” accounted for another 28 percent of portable heater fires. “Furniture, utensils” was the third leading category at 16 percent.

Figure 4. Item First Ignited in Portable Heater Fires in Residential Buildings (2008–2010)



Source: NFIRS 5.0.

Of the fires that originated in bedrooms (Table 3), bedding, such as blankets, sheets, and comforters, was the leading item first ignited by portable heaters (25 percent). Clothing not on a person accounted for another 13 percent.

For portable heater fires that originated in common rooms, 24 percent were started with the ignition of upholstered sofas and chairs. Floor coverings such as rugs, carpets, or mats accounted for an additional 18 percent.

Factors Contributing to Ignition in Portable Heater Fires in Residential Buildings

Table 4 shows the leading factors contributing to ignition of portable heater fires. Placing a heat source too close to combustible objects was the leading contributing factor (52 percent). Unattended equipment was a contributing factor in another 12 percent of portable heater fires, and electrical failure or malfunction was a contributing factor in 9 percent of the fires. These 3 contributing factors played a role in 73 percent of residential portable heater fires.

Table 4. Leading Factors Contributing to Ignition for Portable Heater Fires in Residential Buildings (Where Factor Contributing to Ignition Specified, 2008–2010)

Factor Contributing to Ignition	Percent of Portable Heater Fires in Residential Buildings (Unknowns Apportioned)
Heat source too close to combustibles	52.4
Equipment unattended	11.5
Unspecified electrical failure, malfunction	9.0
Unspecified short-circuit arc	6.4
Unspecified mechanical failure, malfunction	5.2

Source: NFIRS 5.0.

Notes: 1) Includes only incidents where factors that contributed to the ignition of the fire were specified.
2) Multiple factors contributing to fire ignition may be noted for each incident.

Suppression/Alerting Systems in Portable Heater Fires in Residential Buildings

Over the past 30 years, technologies to detect and extinguish fires have been major contributors in the drop in fire fatalities and injuries. Smoke alarms are now present in the majority of residential buildings. In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Note that the data presented in Tables 5 to 7 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms and sprinklers in portable heater fires. In addition, NFIRS does not allow for the

determination of the type of smoke alarm (i.e., photoelectric or ionization) or the location of the smoke alarm with respect to the area of fire origin.

Smoke Alarms

As shown in Table 5, smoke alarms were present in 40 percent of portable heater fires. Smoke alarms were not present in 32 percent of portable heater fires, and firefighters were unable to determine if a smoke alarm was present in another 28 percent of these fires. Additionally, smoke alarm presence status was not reported in less than 1 percent of incidents.^{13, 14} Thus, smoke alarms were potentially missing in between 32 and 60 percent of these fires with the ability to spread and possibly result in fatalities.

Table 5. Presence of Smoke Alarms in Portable Heater Fires in Residential Buildings (2008–2010)

Presence of Smoke Alarms	Percent
Present	40.4
None present	31.5
Undetermined	27.5
Null/Blank	0.6
Total	100.0

Source: NFIRS 5.0.

Only 8 percent of all portable heater fires occurred in residential buildings that are **not** currently or routinely occupied. These occupancies—buildings under construction, undergoing major renovation, vacant, and the like—are more unlikely to have alerting and suppression systems that are in place and, if in place, that operate.¹⁵ As a result, the detailed smoke alarm analyses in the next section focus only on portable heater fires in occupied residential buildings.

Smoke Alarms in Portable Heater Fires in Occupied Residential Buildings

Smoke alarms were reported as present in 43 percent of portable heater fires in occupied residential buildings (Table 6). No smoke alarms were present in 30 percent of portable heater fires in occupied residential buildings, and firefighters were unable to determine if a smoke alarm was present in another 28 percent of these fires.¹⁶

When smoke alarms were present (43 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consisted of:

- present and operated—25 percent;
- present but did not operate—11 percent (alarm failed to operate, 8 percent; fire too small, 3 percent); and
- present, but operational status unknown—7 percent.

When the subset of incidents where smoke alarms were reported as present are analyzed separately and as a whole, smoke alarms were reported to have operated in 58 percent of the incidents. Smoke alarms failed to operate in 19 percent of the incidents and in another 7 percent, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 16 percent of the incidents.

Table 6. NFIRS Smoke Alarm Data for Portable Heater Fires in Occupied Residential Buildings (2008-2010)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		41	2.8
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	257	17.6
		Smoke alarm alerted occupants, occupants failed to respond	7	0.5
		No occupants	38	2.6
		Smoke alarm failed to alert occupants	14	1.0
		Undetermined	44	3.0
	Smoke alarm failed to operate		117	8.0
Undetermined		102	7.0	
None present			435	29.9
Undetermined			402	27.6
Total incidents			1,457	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in portable heater fires in residential buildings. They are presented for informational purposes

Automatic Extinguishing Systems in Portable Heater Fires in Residential Buildings

The analyses presented here do not differentiate between occupied and unoccupied housing, as extremely few reported fires in unoccupied housing have automatic

extinguishing systems (AESs) present. Full AESs were present in only 1 percent of portable heater fires (Table 7).¹⁷

While the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities, the lack of AESs is not unexpected as they are not yet widely installed.

