TOPICAL FIRE REPORT SERIES Volume 10, Issue 7 / June 2010

One- and Two-Family 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 253,500 one- and two-family residential building fires are reported to U.S. fire departments each year and cause an estimated 2,150 deaths, 8,775 injuries, and $5.3 billion in property loss.
- One- and two-family residential building fires account for 66 percent of all residential building fires, representing the largest subgroup of residential building fires.
- Cooking is the leading cause of one- and two-family residential building fires reported to the fire service (30 percent). Nearly all one- and two-family residential building cooking fires are small, confined fires (91 percent).
- Forty-six percent of nonconfined one- and two-family residential building fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (17 percent), other unintentional or careless actions (14 percent), and intentional (12 percent).
- One- and two-family residential building fires peak in January and December (10 percent each).
- Smoke alarms were not present in 28 percent of the larger, nonconfined fires, a high percentage when compared to the 8 percent of homes lacking smoke alarms nationally.

From 2005 to 2007, fire departments responded to an estimated 253,500 fires in one- and two-family residences each year across the Nation.[1,2] These fires resulted in an annual average loss of 2,150 deaths, 8,775 injuries, and over $5.3 billion in property loss. One- and two-family residential building fires account for the majority of all residential building fires (66 percent) and dominate the overall residential building fire profile. One- and two-family residential buildings include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes.

The vast majority of fire deaths in the Nation occur in these one- and two-family dwellings. Because these fatalities are spread in time and geographically, they do not often make the headlines. Nevertheless, fire deaths in one- and two-family dwellings account for far more deaths in most years than all natural disasters and terrorist actions in the Nation combined.[3]

This topical report describes characteristics and trends in one- and two-family residential building fires reported to the National Fire Incident Reporting System (NFIRS) from 2005 to 2007, the most recent data available at the time of the analysis. It is useful by itself and as a point of comparison with other residential building categories.

Most one- and two-family residential building fires (62 percent) are larger, nonconfined fires, that is, fires that are not contained in pots, stoves, garbage containers, or other containers that confine them. Fires in other types of residential buildings, by contrast, are mostly small "confined" or contained fires (65 percent).

One- and two-family residential building fires also differ from other residential building fires in their cause profiles. While cooking accounts for the cause of 30 percent of all one- and two-family residential building fires, cooking fires play a much larger role in other types of residential buildings, accounting for over 60 percent of fires. Heating and electrical malfunctions (short circuits, arcing, and the like) play a larger role in one- and two-family residential building fires as well.

Residential building fires are addressed in a series of U.S. Fire Administration (USFA) reports. *Residential Structure and Building Fires*, produced in 2008, addresses many of the important factors in residential building fires in the United States. This current topical report, along with other topical reports that address multifamily residential building fires (*Multifamily Residential Building Fires*, Volume 10, Issue 6),

continued on next page

university housing fires (*University Housing Fires*, Volume 10, Issue 1), and hotel and motel fires (*Hotel and Motel Fires*, Volume 10, Issue 4), focus on specific property types within the residential building category.

For the purpose of this report, the terms "residential fires" and "one- and two-family fires" are synonymous with "residential building fires" and "one- and two-family residential building fires," respectively. "One- and two-family fires" is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, "one- and two-family residential building fires."

Type of Fire

Building fires are divided into two major categories of incidents: fires that are confined to specific types of equipment or objects (confined fires) and fires that are not (nonconfined fires). Confined fires are expected to have little, if any, losses, while nonconfined fires generally have more substantial losses; some of which may be significant.[4,5] This latter category, nonconfined fires, makes up 62 percent of the one- and two-family fires. The smaller, confined fires account for the remaining 38 percent of one- and two-family fires. Cooking fires are the predominant type of confined fires in one- and two-family dwellings (Table 1), as they are in most residential occupancies.

Table 1. One- and Two-Family Residential Building Fires by Type of Incident (2005–2007)

Incident Type	Percent
Nonconfined fires	61.9
Confined fires	38.1
Cooking fire, confined to container	21.8
Chimney or flue fire, confined to chimney or flue	8.7
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	3.7
Commercial compactor fire, confined to rubbish	0.0
Trash or rubbish fire, contained	3.7
Total	100.0

Source: NFIRS 5.0.

Loss Measures

Table 2 presents losses, averaged over this 3-year-period, of reported residential fires and one- and two-family fires.[6]

Table 2. Loss Measures for One- and Two-Family Residential Building Fires (3-year-average, 2005–2007)

