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Heating Fires in Residential Buildings (2010–2012)

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 45,200 heating fires in residential buildings were reported to fire departments within the United States each year and caused an estimated 155 deaths, 625 injuries and $351 million in property loss.**
- **Heating was the second leading reported cause of all residential building fires, following cooking.**
- **Residential building heating fires peaked in the early evening hours from 5 to 9 p.m., with the highest peak from 6 to 8 p.m. This four-hour period accounted for 30 percent of all residential building heating fires.**
- **Residential building heating fire incidence peaked in January at 21 percent and declined to the lowest point during the months of June to August. Confined fuel burner/boiler malfunction fires accounted for 56 percent of the heating fires that occurred during these three warmer months.**
- **Confined fires, those fires confined to chimneys, flues or fuel burners, accounted for 84 percent of residential building heating fires.**
- **The heat source was too close to combustibles in 29 percent of the nonconfined residential building heating fires.**

From 2010 to 2012, an estimated average of 45,200 heating fires in residential buildings occurred in the U.S. each year and resulted in an annual average of 155 deaths, 625 injuries and $351 million in property loss.[1, 2, 3] The term "heating fires" applies to those fires that are caused by central heating units, fixed or portable local heating units, fireplaces, heating stoves, chimneys, and water heaters.[4]

Previously, especially during the late 1970s and early 1980s, heating was, by far, the leading reported cause of residential building fires. Stimulated in part by an energy shortage, this surge in heating fires was the result of the sudden increased use of alternative heating, particularly wood heating stoves and space heaters. Since then, the overall number of heating fires has substantially decreased. In 1983, there were 200,000 heating fires; but by 2012, that number had fallen to an estimated 45,200 (Table 1).[5, 6] Despite this decline, from 2010 to 2012, heating remained the second reported leading cause and accounted for 12 percent of all residential building fires responded to by fire departments across the nation.[7]

Table 1. National Estimates of Residential Building Heating Fires and Losses by Year (2010–2012)

Year	Residential Building Heating Fires	Residential Building Heating Fire Deaths	Residential Building Heating Fire Injuries	Residential Building Heating Fire Dollar Loss
2010	46,800	145	575	$343,000,000
2011	43,700	130	550	$289,000,000
2012	45,200	195	775	$421,000,000

Sources: National Fire Incident Reporting System (NFIRS) 5.0, 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.

Notes: 1. Fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and loss to the nearest million dollars.
2. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.

This topical report addresses the characteristics of residential building heating fires, as reported to NFIRS from 2010 to 2012, the most recent data available at the time of the analysis.[8] For the purpose of this report, the term "residential heating fires" is synonymous with "residential building heating fires," as residential heating fires commonly mean those fires caused by heating that occur in buildings. The term "residential heating fires" is used throughout the body of this report; the findings, tables, charts, headings and endnotes reflect the full category, "residential building heating fires."

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. Confined building fires are small fire incidents that are limited in extent, staying within pots, fireplaces or certain other noncombustible containers.[9] Confined fires rarely result in serious injury or large content loss and are expected to have no significant accompanying property loss due to flame damage.[10] Of the two classes of severity, 84 percent of residential heating fires were confined fires, as shown in Table 2. By comparison, from 2010 to 2012, 49 percent of all residential building fires were confined fires.[11]

Table 2. Residential Building Heating Fires by Type of Incident (2010-2012)

Incident Type	Percent
Nonconfined fires	16.5
Confined fires	83.5
Chimney or flue fire, confined to chimney or flue	55.3
Fuel burner/boiler malfunction, fire confined	28.2
Total	100.0

Source: NFIRS 5.0.

Loss Measures

Table 3 presents losses, averaged over the three-year period from 2010 to 2012, for residential heating fires and all other residential building fires (i.e., excluding heating fires) reported to NFIRS.[12] As can be expected, the average losses associated with nonconfined residential heating fires were notably high, since nonconfined fires generally include larger fires that more often result in serious injury and more content losses. The average losses of fatalities, injuries and dollar loss for residential heating fires were less than those for all other residential building fires.

Table 3. Loss Measures for Residential Building Heating Fires (Three-Year Average, 2010-2012)

Measure	Residential Building Heating Fires	Confined Residential Building Heating Fires	Nonconfined Residential Building Heating Fires	Residential Building Fires (Excluding Heating Fires)
Average Loss				
Fatalities/1,000 fires	1.8	0.0	11.2	3.8
Injuries/1,000 fires	10.2	1.5	54.4	29.3
Dollar loss/fire	$4,710	$210	$27,490	$12,530

Source: NFIRS 5.0.