Table 7. NFIRS Automatic Extinguishing System (AES) Data for Portable Heater Fires in Residential Buildings (2008-2010)

AES Presence	Count	Percent
AES present	17	1.1
Partial system present	0	0.0
AES not present	1,503	94.2
Unknown	65	4.1
Null/Blank	10	0.6
Total incidents	1,595	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of AESs in portable heater fires in residential buildings. They are presented for informational purposes.

Examples

The following recent examples of portable heater fires reported by the media illustrate the leading factors contributing to ignition of these fires—unattended equipment left too close to combustibles—and the damage they cause:

- April 2012: A police officer reported hearing a small explosion in the garage of a Yakima, WA, condominium. Upon arrival, firefighters found smoke and fire coming from the garage. The fire was reportedly caused when a portable heater, which was left on to warm up the garage, was placed too close to combustible objects. The fire destroyed two vehicles located in the garage and heavily damaged the condominium. Damage was estimated at over \$140,000.¹⁸
- January 2012: A fire believed to have started by a portable heater in a bedroom forced a family from their home in Baton Rouge, LA. Investigators reported that the fire started around the heater that was next to a bed. A smoke alarm in the bedroom woke the homeowner, and after unsuccessfully attempting to extinguish the fire, the family of four escaped. Flame damage occurred in the bedroom as well as in the home’s living room. The remainder of the house suffered smoke damage.¹⁹
- January 2011: Fairfax County Fire and Rescue Department units responded to a late afternoon single-family house fire near Clifton, VA. When firefighters arrived, fire could be seen from the front of the house and heavy smoke was coming from all sides. Firefighters conducted a fire attack and entered through a side door where they found and rescued an adult male who was trapped. The man was treated at the scene and then transported to a hospital with life-threatening injuries. Damage to the home was estimated at \$80,000. The fire, which was accidental and originated in a bedroom, was caused by a portable heater placed too close to combustible materials.²⁰

NFIRS Data Specifications for Portable Heater Fires in Residential Buildings

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2008, 2009, and 2010. Only version 5.0 data were extracted.

Portable heater fires in residential buildings were defined by the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are excluded to avoid double counting of incidents.
- Incident types 111, 114, 116, 120-123:²¹

Incident Type	Description
111	Building fire
114	Chimney or flue fire, confined to chimney or flue
116	Fuel burner/boiler malfunction, fire confined
120	Fire in mobile property used as a fixed structure, other
121	Fire in mobile home used as fixed residence
122	Fire in motor home, camper, recreational vehicle
123	Fire in portable building, fixed location

Notes: 1) Incident types 114 and 116 do not specify if the structure is a building.
 2) Incident Type 112 was included in data analyses prior to 2008 as previous analyses showed that Incident Types 111 and 112 were used interchangeably. As of 2008, Incident Type 112 is excluded.

- Property use 400–464 is included to specify residential buildings:

Property Use	Description
400	Residential, other
419	One- or two-family dwelling
429	Multifamily dwelling
439	Boarding/Rooming house, residential hotels
449	Hotel/Motel, commercial
459	Residential board and care
460	Dormitory-type residence, other
462	Sorority house, fraternity house
464	Barracks, dormitory

- Structure Type:
 - For Incident Types 114 and 116:
 - 1—Enclosed building,
 - 2—Fixed portable or mobile structure, and
 - Structure Type not specified (null entry).
 - For Incident Types 111 and 120–123:
 - 1—Enclosed building, and
 - 2—Fixed portable or mobile structure.
- The U. S. Fire Administration (USFA) Structure Fire Cause Methodology was used to determine residential building heating fire incidents.²²
- Equipment involved in ignition codes 141 to 143:

- Equipment portability code 1 was used to identify portability.

The analyses contained in this report reflect the current methodologies used by the USFA. The USFA is committed to providing the best and most current information on the United States fire problem and continually examines its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

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Equipment Involved in Ignition	Description
141	Heater; includes floor furnaces, wall heaters, and baseboard heaters; excludes hot water heaters
142	Heater, catalytic
143	Heater, oil-filled

Notes:

¹ In the National Fire Incident Reporting System (NFIRS), Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of NFIRS, the term “residential structure” commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for NFIRS 5.0 has, therefore, changed to include only those fires where the NFIRS 5.0 Structure Type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such fires are referred to as “residential buildings” to distinguish these buildings from other structures on residential properties that may include fences, sheds, and other uninhabitable structures. In addition, confined fire incidents that have a residential property use, but do not have a structure type specified, are presumed to be buildings. Nonconfined fire incidents that have a residential property use without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

² The term “residential buildings” includes what are commonly referred to as “homes,” whether they are one- or two-family dwellings or multifamily buildings. It also includes manufactured housing, hotels and motels, residential hotels, dormitories, assisted living facilities, and halfway houses—residences for formerly institutionalized individuals (patients with mental disabilities, drug addicts, or those formerly incarcerated) that are designed to facilitate their readjustment to private life. The term “residential buildings” does not include institutions such as prisons, nursing homes, juvenile care facilities, or hospitals, even though people may reside in these facilities for short or long periods of time.

