

Intentionally Set Fires in Residential Buildings

These short 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 18,100 intentionally set residential building fires occur annually in the United States. These fires result in approximately 290 deaths, 850 injuries, and \$533 million in property loss each year.
- Approximately 5 percent of residential building fires are intentionally set.
- Lighters (23 percent) and matches (19 percent) are the leading heat sources of intentionally set fires in residential buildings.
- Seventy-four percent of intentionally set fires in residential buildings occur in one- or two-family dwellings. Nineteen percent of fires occur in multifamily dwellings.
- Rubbish, trash, and waste (8 percent), magazines, newspapers, and writing paper (7 percent), and flammable liquids or gas, uncontained (7 percent) are the items most often first ignited in intentionally set fires in residential buildings.

From 2004 to 2006, an estimated average of 18,100 intentionally set fires in residential buildings occurred each year in the United States. Intentionally set fires account for 5 percent of residential building fires responded to by fire departments across the Nation.^{1,2,3} These fires resulted in an average of approximately 290 deaths, 850 injuries, and \$533 million in property loss each year.

As part of the Intentionally Set Fires Topical Reports series, this topical report addresses the characteristics of intentionally set fires in residential buildings reported to the National Fire Incident Reporting System (NFIRS) between 2004 and 2006. Intentional fires are those fires that require fire service intervention and are deliberately set. These fires include fires that result from deliberate misuse of a heat source, fires of an incendiary nature (arson), as well as other deliberate acts. The first report, *Intentionally Set Fires* (Volume 9, Issue 5), presents the overall intentionally set fires problem. Other aspects of the intentionally set fire problem are explored in *Intentionally Set Outdoor Fires* (Volume 9, Issue 6) and *Intentionally Set Vehicle Fires* (Volume 9, Issue 7).

Table 1 presents losses, averaged over this 3-year period, of all reported residential building fires and intentionally set fires in residential buildings.⁴

Table 1. Loss Measures for Intentionally Set Fires in Residential Buildings (3-year average, 2004–2006)

Measure	Residential Building Fires	Intentionally Set Residential Building Fires
Average Loss:		
Fatalities/1,000 Fires	5.5	8.5
Injuries/1,000 Fires	28.5	37.9
Dollar Loss/Fire	\$12,304	\$17,819

Source: NFIRS 5.0

Note: Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed *per fire*.

Where Intentionally Set Fires in Residential Buildings Occur

Approximately three-quarters of intentionally set fires in residential buildings occurred in one- and two-family residential properties. Multifamily and other residential properties accounted for 19 and 7 percent, respectively (Table 2). Other residential properties included barracks, dormitories, and boarding/rooming houses among other categories.

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Table 2. Intentionally Set Fires in Residential Buildings by Type of Residential Property and Type of Incident (2004–2006)

Residential Property Type	Incident Type				Total
	Residential Building Fire	Confined Residential Building Fire	Fire in Mobile Property Used as a Building	Other Residential Building Fire	
One- and two-family	61.8	6.7	4.3	1.6	74.4
Multifamily	16.9	1.7	0.0	0.4	19.0
Other residential property	5.1	0.8	0.5	0.2	6.6
Total	83.7	9.3	4.9	2.1	100.0