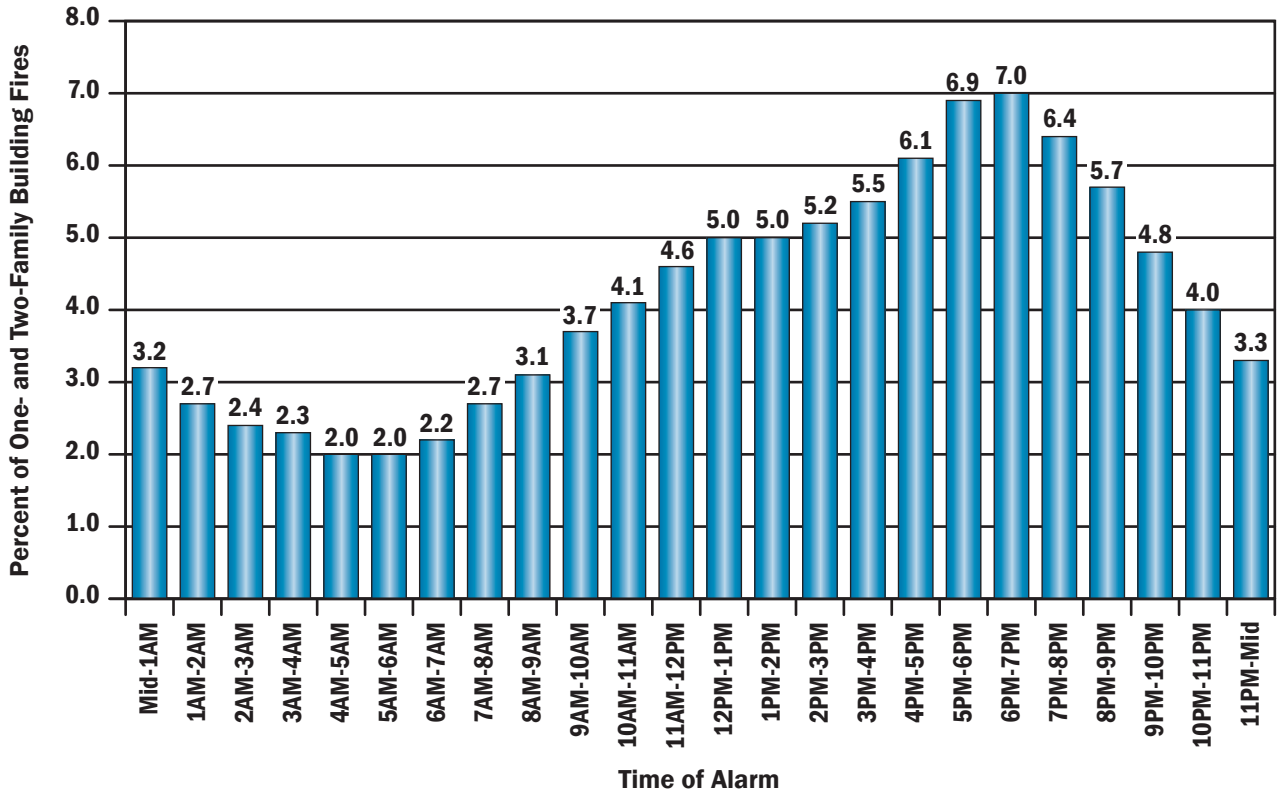
Measure	Residential Building Fires	One- and Two-Family Residential Building Fires	Confined One- and Two-Family Residential Building Fires	Nonconfined One- and Two-Family Residential Building Fires
Average Loss:				
Fatalities/1,000 fires	5.4	6.5	0.0	10.4
Injuries/1,000 fires	28.1	28.6	7.8	41.4
Dollar loss/fire	$14,560	$17,460	$220	$28,060

Source: NFIRS 5.0.
Notes: 1) Seven deaths in confined one- and two-family 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 One- and Two-Family Residential Building Fires Occur

As shown in Figure 1, one- and two-family fires occur most frequently in the early evening hours, peaking during the dinner hours from 5 to 7 p.m., when cooking fires are high.[7] Cooking fires, discussed later in the section "Causes of One- and Two-Family Residential Building Fires," account for 30 percent of one- and two-family fires. Fires then decline throughout the night, reaching the lowest point during the early morning hours (4 to 6 a.m.).

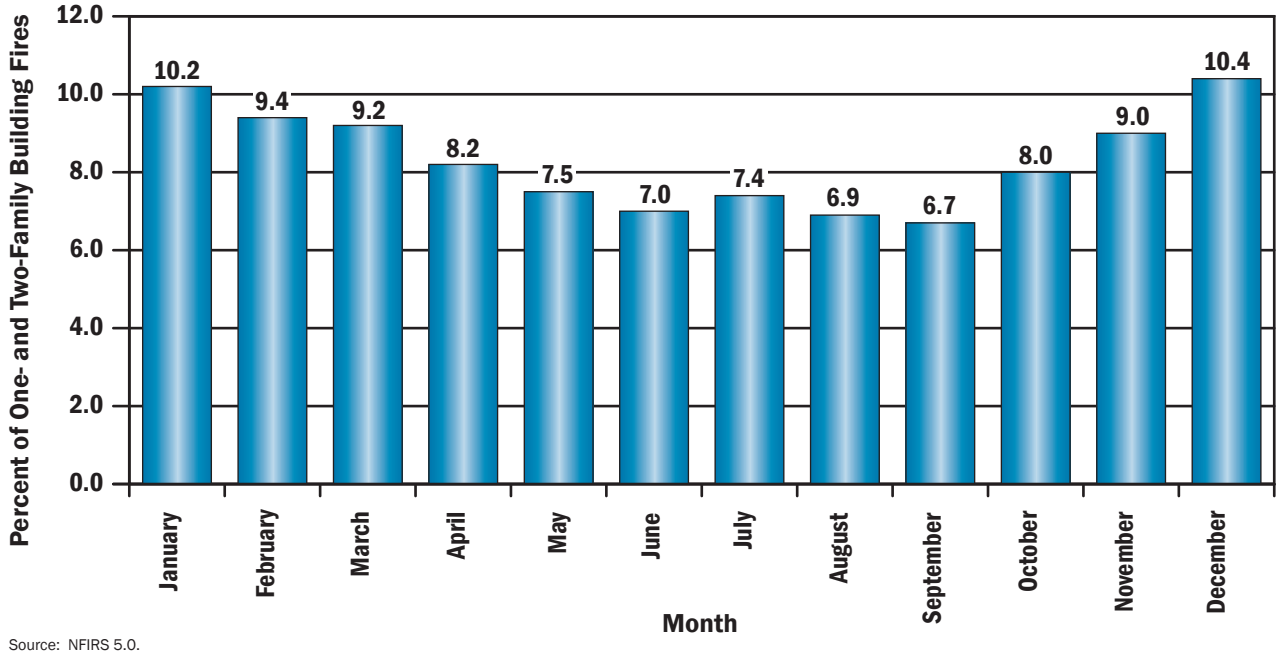
Figure 1. One- and Two-Family Residential Building Fires by Time of Alarm (2005–2007)