³ National estimates are based on 2008–2010 native Version 5.0 data from NFIRS, residential structure fire-loss estimates from the National Fire Protection Association’s (NFPA’s) annual surveys of fire loss, and the U.S. Fire Administration’s (USFA’s) residential building fire-loss estimates. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest \$million.

⁴ For purposes of this analysis, portable heater fires in residential buildings are defined as those residential buildings (defined above) for which the cause of the fire was determined to be portable heaters.

⁵ Space heaters may be fixed (stationary) or portable. Space heaters typically include: heating and wood stoves; heaters (including portable kerosene heaters, portable electric heaters, oil-filled heaters, and catalytic heaters); local furnaces; and fireplace inserts.

⁶ In NFIRS, confined fires are defined by Incident Type codes 113–118.

⁷ NFIRS distinguishes between “content” and “property” loss. Content loss includes loss to the contents of a structure due to damage by fire, smoke, water, and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container, and hence, there was no property damage (damage to the structure itself) from the flames. There could be, however, property damage as a result of smoke, water, and overhaul.

⁸ The average fire death and fire injury loss rates computed from the national estimates above do not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The fire death rate computed from national estimates is $(1,000*(70/900)) = 77.8$ deaths per 1,000 portable heater fires in residential buildings, and the fire injury rate is $(1,000*(150/900)) = 166.7$ injuries per 1,000 portable heater fires in residential buildings.

⁹ “Heating Fires in Residential Buildings (2008–2010),” USFA, September 2012, Volume 13, Issue 8, <http://www.usfa.fema.gov/downloads/pdf/statistics/v13i8.pdf>.

¹⁰ “One- and two-family residential buildings” include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes. “Multifamily residential buildings” include apartments, townhouses, rowhouses, condominiums, and other tenement properties. “Other residential buildings” include boarding/rooming houses, hotel/motels, residential board and care facilities, dormitory-type residences, sorority/fraternity houses, and barracks.

¹¹ “Residential Building Fires (2008–2010),” USFA, April 2012, Volume 13, Issue 2, <http://www.usfa.fema.gov/downloads/pdf/statistics/v13i2.pdf>.

¹² For the purposes of this report, the time of the fire alarm is used as an approximation for the general time the fire started. However, in NFIRS, it is the time the fire was reported to the fire department.

¹³ All incidents where smoke alarm presence was not reported (i.e., null/blank) were confined fires (Incident Type codes 114 and 116). NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires including smoke alarm presence are not required and, as a result, may not be reported.

¹⁴ Total does not add to 100 percent due to rounding.

¹⁵ “Residential Building Fires (2008–2010),” USFA, April 2012, Volume 13, Issue 2, <http://www.usfa.fema.gov/downloads/pdf/statistics/v13i2.pdf>.

¹⁶ Total does not add to 100 percent due to rounding.

¹⁷ All incidents where automatic extinguishing system (AES) presence was not reported (i.e., null/blank) were confined fires (Incident Type codes 114 and 116). NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires including AES presence are not required and, as a result, may not be reported.

¹⁸ David Mance, “Portable Heater Near Objects Causes Condo Fire,” www.kvewtv.com, April 2, 2012, <http://www.kvewtv.com/article/2012/apr/02/portable-heater-near-objects-causes-condo-fire/> (accessed June 15, 2012).

¹⁹ Joshua Auzenne, “Portable Heater Sparks House Fire,” www.wafb.com, January 12, 2012, <http://www.wafb.com/story/16451162/fire-sparks-in-baton-rouge-home> (accessed June 15, 2012).

²⁰ “Fairfax County Crews Respond to House Fire Caused By Portable Heater,” www.fdnntv.com, January 17, 2011, <http://www.fdnntv.com/Fairfax-County-Crews-Respond-House-Fire-Portable-Heater> (accessed June 15, 2012).

²¹ Heating is defined by the equipment used to heat a residential building. Incident Types 113, 115, 117, and 118 were excluded because by definition these Incident Types were not heating fires.

²² The USFA Structure Fire Cause Methodology is designed for structure fires of which buildings are a subset. The cause definitions can be found at http://www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.