Source: NFIRS 5.0

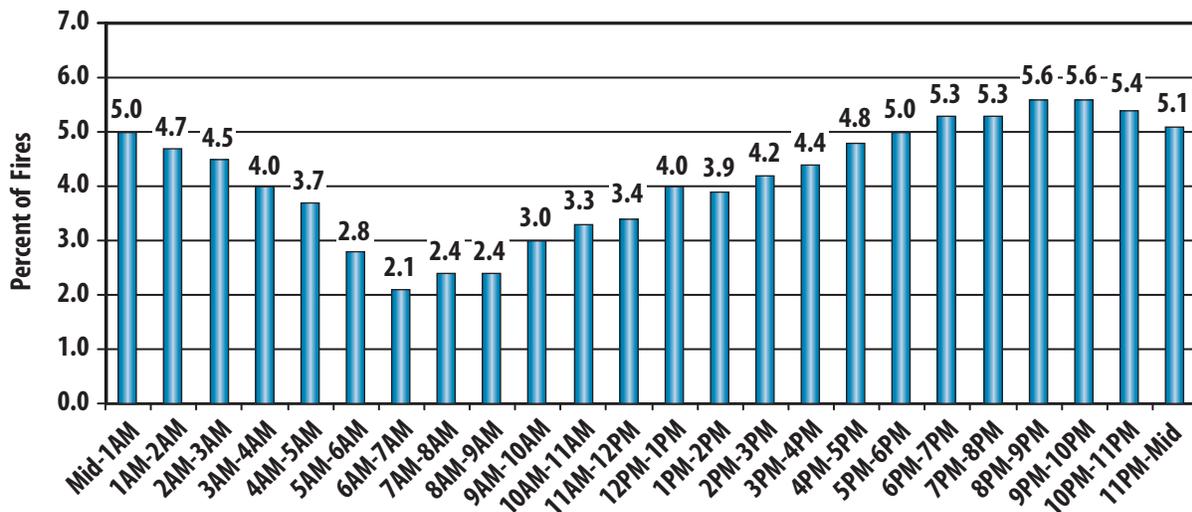
Note: Totals may not add to 100 percent due to rounding.

Eighty-four percent of intentionally set fires in residential buildings occurred in typical residential buildings. Confined fires, small fire incidents that are limited in scope, accounted for 9 percent of intentionally set fires (with trash or rubbish fires accounting for 59 percent of these confined fires).⁵ Five percent of intentionally set fires occurred in mobile properties used as buildings, with mobile homes used as fixed residences as the leading category. Only 2 percent of intentionally set fires occurred in other residential buildings (Table 2).

When Intentionally Set Fires in Residential Buildings Occur

As shown in Figure 1, intentionally set fires in residential buildings occurred mainly in the evening hours, peaking from 8 p.m. to 10 p.m., and then declining throughout the night and early morning reaching the lowest point during the morning hours (6 a.m. to 9 a.m.). The 2-hour evening period accounts for 11 percent of these intentionally set fires and the 3-hour morning period accounts for 7 percent.⁶

Figure 1. Intentionally Set Fires in Residential Buildings by Time of Alarm (2004–2006)

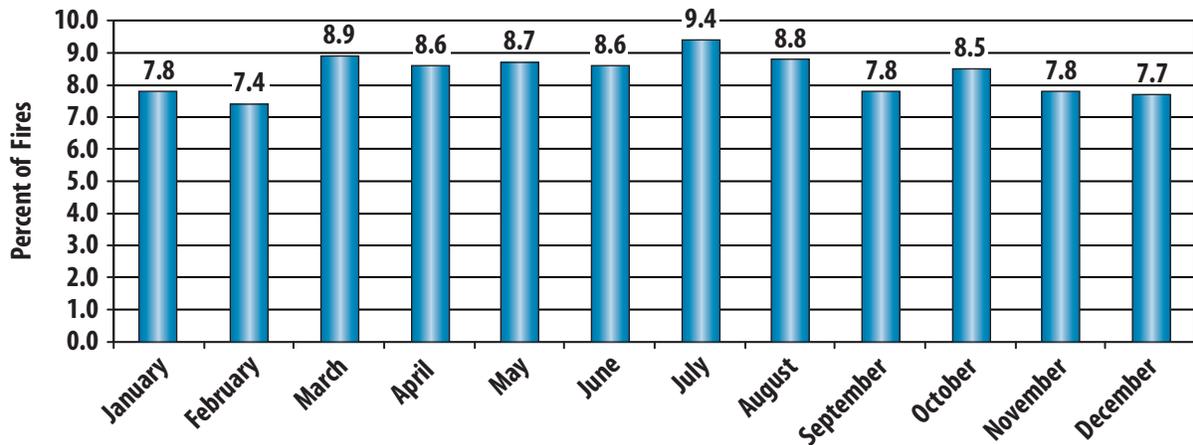


Source: NFIRS 5.0

Figure 2 illustrates that the percentage of intentionally set fires in residential buildings ranges from 7 to 9 percent for each month throughout the year, peaking slightly in July, but not by much more than the previous and following months. From March to August, fires fluctuate between 8 and 9 percent, accounting for just over half of all

