

# Multifamily Residential Building Fires

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 108,400 multifamily residential building fires are reported to U.S. fire departments each year and cause an estimated 450 deaths, 3,800 injuries, and \$1.1 billion in property loss.
- Multifamily residential building fires account for 28 percent of all residential building fires.
- Sixty-seven percent of multifamily residential building fires are small, confined fires.
- Cooking is the leading cause of multifamily residential building fires (65 percent); nearly all multifamily residential building cooking fires are small, confined fires (96 percent).
- Twenty-seven percent of nonconfined multifamily residential building fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (13 percent), exposure fires (12 percent), fires caused by open flames (12 percent), and intentionally set fires (12 percent). In contrast, 46 percent of nonconfined one- and two-family residential building fires extend beyond the room of origin.
- Cooking areas and kitchens are the primary area of origin for nonconfined multifamily residential building fires (32 percent) and are likely to be the primary origin for all multifamily residential building fires when confined cooking fires are factored into the analysis.
- Multifamily residential building fires peak slightly in December (10 percent).

From 2005 to 2007, fires in multifamily residential buildings accounted for an estimated 108,400 reported fires annually. These fires accounted for 28 percent of all residential building fires responded to by fire departments across the Nation.<sup>1,2</sup> These fires resulted in an annual average loss of 450 deaths and 3,800 injuries as well as over \$1.1 billion in property loss. Multifamily residential buildings include structures such as apartments, townhouses, rowhouses, condominiums, and other tenement properties. Multifamily residential buildings tend to have stricter building codes than one- and two-family buildings. Many multifamily residential buildings are rental properties, and are usually required to comply with more stringent fire prevention statutes and regulations involving smoke alarms and sprinkler systems.

As a result of the type of building, the more stringent building and code requirements, and the fact that more people live in the building itself than in the typical residence, fires in multifamily residential buildings tend to have a different profile than fires in other types of residences.

A major difference in the multifamily residential building fire profile is seen in cooking fires. Cooking is the cause of 65 percent of multifamily residential building fires—twice that of other residential buildings. Multifamily residential buildings also tend to have central heating systems that are maintained by professionals and not the homeowner, thus there are fewer heating fires from poor maintenance or misuse than in one- and two-family homes. As well, fire problems related to fireplaces, chimneys, and fireplace-related equipment tend to occur less often in multifamily heating fires since multifamily residential buildings generally lack these features. Finally, multifamily residential buildings usually have fewer fires caused by electrical problems due to the construction materials, building codes, and professional maintenance.

As part of a series of Topical Reports that addresses fires in the major residential building types, the remainder of this topical report addresses the characteristics of multifamily residential building fires reported to the National Fire Incident Reporting System (NFIRS). The focus is on fires reported from 2005 to 2007, the most recent data available

at the time of the analysis. Comparisons to one- and two-family residential building fires are noted. Other reports in this volume of Topical Reports that address residential building types are: *One- and Two-Family Residential Building Fires* (Volume 10, Issue 7), *Hotel and Motel Fires* (Volume 10, Issue 4), and *University Housing Fires* (Volume 10, Issue 1).

For the purpose of this report, the terms “residential fires” and “multifamily fires” are synonymous with “residential building fires” and “multifamily residential building fires,” respectively. “Multifamily fires” is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, “multifamily residential building fires.”

## Type of Fire

Building fires consist of two major categories: fires that are confined to specific types of equipment or objects (confined fires) and those that are not (nonconfined fires).<sup>3,4</sup> The smaller, confined fires account for two-thirds of the multifamily fires with cooking fires as the predominant type of confined fire (Table 1). Nonconfined fires make up the remaining third of the multifamily fires. In contrast to one- and two-family residences, the relative proportions of confined and nonconfined fires are reversed; nonconfined fires account for the bulk of one- and two-family building fires (62 percent) and confined fires account for the remaining 38 percent.

**Table 1. Multifamily Residential Building Fires by Type of Incident (2005–2007)**

Incident Type	Percent
Nonconfined fires	33.5
Confined fires	66.5
Cooking fire, confined to container	53.9
Chimney or flue fire, confined to chimney or flue	0.6
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	4.7
Commercial compactor fire, confined to rubbish	1.3
Trash or rubbish fire, contained	5.8
Total	100.0

Source: NFIRS 5.0.

## Loss Measures

Table 2 presents losses, averaged over this 3-year-period, of reported residential fires and multifamily fires.<sup>5</sup>

**Table 2. Loss Measures for Multifamily Residential Building Fires (3-year average, 2005–2007)**

Measure	Residential Building Fires	Multifamily Residential Building Fires	Confined Multifamily Residential Building Fires	Nonconfined Multifamily Residential Building Fires
<b>Average Loss:</b>				
Fatalities/1,000 fires	5.4	3.2	0.0	9.4
Injuries/1,000 fires	28.1	29.0	8.6	69.3
Dollar loss/fire	\$14,560	\$8,770	\$120	\$25,900

Source: NFIRS 5.0.

