TOPICAL FIRE REPORT SERIES Volume 15, Issue 9 / January 2015

Winter Residential Building Fires (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 National Fire Incident Reporting System. 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.

Findings

- An estimated average of 104,000 winter residential building fires were reported to fire departments within the United States each year and caused an estimated 890 deaths, 4,025 injuries and $2 billion in property loss.
- Winter residential building fires accounted for only 8 percent of the total number of fires in the U.S., but they resulted in 30 percent of all fire deaths and 23 percent of all fire injuries.
- Cooking, at 41 percent, was the leading reported cause of winter residential building fires. Nearly all winter residential building cooking fires were small, confined fires (92 percent).
- Residential building fire incidence was collectively higher in the winter months of January, February and March, peaking in January at 11 percent.
- Winter residential building fires occurred most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m., when cooking fire incidence is high.
- Nonconfined winter residential building fires most often started in cooking areas and kitchens (21 percent).
- In 49 percent of nonconfined winter residential building fires, the fire extended beyond the room of origin. The leading causes of these larger fires were unintentional or careless actions (18 percent), electrical malfunctions (14 percent), open flames (12 percent), and intentional actions (10 percent).
- The leading reported factor contributing to ignition category in winter residential building fires was a heat source too close to combustibles (15 percent).
- Smoke alarms were not present in 22 percent of nonconfined winter fires in occupied residential buildings. Additionally, automatic extinguishing systems (AESs) were present in only 4 percent of nonconfined winter fires in occupied residential buildings.

Each year, from 2010 to 2012, fire departments responded to an estimated 104,000 fires in residential buildings during the months of January, February and March across the nation.[1, 2] These fires resulted in an estimated annual average of 890 deaths, 4,025 injuries and $2 billion in property loss.

The residential building portion of the fire problem is of great national importance as it accounts for the vast majority of civilian casualties, and winter residential building fires account for a considerable portion of that. National estimates for 2010-2012 show that 82 percent of all fire deaths and 78 percent of all fire injuries occurred in residential buildings.[3] Winter residential fires accounted for only 8 percent of the total number of fires, but they resulted in 30 percent of all fire deaths and 23 percent of all fire injuries. In addition, residential building fires accounted for over half (57 percent) of the total dollar loss from all fires, while winter residential fires were 16 percent of the total.[4]

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 or drug addictions, 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.

As part of a series of topical reports that addresses fires in types of residential buildings, this report addresses the characteristics of winter residential building fires reported to the National Fire Incident Reporting System (NFIRS). The focus is on winter fires reported during the months of January, February and March from 2010 to 2012, the most recent data available at the time of the analysis.[5] NFIRS data is used for the analyses throughout this report.

For the purpose of this report, the term "winter residential fires" is synonymous with "winter residential building fires." "Winter residential fires" is used throughout the body of this report; the findings, tables, charts, headings and endnotes reflect the full category, "winter residential building 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 fires that are not confined to the aforementioned types of equipment or objects. 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 loss and are expected to have no significant accompanying property loss due to flame damage.[7] Of the two classes of severity, nonconfined fires accounted for 48 percent of winter residential fires. The smaller, confined fires accounted for the remaining 52 percent of winter residential fires. Cooking fires were the predominant type of confined fires during the winter in residential buildings (Table 1).

Table 1. Winter Residential Building Fires by Type of Incident (2010-2012)

Incident Type	Percent
Nonconfined fires	48.4
Confined fires	51.6
Cooking fire, confined to container	31.9
Chimney or flue fire, confined to chimney or flue	11.1
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	4.1
Commercial compactor fire, confined to rubbish	0.3
Trash or rubbish fire, contained	4.0
Total	100.0

Source: NFIRS 5.0.

Loss Measures

Table 2 presents losses, averaged over the three-year period for the winter months of 2010-2012, of reported residential building fires.[8] The average number of fatalities and injuries per 1,000 winter residential fires was notably higher than the same loss measures for residential building fires that did not occur in winter.

Table 2. Loss Measures for Winter and Nonwinter Residential Building Fires (Three-Year Average, 2010-2012)

Measure	Winter Residential Building Fires	**Confined** Winter Residential Building Fires	**Nonconfined** Winter Residential Building Fires	Nonwinter Residential Building Fires
Average Loss				
Fatalities/1,000 fires	7.0	0.0	14.4	4.9
Injuries/1,000 fires	30.9	7.1	56.3	28.5
Dollar loss/fire	$15,430	$190	$31,680	$15,250

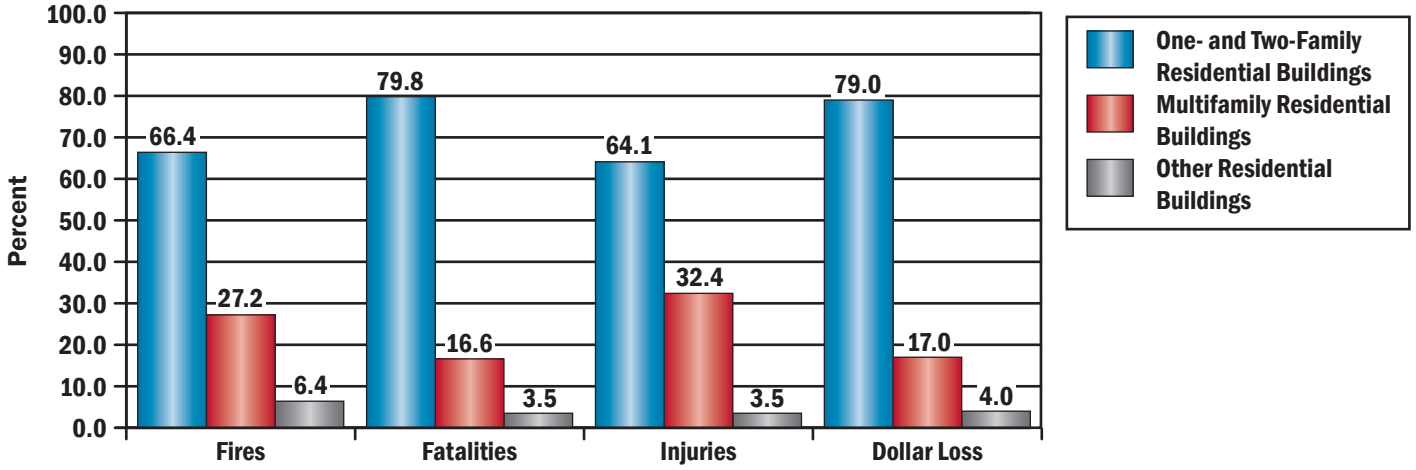
Source: NFIRS 5.0.