intentionally set fires in residential buildings (53 percent). While fireworks do play a role in the July fires, their role is limited to July 4 and the days following (July 4 – July 6) when fireworks account for 16 percent of intentionally set residential building fires.

Figure 2. Intentionally Set Fires in Residential Buildings by Month (2004–2006)



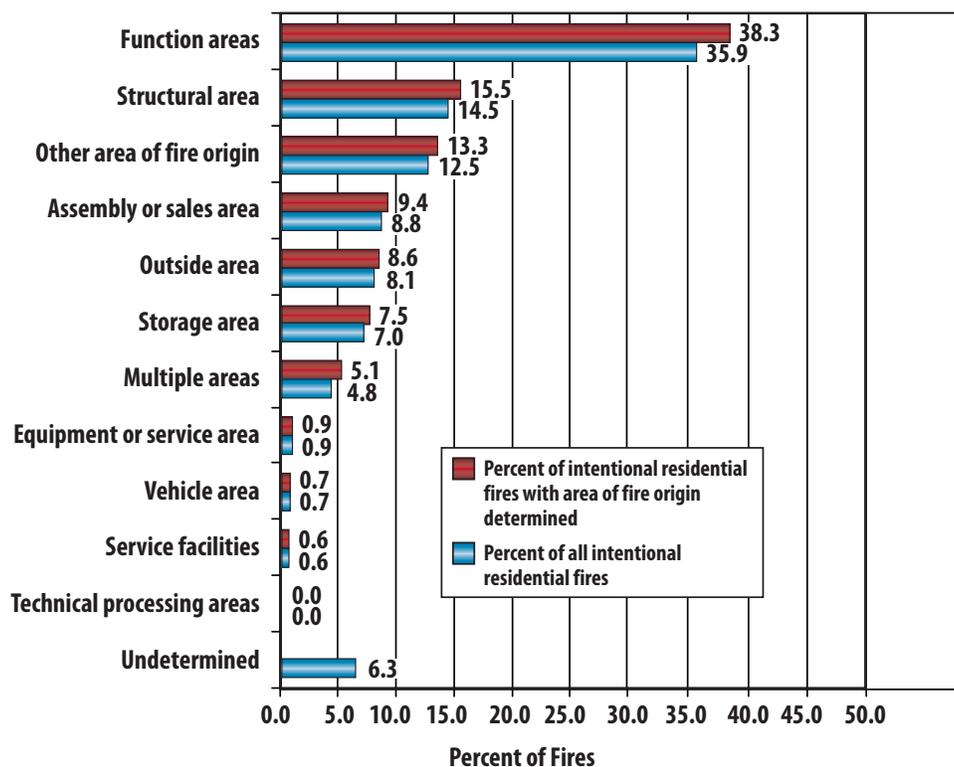
Source: NFIRS 5.0

Where Intentionally Set Residential Building Fires Start (Area of Fire Origin)

Thirty-eight percent of intentionally set fires in residential buildings occurred in “function areas” of a house such as bedrooms and kitchens; of intentionally set fires in residential buildings, 19 percent occur in bedrooms and 9 percent occur in cooking areas and kitchens. The second leading area of fire origin category for intentionally set fires in residential buildings is structural areas—walls, ceilings,

floors, attics, crawl spaces—at 16 percent. The third most common area of fire origin in intentionally set fires in residential buildings occurred in other areas (13 percent) which include hallways, stairways, and entranceways. An additional 9 percent occur in common rooms, dens, family rooms, living rooms, and lounges (referred to as assembly areas) (Figure 3).