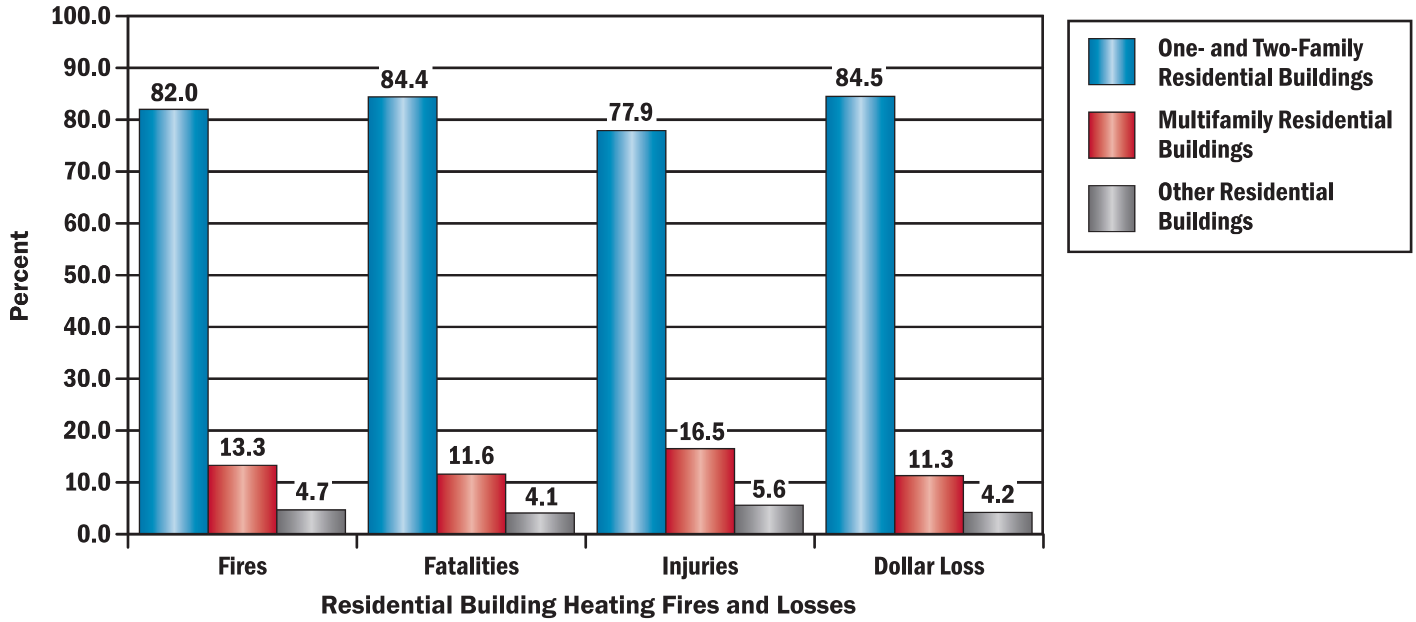
Notes: 1. No deaths in confined fires were reported to NFIRS during 2010-2012; the resulting loss of 0.0 fatalities per 1,000 fires reflects only data reported to NFIRS.
2. Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed **per fire** and is rounded to the nearest $10.
3. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.
4. The Residential Building Fires (Excluding Heating Fires) category does not include fires of unknown cause.

Property Use

Figure 1 presents the percentage distribution of residential heating fires and losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).[13] One- and two-family residences were disproportionately represented in residential heating fires. In fact, 82 percent of residential heating fires occurred in one- and two-family residences — yet only 65 percent of all residential fires occurred in these types of residences.[14] An additional 13 percent of residential heating fires occurred in multifamily dwellings.

Consistent with the fact that the majority (82 percent) of residential heating fires took place in one- and two-family residential buildings, the percentages of fatalities (84 percent), injuries (78 percent) and dollar loss (85 percent) were also highest in these types of residences. One reason that heating played a larger role in one- and two-family fires than in multifamily and other residential fires is that one- and two-family residential buildings have fireplaces, chimneys and fireplace-related equipment that most other types of residences do not have.[15] In addition, multifamily residential buildings tend to have central heating systems that are maintained by professionals and not the home-owner, thus there are fewer heating fires from poor maintenance or misuse than in one- and two-family dwellings.[16]

Figure 1. Residential Building Heating Fires and Losses by Property Use (2010-2012)