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. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.

Property Use

Figure 1 presents the percentage distribution of winter residential fire losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).[9] Consistent with the fact that the majority of winter residential fires took place in one- and two-family residential buildings (66 percent), the percentages of fatalities (80 percent), injuries (64 percent) and dollar loss (79 percent) were also highest in these types of residences. One explanation for the higher percentage of fires and subsequent losses in one- and two-family dwellings may be that more stringent building and fire codes, which require detection and suppression systems, as well as regular fire inspections, are imposed on multifamily dwellings and other residential buildings. In addition, multifamily dwellings and other residential buildings may more often be professionally maintained.

Figure 1. Winter Residential Building Fires and Losses by Property Use (2010–2012)

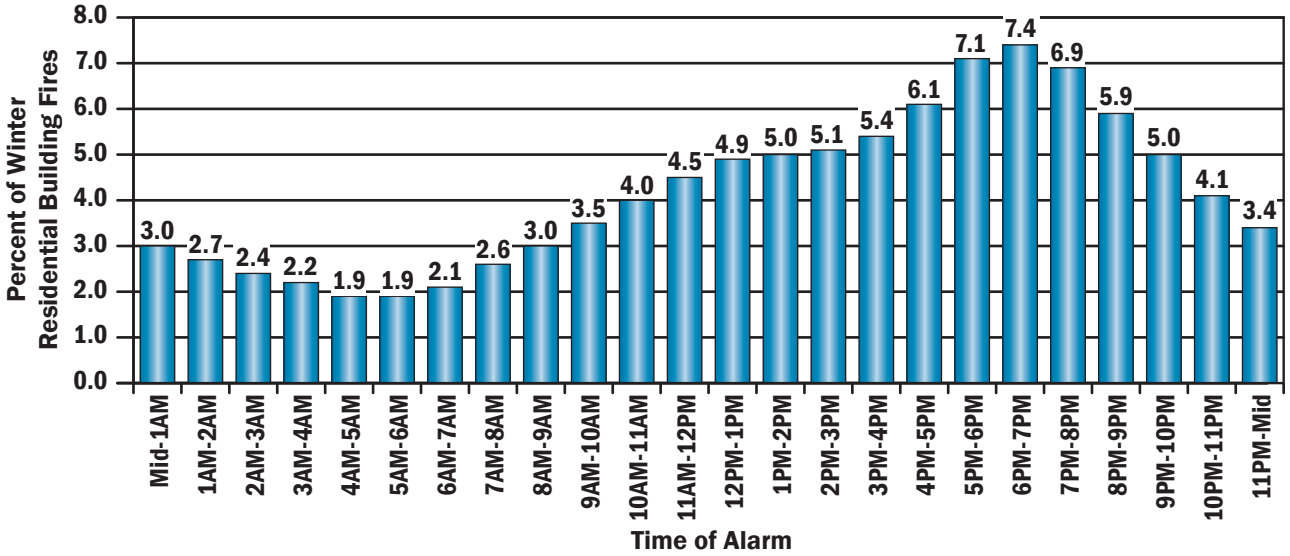


Source: NFIRS 5.0.
Notes: 1. Total percentages of fatalities do not add up to 100 percent due to rounding.
2. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.

When Winter Residential Building Fires Occur

As shown in Figure 2, winter residential fires occurred most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m., when cooking fire incidence is high.[10, 11] Cooking fires, discussed later in the Causes of Winter Residential Building Fires section, accounted for 41 percent of winter residential fires. Fires then declined throughout the night, reaching the lowest point during the early to midmorning hours (4 to 6 a.m.).

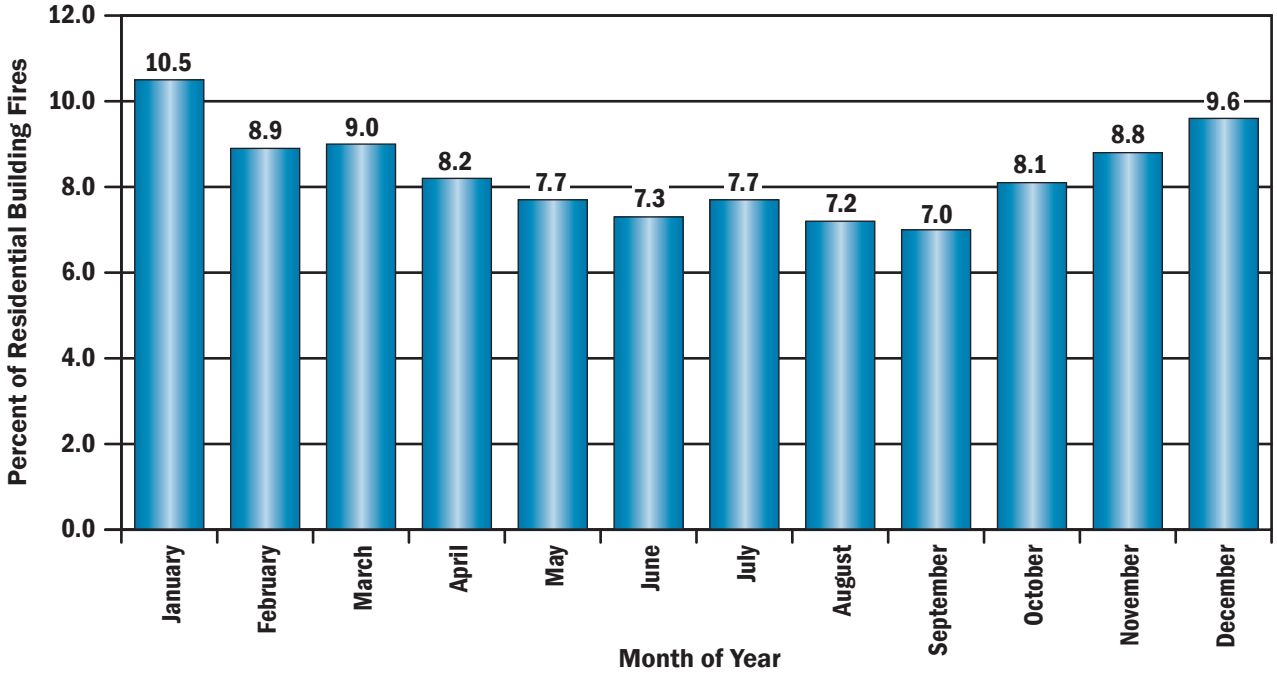
Figure 2. Winter Residential Building Fires by Time of Alarm (2010–2012)



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

Figure 3 illustrates that residential fire incidence was collectively higher in the winter months of January, February and March, peaking in January at 11 percent. Overall, the winter months accounted for 28 percent of residential fires, while spring, summer and fall constituted 23, 22 and 27 percent of the total, respectively. The increase in fires in the cooler months may be explained by the increase in heating fires. In addition, the increase may also be due to more indoor activities in general, as well as more indoor seasonal and holiday-related activities. During the spring and summer months, fire incidence declined steadily, reaching a low in September.

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



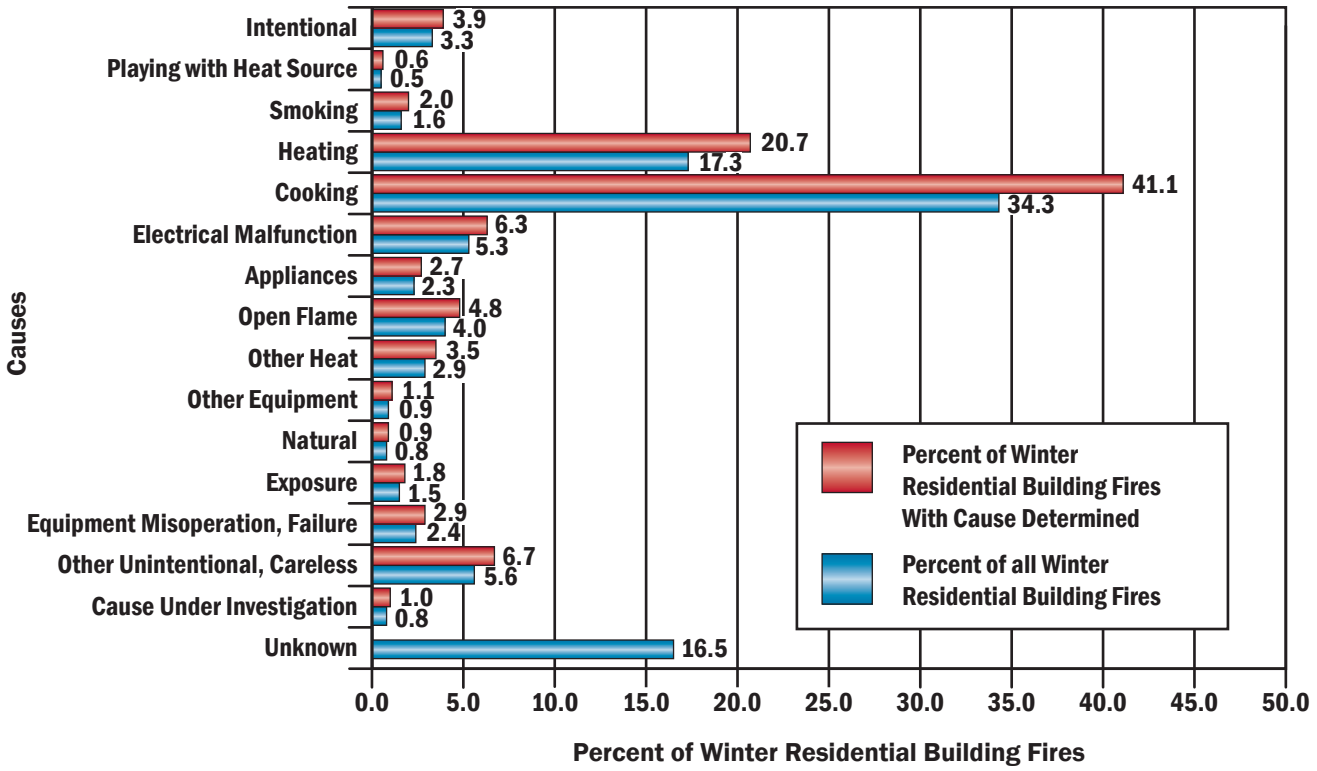
Source: NFIRS 5.0.

Causes of Winter Residential Building Fires

Cooking was the leading reported cause and accounted for 41 percent of all winter residential fires, as shown in Figure 4.[12] Nearly all of these cooking fires (92 percent) were small, confined fires with limited damage.

The next five reported causes combined accounted for 42 percent of residential fires: fires caused by heating (21 percent); other unintentional or careless actions, a miscellaneous group (7 percent); electrical malfunctions, such as short circuits and wiring problems (6 percent); open flames that resulted from candles, matches and the like (5 percent); and intentional actions (4 percent).[13]

Figure 4. Causes of Winter Residential Building Fires (2010-2012)



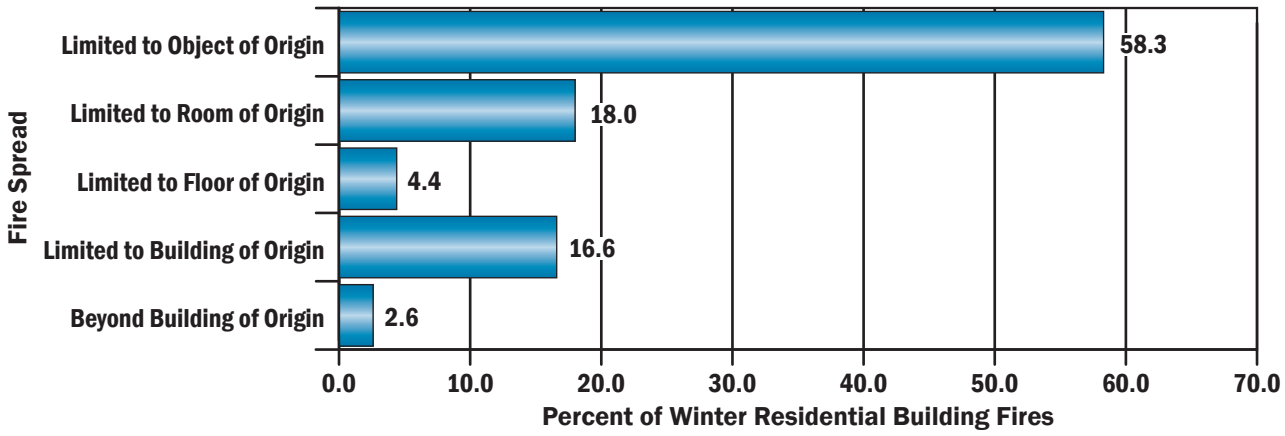
Source: NFIRS 5.0.

Note: Causes are listed in order of the U.S. Fire Administration (USFA) Structure Fire Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to one of 16 cause groupings using a hierarchy of definitions, approximately as shown in the chart above. A fire is included in the highest category into which it fits. If it does not fit the top category, then the second one is considered, and if not that one, the third and so on. For example, if the fire is judged to be intentionally set and a match was used to ignite it, it is classified as intentional and not open flame because intentional is higher in the hierarchy.

Fire Spread in Winter Residential Building Fires

As shown in Figure 5, 58 percent of winter residential fires were limited to the object of origin. Included in these fires were those coded as "confined fires" in NFIRS. In addition, 24 percent of fires extended beyond the room of origin.

Figure 5. Extent of Fire Spread in Winter Residential Building Fires (2010-2012)



Source: NFIRS 5.0.

Note: Total does not add up 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).[14] As previously discussed, however, it is known that confined fires accounted for 52 percent of all winter residential fires. Confined cooking fires — those cooking fires confined to a pot or the oven, for example — accounted for the majority (62 percent) of these confined fires (Table 1).

In addition, the number of confined winter residential fires was greatest from 5 to 7 p.m. These fires accounted for 64 percent of all winter residential fires occurring in this time period. Moreover, confined cooking fires accounted for 66 percent of the confined fires and 42 percent of all fires in residential buildings that occurred between 5 and 7 p.m. during the winter months.

Of the three winter months, January, February and March, confined residential fires peaked in January at 37 percent, while February and March accounted for 32 percent and 31 percent of the fires, respectively.

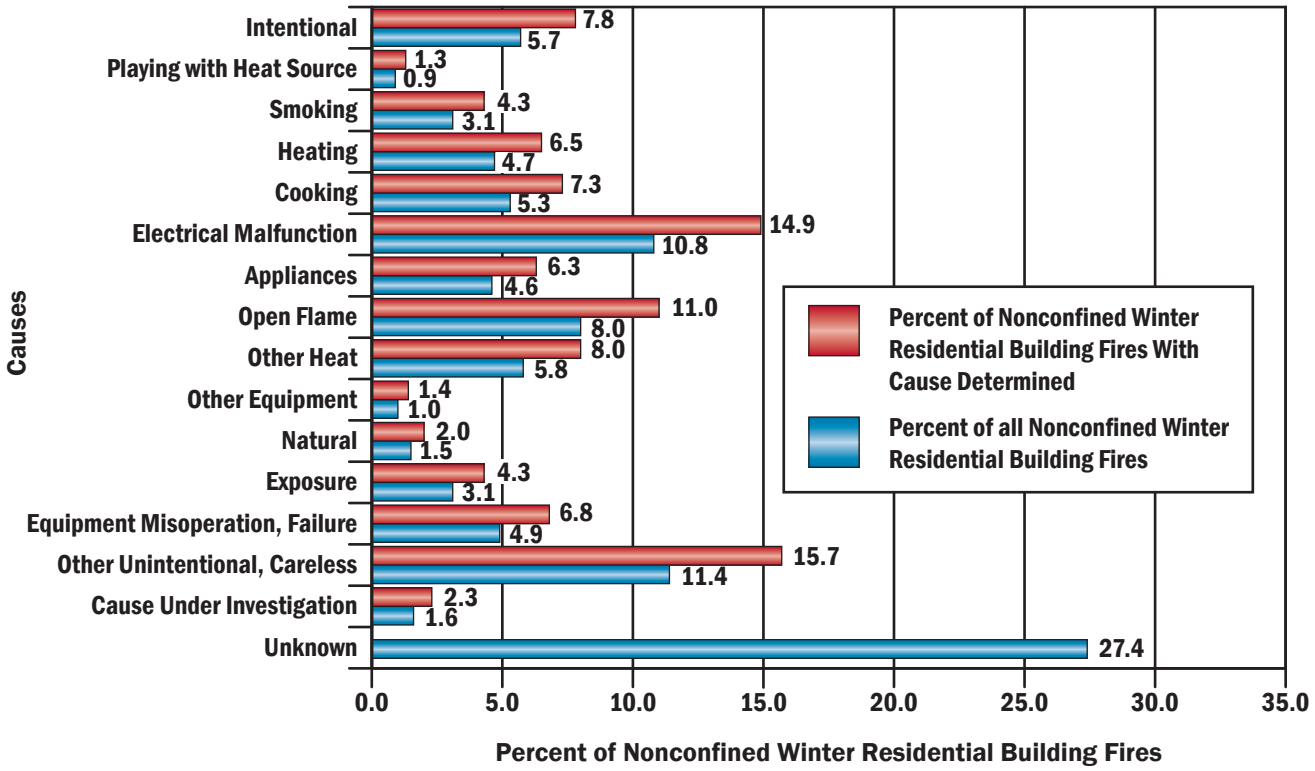
Nonconfined Fires

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

Causes of Nonconfined Winter Residential Building Fires

While cooking was the leading reported cause of winter residential fires overall, it only accounted for 7 percent of all nonconfined winter residential fires, as shown in Figure 6. At 16 percent, carelessness or other unintentional actions was the leading reported cause of nonconfined winter residential fires. Other leading reported causes of nonconfined winter residential fires were electrical malfunction (15 percent), open flames (11 percent), other heat (8 percent) and intentional actions (8 percent).

Figure 6. Causes of Nonconfined Winter Residential Building Fires (2010-2012)



Source: NFIRS 5.0.

Notes: 1. Causes are listed in order of the USFA Structure Fire Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to one of 16 cause groupings using a hierarchy of definitions, approximately as shown in the chart above. A fire is included in the highest category into which it fits. If it does not fit the top category, then the second one is considered, and if not that one, the third and so on. For example, if the fire is judged to be intentionally set and a match was used to ignite it, it is classified as intentional and not open flame because intentional is higher in the hierarchy.

2. Totals do not add up to 100 percent due to rounding.

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

Nonconfined winter residential fires most often started in cooking areas and kitchens (21 percent), as shown in Table 3. Bedrooms (14 percent) and common rooms, living rooms or lounge areas (7 percent) were the next most common areas of fire origin in the home. Smaller percentages of fires started in laundry areas (5 percent) and vacant spaces and attics (5 percent).

Note that these areas of origin do not include areas associated with confined fires. Cooking was the leading cause of all winter residential fires at 41 percent, and it is not surprising that kitchens were the leading area of fire origin. The percentages were not identical between cooking and kitchen fires because some cooking fires started outside the kitchen, some areas of origin for cooking fires were not reported (as is the case in most confined cooking fires), and some kitchen fires did not start due to cooking. In fact, only 34 percent of nonconfined winter residential fires that started in the kitchen were cooking fires. Other unintentional or careless actions accounted for 18 percent of kitchen fires, and nonheat-producing equipment that malfunctions or fails accounted for an additional 14 percent of kitchen fires.

Table 3. Leading Areas of Fire Origin in Nonconfined Winter Residential Building Fires (2010–2012)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	20.5
Bedrooms	13.6
Common room, den, family room, living room, lounge	7.0

Source: NFIRS 5.0.

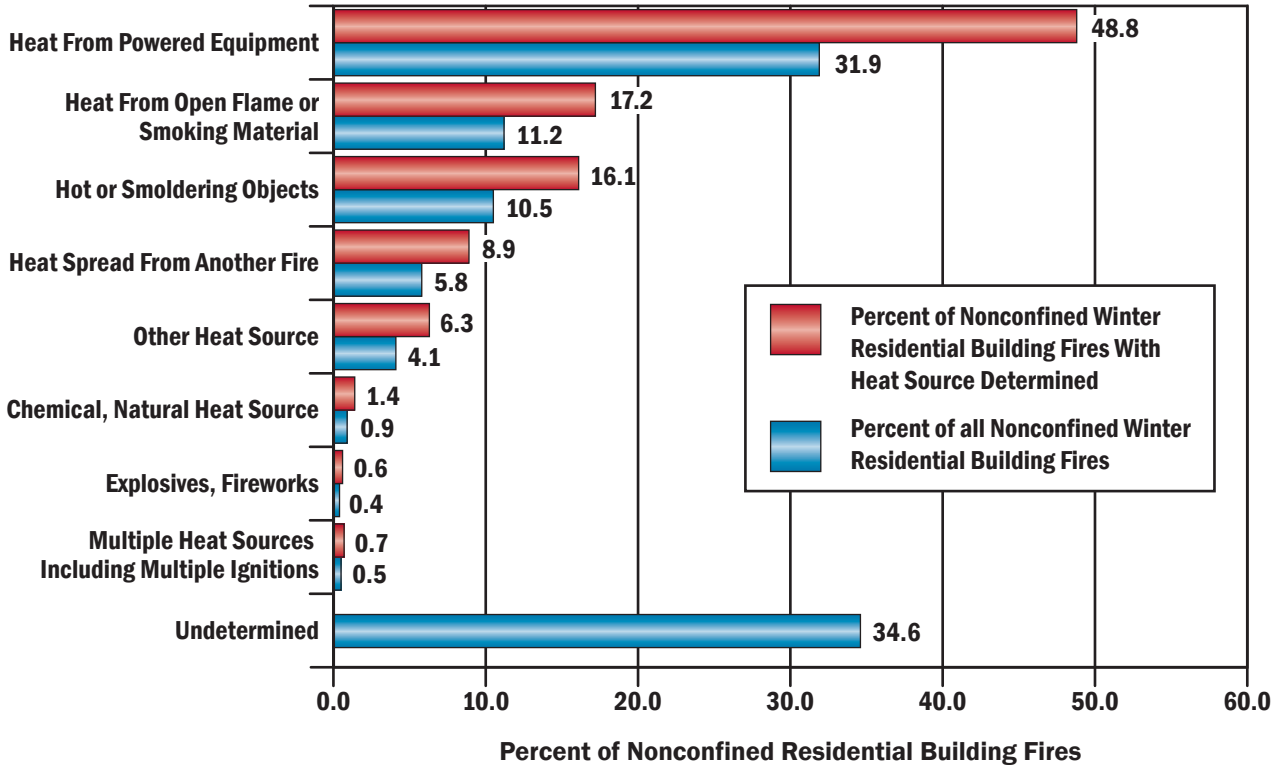
How Nonconfined Winter Residential Building Fires Start (Heat Source)

Figure 7 shows sources of heat categories for nonconfined winter residential fires. Heat from powered equipment accounted for 49 percent of nonconfined winter residential fires. This category includes radiated or conducted heat from operating equipment (15 percent); electrical arcing (15 percent); heat from other powered equipment (13 percent); and spark, ember or flame from operating equipment (5 percent).[15]

Heat from open flame or smoking materials accounted for 17 percent of nonconfined winter residential fires. This category includes such items as cigarettes (4 percent), other miscellaneous open flame or smoking materials (4 percent), lighters and matches (combined, 4 percent), and candles (3 percent).

The third largest category pertains to hot or smoldering objects (16 percent). This category includes items such as miscellaneous hot or smoldering objects (7 percent) and hot embers or ashes (7 percent).

Figure 7. Sources of Heat in Nonconfined Winter Residential Building Fires by Major Category (2010–2012)



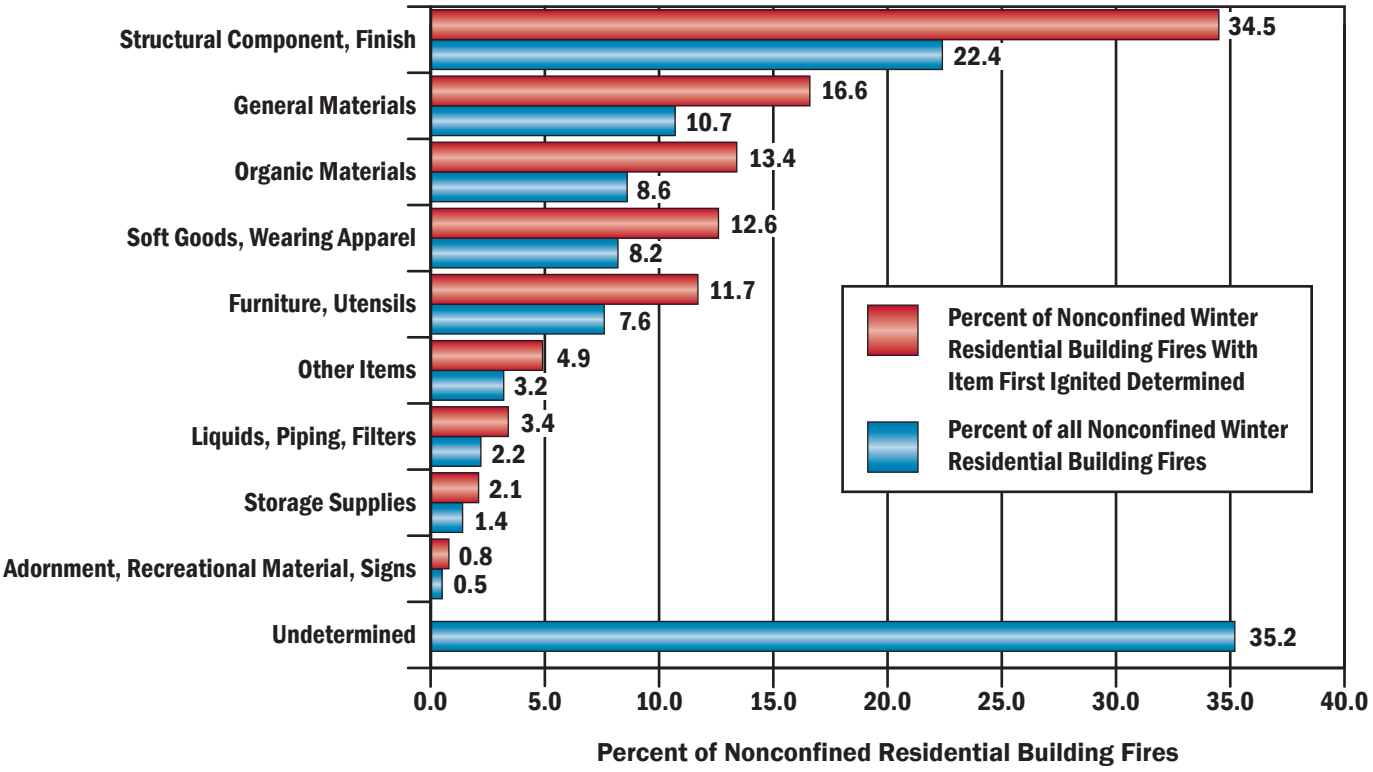
Source: NFIRS 5.0.
Note: Total percent of all nonconfined winter residential building fires does not add up to 100 percent due to rounding.

What Ignites First in Nonconfined Winter Residential Building Fires

As shown in Figure 8, 35 percent of the items first ignited in nonconfined winter residential fires where the item is determined fell under the "structural component, finish" category. This category includes structural member or framing and exterior sidewall covering. The second leading category of items first ignited in nonconfined winter residential fires was "general materials," which accounted for 17 percent of these fires. "General materials" include items such as electrical wire, cable insulation, and trash or rubbish. The next three leading categories of nonconfined winter residential fires were "organic materials" at 13 percent; "soft goods, wearing apparel" at 13 percent; and "furniture, utensils" at 12 percent. These categories include items such as cooking materials, clothing, bedding, linens, curtains, cabinetry, and upholstered sofas and chairs.

Structural member and framing (11 percent), cooking materials (11 percent), electrical wire, cable insulation (7 percent), and exterior sidewall covering (6 percent) were the specific items most often first ignited in nonconfined winter residential fires.

Figure 8. Item First Ignited in Nonconfined Winter Residential Building Fires by Major Category (2010-2012)



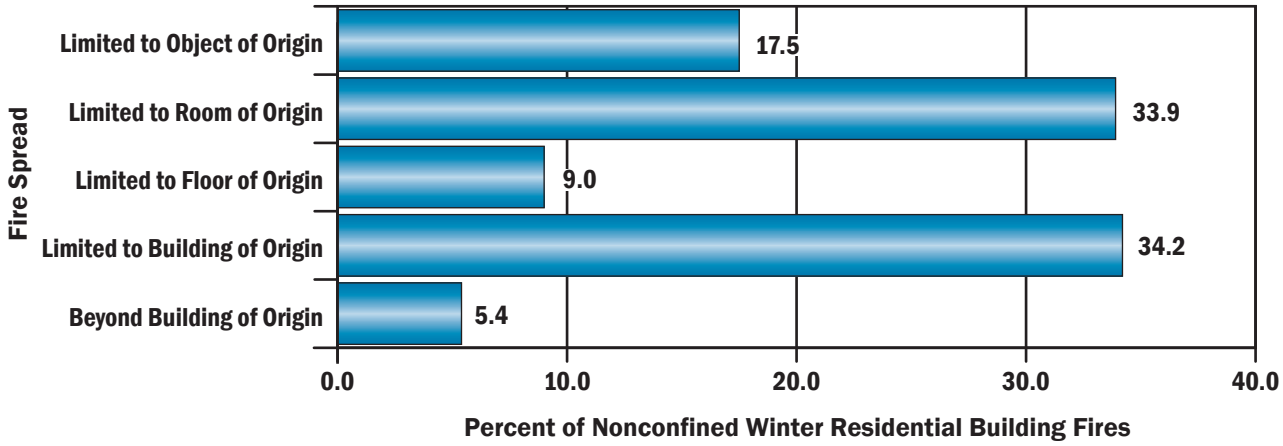
Source: NFIRS 5.0.

Fire Spread in Nonconfined Winter Residential Building Fires

Figure 9 shows the extent of fire spread in nonconfined winter residential fires. In 51 percent of these nonconfined fires, the fire was limited to the object or room of fire origin — in 34 percent of nonconfined fires, the fire was limited to the room of origin; in another 17 percent of fires, the fire was limited to the object of origin. (Note that a fire limited to a sofa or bed is not defined as a "confined fire" 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.)

In 49 percent of nonconfined winter residential fires, the fire extended beyond the room of origin. The leading causes of these larger fires were unintentional or careless actions (18 percent), electrical malfunctions (14 percent), open flames (12 percent), and intentional actions (10 percent).

Figure 9. Extent of Fire Spread in Nonconfined Winter Residential Building Fires (2010-2012)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined Winter Residential Building Fires

Table 4 shows the categories of factors contributing to ignition in nonconfined winter residential fires. The leading category was the misuse of material or product (38 percent). In this category, the leading specific factors contributing to ignition were a heat source too close to combustible materials (15 percent) and abandoned or discarded materials, such as matches or cigarettes (10 percent).

Electrical failures and malfunctions contributed to 21 percent of nonconfined winter residential fires. Operational deficiency was the third leading category at 17 percent. Unattended equipment was the leading factor in the operational deficiency category and accounted for 8 percent of all nonconfined winter residential fires.

Table 4. Factors Contributing to Ignition for Nonconfined Winter Residential Building Fires by Major Category (Where Factors Contributing to Ignition Are Specified, 2010–2012)

Factors Contributing to Ignition Category	Percent of Nonconfined Winter Residential Building Fires (Unknowns Apportioned)
Misuse of material or product	38.4
Electrical failure, malfunction	21.3
Operational deficiency	16.6
Fire spread or control	10.2
Mechanical failure, malfunction	7.7
Other factors contributing to ignition	6.2
Design, manufacture, installation deficiency	3.0
Natural condition	2.2

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; the total will exceed 100 percent.

Alerting/Suppression Systems in Winter Residential Building 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. 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. Since different levels of data are collected on smoke alarms in confined and nonconfined fires, the analyses are performed separately. Note that the data presented in Tables 5 to 7 are the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in winter residential 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 Winter Fires

Overall, smoke alarms were reported as present in 43 percent of nonconfined winter residential fires (Table 5). In 27 percent of nonconfined winter residential fires, there were no smoke alarms present. In another 30 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were potentially missing in between 30 and 57 percent of fires with the ability to spread and possibly result in fatalities.

Table 5. Presence of Smoke Alarms in Nonconfined Winter Residential Building Fires (2010–2012)

Presence of Smoke Alarms	Percent
Present	43.0
None present	26.7
Undetermined	30.4
Total incidents	100.0

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

While 15 percent of all nonconfined winter residential fires occurred in residential buildings that are **not** currently or routinely occupied, these buildings — which 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 7 percent of all nonconfined winter 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 winter fires in occupied residential buildings only.

Smoke Alarms in Nonconfined Winter Fires in Occupied Residential Buildings

Smoke alarms were reported as present in 48 percent of nonconfined winter fires in occupied residential buildings (Table 6). In 22 percent of nonconfined winter fires in occupied residential buildings, there were no smoke alarms present. In another 30 percent of these fires, firefighters were unable to determine if a smoke alarm was present; unfortunately, in 48 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 (48 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consisted of:

- Present and operated — 29 percent.
- Present but did not operate — 12 percent (alarm did not operate, 6 percent; fire too small, 6 percent).
- Present but operational status unknown — 8 percent.[16]

When the subset of incidents where smoke alarms were reported as present was analyzed separately and as a whole, smoke alarms were reported to have operated in 59 percent of the incidents and failed to operate in 13 percent. In another 12 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 16 percent of these incidents.

Nationally, only 3 percent of households lack smoke alarms.[17] At least 22 percent of nonconfined winter fires in occupied residential buildings had no smoke alarms present — and perhaps more if fires without information on smoke alarms could be factored in.[18] A large proportion of reported fires without smoke alarms may reflect the effectiveness of the alarms themselves: Smoke alarms do not prevent fires, but they may prevent a fire from being reported if it is detected at an early stage and extinguished before the fire department becomes involved. Alternatively, fires in homes without smoke alarms may **not** be detected at an early stage, causing them to grow large, require fire department intervention, and thus be reported.[19]

Properly installed and maintained smoke alarms provide an early warning signal to household members in the event that a fire occurs. Smoke alarms help save lives and property. The USFA continues to partner with other government agencies and fire service entities to improve and develop new smoke alarm technologies. More information on smoke alarm technologies, performance, disposal and storage, training bulletins, and public education and outreach materials can be found at http://www.usfa.fema.gov/prevention/technology/smoke_fire_alarms.html.

Table 6. NFIRS Smoke Alarm Data for Nonconfined Winter 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		5,144	5.6
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	19,441	21.0
		Smoke alarm alerted occupants, occupants failed to respond	895	1.0
		No occupants	2,754	3.0
		Smoke alarm failed to alert occupants	669	0.7
		Undetermined	2,632	2.8
	Smoke alarm failed to operate		5,709	6.2
	Undetermined		7,241	7.8
None present			20,471	22.1
Undetermined			27,525	29.8
Total incidents			92,481	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 winter fires in occupied residential buildings. They are presented for informational purposes.

Smoke Alarms in Confined Winter Fires

Less information about smoke alarm status is collected for confined fires, but the data still give important insights about the effectiveness of alerting occupants in these types of 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 41 percent of the reported confined winter residential fires (Table 7). In other words, residents received a warning from a smoke alarm in about two-fifths of these fires. The data suggest that smoke alarms may alert residents to confined fires, as the early alerting allowed the occupants to extinguish the fires, or the fires self-extinguished. If this is the case, it is an example of the contribution to overall safety and the ability to rapidly respond to fires in early stages that smoke alarms afford. Details on smoke alarm effectiveness for confined fires are needed to pursue this analysis further.

Occupants were not alerted by smoke alarms in 19 percent of confined winter residential fires.[20] In 41 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 7. NFIRS Smoke Alarm Data for Confined Winter Residential Building Fires (2010-2012)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	46,808	40.5
Smoke alarm did not alert occupants	21,947	19.0
Unknown	46,874	40.5
Null/Blank	1	0.0
Total incidents	115,630	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 winter residential building fires. They are presented for informational purposes.

Automatic Extinguishing Systems in Nonconfined Winter Fires in Occupied Residential Buildings

AES data are available for both confined and nonconfined fires, although for confined fires the data are very limited in scope. In confined winter residential building fires, an AES was present in only 1 percent of reported incidents.[21] In addition, the following AES analyses focus on nonconfined winter fires in occupied residential buildings only, as even fewer AESs are present in unoccupied housing.

Residential sprinklers are the primary AES in residences but are not yet widely installed. In fact, AESs were reported as present in only 4 percent of nonconfined winter fires in occupied residential buildings (Table 8).

Residential sprinkler systems help to reduce the risk of civilian and firefighter casualties, homeowner insurance premiums, and uninsured property losses. Yet many residences are unequipped with AESs, which are often installed in hotels and businesses. Sprinklers are required by code in hotels and many multifamily residences. There are major movements in the U.S. fire service to require or facilitate use of sprinklers in all new homes, which could improve the use of residential sprinklers in the future. At present, however, they are largely absent in residences nationwide.[22] The USFA and fire service officials across the nation are working to promote and advance residential fire sprinklers. More information on costs and benefits, performance, training bulletins, and public education and outreach materials regarding residential sprinklers can be found at http://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. Additionally, USFA's position statement on residential sprinklers is available at http://www.usfa.fema.gov/about/sprinklers_position.html.

Table 8. NFIRS Automatic Extinguishing System Data for Nonconfined Winter Fires in Occupied Residential Buildings (2010–2012)

Automatic Extinguishing System Presence	Count	Percent
Automatic extinguishing system present	3,295	3.6
Partial system present	152	0.2
Automatic extinguishing system not present	81,441	88.1
Unknown	7,593	8.2
Total incidents	92,481	100.0

Source: NFIRS 5.0.

Notes: 1. The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of AESs in nonconfined winter fires in occupied residential buildings. They are presented for informational purposes.
2. Total does not add up to 100 percent due to rounding.

Examples

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

- January 2014: A midafternoon fire destroyed a two-story home in Dunmore, Pennsylvania, where two residents escaped uninjured. Flames shot through the roof, destroying the attic and second floor of the house. Firefighters were able to contain the fire by 5 p.m. The cause of the blaze is under investigation.[23]
- February 2014: Five children perished in a 5 a.m. fire that engulfed the top floors of a north Minneapolis, Minnesota, duplex. Once on-scene, firefighters found heavy smoke coming from the duplex's second and third floors, with the smoke quickly changing to fire. Firefighters were able to rescue several people; however, one firefighter suffered injuries, and several other victims were taken to local hospitals for treatment. The fire was believed to have started on the second floor, where a space heater was discovered; however, it was unknown if the heater was in use before the fire began. It was reported that the duplex had smoke alarms and carbon monoxide detectors.[24]
- March 2014: Two young children and a man died as a result of a 4 a.m. fire that destroyed a South Baltimore, Maryland, home, and one woman was transported to a hospital to be treated for critical injuries. Upon arrival, fire crews discovered that the flames had spread to both floors of the home. The cause of the fire is under investigation, and it is unknown whether the home had working smoke alarms. Several other attached houses also sustained smoke, fire and water damage.[25]

NFIRS Data Specifications for Winter Residential Building 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.

Winter residential building 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 to 123 (excluding Incident Type 112):

Incident Type	Description
111	Building fire
113	Cooking fire, confined to container
114	Chimney or flue fire, confined to chimney or flue
115	Incinerator overload or malfunction, fire confined
116	Fuel burner/boiler malfunction, fire confined
117	Commercial compactor fire, confined to rubbish
118	Trash or rubbish fire, contained
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 113 to 118 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, detached, manufactured home, mobile home not in transit, duplex
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 113 to 118:
    - 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.
- Residential building fires that occurred in the three months of January, February and March.

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 National Fire Protection Association's (NFPA) 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]"Residential Building Fires (2010-2012)," Topical Fire Report Series, USFA, September 2014, Volume 15, Issue 1, http://www.usfa.fema.gov/downloads/pdf/statistics/v15i1.pdf.

[4]The percentages shown here are derived from the national estimates of residential building fires as explained in Endnote 1 and the summary data resulting from NFPA's annual fire-loss surveys (Karter, Jr., Michael, J., "Fire Loss in the United States During 2012," NFPA, September 2013; "Fire Loss in the United States During 2011," NFPA, September 2012; "Fire Loss in the United States During 2010," NFPA, September 2011).

[5]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.

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

[7]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.

[8]The average fire death and fire injury loss rates computed from the national estimates 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*(890/104,000)) = 8.6 deaths per 1,000 winter residential building fires, and the fire injury rate is (1,000*(4,025/104,000)) = 38.7 injuries per 1,000 winter residential building fires.

[9]"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.

[10]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.

[11]USFA, "Cooking Fires in Residential Buildings (2008-2010)," Volume 13, Issue 12, January 2013, http://www.usfa.fema.gov/downloads/pdf/statistics/v13i12.pdf.

[12]The USFA Structure Fire Cause Methodology was used to determine the cause of winter residential building fires. 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.

[13]Fires caused by intentional actions include, but are not limited to, fires that are deemed to be arson. Intentional fires are those fires that are deliberately set and include fires that result from the deliberate misuse of a heat source and fires of an incendiary nature (arson) that require fire service intervention. For information and statistics on arson fires only, refer to the Uniform Crime Reporting Program arson statistics from the U.S. Department of Justice, FBI, Criminal Justice Information Services Division, http://www.fbi.gov/about-us/cjis/ucr/ucr.

[14]As noted previously, confined building fires are small fire incidents that are limited in scope, are 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.

[15]Total does not add up to 49 percent due to rounding.

[16]Total does not add up to 48 percent due to rounding.

[17]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.

[18]Here, **at least** 22 percent of nonconfined winter fires in occupied residential buildings had no smoke alarms present — the 22 percent that were known to not have smoke alarms and some portion (or as many as all) of the fires where the smoke alarm presence was undetermined.

[19]The "2004-2005 National Sample Survey of Unreported Residential Fires," however, suggests that this may not be the case. It is observed that "if this conjecture is true, it would suggest that the percentage decrease in fire department-attended fires would have been greater than unattended fires in the 20 year period between the surveys."

[20]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.

[21] 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.

[22] Department of Housing and Urban Development and U.S. Census Bureau, 2011 American Housing Survey, "Health and Safety Characteristics-All Occupied Units (National)," Table S-01-AO, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2011_S01AO&prodType=table.

[23] Cameron, Peter and Kyle Wind, "Massive fire destroys two-story Dunmore home," http://thetimes-tribune.com, Jan. 17, 2014, http://thetimes-tribune.com/news/massive-fire-destroys-two-story-dunmore-home-1.1618058 (accessed Nov. 12, 2014).

[24] "5 Children Dead In North Minneapolis House Fire," http://minnesota.cbslocal.com, Feb. 14, 2014, http://minnesota.cbslocal.com/2014/02/14/3-hospitalized-in-north-minneapolis-fire/ (accessed Nov. 12, 2014).

[25] Wells, Carrie, "Two young children, adult killed in South Baltimore house fire," http://articles.baltimoresun.com, March 1, 2014, http://articles.baltimoresun.com/2014-03-01/news/bs-md-ci-fatal-fire-20140301_1_ian-brennan-baltimore-fire-department-house-fire (accessed Nov. 12, 2014).