Figure 3. Area of Fire Origin in Intentionally Set Fires in Residential Buildings (2004–2006)



Source: NFIRS 5.0

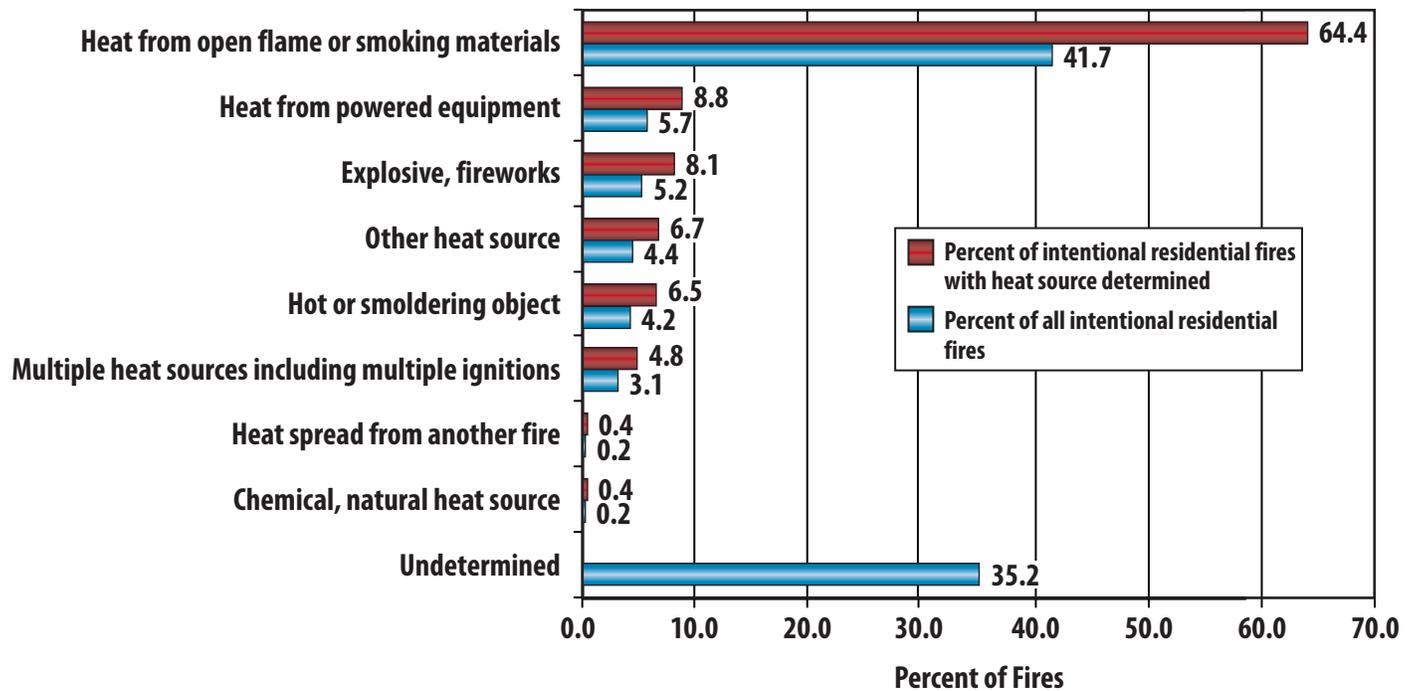
How Intentionally Set Residential Building Fires Start (Heat Source)

Sixty-four percent of intentionally set fires in residential buildings derive their heat source from open flame or smoking materials (Figure 4). Not surprisingly, the sub-components of this category comprise three of the top four leading sources of heat in all residential building intentionally set fires—lighters for cigarettes or cigars (23 percent),

matches (19 percent), and heat from other open flame or smoking materials (15 percent).

Another 9 percent of intentionally set fires in residences derive their heat source from powered equipment and 8 percent are from explosives or fireworks.