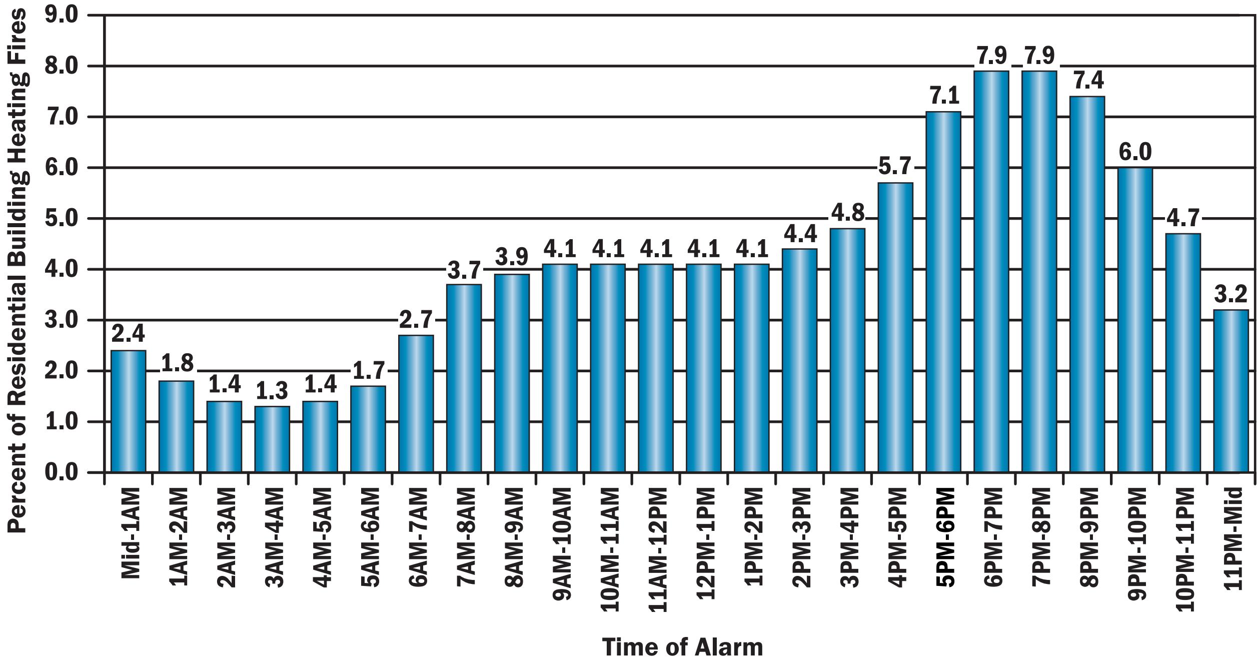


Source: NFIRS 5.0.
Notes: 1. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.
2. Total percent of fatalities does not add to 100 percent due to rounding.

When Residential Building Heating Fires Occur

As shown in Figure 2, residential heating fires occurred mainly in the evening hours, 5 to 9 p.m., peaking from 6 to 8 p.m.[17] These fires declined throughout the night and early morning and reached their lowest point during the morning hours from 2 to 5 a.m. The four-hour evening period from 5 to 9 p.m. accounted for 30 percent of residential heating fires, and the three-hour morning period from 2 to 5 a.m. accounted for 4 percent. The confined fire incidents dominated the alarm profile and produced the pronounced peaks and valleys; the nonconfined fires experienced an early morning low and an evening peak as well, but less pronounced.

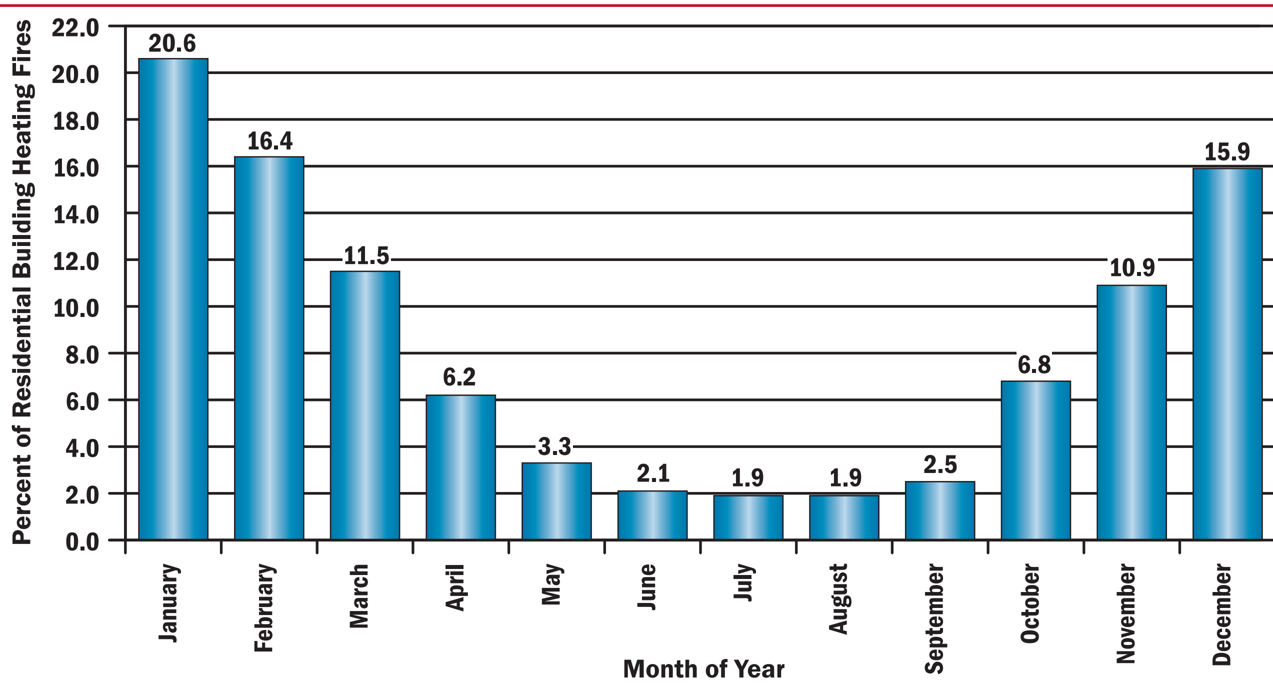
Figure 2. Residential Building Heating Fires by Time of Alarm (2010-2012)



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

As expected, residential heating fires were most prevalent during the colder months from December through February, when the use of central heating systems, portable heaters and fireplaces is most common (Figure 3). The incidence of heating fires peaked in January at 21 percent. From March to August, fires declined from 12 percent to 2 percent. Fire incidence reached its lowest point during the warmer months of June to August, corresponding to reduced heating activities in residences. Confined fuel burner/boiler malfunction fires accounted for 56 percent of the heating fires that occurred during these three warmer months. Additionally, both confined and nonconfined residential heating fires also followed the overall pattern of winter peaks and summer lows.

