Residential Building Fires (2007–2009)

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 374,900 residential building fires are reported to U.S. fire departments each year and cause an estimated 2,630 deaths, 13,075 injuries, and $7.6 billion in property loss.
- Cooking is the leading cause of residential building fires (44 percent). Nearly all residential building cooking fires are small, confined fires (94 percent).
- Residential building fire incidence is higher in the cooler months, peaking in January at 11 percent.
- Residential building fires occur most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m., when cooking fires are high.
- Nonconfined residential building fires most often start in cooking areas and kitchens (21 percent).
- Forty-six percent of nonconfined residential building fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (16 percent), unintentional or careless actions (15 percent), intentional (12 percent), and open flame (11 percent).
- The leading factors contributing to ignition category is misuse of material or product (37 percent).
- Smoke alarms were not present in 21 percent of the larger, nonconfined fires in occupied residential buildings. This is a high percentage when compared to the 3 percent of households lacking smoke alarms nationally.

From 2007 to 2009, fire departments responded to an estimated 374,900 fires in residential buildings each year across the Nation.[1,2] These fires resulted in an annual average loss of 2,630 deaths, 13,075 injuries, and $7.6 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. National estimates for 2007–2009 show that 81 percent of all fire deaths and 76 percent of all fire injuries occurred in residential buildings. In addition, residential building fires accounted for over half (53 percent) of the total dollar loss from all fires.[3] These losses resulted from only 27 percent of all reported fires.

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.

As part of a series of topical reports that addresses fires in types of residential buildings, this report addresses the characteristics of all residential building fires reported to the National Fire Incident Reporting System (NFIRS). The focus is on fires reported from 2007 to 2009, the most recent data available at the time of the analysis. Other recent topical reports that address fires in the major residential building types include *One- and Two-Family Residential Building Fires* (Volume 12, Issue 2), *Multifamily Residential Building Fires* (Volume 12, Issue 3), and *University Housing Fires, (2007–2009)* (Volume 12, Issue 9).

For the purpose of this report, the term "residential fires" is synonymous with "residential building fires." "Residential fires" is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, "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 not. Confined building fires are small fire incidents that are limited in extent, staying within pots, fireplaces, or certain other noncombustible containers.[4]

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.[5] Of the two classes of severity, nonconfined fires account for 51 percent of residential fires. The smaller, confined fires account for the remaining 49 percent of residential fires. Cooking fires are the predominant type of confined fires in residential buildings (Table 1).

Table 1. Residential Building Fires by Type of Incident (2007–2009)

Incident Type	Percent
Nonconfined fires	51.4
Confined fires	48.6
Cooking fire, confined to container	33.8
Chimney or flue fire, confined to chimney or flue	6.5
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	3.6
Commercial compactor fire, confined to rubbish	0.3
Trash or rubbish fire, contained	4.2
Total	100.0

Source: NFIRS 5.0.

Loss Measures

Table 2 presents losses, averaged over the 3-year period of 2007–2009, of reported residential and nonresidential building fires.[6] The average number of fatalities and injuries per 1,000 residential fires are notably higher than the same loss measures for nonresidential building fires.

Table 2. Loss Measures for Residential and Nonresidential Building Fires (3-year average, 2007–2009)

Measure	Residential Building Fires	Confined Residential Building Fires	Nonconfined Residential Building Fires	Nonresidential Building Fires
Average Loss:				
Fatalities/1,000 fires	5.5	0.0	10.7	0.8
Injuries/1,000 fires	28.4	8.2	47.6	10.5
Dollar loss/fire	$16,940	$180	$32,780	$27,990

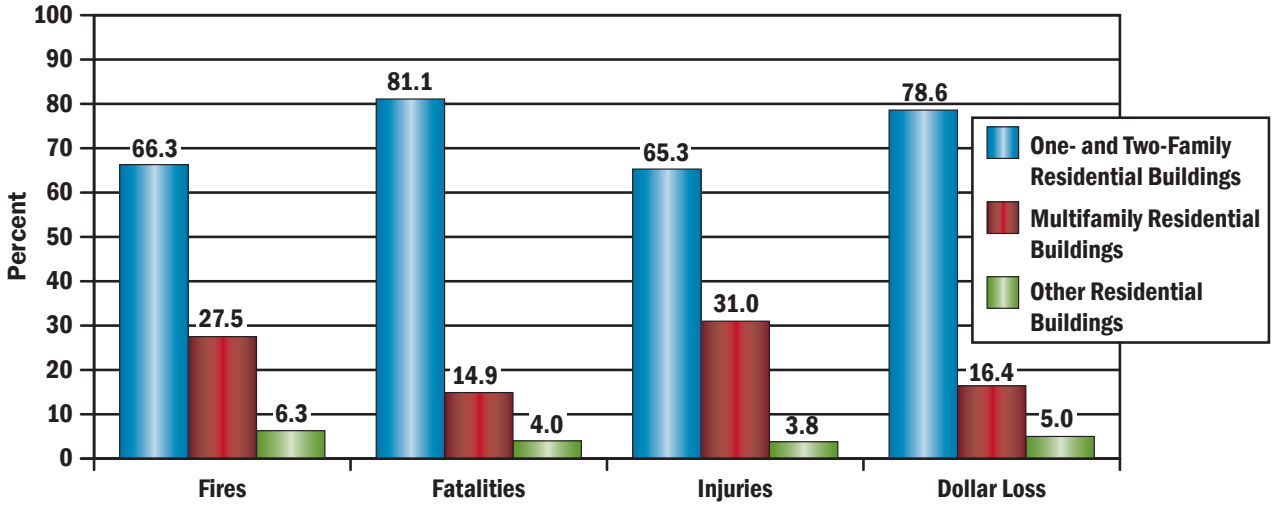
Source: NFIRS 5.0.