Figure 4. Sources of Heat in Intentionally Set Fires in Residential Buildings (2004–2006)



Source: NFIRS 5.0

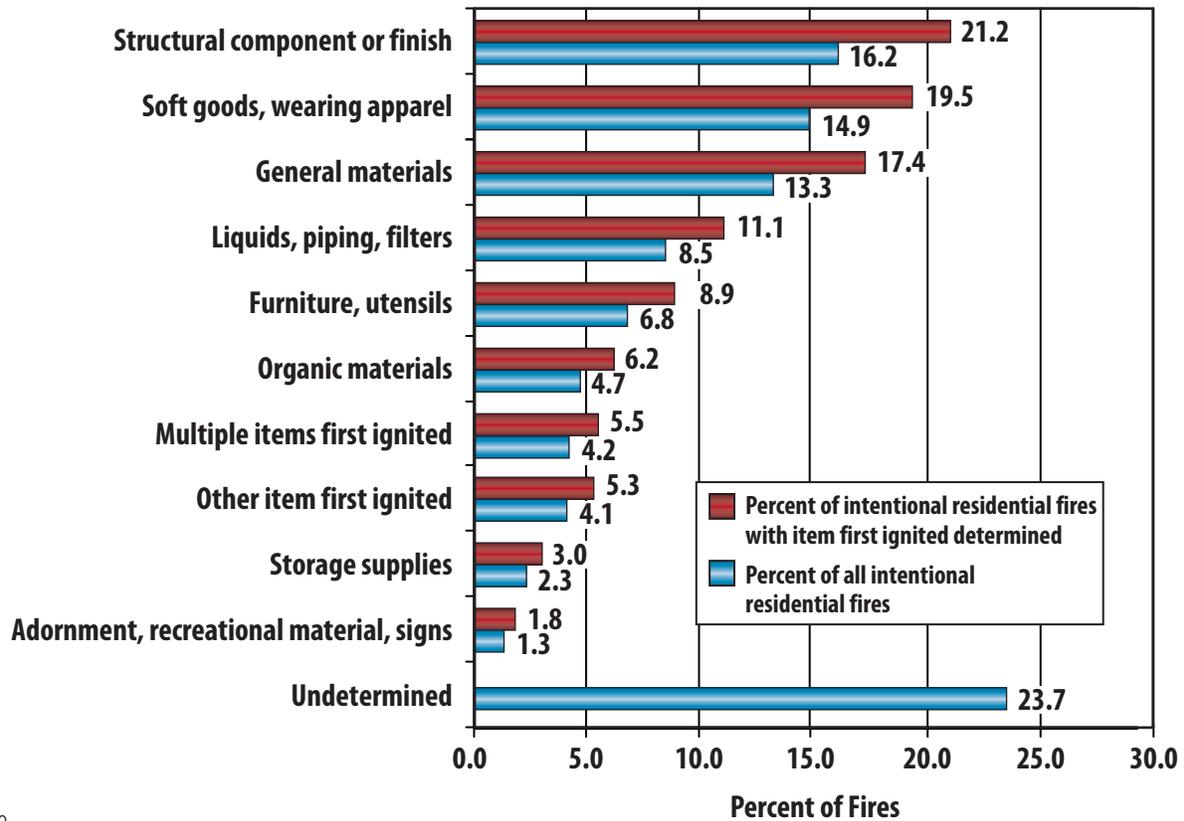
What Ignites First in Intentionally Set Residential Building Fires

Twenty-one percent of the items first ignited in intentionally set fires in residential buildings fall under the structural component or finish category (Figure 5). This category includes materials such as floor coverings, rugs, carpets, or mats as well as exterior sidewall coverings, surfaces, or finishes. The second leading category, soft goods and wearing apparel, accounted for 20 percent of intentional fires in

residential buildings and third was general materials (17 percent).

Rubbish, trash, and waste (8 percent); magazines, newspapers, and writing paper (7 percent); and flammable liquids or gas, uncontained (7 percent) are the specific items most often first ignited in intentionally set fires in residential buildings.

Figure 5. Item First Ignited in Intentionally Set Fires in Residential Buildings (2004–2006)



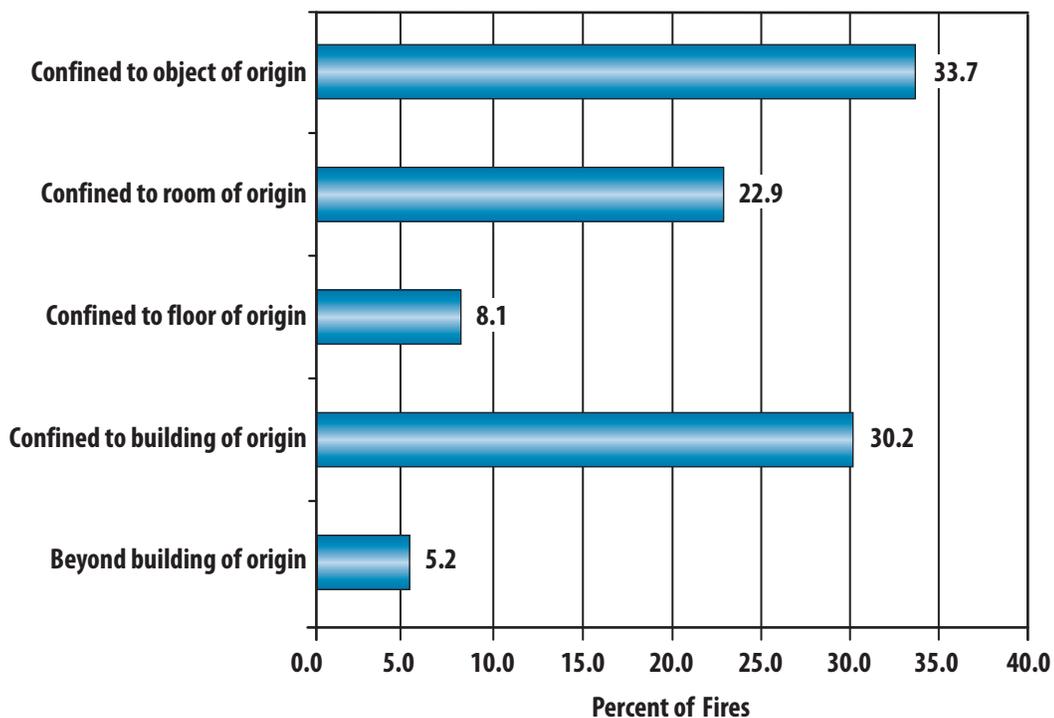
Source: NFIRS 5.0

Fire Spread

Figure 6 shows the fire spread in intentionally set fires in residential buildings. In 34 percent of the intentional fires, the fire was confined to the object of origin. Thirty percent

of intentionally set fires in residential buildings were confined to the building, and an additional 23 percent were confined to the room of origin.

Figure 6. Extent of Fire Spread in Intentionally Set Fires in Residential Buildings (2004–2006)



Source: NFIRS 5.0

Factors Contributing to Ignition

Table 3 shows the leading factor contributing to the ignition of intentionally set residential building fires is “playing with heat source” (26 percent). The category “playing with heat source” includes playing with lighters, matches, and other open flame or smoking materials. “Misuse of material or product” is the next leading factor at approximately 18

percent. The remaining factors are “flammable liquid used to kindle fire” (8 percent) and “abandoned or discarded materials or products” (7 percent). Tied with the leading category is “other factors” (26 percent) which include unspecified components that did not fit into any other category of contributing ignition factors.

Table 3. Leading Factors Contributing to Ignition for Intentionally Set Fires in Residential Buildings (Where Factor Contributing Specified, 2004–2006)

Factors Contributing to Ignition	Percent of Intentionally Set Fires in Residential Buildings
Playing with heat source	25.7
Misuse of material or product, other	17.8
Flammable liquid used to kindle fire	8.4
Abandoned or discarded materials or products	7.3
Other, unspecified factors contributing to ignition	25.7

Source: NFIRS 5.0

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

Smoke Alarms

Smoke alarm data are available for both confined and nonconfined fires although for confined fires, the data are very limited in scope.