Figure 3. Residential Building Heating Fires by Month (2010-2012)

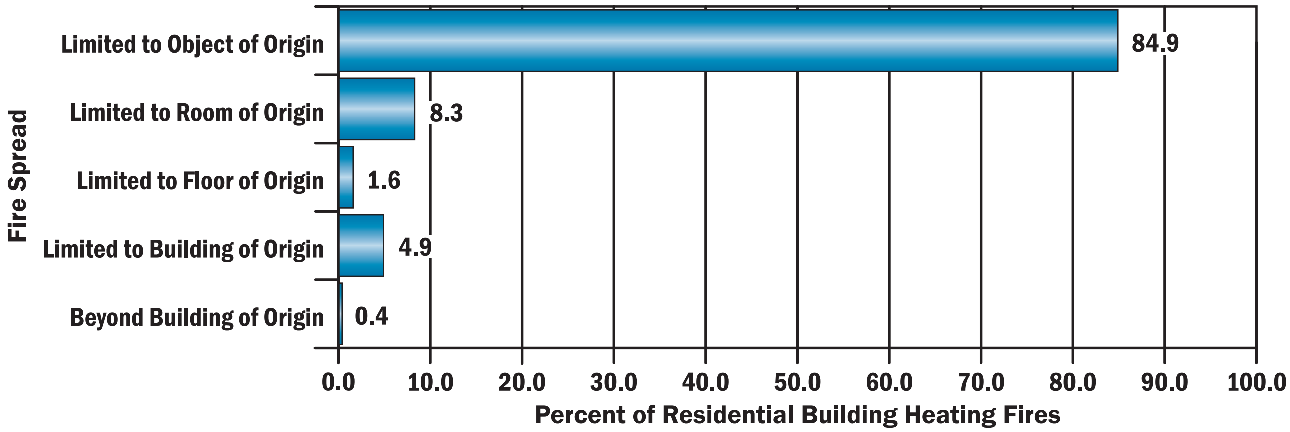


Source: NFIRS 5.0.

Fire Spread in Residential Building Heating Fires

In 85 percent of residential heating fires, the fire was limited to the object of origin (Figure 4). These fires were primarily coded as "confined fires" in NFIRS — 96 percent of residential heating fires limited to the object of origin were coded as confined fires. Few fires, 7 percent, extended beyond the room of origin.

Figure 4. Extent of Fire Spread in Residential Building Heating Fires (2010-2012)



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

Confined Fires

NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires are not required, nor are they reported (not all fires confined to the object of origin are counted as confined fires).[18] Confined residential heating fires accounted for the majority (84 percent) of residential heating fire incidents and dominated the time of alarm profile. The number of confined residential heating fires was greatest during the hours from 5 to 9 p.m., when they accounted for 89 percent of fires that occurred during this period. Confined residential heating fires peaked in January, declined through May, and were lowest during the months of June through August.

Nonconfined Fires

The next sections of this topical report address nonconfined residential heating fires, the typically larger and more serious fires, where more detailed fire data are available, as they are required to be reported in NFIRS.

Where Nonconfined Residential Building Heating Fires Start (Area of Fire Origin)

Five areas in the home — heating rooms/areas or water heater areas (13 percent), cooking areas and kitchens (13 percent), bedrooms (10 percent), common rooms or lounge areas (10 percent), and walls or concealed wall spaces (6 percent) — accounted for 51 percent of nonconfined residential heating fires (Table 4).[19]

Table 4. Leading Areas of Fire Origin in Nonconfined Residential Building Heating Fires (2010-2012)

Areas of Origin	Percent of Nonconfined Residential Building Heating Fires (Unknowns Apportioned)
Heating room or area, water heater area	12.8
Cooking area, kitchen	12.6
Bedrooms	9.8
Common room, den, family room, living room, lounge	9.8
Wall assembly, concealed wall space	6.1