Notes: 1) One death in confined residential building fires was reported to NFIRS during 2007–2009; 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) When calculating the average dollar loss per fire for 2007–2009, the 2007 and 2008 dollar-loss values were adjusted to their equivalent 2009 dollar-loss values to account for inflation.

Property Use

Figure 1 presents the percentage distribution of fire losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).[7] Consistent with the fact that the majority of residential fires take place in one- and two-family residential buildings (66 percent), the percentages of fatalities (81 percent), injuries (65 percent), and dollar loss (79 percent) are 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 that 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. Fire Losses by Property Use (2007–2009)

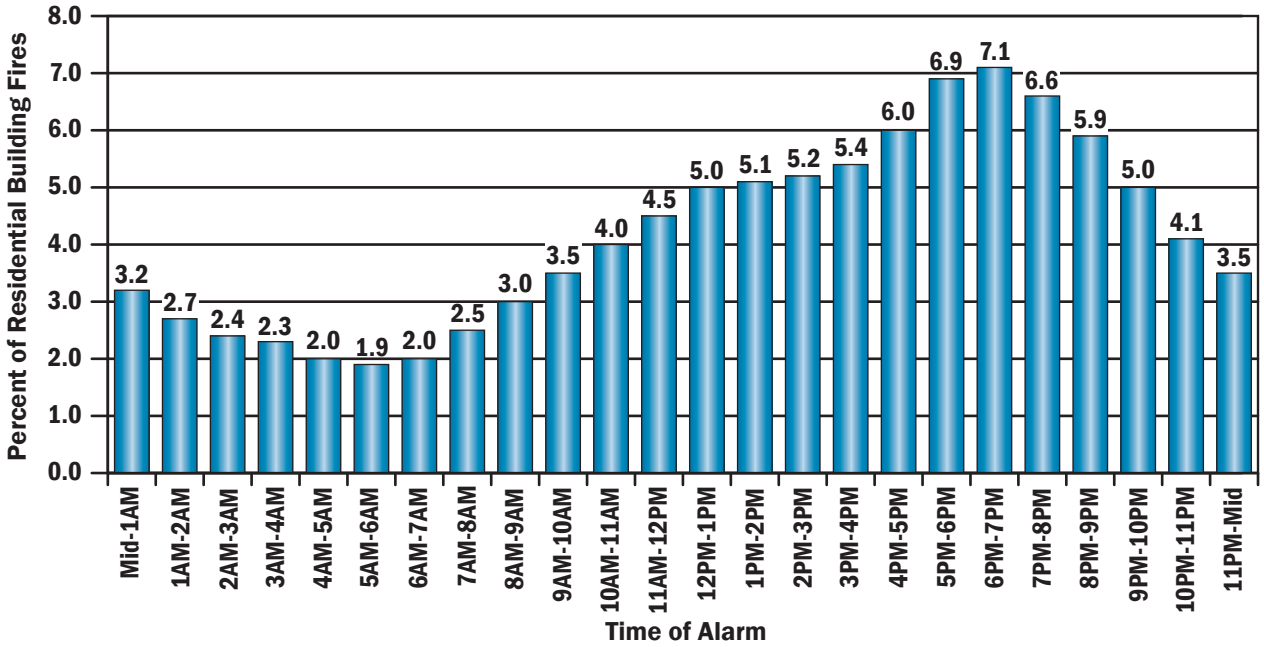


Source: NFIRS 5.0.
Notes: 1) When calculating the dollar losses by property use for 2007–2009, the 2007 and 2008 dollar-loss values were adjusted to their equivalent 2009 dollar-loss values to account for inflation.
2) Totals may not add to 100 percent due to rounding.

When Residential Building Fires Occur

As shown in Figure 2, residential fires occur most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m., when cooking fires are high.[8] Cooking fires, discussed later in the section "Causes of Residential Building Fires," account for 44 percent of residential fires. Fires then decline throughout the night, reaching the lowest point during the early to midmorning hours (4 to 7 a.m.).

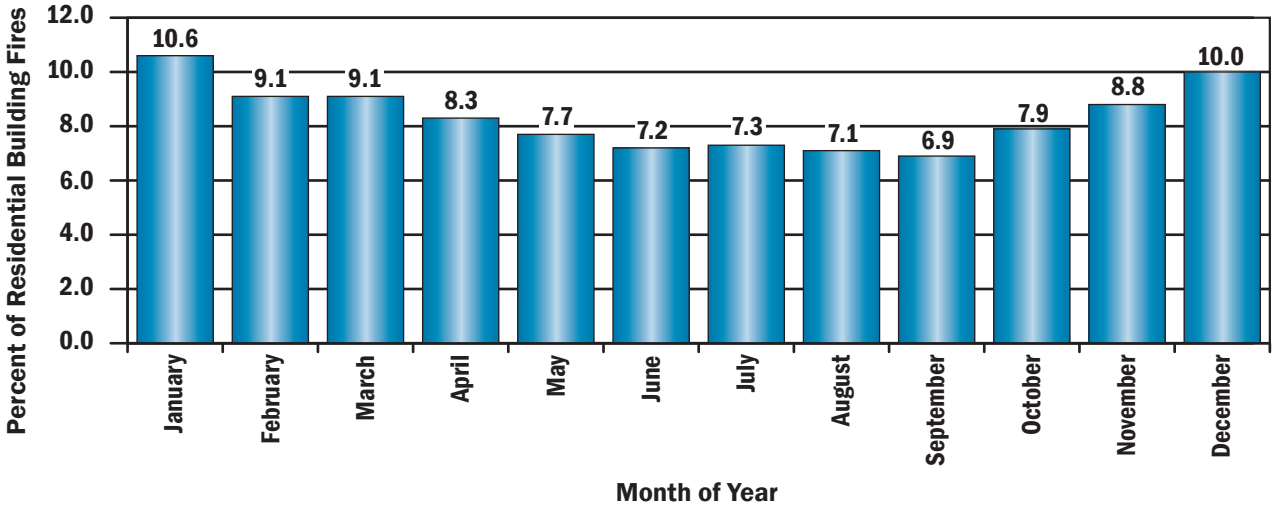
Figure 2. Residential Building Fires by Time of Alarm (2007–2009)