Source: NFIRS 5.0.

Figure 2 illustrates that one- and two-family fire incidence is higher in the cooler months, peaking in January and December (10 percent each). Winter peaks are often explained by the increase in heating fires. In fact, this peak is the result of increases in multiple causes of fires during these winter months. The increase in fires in the cooler months may be the result of more indoor activities in general as well as more indoor seasonal and holiday-related activities. The highest daily one- and two-family fire incidence is on Thanksgiving Day and is attributed to cooking fires. During the spring and summer months, the fire incidence declines steadily, reaching a low in September. There is a small peak in July, which corresponds to fires caused by Fourth of July activities such as cooking and fireworks.

Figure 2. One- and Two-Family Residential Building Fires by Month (2005–2007)



Source: NFIRS 5.0.

Causes of One- and Two-Family Residential Building Fires

Cooking is the leading cause of one- and two-family fires and accounts for 30 percent of all one- and two-family fires, as shown in Table 3. Nearly all of these cooking fires (91 percent) are small, confined fires with limited damage.

The next four causes combined account for 42 percent of one- and two-family fires: fires caused by heating (18 percent); electrical malfunction fires such as short circuits and wiring problems (10 percent); other unintentional or careless fires, a miscellaneous group, (7 percent); and open flame fires that result from candles, matches, and the like (7 percent).[8] Heating and electrical malfunction together cause nearly as many fires as cooking.

Table 3. Leading Causes of One- and Two-Family Residential Building Fires (2005–2007)

Cause	Percent (Unknowns Apportioned)
Cooking	30.1
Heating	17.7
Electrical malfunction	10.0
Other unintentional, careless	7.3
Open flame	6.8

Source: NFIRS 5.0.

There is a striking difference between one- and two-family and the other residential occupancies in the prevalence of cooking as a fire cause. While cooking accounts for 30 percent of one- and two-family building fires, it accounts for 65 percent of multifamily residential building fires and 54 percent of other residential occupancies. 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 be called automatically.

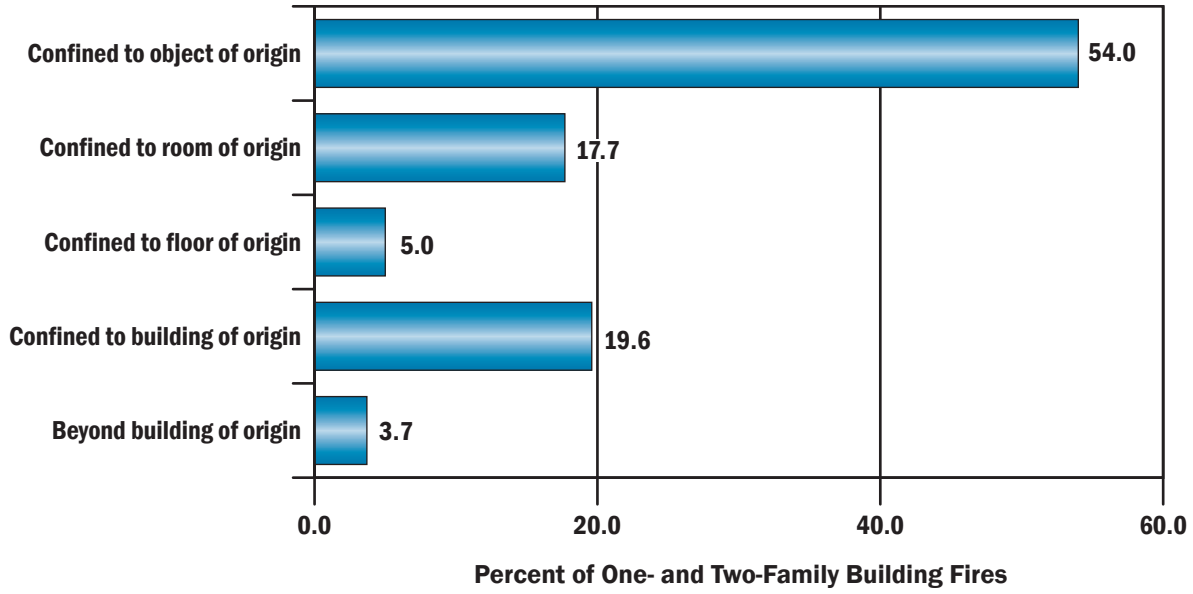
Heating and electrical malfunctions also play a larger role in one- and two-family fires than in multifamily fires. Many one- and two-family residential buildings have fireplaces, chimneys, and fireplace-related equipment that most other types of residential properties do not.[9] This heating equipment difference may 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) (Table 1) as compared to multifamily fires (less than 1 percent).