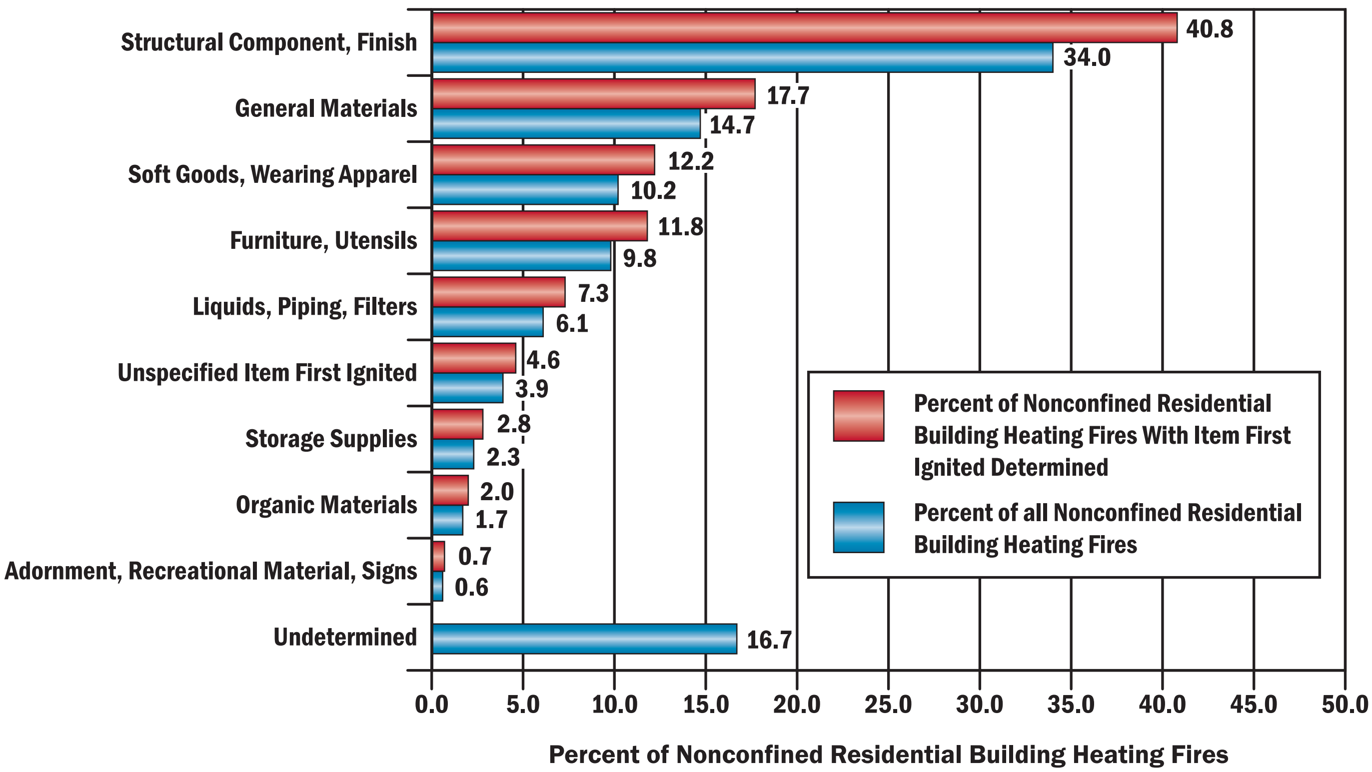
Source: NFIRS 5.0.

What Ignites First in Nonconfined Residential Building Heating Fires

Figure 5 shows that 41 percent of the items first ignited in nonconfined residential heating fires fell under the "structural component, finish" category. This category includes structural members or framing; exterior trim and finishes; interior wall coverings; and insulation within the walls, partitions and floor/ceiling surfaces. The second leading category was "general materials," a catchall category that includes items such as electrical wire insulation, trash/rubbish, and residues (such as chimney residue). "General materials" accounted for an additional 18 percent of nonconfined residential heating fires.

Structural members or framing (17 percent) and electrical wire and cable insulation (12 percent) were the specific items most often first ignited in nonconfined residential heating fires. In an additional 6 percent of nonconfined residential heating fires, interior wall coverings, such as cloth wall coverings and wood paneling, were the items first ignited.

Figure 5. Item First Ignited in Nonconfined Residential Building Heating Fires by Major Category (2010-2012)



Source: NFIRS 5.0.

Note: Total of nonconfined residential building heating fires with item first ignited determined does not add to 100 percent due to rounding.

Equipment Involved in Ignition of Nonconfined Residential Building Heating Fires

Three types of equipment played a leading role in the ignition of 48 percent of nonconfined residential heating fires. These leading types of equipment involved in ignition of nonconfined residential heating fires, as shown in Table 5, were water heaters (17 percent), heating stoves (16 percent) and heaters (15 percent). "Water heaters" include sink-mounted instant hot water heaters and water bed heaters. "Heaters" include floor furnaces, wall heaters and baseboard heaters.[20]

Table 5. Leading Equipment Involved in Ignition of Nonconfined Residential Building Heating Fires (2010-2012)

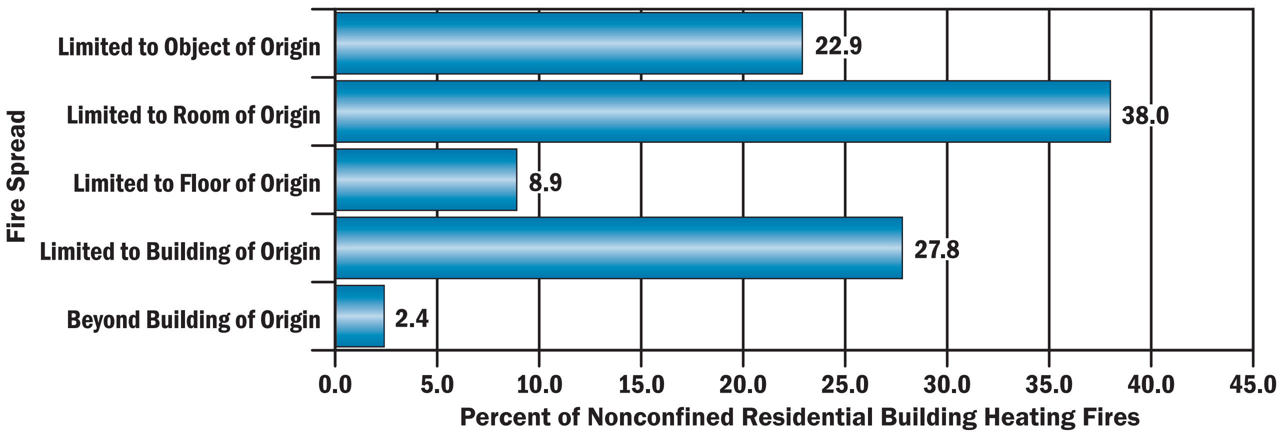
Equipment Involved in Ignition	Percent of Nonconfined Residential Building Heating Fires
Water heater	16.6
Heating stove	16.2
Heater	15.2

Source: NFIRS 5.0.