In forty-four percent of nonconfined intentionally set fires in residential buildings there were no smoke alarms present (Table 4). In another 23 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Smoke alarms were present in only 33 percent of nonconfined intentionally set fires in residential buildings. Smoke alarms are known to have operated in 18 percent of intentionally set residential building fires. Smoke alarms failed

to operate in 16 percent of intentionally set, nonconfined residential building fires where smoke alarms were present.

In 62 percent of confined intentionally set fires in residential buildings, the smoke alarm effectiveness was unknown (Table 5). Smoke alarms operated and alerted occupants in 16 percent of confined fires. In 22 percent of confined intentionally set residential building fires, the occupants were not alerted by the smoke alarm.⁷ Note that the data presented in Table 4 and Table 5 are the raw counts from the NFIRS data set and not scaled to national estimates of smoke alarms in residential building intentionally set fires.

Table 4. NFIRS Smoke Alarm Data for Nonconfined Intentionally Set Fires in Residential Buildings (NFIRS, 2004-2006)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		848	3.8
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	2,649	11.8
		Smoke alarm alerted occupants, occupants failed to respond	158	0.7
		No occupants	674	3.0
		Smoke alarm failed to alert occupants	86	0.4
		Undetermined	361	1.6
	Smoke alarm failed to operate		1,215	5.4
Undetermined		1,443	6.4	
None present			9,847	43.9
Undetermined			5,123	22.9
No Data			3	0.0
Total Incidents			22,407	100.0

Source: NFIRS 5.0

Note: The data presented in Table 4 are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in nonconfined intentionally set fires in residential buildings. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Table 5. NFIRS Smoke Alarm Data for Confined Intentionally Set Fires in Residential Buildings (NFIRS, 2004-2006)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	353	15.5
Smoke alarm did not alert occupants	508	22.2
Undetermined	1,423	62.3
Total Incidents	2,284	100.0

Source: NFIRS 5.0

Notes: The data presented in Table 5 are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in confined intentionally set fires in residential buildings. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Examples

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

- January 2009: Firefighters in Derry Township, Pennsylvania, dealt with six intentionally set fires that occurred between August 2007 and January 2009. Investigators stated that the fires were considered to be arson. Police are working with homeowners to set up neighborhood watches.⁸
- February 2009: A Conroe, Texas, family escaped a residential fire in their family home which they believe was intentionally set. Firefighters were able to control the fire within an hour. A preliminary investigation did not reveal anything of a suspicious nature, but the investigation is still being conducted.⁹
- February 2009: The Kenosha Fire Department responded to a residential fire in a Dayton Residential Facility. Investigation showed that a man intentionally set a blanket on fire in his living room. The facility smoke alarms went off and the fire was quickly controlled. The fire was contained to the room largely due to the building’s sprinkler system.¹⁰
- February 2009: Clemson University police and firefighters responded to an early-morning residence hall fire. The fire was believed to have been intentionally set. The sprinkler system successfully contained the fire, but the building had severe fire and water damage.¹¹

Conclusion

Intentionally set residential fires have become the focus of increased attention within the State and Federal governments, local fire departments and State agencies, affected neighborhoods and communities, and the criminal justice system, largely because they account for and cause many injuries and deaths as well as property damage. Intentionally set fires account for 5 percent of all residential building fires. Intentionally set fires also account for 10 percent of all fire deaths and 6 percent of all fire injuries in residential buildings. The challenge for communities and the fire service is to pinpoint the reasons why people set intentional fires in residential buildings and address these issues to prevent fires and severe property damage from occurring in the future.

NFIRS Data Specifications for Intentionally Set Fires in Residential Buildings

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2004, 2005, and 2006. Only version 5.0 data were extracted.

Intentionally set fires were defined as:

- 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

Notes:

¹ National estimates are based on 2004-2006 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and residential structure fire loss estimates from the National Fire Protection Association’s (NFPA’s) annual survey of fire loss. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to nearest \$million.

² Residential buildings include, but are not limited to, one- or two-family dwellings, multifamily dwellings, boarding houses or residential hotels, commercial hotels, college dormitories, and sorority/fraternity houses.

Note that incident types 113–118 do not specify if the structure is a building.

Incident type 112 is included as previous analyses have shown that incident types 111 and 112 are used interchangeably.

- Aid types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.
- Property use 400 to 464:

Property Use	Description
400	Residential, other
419	1 or 2 family dwelling
429	Multifamily dwelling
439	Boarding/Rooming house, residential hotels
449	Hotel/Motel, commercial
459	Residential board and care
460	Dormitory-type residence, other
462	Sorority house, fraternity house
464	Barracks, dormitory

- Structure type:
 - 1 - Enclosed building
 - 2 - Fixed portable or mobile structure
 - Structure type not specified (null entry), and
- The USFA cause hierarchy was used to determine intentionally set fire incidents:¹² http://www.usfa.dhs.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.

To request additional information or to comment on this report, visit <http://www.usfa.dhs.gov/applications/feedback/index.jsp>

³ In the National Fire Incident Reporting System (NFIRS), version 5.0, a structure is a constructed item of which a building is one type. In previous versions of NFIRS, the term “residential structure” commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for NFIRS 5.0 has, therefore, changed to include only those fires where the NFIRS 5.0 structure type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such fires are referred to as “residential buildings” to distinguish these buildings from other structures on residential properties that may include fences, sheds, and other uninhabitable structures. In addition, incidents that have a residential property use, but do not have a structure type specified are presumed to be buildings.

⁴ 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 $(1,000 * (290 / 18,100)) = 16.0$ deaths per 1,000 intentional residential building fires and the fire injury rate would be $(1,000 * (850 / 18,100)) = 47.0$ injuries per 1,000 intentional residential building fires. In addition, NFPA has a separate estimate for intentionally set structure fires. The fire death rate computed from these estimates for intentional structure fires for 2006 would be $(1,000 * (305 / 31,000)) = 9.8$ deaths per 1,000 intentional structure fires. Structure fire injuries are not reported. (NFPA, *Fire Loss in the United States*, September 2007).

⁵ Confined fires in NFIRS are small fire incidents that are limited in scope, confined to noncombustible containers, rarely result in serious injury or large content losses, and expected to have no significant accompanying property losses due to flame damage. This incident type differs from extent of flame spread confined to object of origin in the expectation of loss—a fire confined to the object of origin could still have significant property loss. An example of a confined fire is food on the stove where the damage is limited to the food and cooking container.

⁶ 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.

⁷ 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, or the smoke alarm was present and operated but the occupant was already aware of the fire.

⁸ “6 arsons in Derry leave residents, police on edge,” *pressandjournal.com*, February 18, 2009. <http://www.pressandjournal.com/articleDetail.aspx?id=2202> (accessed March 5, 2009).

⁹ Howard Roden, “Conroe men escape residential fire,” *hcnonline.com*, February 12, 2009. http://www.hcnonline.com/articles/2009/02/12/conroe_courier/news/fire0213.prt (accessed March 5, 2009).

¹⁰ Mark Hornickel, “Fire official: Blaze in Dayton Residential Facility intentionally set,” *kenoshanews.com*, February 12, 2009. http://www.kenoshanews.com/news/fire_official_blaze_in_dayton_residential_facility_intentionally_set_4359862.html (accessed March 5, 2009).

¹¹ Anna Simon, “Probe continues into dorm fire: sprinklers extinguished early-morning blaze on sixth-floor of 10-story building,” *Greenvilleonline.com*, February 10, 2009. <http://www.greenvilleonline.com/article/20090210/PCN/902100320/1001/NEWS01> (accessed March 5, 2009).

¹² USFA’s cause hierarchy is designed for structure fires; however, it can be used to determine certain causes for some specific types of fires.