Notes: 1) Two deaths in confined multifamily fires were reported to NFIRS during 2005–2007; the resulting loss of 0.0 fatalities per 1,000 fires reflects only data reported to NFIRS.

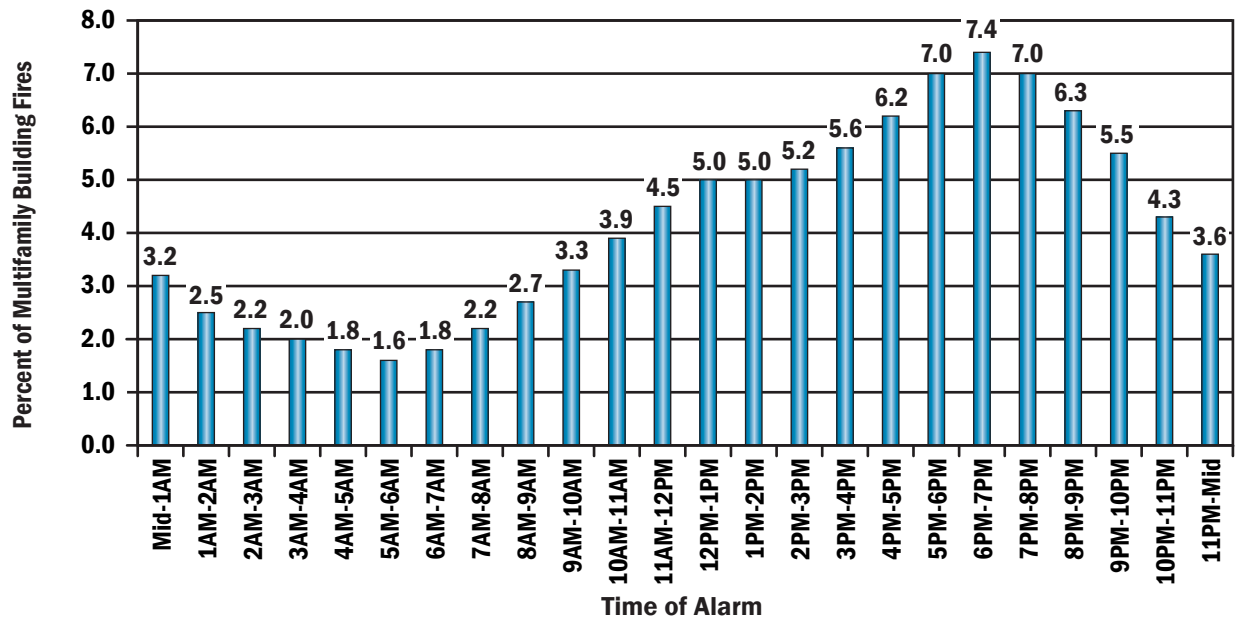
2) Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed **per fire** and is rounded to the nearest \$10.

### When Multifamily Residential Building Fires Occur

As shown in Figure 1, multifamily fires occur most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m.<sup>6</sup> This peak period is consistent

with the major cause of fires, cooking (discussed in the next section on “Causes of Multifamily Residential Building Fires”), and accounts for 21 percent of multifamily fires. Fires then decline throughout the night, reaching the lowest point during the morning hours (4 to 7 a.m.).

**Figure 1. Multifamily Residential Building Fires by Time of Alarm (2005–2007)**

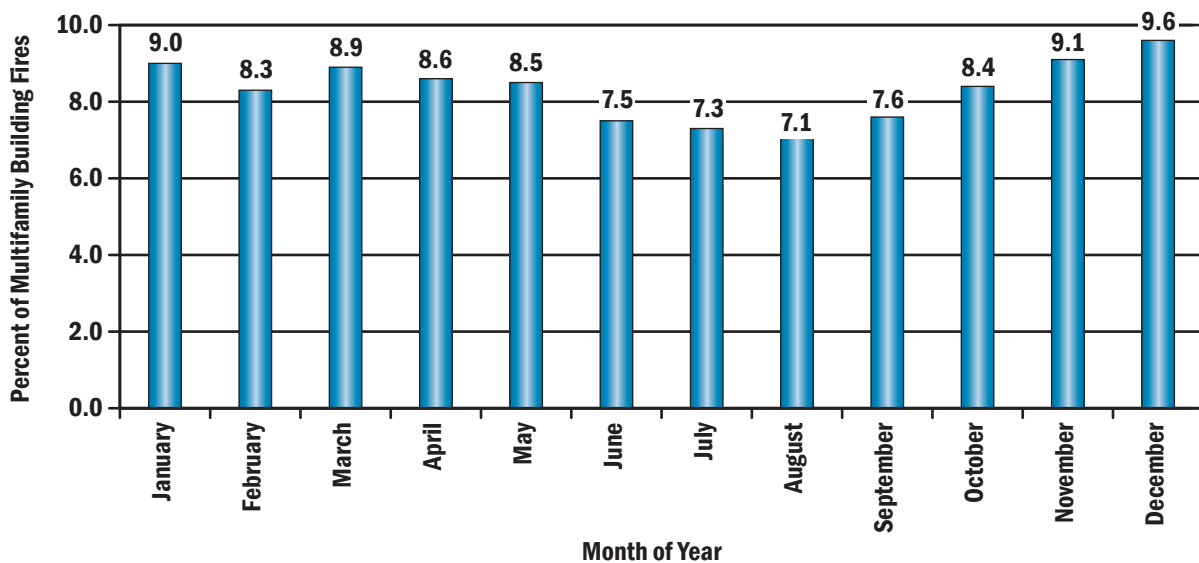


Source: NFIRS 5.0.