A strong relationship between housing age and the rate of electrical fires has been observed, with housing over 40 years old having the strongest association with electrical distribution fires.[10,11] As of 2007, the median age of one- and two-family housing was over 35 years. With half of this housing stock older than 35 years, electrical issues become an increasingly large player in residential fires.[12] As well, a 2008 study concludes there are three major areas in older properties that contribute to compromised electrical systems: the effects of aging on the wiring itself, misuse and abuse of the electrical components, and noncode compliant installations.[13] Codes, including the National Electrical Code®, are comprehensive and standard in nearly every community. "Noncode" improvements or changes, however, are difficult to track and therefore, difficult to enforce.

Fire Spread in One- and Two-Family Building Fires

Fifty-four percent of one- and two-family fires are confined to the object of origin (Figure 3). Included in these fires are those coded as "confined fires" in NFIRS. Approximately 28 percent of fires extend beyond the room of origin.

Figure 3. Extent of Fire Spread in One- and Two-Family Residential Building Fires (2005–2007)



Source: NFIRS 5.0.

Confined Fires

Confined fires are allowed abbreviated NFIRS reporting and many details of these fires are not required to be reported. Confined fires account for 38 percent of all one- and two-family 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).

The numbers of confined one- and two-family fires are greatest from 5 to 8 p.m.; they account for 50 percent of the one- and two-family fires in this time period. Moreover, confined cooking fires account for 61 percent of the confined fires and 30 percent of all fires in one- and two-family buildings that occur between 5 and 8 p.m.

Confined one- and two-family fires peak in December and January, then decline through the spring and summer, reaching the lowest incidence during August.