Source: NFIRS 5.0.

Figure 3 illustrates that residential fire incidence is higher in the cooler months, peaking in January at 11 percent. The increase in fires in the cooler months may be explained by the increase in heating fires and as a result of more indoor activities in general, as well as more indoor seasonal and holiday-related activities. During the spring and summer months, the fire incidence declines steadily, reaching a low in September.

Figure 3. Residential Building Fires by Month (2007–2009)



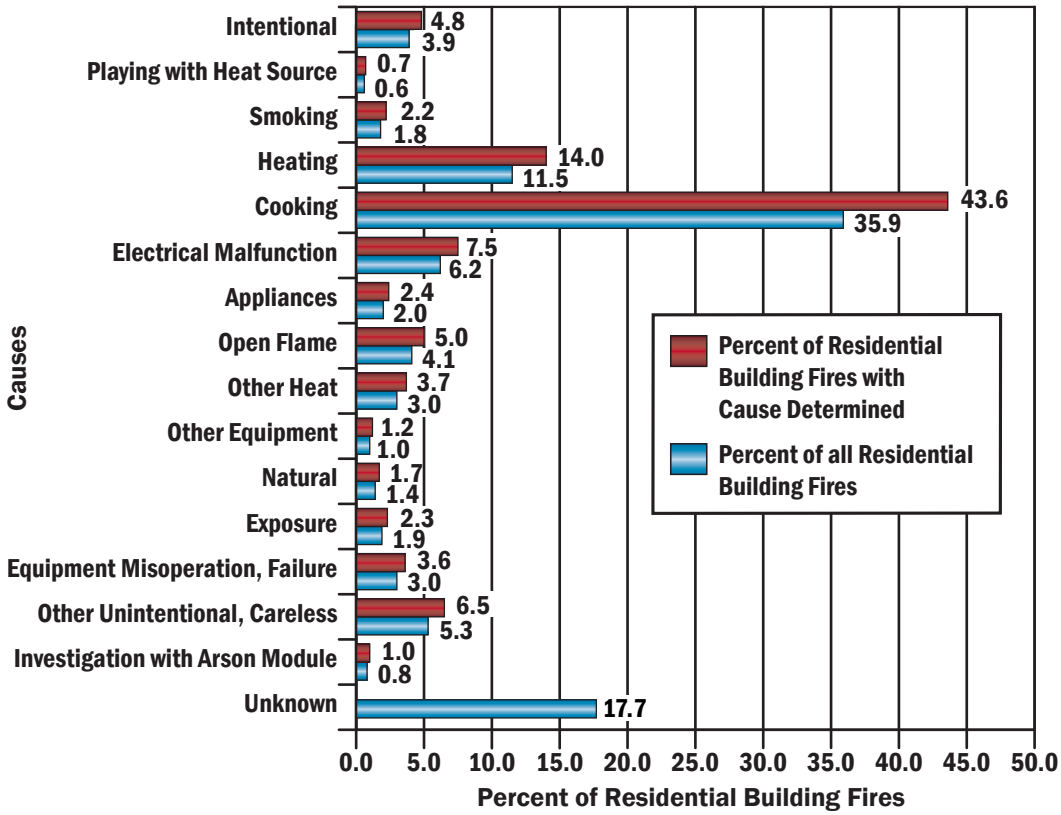
Source: NFIRS 5.0.

Causes of Residential Building Fires

Cooking is the leading cause and accounts for 44 percent of all residential fires, as shown in Figure 4. Nearly all of these cooking fires (94 percent) are small, confined fires with limited damage.

The next five causes combined account for 38 percent of residential fires: fires caused by heating (14 percent); electrical malfunctions such as short circuits and wiring problems (8 percent); other unintentional or careless actions, a miscellaneous group, (7 percent); open flames that result from candles, matches, and the like (5 percent); and intentionally-set fires (5 percent).[9]

Figure 4. Causes of Residential Building Fires (2007–2009)



Source: NFIRS 5.0.

Note: Causes are listed in order of the U.S. Fire Administration (USFA) Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to 1 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.