Fire Spread in Nonconfined Residential Building Heating Fires

The majority of nonconfined residential heating fires, 61 percent, were limited to the object or room of fire origin (Figure 6).[21] The fire spread profile for nonconfined residential heating fires was similar to the fire spread profile for all nonconfined residential fires, with slightly more nonconfined heating fires being limited to the room or object of origin.[22]

Figure 6. Extent of Fire Spread in Nonconfined Residential Building Heating Fires (2010-2012)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined Residential Building Heating Fires

Table 6 shows the categories of factors contributing to ignition for nonconfined residential heating fires. "Misuse of material or product" was the leading category contributing to the ignition of nonconfined residential heating fires (37 percent). "Operational deficiency" was the second leading category in 20 percent of residential heating fires, and "mechanical failure or malfunction" was the third leading category, also in 20 percent of the fires. These three categories played a role in 77 percent of nonconfined residential heating fires.

Heat source too close to combustibles (29 percent) was by far the leading specific factor contributing to ignition. This specific factor was more than twice the second leading factor contributing to ignition, miscellaneous mechanical failure/malfunction (11 percent).

Table 6. Factors Contributing to Ignition for Nonconfined Residential Building Heating Fires by Major Category (Where Factors Contributing to Ignition are Specified, 2010-2012)

Factor Contributing to Ignition Category	Percent of Nonconfined Residential Building Heating Fires (Unknowns Apportioned)
Misuse of material or product	36.6
Operational deficiency	20.3
Mechanical failure or malfunction	19.9
Electrical failure, malfunction	18.8
Design, manufacture, installation deficiency	8.8
Other factors contributing to ignition	3.0
Fire spread or control	1.1
Natural condition	0.9

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; total will exceed 100 percent.

Alerting/Suppression Systems in Residential Building Heating Fires

Technologies to detect and extinguish fires have been major contributors to the drop in fire fatalities and injuries over the past 35 years. Smoke alarms are now present in the majority of residential buildings. Nationally, only 3 percent of households lack smoke alarms.[23] In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Smoke alarm data is available for both confined and nonconfined fires, although for confined fires, the data is very limited in scope. As different levels of data are reported for smoke alarms in confined and nonconfined fires, the analyses are performed separately. Note that the data presented in Tables 7 to 9 are the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in residential heating 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 in Nonconfined Residential Building Heating Fires

Smoke alarms were present in 54 percent of nonconfined residential heating fires (Table 7). In 22 percent of nonconfined residential heating fires, there were no smoke alarms present. In another 24 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were potentially missing in between 22 and 46 percent of these fires with the ability to spread and possibly result in fatalities.

Table 7. Presence of Smoke Alarms in Nonconfined Residential Building Heating Fires (2010-2012)

Presence of Smoke Alarms	Percent
Present	53.8
None present	22.4
Undetermined	23.8
Total	100.0

Source: NFIRS 5.0.

While only 5 percent of all nonconfined residential heating fires occurred in residential buildings that were **not** currently or routinely occupied, these occupancies — buildings that are under construction, undergoing major renovation, vacant and the like — are unlikely to have alerting and suppression systems that are in place and, if in place, that are operational. In fact, only 20 percent of all nonconfined heating fires in unoccupied residential buildings were reported as having smoke alarms that operated. As a result, the detailed smoke alarm analyses in the next section focus on nonconfined heating fires in occupied residential buildings only.

Smoke Alarms in Nonconfined Heating Fires in Occupied Residential Buildings

Smoke alarms were reported as present in 55 percent of nonconfined heating fires in occupied residential buildings (Table 8). In 22 percent of nonconfined heating fires in occupied residential buildings, there were no smoke alarms present. In another 23 percent of these fires, firefighters were unable to determine if a smoke alarm was present; unfortunately, in 36 percent of the fires where the presence of a smoke alarm was undetermined, either the flames involved the building of origin or spread beyond it. The fires were so large and destructive that it is unlikely the presence of a smoke alarm could be determined.

When smoke alarms were present (55 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consisted of:

- Present and operated — 32 percent.
- Present but did not operate — 16 percent (alarm failed to operate, 8 percent; fire too small, 8 percent).
- Present but operational status unknown — 7 percent.

When the subset of incidents where smoke alarms were reported as present was analyzed separately, smoke alarms were reported to have operated in 58 percent of the incidents. Smoke alarms failed to operate in 15 percent of the incidents, and in another 14 percent, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 13 percent of these incidents.