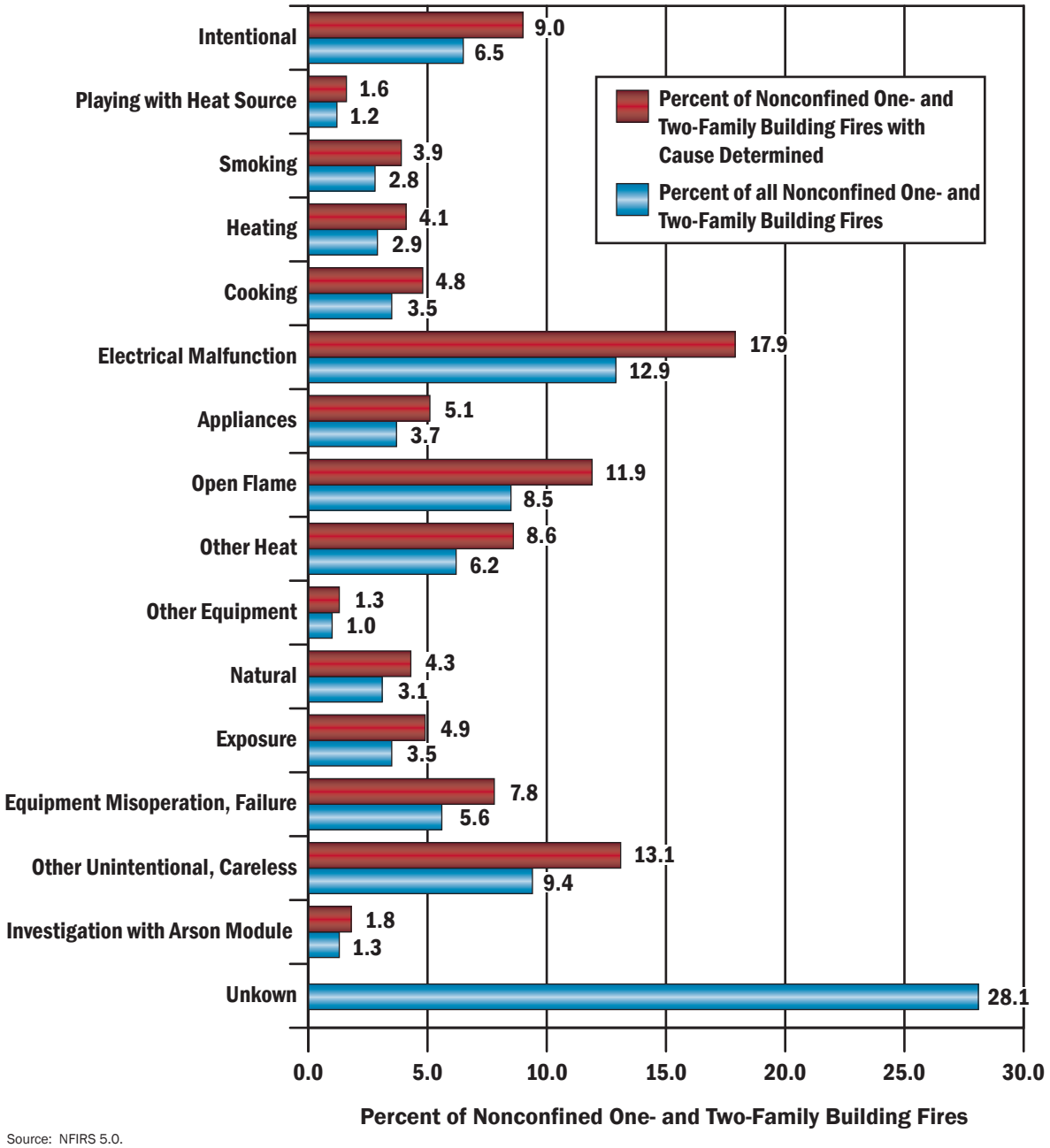
Nonconfined Fires

The next sections of this topical report address nonconfined one- and two-family fires, the larger and more serious fires, where more detailed fire data are available.

Causes of Nonconfined One- and Two-Family Residential Building Fires

While cooking is the leading cause of one- and two-family fires overall, it only accounts for 5 percent of all nonconfined one- and two-family fires. Electrical malfunction fires account for 18 percent of all nonconfined one- and two-family fires. Other leading causes of nonconfined one- and two-family fires are carelessness or other unintentional actions (13 percent), open flames (12 percent), and intentional actions, a group that includes fires commonly called arson fires (9 percent) (Figure 4).

Figure 4. Causes of Nonconfined One- and Two-Family Residential Building Fires (2005–2007)



Source: NFIRS 5.0.

Where Nonconfined One- and Two-Family Residential Building Fires Start (Area of Fire Origin)

Nonconfined one- and two-family fires most often start in cooking areas and kitchens (19 percent) as shown in Table 4. 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 vacant spaces and attics (5 percent), laundry areas (5 percent), and exterior wall surfaces (5 percent).

Note that these areas of origin do not include areas associated with confined fires. Cooking is the leading cause of one- and two-family fires at 30 percent, and it is not surprising that kitchens are the leading area of fire origin. Some cooking fires start outside the kitchen, some areas of origin for cooking fires are not reported (as in most confined cooking fires), and some kitchen fires are not due to cooking, which is why the percentages are not identical between cooking and kitchen fires. In fact, only 24 percent of fires that start in the kitchen are cooking fires. Nonheat producing equipment that malfunctions or fails accounts for 19 percent of kitchen fires, and other unspecified unintentional or careless fires account for another 18 percent.

Table 4. Leading Areas of Fire Origin in Nonconfined One- and Two-Family Residential Building Fires (2005–2007)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	18.8
Bedrooms	13.7
Common room, den, family room, living room, lounge	6.8
Attic, vacant spaces	5.3
Laundry area	5.1
Wall surface: exterior	5.1

Source: NFIRS 5.0.

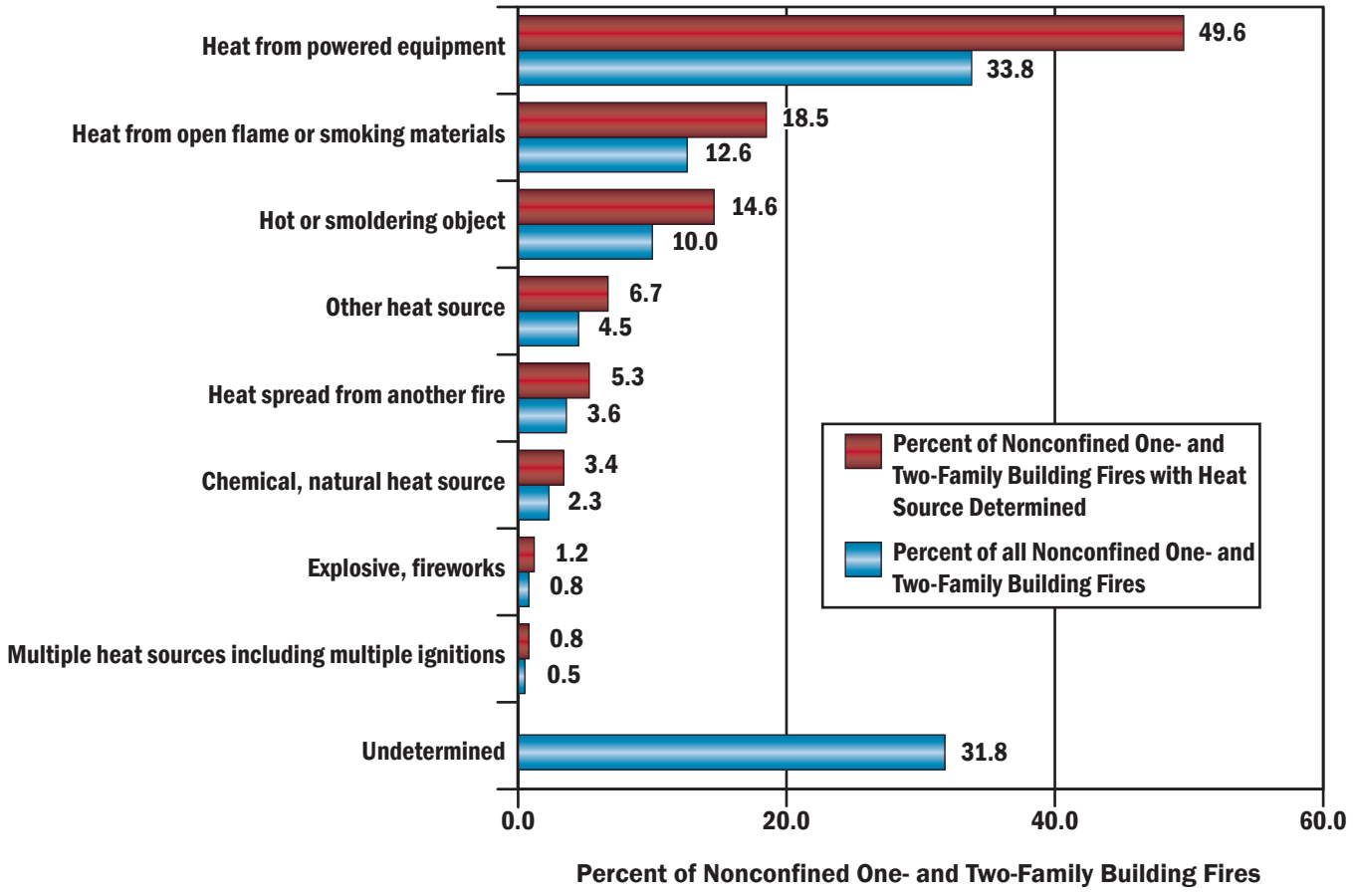
How Nonconfined One- and Two-Family Residential Building Fires Start (Heat Source)