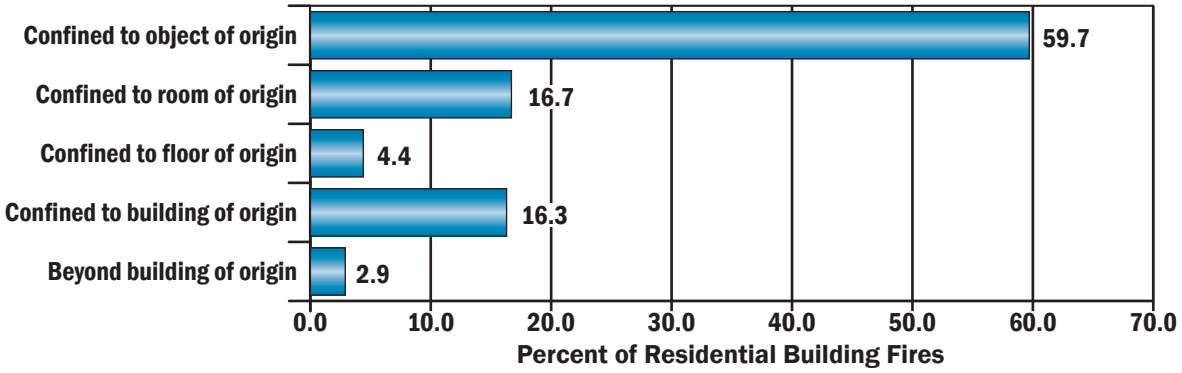
When looking at the different types of property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings), however, there is a striking difference in the prevalence of cooking as a fire cause. Cooking accounts for 67 percent of multifamily residential building fires and 57 percent of all other types of residential occupancies, but only 31 percent of one- and two-family building fires.[10] The most persuasive explanation for this difference may be that the smaller, confined fires in one- and two-family dwellings are not reported as often to fire departments. They are small, contained, and do not cause much damage. In addition, only the residents hear the smoke alarm if it is activated. However, these same confined fires in multifamily residences may be reported—if someone else in the complex hears the alarm or smells the fire. Alternatively, if it is a newer complex, the alarms are connected to the building alarm system and the fire department may automatically be called.

Heating and electrical malfunctions also play a larger role in one- and two-family fires than in multifamily fires. One reason for this may be that many one- and two-family residential buildings have fireplaces, chimneys, and fireplace-related equipment that most other types of residential properties do not.[11] This heating equipment difference may also be the explanation for the increase in confined chimney and flue fires (a component of heating fires) seen in one- and two-family fires (9 percent) as compared to multifamily fires (less than 1 percent).[12]

Fire Spread in Residential Building Fires

Sixty percent of residential fires are confined to the object of origin (Figure 5). Included in these fires are those coded as "confined fires" in NFIRS. Approximately 24 percent of fires extend beyond the room of origin.

Figure 5. Extent of Fire Spread in Residential Building Fires (2007–2009)



Source: NFIRS 5.0.

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).[13] As previously discussed, however, it is known that confined fires account for 49 percent of all residential fires. Confined cooking fires—those cooking fires confined to a pot or the oven, for example—account for the majority of these confined fires (Table 1).

In addition, the numbers of confined residential fires are greatest from 5 to 8 p.m.; they account for 59 percent of all residential fires occurring in this time period. Moreover, confined cooking fires account for 72 percent of the confined fires and 43 percent of all fires in residential buildings that occur between 5 and 8 p.m.

Confined residential fires peak in December and January, then steadily decline until reaching the lowest incidence in June.

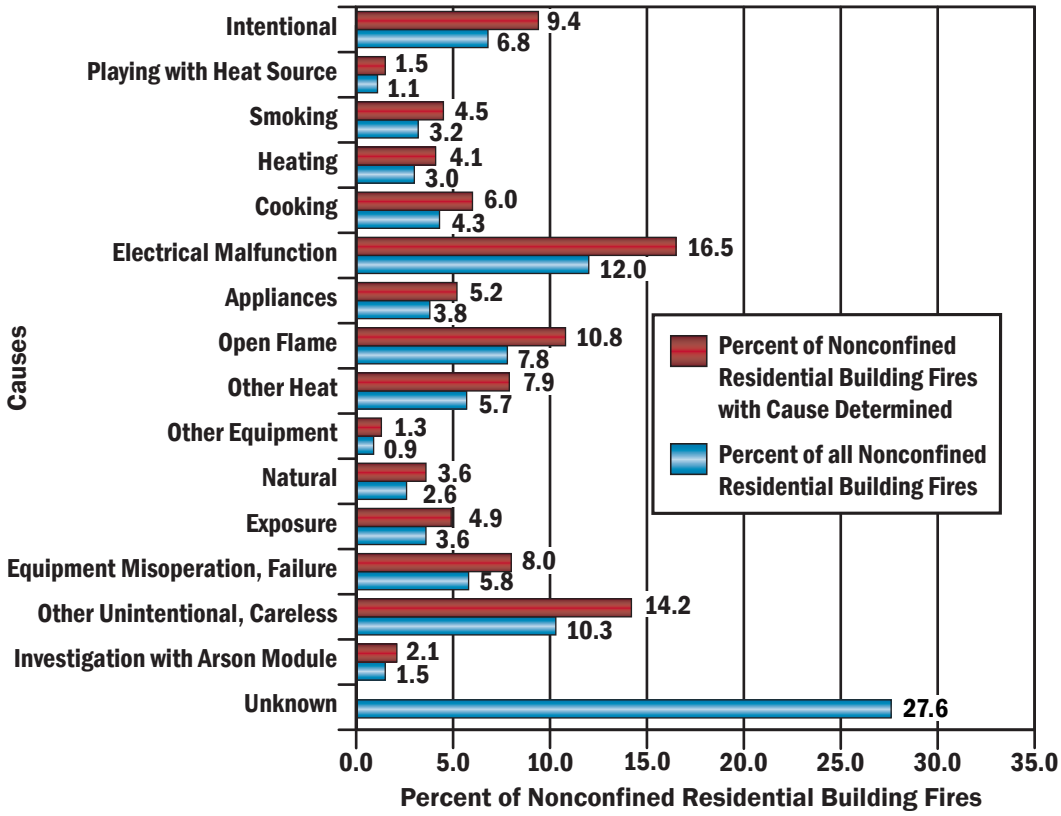
Nonconfined Fires

The next sections of this topical report address nonconfined 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 Residential Building Fires

While cooking is the leading cause of residential fires overall, it only accounts for 6 percent of all nonconfined residential fires. At 17 percent, electrical malfunction is the leading cause of nonconfined residential fires. Other leading causes of nonconfined residential fires are carelessness or other unintentional actions (14 percent), open flames (11 percent), and intentional actions, a group that includes fires commonly called arson fires (9 percent) (Figure 6).

Figure 6. Causes of Nonconfined Residential Building Fires (2007–2009)



Source: NFIRS 5.0.

Note: Causes are listed in order of the USFA Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to 1 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.

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

Nonconfined residential fires most often start 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) are the next most common areas of fire origin in the home. Smaller, but not minor, percentages of fires start in laundry areas (5 percent), vacant spaces and attics (5 percent), and exterior wall surfaces (5 percent). Also of interest, 4 percent of nonconfined residential fires start in garages and carports.

Note that these areas of origin do not include areas associated with confined fires. Cooking is the leading cause of all residential fires at 44 percent, and it is not surprising that kitchens are the leading area of fire origin. The percentages are not identical between cooking and kitchen fires because some cooking fires start outside the kitchen, some areas of origin for cooking fires are not reported (as is the case in most confined cooking fires), and some kitchen fires are not due to cooking. In fact, only 27 percent of nonconfined residential fires that start in the kitchen are cooking fires. Other, unspecified unintentional or careless actions account for 19 percent of kitchen fires, and nonheat-producing equipment that malfunctions or fails also accounts for an additional 19 percent of kitchen fires.

Table 3. Leading Areas of Fire Origin in Nonconfined Residential Building Fires (2007–2009)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	21.1
Bedrooms	13.7
Common room, den, family room, living room, lounge	6.7

Source: NFIRS 5.0.

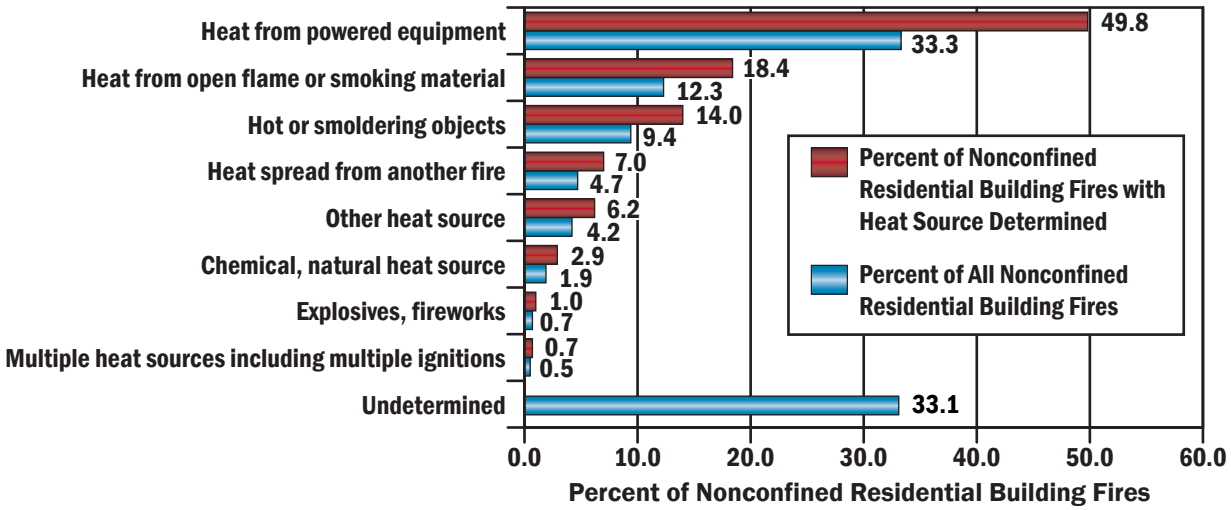
How Nonconfined Residential Building Fires Start (Heat Source)

Figure 7 shows sources of heat categories for nonconfined residential fires. Heat from powered equipment accounts for 50 percent of nonconfined residential fires. This category includes electrical arcing (16 percent), radiated or conducted heat from operating equipment (15 percent), heat from other powered equipment (13 percent), and spark, ember, or flame from operating equipment (5 percent).

Heat from open flame or smoking materials accounts for 18 percent of nonconfined residential fires. This category includes such items as cigarettes (4 percent), candles (4 percent), lighters and matches (combined, 4 percent), and other miscellaneous open flame or smoking materials (4 percent).

The third largest category pertains to hot or smoldering objects (14 percent). This category includes miscellaneous hot or smoldering objects (7 percent) and hot embers or ashes (6 percent).

Figure 7. Sources of Heat in Nonconfined Residential Building Fires by Major Category (2007–2009)



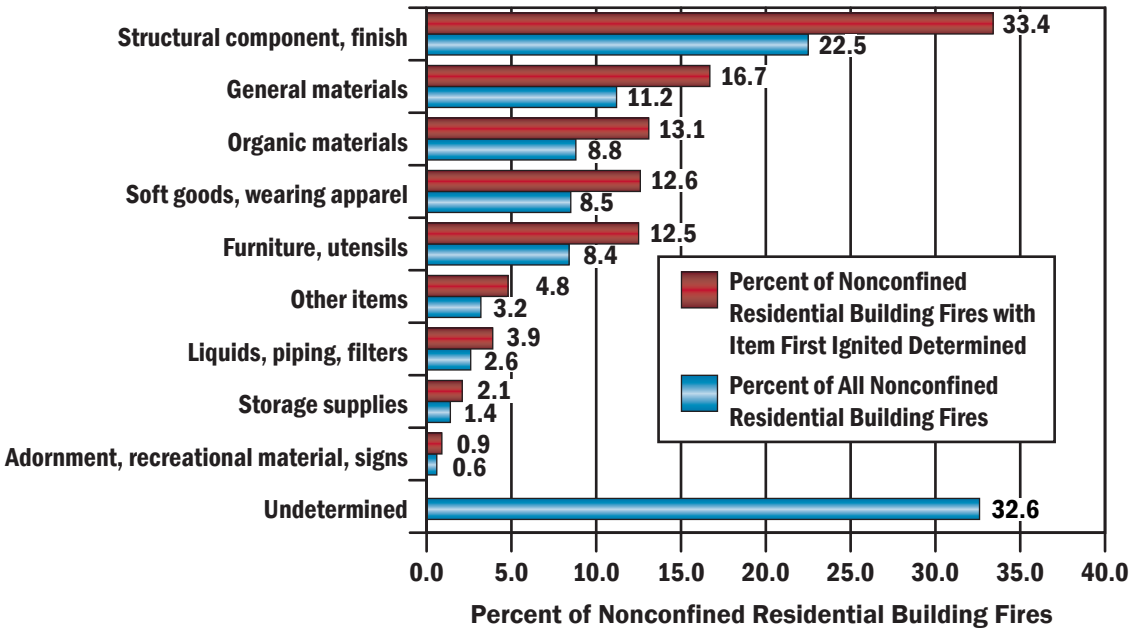
Source: NFIRS 5.0.

What Ignites First in Nonconfined Residential Building Fires

Thirty-three percent of the items first ignited in nonconfined residential fires where the item first ignited is determined fall under the "structural component, finish" category (Figure 8). This category includes structural member or framing and exterior sidewall covering. The second leading category of items first ignited in nonconfined residential fires is "general materials" which accounts 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, "organic materials," "soft goods, wearing apparel," and "furniture, utensils" each account for 13 percent of nonconfined residential fires. These categories include items such as cooking materials, clothing, bedding, and upholstered sofas and chairs.

Cooking materials (11 percent), structural member and framing (10 percent), electrical wire, cable insulation (8 percent), and exterior sidewall covering (7 percent) are the specific items most often first ignited in nonconfined residential fires.

Figure 8. Item First Ignited in Nonconfined Residential Building Fires by Major Category (2007–2009)



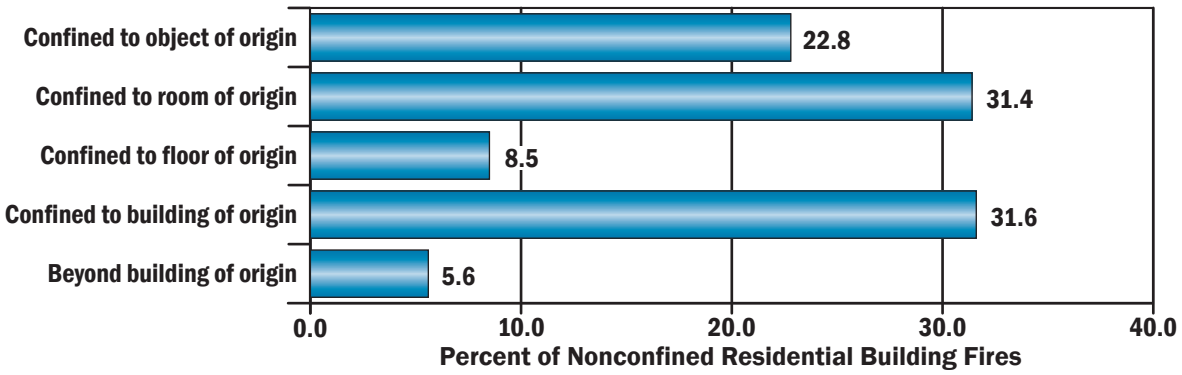
Source: NFIRS 5.0.

Fire Spread in Nonconfined Residential Building Fires

Figure 9 shows the extent of fire spread in nonconfined residential fires. Fifty-four percent of the nonconfined fires are limited to the object or room of fire origin—in 31 percent of nonconfined fires, the fire is confined to the room of origin; in another 23 percent of fires, the fire is confined to the object of origin. (Note that a fire confined 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.)

Forty-six percent of nonconfined residential fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (16 percent), unintentional or careless actions (15 percent), intentional (12 percent), and open flame (11 percent).

Figure 9. Extent of Fire Spread in Nonconfined Residential Building Fires (2007–2009)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined Residential Building Fires

Table 4 shows the categories of factors contributing to ignition in nonconfined residential fires. The leading category is the misuse of material or product (37 percent). In this category, the leading specific factors contributing to ignition are a heat source too close to combustible materials (14 percent) and abandoned or discarded materials such as matches or cigarettes (10 percent).

Electrical failures and malfunctions contribute to 22 percent of nonconfined residential fires. Operational deficiency is the third leading category at 16 percent. Unattended equipment is the leading factor in the operational deficiency category and accounts for 8 percent of all nonconfined residential fires.

Table 4. Factors Contributing to Ignition for Nonconfined Residential Building Fires by Major Category (Where Factors Contributing to Ignition are Specified, 2007–2009)

Factors Contributing to Ignition Category	Percent of Nonconfined Residential Building Fires (Unknowns Apportioned)
Misuse of material or product	37.4
Electrical failure, malfunction	22.3
Operational deficiency	15.7
Fire spread or control	10.2
Mechanical failure, malfunction	7.3
Other factors contributing to ignition	6.7
Natural condition	3.4
Design, manufacture, installation deficiency	2.3

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 Fires

Technologies to detect and extinguish fires have been a major contributor in the drop in fire fatalities and injuries over the past 30 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 are available for both confined and nonconfined fires, although for confined fires, the data are very limited in scope. As 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 data set and are not scaled to national estimates of smoke alarms in 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 Fires

Overall, smoke alarms were reported as present in 43 percent of nonconfined residential fires (Table 5). In 26 percent of nonconfined residential fires, there were no smoke alarms present. In another 31 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were potentially missing in between 31 and 57 percent of these fires with the ability to spread and possibly result in fatalities.

Table 5. Presence of Smoke Alarms in Nonconfined Residential Building Fires (2007–2009)

Presence of Smoke Alarms	Percent
Present	42.7
None present	26.1
Undetermined	31.2

Source: NFIRS 5.0.

While 17 percent of all nonconfined residential fires occur in residential buildings that are *not* currently or routinely occupied, these occupancies—buildings 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 operate. In fact, only 6 percent of all nonconfined fires in unoccupied residential buildings were reported as having smoke alarms that were present and that operated. As a result, the detailed smoke alarm analyses in the next section focus on nonconfined fires in occupied residential buildings only.

Smoke Alarms in Nonconfined Fires in Occupied Residential Buildings

Smoke alarms were reported as present in 48 percent of nonconfined fires in occupied residential buildings (Table 6). In 21 percent of nonconfined fires in occupied residential buildings, there were no smoke alarms present. In another 31 percent of these fires, firefighters were unable to determine if a smoke alarm was present; unfortunately, in 45 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:

- smoke alarms present and operated—28 percent;
- present but did not operate—12 percent (alarm did not operate, 7 percent; fire too small, 6 percent);[14] and
- present, but operational status unknown—8 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 and failed to operate in 14 percent. In 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.[15] Here, at least 21 percent of nonconfined fires in occupied residential buildings had no smoke alarms present—and perhaps more if fires without information on smoke alarms could be factored in.[16] The irony is that the 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 because it is detected at the earliest stage. Fires in these homes are *not* detected at the earliest stage, they grow large, require fire department intervention, and thus are reported.[17]

Table 6. NFIRS Smoke Alarm Data for Nonconfined Fires in Occupied Residential Buildings (2007–2009)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		18,332	5.8
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	64,222	20.2
		Smoke alarm alerted occupants, occupants failed to respond	2,988	0.9
		No occupants	10,792	3.4
		Smoke alarm failed to alert occupants	2,395	0.8
		Undetermined	8,452	2.7
		Null/Blank	1	0.0
	Smoke alarm failed to operate		20,758	6.5
	Undetermined		24,840	7.8
	Null/Blank		1	0.0
None present			67,444	21.2
Undetermined			97,304	30.6
Null/Blank			1	0.0
Total Incidents			317,530	100.0

Source: NFIRS 5.0.

Notes: 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 nonconfined fires in occupied residential buildings. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Smoke Alarms in Confined 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 42 percent of the reported confined residential fires (Table 7). In other words, residents received a warning from a smoke alarm in approximately 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 17 percent of confined residential fires.[18] In 41 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 7. NFIRS Smoke Alarm Data for Confined Residential Building Fires (2007–2009)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	150,915	41.5
Smoke alarm did not alert occupants	62,671	17.3
Unknown	149,705	41.2
Null/blank	1	0.0
Total Incidents	363,292	100.0

Source: NFIRS 5.0.
Notes: 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 confined residential building fires. They are presented for informational purposes.

Automatic Extinguishment Systems in Nonconfined Residential Building Fires

Automatic extinguishing system (AES) data are available for both confined and nonconfined fires, although for confined fires, the data are also very limited in scope. In confined residential building fires, an AES was present in less than 1 percent of reported incidents.[19] In addition, the analyses presented here do not differentiate between occupied and unoccupied housing, as extremely few reported fires in unoccupied housing have AESs present.

Residential sprinklers are the primary AES in residences and are not yet widely installed. In fact, sprinklers are reported as present in only 3 percent of nonconfined residential fire incidents (Table 8). 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.[20]

Table 8. NFIRS Automatic Extinguishing System Data for Nonconfined Residential Building Fires (2007–2009)

AES Presence	Count	Percent
AES present	11,351	3.0
Partial system present	414	0.1
AES not present	338,579	88.1
Unknown	33,894	8.8
Null/Blank	2	0.0
Total Incidents	384,240	100.0

Source: NFIRS 5.0.
Notes: The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of AESs in nonconfined residential building fires. They are presented for informational purposes.

Examples

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

- May 2011: Firefighters responded to an early morning house fire in Bakersfield, CA, and controlled the fire within 20 minutes. Although the house did not have a working smoke alarm, seven people were able to escape after hearing glass break and other sounds caused by the fire. An unattended candle started the fire and damages were estimated at $150,000.[21]
- April 2011: A 3-year-old boy playing with a lighter in a Modesto, CA, motel room started a two-alarm fire that quickly spread. The boy accidentally lit the first floor room's mattress on fire, which spread to the bed's headboard and the rest of the room. The boy and his parents quickly got out of the room and no injuries were reported. The fire damage, estimated at $70,000, was limited to two first-floor rooms and one second-floor room.[22]
- February 2011: Montgomery County Fire and Rescue crews responded to a three-story townhouse fire in North Potomac, MD. According to Montgomery County Fire and Rescue, a toaster oven's timer function failed after it was used to cook on the home's deck earlier in the day, causing it to stay on and start the fire. The two adult residents of the townhouse were not home when the fire started and no injuries were reported. According to the residents, most of the rooms in the rear of the townhouse and the top two floors were destroyed.[23]
- January 2011: A Medina, OH, family was forced out of their home by a fast-moving fire which started when a 19-year-old family member used a lighter to look for a remote control under a bed. According to the fire chief, when the family opened windows and a door upon their exit intending to limit smoke damage, the fire was fed with oxygen causing it to grow rapidly. Damages were estimated at $180,000 and three of the family's dogs died as a result of the fire. No other injuries were reported.[24]

NFIRS Data Specifications for Residential Building Fires

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2007, 2008, and 2009. Only Version 5.0 data were extracted.

Residential building fires are defined as:

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

Incident Type	Description
111	Building fire
112	Fires in structure other than in a building
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 that Incident Types 113 to 118 do not specify if the structure is a building.

Incident Type 112 is included prior to 2008 as previous analyses have shown that Incident Types 111 and 112 were used interchangeably. As of 2008, Incident Type 112 is excluded.

- Property Use 400 to 464:

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 113–118:
    - 1—Enclosed building,
    - 2—Fixed portable or mobile structure, and
    - Structure Type not specified (null entry).
  - For Incident Types 111, 112, and 120–123:
    - 1—Enclosed building, and
    - 2—Fixed portable or mobile structure.

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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Notes:

[1] National estimates are based on 2007–2009 native Version 5.0 data from the National Fire Incident Reporting System (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.

[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 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.

[3] 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 2009*, NFPA, August 2010; *Fire Loss in the United States During 2008*, NFPA, August 2009; *Fire Loss in the United States During 2007*, NFPA, August 2008).

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

[5] 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 (or rubbish for Incident Type code 118) 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.

[6] The average fire death and fire injury loss rates computed from the national estimates will not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The fire death rate computed from national estimates would be (1,000*(2,630/374,900)) = 7.0 deaths per 1,000 residential building fires and the fire injury rate would be (1,000*(13,075/374,900)) = 34.9 injuries per 1,000 residential building fires.

[7] "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.

[8] 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.

[9] The USFA Cause Hierarchy was used to determine the cause of residential building fire incidents. The cause definitions can be found at www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm

[10] USFA, *One- and Two-Family Residential Building Fires (2007–2009)*, Volume 12, Issue 2, May 2011, p. 4, www.usfa.dhs.gov/downloads/pdf/statistics/v12i2.pdf

[11] The American Housing Survey does not indicate the number of fireplaces, chimneys, and fireplace-related equipment per se. It does collect data on fireplaces, etc., as the primary heating unit which applies to this analysis. U.S. Department of Housing and Urban Development (HUD) and U.S. Census Bureau, American Housing Survey Branch, "American Housing Survey for the United States: 2009," Table 2-25.

[12] USFA, *One- and Two-Family Residential Building Fires (2007–2009)*, Volume 12, Issue 2, May 2011, p. 4, www.usfa.dhs.gov/downloads/pdf/statistics/v12i2.pdf

[13] 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 losses, and are expected to have no significant accompanying property losses due to flame damage. In NFIRS, confined fires are defined by Incident Type codes 113–118.

[14] Total does not equal 12 due to rounding.

[15] 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.

[16] Here, *at least* 21 percent of nonconfined fires in occupied residential buildings had no smoke alarms present—the 21 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.

[17] 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."

[18] 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 was already aware of the fire, or there were no occupants present at the time of the fire.

[19] 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 automatic extinguishing system (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.

[20] HUD and U.S. Census Bureau, American Housing Survey Branch, "American Housing Survey for the United States: 2009," Table 1-4, www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html

[21] "Unattended Candle Causes Fire at Residence," www.bakersfield.com, May 12, 2011, www.bakersfield.com/blogs/breaking_news/x43486098/Unattended-candle-causes-fire-at-residence (accessed May 31, 2011).

[22] Rosalio Ahumada, "Toddler Playing with Lighter Starts Modesto Hotel Fire," www.modbee.com, April 9, 2011, www.modbee.com/2011/04/09/1637534/modesto-fire-damages-rooms-at.html (accessed May 31, 2011).

[23] Jillian Badanes, "Toaster Oven Blamed for Townhouse Fire," www.northpotomac.patch.com, February 16, 2011, northpotomac.patch.com/articles/firefighters-respond-to-townhouse-fire-in-north-potomac (accessed May 31, 2011).

[24] Jack Shea, "Lost Remote Control Leads to House Fire," www.fox8.com, January 22, 2011, www.fox8.com/news/wjw-medina-house-fire-txt,0,5401650.story (accessed May 31, 2011).