Table 8. NFIRS Smoke Alarm Data for Nonconfined Heating Fires in Occupied Residential Buildings (2010-2012)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		959	7.7
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	3,064	24.5
		Smoke alarm alerted occupants, occupants failed to respond	111	0.9
		No occupants	409	3.3
		Smoke alarm failed to alert occupants	127	1.0
		Undetermined	289	2.3
	Smoke alarm failed to operate		1,016	8.1
	Undetermined		903	7.2
None present			2,714	21.7
Undetermined			2,915	23.3
Total incidents			12,507	100.0

Source: NFIRS 5.0.
Note: The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of smoke alarms in nonconfined heating fires in occupied residential buildings. They are presented for informational purposes.

Smoke Alarms in Confined Residential Building Heating Fires

Less information about smoke alarm status is reported for confined fires, but the data still give important insights about the effectiveness of alerting occupants in these types of fires. It is especially important to look at the limited information provided for these fires, since the majority (84 percent) of residential heating fires were confined fires. The analyses presented here do not differentiate between occupied and unoccupied residential buildings, as this data detail is not required when reporting confined fires in NFIRS. However, an assumption may be made that confined fires are fires in occupied housing, as these types of fires are unlikely to be reported in residential buildings that are not occupied.

Smoke alarms alerted occupants in 20 percent of confined residential heating fires (Table 9). Occupants were not alerted by the smoke alarm in 27 percent of the confined fires.[24] In 53 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 9. NFIRS Smoke Alarm Data for Confined Residential Building Heating Fires (2010-2012)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	13,560	20.3
Smoke alarm did not alert occupants	17,730	26.5
Unknown	35,521	53.2
Null/Blank	1	0.0
Total incidents	66,812	100.0

Source: NFIRS 5.0.
Note: The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of smoke alarms in confined residential building heating fires. They are presented for informational purposes.

Automatic Extinguishing Systems in Nonconfined Heating Fires in Occupied Residential Buildings

Automatic extinguishing system (AES) data is available for both confined and nonconfined fires, although for confined fires, the data is also very limited in scope. In confined residential building fires, an AES was present in 1 percent of reported incidents.[25, 26] In addition, the following AES analyses focus on nonconfined heating fires in occupied residential buildings only, as even fewer AESs are present in unoccupied housing.

Full or partial AESs were present in only 3 percent of nonconfined heating fires in occupied residential buildings (Table 10). 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. In fact, AESs were present in only 4 percent of **all** nonconfined fires in occupied residential buildings.[27]

Table 10. NFIRS Automatic Extinguishing System Data for Nonconfined Heating Fires in Occupied Residential Buildings (2010-2012)

Automatic Extinguishing System Presence	Count	Percent
Automatic extinguishing system present	402	3.2
Partial system present	12	0.1
Automatic extinguishing system not present	11,559	92.4
Unknown	534	4.3
Total incidents	12,507	100.0

Source: NFIRS 5.0.
Note: The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of AESs in nonconfined heating fires in occupied residential buildings. They are presented for informational purposes.

Examples

The following are recent examples of residential heating fires reported by the media:

- May 2014: An outdoor propane heater being used indoors resulted in a morning house fire in Forest Grove, Oregon. The heater was being used to heat a room in the home's basement when it ignited nearby combustible items. While three people inside of the home at the time of the fire made it out safely, including two who were sleeping in the basement, one of these individuals sustained minor burns to the arm. No other injuries were reported. Damages to the house were estimated at $2,000.[28]
- March 2014: A water heater that had just been replaced earlier that day caused a late night house fire in Allegan, Michigan. The water heater exploded, causing the home's roof to collapse and sparking a fire that took firefighters several hours to extinguish. No injuries were reported.[29]
- February 2014: A space heater likely caused the ignition of a mobile home fire in Barry County, Michigan, which led to the death of an 81-year-old woman. It was believed that the heater, which was being used to prevent water pipes from freezing, was placed too close to combustibles. The woman who was killed lived alone inside of the house and died as a result of smoke inhalation. The fire completely destroyed the home.[30]

NFIRS Data Specifications for Residential Building Heating Fires

Data for this report were extracted from the NFIRS annual Public Data Release files for 2010, 2011 and 2012. Only Version 5.0 data were extracted.

Residential building heating fires were defined using the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.
- Incident Types 111, 114, 116, 120 to 123:[31]

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

Note: Incident Types 114 and 116 do not specify if the structure is a building.

- Property Use Series 400, which consists of the following:

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 to 123:
    - 1—Enclosed building.
    - 2—Fixed portable or mobile structure.

- The USFA Structure Fire Cause Methodology was used to determine residential building heating fire incidents.[32] Heating fire incidents involving heating stoves and food were believed to be cooking fires. As a result, fires with equipment involved in Ignition Code 124 (stove, heating) and Item First Ignited Code 76 (cooking materials, includes edible materials for man or animal, excludes cooking utensils) were excluded from the heating cause category.

The analyses contained in this report reflect the current methodologies used by USFA. USFA is committed to providing the best and most currently available information on the U.S. 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.

Information regarding USFA's national estimates for residential building fires as well as the data sources used to derive the estimates can be found in the document, "Data Sources and National Estimates Methodology Overview for U.S. Fire Administration's Topical Fire Report Series (Volume 15)," http://www.usfa.fema.gov/downloads/pdf/statistics/data_sources_and_national_estimates_methodology.pdf. This document also addresses the specific NFIRS data elements analyzed in the topical reports as well as "unknown" data entries and missing data.