Figure 5 shows sources of heat for nonconfined one- and two-family fires. Heat from powered equipment accounts for 50 percent of nonconfined one- and two-family fires. This category includes electrical arcing (17 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 (6 percent).

Heat from open flame or smoking materials accounts for 19 percent of nonconfined one- and two-family fires. This category includes such items as candles (5 percent), cigarettes (4 percent), and lighters and matches (combined, 4 percent).

The third largest category pertains to hot or smoldering objects (15 percent). This category includes miscellaneous hot or smoldering objects (7 percent) and hot embers or ashes (6 percent).

Figure 5. Sources of Heat in Nonconfined One- and Two-Family Residential Building Fires (2005–2007)



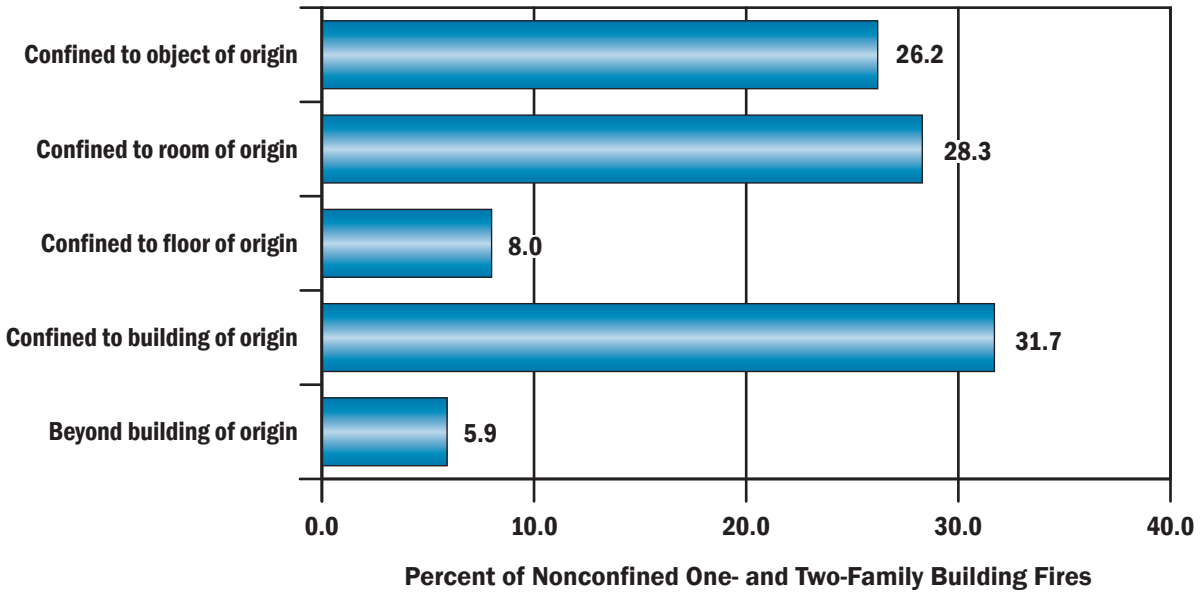
Source: NFIRS 5.0.

Fire Spread in Nonconfined One- and Two-Family Residential Building Fires

Figure 6 shows the fire spread in nonconfined one- and two-family fires. The majority of nonconfined fires, 54 percent, are limited to the object or room of fire origin with fire spread almost evenly split between the two areas of fire origin—in 28 percent of nonconfined fires, the fire is confined to the room of origin; in another 26 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 one- and two-family fires extend beyond the room of origin. The leading causes of these larger fires are electrical malfunctions (17 percent), unintentional or careless actions (14 percent), and intentional (12 percent).

Figure 6. Extent of Fire Spread in Nonconfined One- and Two-Family Residential Building Fires (2005–2007)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined One- and Two-Family Residential Building Fires

Table 5 shows the categories of factors contributing to ignition in nonconfined one- and two-family fires. The leading category is the misuse of material or product (35 percent). In this category, the leading specific factors contributing to ignition are a heat source too close to combustible materials (14 percent of all fires) and abandoned or discarded materials such as matches or cigarettes (9 percent of all fires).

Electrical failures and malfunctions contribute to 24 percent of nonconfined one- and two-family fires. Operational deficiency is the third leading category at 15 percent. Unattended equipment is the leading factor in the operational deficiency category and accounts for 7 percent of all nonconfined one- and two-family fires.

Table 5. Factors Contributing to Ignition for Nonconfined One- and Two-Family Residential Building Fires (Where Factors Contributing to Ignition are Specified, 2005–2007)

Factors Contributing to Ignition Category	Percent of Nonconfined One- and Two-Family Residential Building Fires (Unknowns Apportioned)
Misuse of material or product	35.3
Electrical failure, malfunction	24.0
Operational deficiency	14.7
Fire spread or control	10.1
Mechanical failure, malfunction	7.9
Other factors contributing to ignition	6.5
Natural condition	3.9
Design, manufacture, installation deficiency	2.8

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 One- and Two-Family Residential Building Fires

Technology to detect and/or extinguish fires has been a major contributor to the drop in fire fatalities and injuries over the past 30 years. Smoke alarms are now the norm in residential buildings; residential sprinklers are widely supported by the fire service and are 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 Table 6 (nonconfined fires) and Table 7 (confined fires) are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms in one- and two-family fires.

Nonconfined Fires

Smoke alarms were present in 40 percent of nonconfined one- and two-family fires and were known to have operated in 21 percent of them (Table 6). In 28 percent of nonconfined one- and two-family fires, there were no smoke alarms present. In another 33 percent, firefighters were unable to determine if a smoke alarm was present—unfortunately, in half of the fires where the presence of a smoke alarm was undetermined (49 percent), 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 (40 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consists of:

- smoke alarms present and operated—21 percent;
- present but did not operate—11 percent (fire too small, 5 percent; alarm did not operate, 6 percent); and
- present but operational status unknown—8 percent.

When the subset of incidents where smoke alarms were reported as present are analyzed separately, smoke alarms were reported to have operated in 54 percent of the incidents and failed to operate in 14 percent. In 13 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 19 percent of these incidents.

Because of the differing data collected on smoke alarm operation and effectiveness for nonconfined and confined fires, it is difficult to make definitive statements about the overall presence and operational status of smoke alarms. What can be said, however, is that in the larger, more destructive fires—the nonconfined fires—one- and two-family households *without* smoke alarms have a much larger proportion of fires (28 percent) than households *with* operating alarms (21 percent) and that the fires spread much further. In households without smoke alarms, 50 percent of fires spread beyond the room of origin; when alarms are present and operating, 34 percent of fires spread beyond the room of origin.

Nationally, only 3 percent of one- and two-family households lack smoke alarms.[14] Here, at least 28 percent of nonconfined one-and two-family fires had no smoke alarms present—and perhaps more if fires without information on smoke alarms could be factored in.[15] 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.[16]

Table 6. NFIRS Smoke Alarm Data for Nonconfined One- and Two-Family Residential Building Fires (2005–2007)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		14,272	5.0
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	43,150	15.0
		Smoke alarm alerted occupants, occupants failed to respond	1,555	0.5
		No occupants	9,420	3.3
		Smoke alarm failed to alert occupants	1,732	0.6
		Undetermined	5,850	2.0
		Null/Blank	2	0.0
	Smoke alarm failed to operate		16,453	5.7
	Undetermined		21,399	7.5
None present			79,597	27.7
Undetermined			93,745	32.6
Null/Blank			2	0.0
Total Incidents			287,177	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 one- and two-family residential building fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Confined Fires

Smoke alarms alerted occupants in 32 percent of the reported confined one- and two-family fires (Table 7). In other words, in about one-third of fires in these types of homes, residents received a warning from a smoke alarm. 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 life safety and the ability to rapidly respond to fires in early stages that smoke alarms afford. Details on smoke alarm effectiveness for confined fires is needed to pursue this analysis further.

Occupants were not alerted by smoke alarms in 21 percent of confined one- and two-family fires. Why the occupant was not alerted is not clearly known: The alarm may not have been present; it may not have worked; the fire may have been extinguished by the occupant or the fire self-extinguished; or the occupant sensed the fire before the alarm activated. In 48 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 7. NFIRS Smoke Alarm Data for Confined One- and Two-Family Residential Building Fires (2005–2007)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	55,674	31.5
Smoke alarm did not alert occupants	37,165	21.0
Unknown	83,982	47.5
Total Incidents	176,821	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 one- and two-family residential building fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

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.[17] Residential sprinklers are the primary AES in one- and two-family residences and are not yet widely installed.

Less than 1 percent of nonconfined one- and two-family fire incidents report sprinklers as present—the lowest reported presence of sprinklers in nonconfined fires in any residential occupancy (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 usage of residential sprinklers in the future. At present, however, they are largely absent nationwide.

Table 8. NFIRS Automatic Extinguishing System Data for Nonconfined One-and Two-Family Residential Building Fires (2005–2007)

AES Presence	Count	Percent
AES present	2,512	0.9
Partial system present	35	0.0
AES not present	261,354	91.0
Unknown	23,274	8.1
Null/blank	2	0.0
Total Incidents	287,177	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 one- and two-family residential building fires. They are presented for informational purposes.

Examples

The following are some recent examples of one- and two-family fires reported by the media.

- February 2010: Unattended food cooking on a stove was the cause of a fire in a single family home in Huntington Township, PA. The fire was contained in the kitchen, but caused between $60,000 and $75,000 in damages. The homeowner was alerted by a smoke alarm in the home. Firefighters were able to control the fire and noted that this fire could serve as a reminder not to leave food unattended on a stove and the importance of installing smoke alarms.[18]
- January 2010: A malfunctioning furnace damaged a two-family home in Danville, CA. Firefighters determined that the fire started in the garage. The fire was quickly contained, and no one was seriously injured.[19]
- January 2010: Several firefighters from six different towns were called to extinguish a large fire in a single-family home in Berkeley Heights, NJ. The house was significantly damaged but no one was hurt. The cause of the fire was determined to be accidental and started in the basement.[20]
- January 2010: Firefighters were called to a fire in a single-family home caused by a back-porch propane stove in Bothell, WA. The homeowner was evacuated and the fire was controlled.[21]

Conclusion

With cooking, heating, and electrical fires accounting for more than half of one- and two-family fires, residents should focus on equipment maintenance and proper equipment use. Prevention programs should highlight the importance of proper cooking techniques and methods to prevent cooking fires. Special emphasis should be placed on proper heating equipment installation, regular maintenance, and homeowner responsibility. Prevention programs should be tailored towards responsible use of fireplaces, chimneys, and fireplace-related equipment to reduce the number of heating fires in one- and two-family buildings. Proper electrical equipment maintenance is also important for homeowners because it is their individual responsibility as opposed to professional management found in other residential buildings.

The installation and maintenance of smoke alarms should also be a high priority for every property owner. The annual check, "change your clocks, change your batteries," is an important part of smoke alarm maintenance.

In addition, 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.

NFIRS Data Specifications for One- and Two-Family 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.

One- and two-family 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 419 is included to specify one- and two-family dwellings.
- Structure Type:
  - 1 - Enclosed building,
  - 2 - Fixed portable or mobile structure, and
  - Structure Type not specified (null entry).

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Notes:

[1]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.

[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, incidents that have a residential property use, but do not have a structure type specified are presumed to be buildings.

[3]U.S. Census Bureau, *The 2008 Statistical Abstract*, http://www.census.gov/compendia/statab/2008/tables/08s0374.pdf.

[4]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.

[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 loss 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.

[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*(2,150/253,500)) = 8.5 deaths per 1,000 one- and two-family residential building fires and the fire injury rate would be (1,000*(8,775/253,500)) = 34.6 injuries per 1,000 one- and two-family residential building fires.

[7]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.

[8]The U.S. Fire Administration cause hierarchy was used to determine the cause of one- and two-family residential building fire incidents. The cause definitions can be found at http://www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.

[9]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 and U.S. Department of Commerce, "American Housing Survey for the United States: 2007," Table 2-25.

[10]Linda E. Smith and Dennis McCoskrie, "What Causes Wiring Fires in Residences?," *Fire Journal*, January/February 1990.

[11]David A. Dini, "Residential Electrical System Aging Research Project," Fire Protection Research Foundation, Quincy, MA: July 1, 2008.

[12]The American Housing Survey does not have a category for one- and two-family residences that conforms to the definition used by NFIRS. Housing age given here is an estimate based on the information presented for single-family attached and detached housing. U.S. Department of Housing and Urban Development and U.S. Department of Commerce, "American Housing Survey for the United States: 2007," Table 2-25.

[13]David A. Dini, Residential Electrical System Aging Research Project, Fire Protection Research Foundation, Quincy, MA, July 1, 2008.

[14]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.

[15]Here, *at least* 28 percent of nonconfined one- and two-family residential building fires had no smoke alarms present—the 28 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.

[16]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."

[17]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.

[18]Heather Faulhefer, "Food on stove causes fire," eveningsun.com, February 15, 2010, http://www.eveningsun.com/ci_14405408?IADID=Search-www.eveningsun.com-www.eveningsun.com. Accessed February 19, 2010.

[19]"Malfunctioning furnace causes Danville duplex fire," danvilleweekly.com, January 22, 2010, http://www.danvilleweekly.com/news/show_story.php?id=2796. Accessed January 29, 2010.

[20]Barbara Rybolt, "Fire destroys single family home in Berkeley Heights," nj.com, January 26, 2010, http://www.nj.com/independentpress/index.ssf/2010/01/fire_destroys_single_family_ho.html. Accessed January 28, 2010.

[21]"Cooking fire chars home in Bothell," heraldnet.com, January 7, 2010, http://heraldnet.com/article/20100107/NEWS01/701079887. Accessed January 29, 2010.