Figure 2 illustrates that multifamily fire incidence is slightly higher in the cooler months, peaking in December (10 percent). This peak is partially a result of increases in heating

and seasonal (holiday) cooking fires. During the spring and summer months, the fire incidence declines steadily, reaching the lowest incidence in July and August at 7 percent each.

**Figure 2. Multifamily Residential Building Fires by Month (2005–2007)**



Source: NFIRS 5.0.

## Causes of Multifamily Residential Building Fires

Cooking is, by far, the leading cause of multifamily fires. Sixty-five percent of all multifamily fires are cooking fires as shown in Table 3. By contrast, 30 percent of fires in one- and two-family residential buildings are due to cooking.

**Table 3. Leading Causes of Multifamily Residential Building Fires (2005–2007)**

Cause	Percent (Unknowns Apportioned)
Cooking	64.5
Heating	7.0
Other unintentional, careless	3.8
Open flame	3.8
Electrical malfunction	3.2

Source: NFIRS 5.0.

The fire cause profile for multifamily buildings is different from the fire cause profile for one- and two-family buildings. While the two leading causes, cooking and heating, are the same, cooking is a substantially more prevalent cause of multifamily fires (65 percent) than of one- and two-family fires (30 percent). Heating is a much smaller cause of multifamily fires (7 percent) than for one- and two-family fires (18 percent). The order and relative size of the remaining causes also differ.

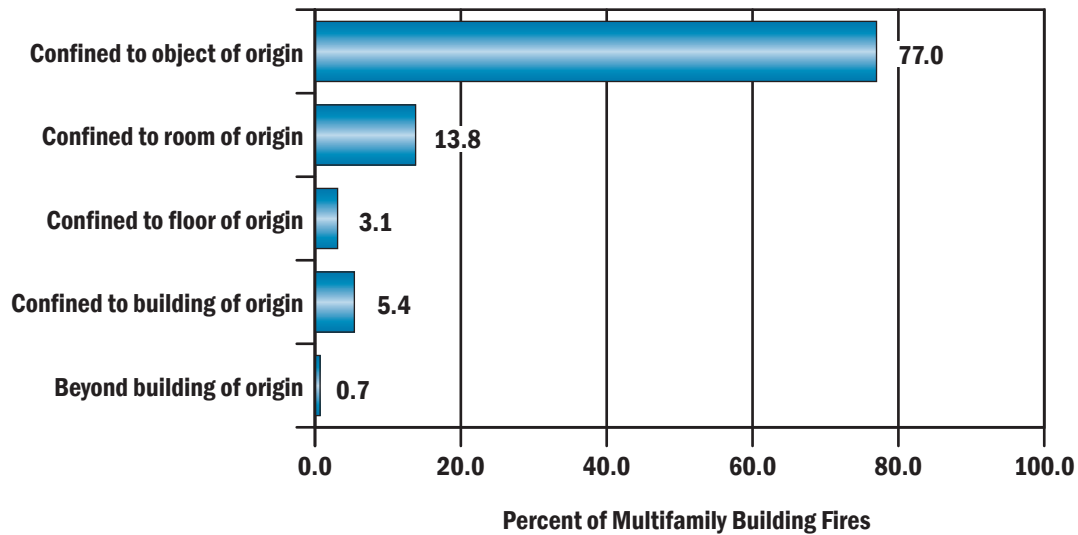
One explanation for the importance of cooking as a cause of multifamily fires may lie in the construction materials, building codes, and professional maintenance of the buildings. For example, many multifamily residential buildings tend to have systems, heating and electrical systems for instance, that are regularly maintained by professionals. As a result, there are fewer fires from lack of maintenance or misuse than in one- and two-family housing. Multifamily buildings also have fewer fire problems related to fireplaces, chimneys, and fireplace-related equipment than one- and two-family residential buildings since multifamily buildings generally lack this equipment.

Ninety-six percent of all cooking fires in multifamily residences are small, confined fires with limited damage. The next four causes combined account for 18 percent of multifamily fires: fires caused by heating (7 percent), other unintentional or careless fires (4 percent), open flame fires (4 percent), and electrical malfunction fires (3 percent).<sup>7</sup>

It may also be that confined cooking fires are reported to the fire department more often in multifamily residences. While these fires are small, contained, and do not cause much damage, someone may hear the alarm in the complex (if the fire is large enough to activate it) or may smell smoke and notify the building manager or the fire department. If it is a newer complex, the alarms are often connected to the building alarm system and the fire department is called automatically. These same small cooking fires in one- and two-family residences may occur as frequently but may not be reported as often. As little damage occurs and only the residents hear the smoke alarm or smell the fire, the resident may elect not to call the fire department. Nevertheless, cooking is a significant cause of multifamily fires.

## Fire Spread in Multifamily Residential Building Fires

Approximately three-quarters of multifamily fires (77 percent) are confined to the object of origin (Figure 3). These fires are primarily coded as confined fires in NFIRS (small, low loss fires that are confined to noncombustible containers)—86 percent of multifamily fires confined to the object of origin are coded as confined fires. Only about 9 percent of multifamily fires extend beyond the room of origin, far fewer than in one- and two-family residences (28 percent).

**Figure 3. Extent of Fire Spread in Multifamily Residential Building Fires (2005–2007)**

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.)<sup>8</sup> Because the majority of multifamily fires are coded as confined fires, the profiles of when multifamily confined fires occur and their causes dominate the overall multifamily fire profile.

As shown in Table 1, confined cooking multifamily fires account for the majority of multifamily fire incidents and dominate the cause of multifamily fires.

The occurrence of confined multifamily fires is greatest during the hours of 5 to 8 p.m. when they account for 72 percent of fires that occur during this period. Moreover, confined cooking fires account for 85 percent of the confined fires and 61 percent of all fires in multifamily buildings that occur between 5 and 8 p.m.

Confined multifamily fires peak in November and December coinciding with the increase in seasonal (holiday) related cooking fires, decline through the spring and summer, reaching the lowest incidence during August.

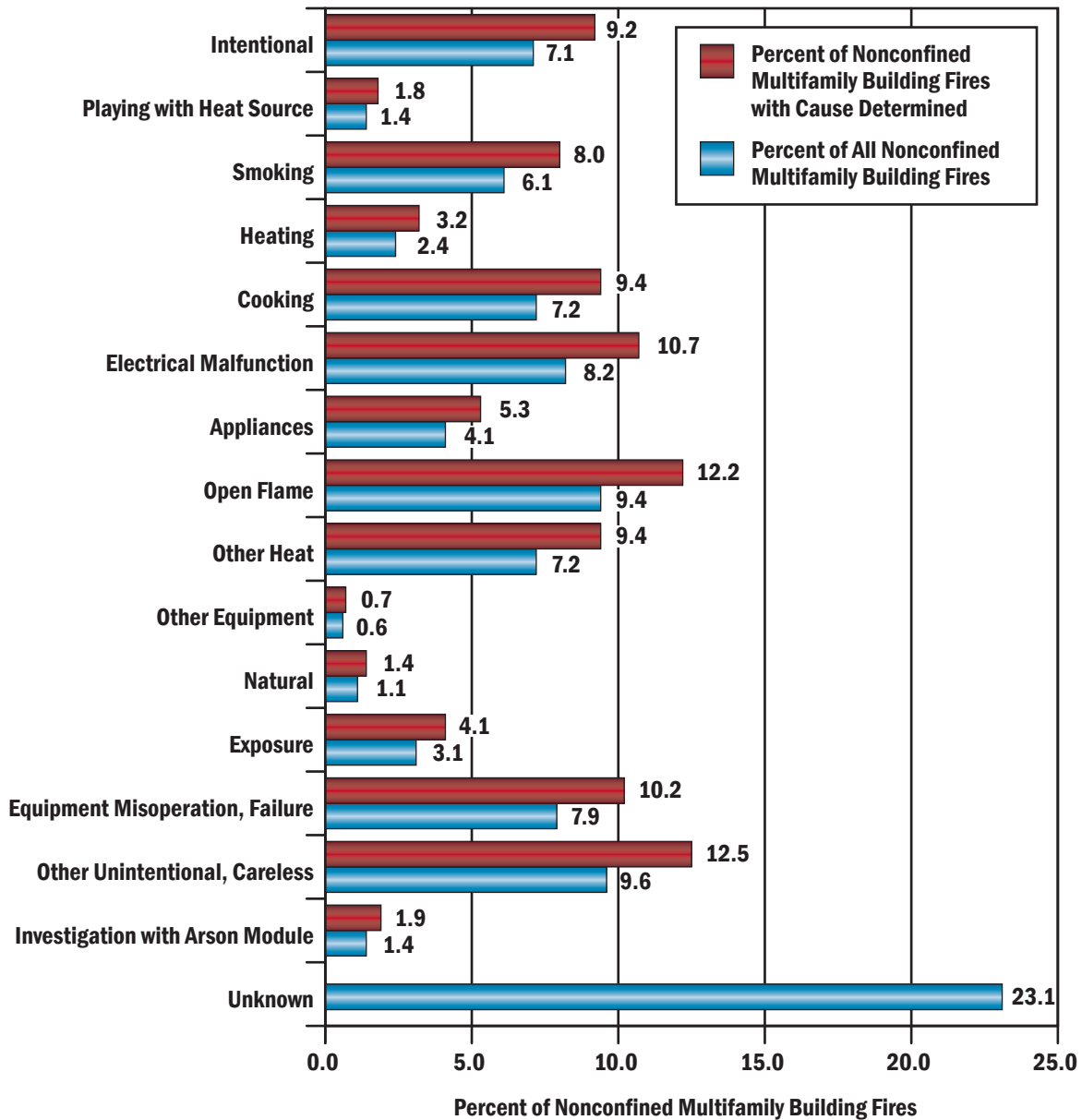
### Nonconfined Fires

The next sections of this Topical Report will address non-confined multifamily fires, the larger and more serious fires, where detailed fire data are available.

### Causes of Nonconfined Multifamily Residential Building Fires

Cooking is the leading cause of multifamily fires overall, however, it only accounts for 9 percent of all nonconfined multifamily fires. Generally, there are no dominating causes of multifamily nonconfined fires. Instead there are a group of causes, each accounting for 10 to 13 percent, that account for nearly half (46 percent) of the fires. These leading causes are carelessness or other unintentional actions (13 percent); open flames such as candles or matches (12 percent); electrical malfunctions (11 percent), and unspecified equipment misoperation or failures (10 percent) (Figure 4).

**Figure 4. Causes of Nonconfined Multifamily Residential Building Fires (2005-2007)**



Source: NFIRS 5.0.

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

Thirty-two percent of nonconfined multifamily fires start in cooking areas and kitchens (Table 4). The next leading areas of fire origin are bedrooms (16 percent) and common rooms or lounge areas (7 percent). A few fires start in bathrooms (5 percent).

Note that these areas of origin do not include areas associated with confined fires as that information generally is not

provided for confined fires. Cooking fires are a substantial percentage of all multifamily fires. Therefore, it is likely that the kitchen is the leading area of fire origin for all multifamily fires.

Nonetheless, nonconfined fires that start in the kitchen are not exclusively cooking fires—only a quarter (25 percent) of fires that start in the kitchen are cooking fires. Equipment that malfunctions or fails accounts for 22 percent of kitchen fires with other unintentional or careless fires accounting for another 20 percent.

**Table 4. Leading Areas of Fire Origin in Nonconfined Multifamily Residential Building Fires (2005–2007)**

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	32.1
Bedrooms	15.8
Common room, den, family room, living room, lounge	7.0
Bathroom, checkroom, lavatory	4.5
Laundry area	4.0
Unspecified function areas	3.8
Exterior balcony, unenclosed porch	3.6

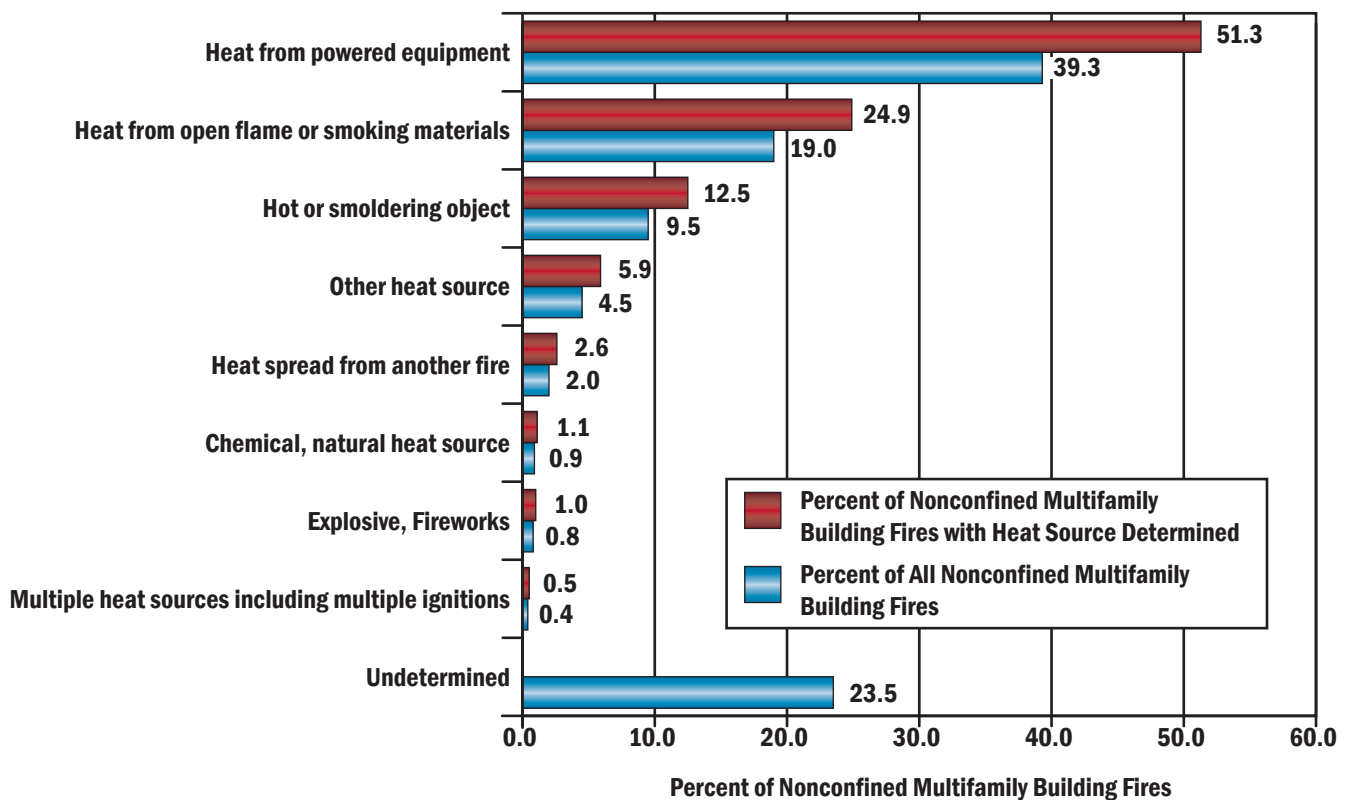
Source: NFIRS 5.0.

**How Nonconfined Multifamily Residential Building Fires Start (Heat Source)**

Figure 5 shows sources of heat categories in nonconfined multifamily fires. The heat from the powered equipment category accounts for 51 percent of nonconfined multifamily fires. Among specific items included in this category, radiated or conducted heat from operating equipment accounts for 19 percent of all nonconfined multifamily fires, heat from other powered equipment accounts for 16 percent of the fires, and electrical arcing accounts for 10 percent of all nonconfined multifamily fires.

Heat from open flame or smoking materials accounts for 25 percent of nonconfined multifamily fires. This category includes cigarettes (7 percent), candles (6 percent), and lighters and matches (combined, 5 percent). The third largest category pertains to hot or smoldering objects (13 percent). This category includes miscellaneous hot or smoldering objects (7 percent) and hot embers or ashes (4 percent).

**Figure 5. Sources of Heat in Nonconfined Multifamily Residential Building Fires by Major Category (2005–2007)**



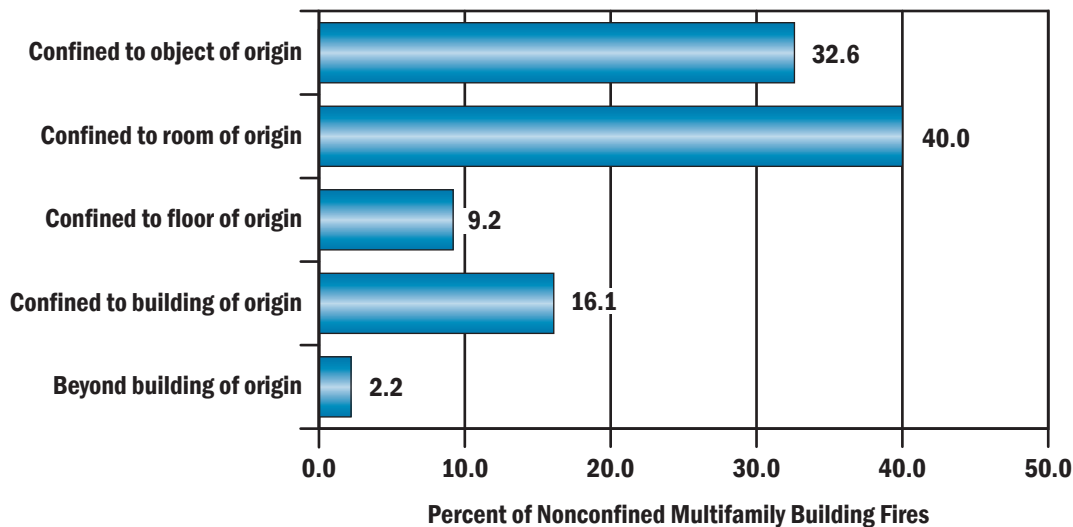
Source: NFIRS 5.0.

### Fire Spread in Nonconfined Multifamily Fires

Figure 6 shows the fire spread in nonconfined multifamily fires. The majority of nonconfined fires, 73 percent, are limited to the object or room of fire origin—in 40 percent of nonconfined fires, the fire is confined to the room of origin; in another 33 percent of fires, the fire is confined to the object of origin. Twenty-seven percent of nonconfined

multifamily fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (13 percent), exposure fires (12 percent), fires caused by open flames (12 percent), and intentionally set fires (12 percent). In contrast, 42 percent of all nonconfined residential building fires extend beyond the room of origin. Automatic extinguishing systems (AESs) may have a role in containing multifamily fires as discussed in a later section.

**Figure 6. Extent of Fire Spread in Nonconfined Multifamily Residential Building Fires (2005–2007)**



Source: NFIRS 5.0.

### Factors Contributing to Ignition in Nonconfined Multifamily Residential Building Fires

Table 5 shows the categories of factors contributing to ignition for nonconfined multifamily fires. By far, the leading category contributing to the ignition of nonconfined multifamily fires is the misuse of material or product (48 percent). A heat source too close to combustible materials (15 percent of all nonconfined multifamily fires) and

abandoned or discarded materials (15 percent of all nonconfined multifamily fires) are the leading specific factors contributing to ignition in this category.

Operational deficiency contributes to 21 percent of nonconfined multifamily fires. Unattended equipment is the leading factor in the operational deficiency category and accounts for 13 percent of all nonconfined multifamily fires. Electrical failures and malfunctions is the third leading category of factors contributing to ignition at 15 percent.



**Table 5. Factors Contributing to Ignition for Nonconfined Multifamily Residential Building Fires by Major Category (Where Factors Contributing to Ignition are Specified, 2005–2007)**

Factors Contributing to Ignition Category	Percent of Nonconfined Multifamily Residential Building Fires (Unknowns Apportioned)
Misuse of material or product	47.5
Operational deficiency	21.4
Electrical failure, malfunction	14.9
Other factors contributing to ignition	6.6
Fire spread or control	6.3
Mechanical failure, malfunction	5.9
Natural condition	1.3
Design, manufacture, installation deficiency	1.0

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 Multifamily Residential Building Fires**

Smoke alarm data are available for both confined and nonconfined fires, although for confined fires, the data are very limited in scope. Automatic extinguishing system (AES) data—primarily sprinkler systems in residential buildings—are also available for both confined and nonconfined fires but, for confined fires, an AES was present in less than 1 percent of reported incidents.<sup>9</sup> Note that the data presented in Tables 6 and 7 are the raw counts from the NFIRS data set and not scaled to national estimates of smoke alarms in multifamily fires.

Smoke alarms were reported as present in 60 percent of nonconfined multifamily fires. In 22 percent of nonconfined multifamily fires, no smoke alarms were present. In another 18 percent of these fires, firefighters were unable to determine if a smoke alarm was present (Table 6).

When operational status is considered, the percentage of smoke alarms reported as present (60 percent) consists of:

- smoke alarms present and operated—35 percent;
- present but did not operate—15 percent (fire too small, 7 percent; alarm did not operate, 8 percent); and
- present but operational status unknown—10 percent.

When the subset of incidents where smoke alarms were reported as present are analyzed separately, smoke alarms were reported to have operated in 58 percent of the incidents and failed to operate in 13 percent. In 11 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 17 percent of these incidents.

**Table 6. NFIRS Smoke Alarm Data for Nonconfined Multifamily Residential Building Fires (NFIRS, 2005-2007)**

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		4,540	6.8
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	17,337	26.0
		Smoke alarm alerted occupants, occupants failed to respond	1,126	1.7
		No occupants	2,415	3.6
		Smoke alarm failed to alert occupants	485	0.7
		Undetermined	1,864	2.8
	Smoke alarm failed to operate		5,319	8.0
	Undetermined		6,939	10.4
Null/Blank		1	0.0	
None present			14,638	22.0
Undetermined			11,894	17.9
<b>Total Incidents</b>			<b>66,558</b>	<b>100.0</b>

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 multifamily fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Smoke alarms operated and alerted occupants in 47 percent of confined multifamily fires (Table 7). In 15 percent of confined multifamily fires, the occupants were not alerted by the smoke alarm.<sup>10</sup> In 38 percent of these confined fires, the smoke alarm effectiveness was unknown.

**Table 7. NFIRS Smoke Alarm Data for Confined Multifamily Residential Building Fires (NFIRS, 2005-2007)**

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	61,555	46.7
Smoke alarm did not alert occupants	19,620	14.9
Unknown	50,656	38.4
<b>Total Incidents</b>	<b>131,831</b>	<b>100.0</b>

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 multifamily fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Nine percent of nonconfined multifamily fires had full or partial AESs present (Table 8). The presence of suppression systems—sprinkler systems most likely<sup>11</sup>—was higher in nonconfined multifamily fires than in nonmultifamily nonconfined fires (2 percent only), possibly as a result of code requirements.

**Table 8. NFIRS Automatic Extinguishing System Data for Nonconfined Multifamily Residential Building Fires (2005-2007)**

AES Presence	Count	Percent
AES present	6,191	9.3
Partial system present	85	0.1
AES not present	57,871	86.9
Unknown	2,410	3.6
Null/blank	1	0.0
<b>Total Incidents</b>	<b>66,558</b>	<b>100.0</b>

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 multifamily fires. They are presented for informational purposes. Totals may not add to 100 percent due to rounding.

## Examples

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

- May 2009: A cooking oil fire in a Columbia, MO, apartment building caused an estimated \$15,000 worth of damages. No injuries were reported as a result of the incident and the apartment's automatic sprinkler system was activated.<sup>12</sup>
- July 2009: A cooking fire in a Philadelphia, PA, row-house killed two, a woman and a boy, while injuring five others. It was determined that there was only one smoke alarm present in the basement of the home where the fire started, and it had no batteries.<sup>13</sup>
- August 2009: A fire started by an unattended candle in Del Mar, CA, damaged six units in a multifamily condominium complex. An elderly man was injured in the fire and treated for burns. Damages are estimated to cost \$4 million dollars.<sup>14</sup>
- October 2009: Firefighters were called to a fire in a multifamily building caused by a boiler in Providence, RI. All of the residents were evacuated and the fire was controlled. Providence firefighters had responded to several similar boiler fires in recent weeks.<sup>15</sup>

## Conclusion

Multifamily fires comprise 28 percent of all residential building fires and cause an estimated 450 deaths, 3,800 injuries, and \$1.1 billion in property loss annually. The reason why multifamily fires tend to remain smaller than one- and two-family fires may be the result of increased use of sprinkler systems and the required presence of smoke alarms in many multifamily occupancies.

Cooking fires account for the majority of multifamily fires. Reducing the number of the many small, confined cooking fires is an important goal for the fire service. Preventing these small fires from starting and preventing them from becoming larger fires when they do start is an essential component of fire and life safety. Local fire department prevention programs need to address the causes of cooking fires, methods to prevent them, and overall cooking safety. Moreover, many of the small, confined cooking fires occur during fire departments' busier call times. Reducing the number of these minor confined fires could provide fire departments with more flexibility to respond during busy call times.

Often, multifamily properties have a reasonably homogeneous socioeconomic mix of residents. They may be suburban townhouse communities, rent subsidized low-income housing projects, high-income families in luxury highrises, or centers of living for the elderly. In large cities, all of these socioeconomic groups can be found living in multifamily buildings. Because these buildings tend to have large clusters of similar people, fire prevention and safety programs need to be tailored specifically to the fire cause profiles of multifamily buildings in different areas of the community.

The high incidence of injuries seen in nonconfined multifamily fires may be because there is less total space in multifamily buildings than in one- and two-family buildings and people in multifamily buildings may be more quickly exposed to fire products than in a house. Often, there is only one doorway exit from the residence (typically in apartments). Stricter building codes, sprinkler systems, and smoke alarms in multifamily buildings may also avert potential fire deaths to injuries. Smoke alarms may be hardwired to a fire station which creates an automatic fire department response when the alarm is set off.

## NFIRS Data Specifications for Multifamily Residential Building Fires

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2005, 2006, and 2007. Only version 5.0 data were extracted.

Multifamily fires are 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

Note that Incident Types 113 to 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) are excluded to avoid double counting of incidents.
- Property Use 429 is included to specify multifamily dwellings.

- Structure Type:
  - 1 - Enclosed building;
  - 2 - Fixed portable or mobile structure; and
  - Structure Type not specified (null entry).

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

## Notes:

<sup>1</sup> National estimates are based on 2005-2007 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 surveys of fire loss. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest \$million.

<sup>2</sup> 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, incidents that have a residential property use, but do not have a structure type specified, are presumed to be buildings.

<sup>3</sup> 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 to 118.

<sup>4</sup> 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 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.

<sup>5</sup> 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  $(1,000 * (450 / 108,400)) = 4.2$  deaths per 1,000 multifamily fires and the fire injury rate would be  $(1,000 * (3,800 / 108,400)) = 35.1$  injuries per 1,000 multifamily fires.

<sup>6</sup> 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.

<sup>7</sup> The U.S. Fire Administration (USFA) cause hierarchy was used to determine the cause of multifamily fire incidents. The USFA's cause methodology and causal definitions can be found at: [http://www.usfa.fema.gov/fireservice/nfirs/tools/fire\\_cause\\_category\\_matrix.shtm](http://www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm).

<sup>8</sup> 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 to 118.

<sup>9</sup> 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.

<sup>10</sup> In confined fires, the entry “smoke alarm did not alert occupants” can imply a variety of situations such as: 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.

<sup>11</sup> From Tables A1-4 and B-25 of the 2007 American Housing Survey, 9.7 to 10.6 percent of multiunit housing units have sprinklers inside the home. The percentage range reflects the differences in NFIRS’s definition of multifamily and that of the American Housing Survey. <http://www.census.gov/prod/2008pubs/h150-07.pdf>. Accessed January 26, 2010.

<sup>12</sup> “Cooking fire damages apartments,” *Missourian*, May 16, 2009, <http://www.pnwlocalnews.com/pierce/bch/news/78438447>. Accessed January 22, 2010.

<sup>13</sup> “Cooking blamed as Philly fire kills 2, injures 5,” *guardian.co.uk*, July 26, 2009, <http://www.guardian.co.uk/world/feedarticle/8627184>. Accessed January 22, 2010.

<sup>14</sup> Brian Flores, “Del Mar condo fire caused by candle,” *fox5sandiego.com*, August 1, 2009, <http://www.fox5sandiego.com/news/kswb-fire-condo,0,5158593.story>. Accessed December 11, 2009.

<sup>15</sup> Kate Bramson “Providence boiler fires, problems up as temps drop,” *newsblog.projo.com*, October 16, 2009. <http://newsblog.projo.com/2009/10/providence-boiler-fires-proble.html>. Accessed December 11, 2009.