To request additional information or to comment on this report, visit http://www.usfa.fema.gov/contact.html.

Notes:

[1]National estimates are based on 2010-2012 native Version 5.0 data from NFIRS, residential structure fire loss estimates from the NFPA's annual surveys of fire loss, and USFA's residential building fire loss estimates: http://www.usfa.fema.gov/data/statistics/order_download_data.html. Further information on USFA's residential building fire loss estimates can be found in the "National Estimates Methodology for Building Fires and Losses," August 2012, http://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf. For information on NFPA's survey methodology, see NFPA's report on fire loss in the U.S.: http://www.nfpa.org/~/media/Files/Research/NFPA%20reports/Overall%20Fire%20Statistics/osfireloss.pdf. In this topical report, fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and dollar loss to the nearest $100 million.

[2]In 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 structures 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 occur in 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.

[3]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.

[4]For the purposes of this analysis, residential building heating fires are defined as those residential buildings (defined above) for which the cause of the fire was determined to be heating. However, for the confined fire portion of residential building fires, only those with Incident Types 114 and 116 were included; all other confined fire types were excluded.

[5]Fire in the United States 1983-1990, Eighth Edition, USFA, Federal Emergency Management Agency, October 1993.

[6] "Residential Building Heating Fire Trends (2003-2012)," USFA Fire Estimate Summary Series, http://www.usfa.fema.gov/downloads/pdf/statistics/res_bldg_fire_estimates.pdf (August 2014).

[7] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[8] Fire department participation in NFIRS is voluntary; however, some states do require their departments to participate in the state system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required. From 2010 to 2012, 70 percent of NFPA's annual average estimated 1,365,300 fires to which fire departments responded were captured in NFIRS. Thus, NFIRS is not representative of all fire incidents in the U.S. and is not a "complete" census of fire incidents. Although NFIRS does not represent 100 percent of the incidents reported to fire departments each year, the enormous dataset exhibits stability from one year to the next, without radical changes. Results based on the full dataset are generally similar to those based on part of the data.

[9] In NFIRS, confined fires are defined by Incident Type codes 113-118.

[10] NFIRS distinguishes between "content" and "property" loss. Content loss includes losses 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 (or rubbish for Incident Type code 118), and hence, there was no property damage (damage to the structure itself) from the flames. However, there could be property damage as a result of smoke, water and overhaul.

[11] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[12] 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*(155/45,200)) = 3.4 deaths per 1,000 residential building heating fires, and the fire injury rate is (1,000*(625/45,200)) =13.8 injuries per 1,000 residential building heating fires.

[13] "One- and two-family residential buildings" include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes. "Multifamily residential buildings" include apartments, town houses, row houses, 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.

[14] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[15] "One- and Two-Family Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 3, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i3.pdf.

[16] "Multifamily Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 4, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i4.pdf.

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

[18] As noted previously, confined building fires are small fire incidents that are limited in scope, confined to noncombustible containers, rarely result in serious injury or large content loss, and are expected to have no significant accompanying property loss due to flame damage. In NFIRS, confined fires are defined by Incident Type codes 113-118.

[19] Total does not equal 51 percent due to rounding.

[20] "Heaters" exclude catalytic heaters, oil-filled heaters, and hot water heaters.

[21] A fire that is limited to a sofa or bed is not defined as a "confined fire" in NFIRS because of the greater potential for spread. Unlike fires in pots or chimneys, there is no container to stop the fire, even though the fire did not spread beyond the object of origin.

[22] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[23] Greene, Michael and Craig Andres, "2004-2005 National Sample Survey of Unreported Residential Fires," Division of Hazard Analysis, Directorate for Epidemiology, U.S. Consumer Product Safety Commission, July 2009.

[24] In confined fires, the entry "smoke alarm did not alert occupants" can mean no smoke alarm was present; the smoke alarm was present but did not operate; the smoke alarm was present and operated, but the occupant/s was already aware of the fire; or there were no occupants present at the time of the fire.

[25] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[26] As confined fires codes are designed to capture fires contained to noncombustible containers, it is not recommended to code a fire incident as a small-, low- or no-loss confined fire incident if the AES operated and contained the fire as a result. The preferred method is to code the fire as a standard fire incident with fire spread confined to the object of origin and provide the relevant information on AES presence and operation.

[27] "Residential Building Fires (2010-2012)," USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[28] "Firefighters: Improper use of propane heater causes Forest Grove house fire," www.katu.com, May 31, 2014, http://www.katu.com/news/local/Firefighters-Improper-use-of-propane-heater-causes-Forest-Grove-house-fire-261386521.html (accessed Sept. 22, 2014).

[29] Rachel Van Gilder, "House fire after water heater explodes," http://woodtv.com, March 16, 2014, http://woodtv.com/2014/03/16/house-fire-after-water-heater-explodes/ (accessed Sept. 22, 2014).

[30] Aaron Mueller, "Barry County fatal fire caused by space heater, investigator says," www.mlive.com, Feb. 14, 2014, http://www.mlive.com/news/kalamazoo/index.ssf/2014/02/barry_county_fatal_fire_caused.html (accessed Sept. 22, 2014).

[31] 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.

[32] The USFA Structure Fire Cause Methodology is designed for structure fires of which buildings are a subset. The cause methodology and definitions can be found in the document "National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues," July 2011, http://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf.