

Large Loss 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 900 large loss building fires are reported to U.S. fire departments each year and cause an estimated 35 deaths, 100 injuries, and \$2.8 billion in total loss.
- Exposures are the leading cause of large loss building fires (22 percent).
- Attics, typically vacant spaces above the top story, are the primary origin of all large loss building fires (7 percent), along with cooking areas or kitchens (6 percent).
- Large loss building fires are most prevalent in May (10 percent) and July (10 percent).
- A peak in large loss building fires is seen between the hours of 1 a.m. and 4 a.m.
- Forty-eight percent of large loss fires occur in residential buildings.

From 2007 to 2009, an estimated 900 large loss building fires were reported by U.S. fire departments annually. These fires caused an estimated 35 deaths, 100 injuries, and \$2.8 billion in property damage.^{1,2,3} In this topical report, large loss building fires were defined as fires that resulted in a total dollar loss of \$1 million or more.⁴

Even though large loss fires made up less than 1 percent of all building fires from 2007 to 2009, they accounted for 26 percent of all building fire dollar loss during the 3-year period. These fires, though small in number, caused a large amount of property damage each year.

Many factors contribute to why these fires become so large in size and ultimately result in larger dollar losses. Detection time, building construction/design, building contents, and the response time have an impact on the overall size and damage produced by a fire. Detection time refers to how long it takes to notice that a fire is burning—a key factor for which there is no available data. Large loss fires tend to start in many locations where detection may be difficult, like attics or storage areas, and most commonly occur in the early morning hours. These two factors, the location and the time of day, can contribute to a longer detection time and ultimately a larger fire resulting in more damage.

The way a building is constructed or designed can affect how a building may burn. In this topical report, the

building's construction or design was to blame for the growth and spread of the fire in 95 percent of the incidents. The most common place where the building construction or design failed was in the roof (27 percent). In the case of residential buildings, modern day roofs are typically built using trusses which are made of a lighter weight material. Truss roofs tend to burn more quickly than conventional roofs, which are made of more solid, robust materials.⁵ When one truss fails in the roof, the adjacent trusses tend to fail, resulting in a domino effect, which can cause an entire collapse of the structure.⁶ This collapse typically causes significant damage to the property and contents below.

Building contents can play a key role in how quickly a fire may spread. Residential buildings which made up 48 percent of all large loss fires, contain furniture, decorative furnishings like drapes and rugs, and in some areas, flammable materials, that can contribute to a larger fire. Nonresidential buildings, like warehouses, storage areas, eating and drinking establishments, or detached garages, may contain a large number of combustibles or materials that burn fairly quickly. These combustibles can inhibit the fire department's ability to extinguish the blaze and sometimes cause the fire to consume the entire building.⁷ Even though nonresidential buildings made up 52 percent of all large loss fires, they accounted for 59 percent of all large loss fire dollar loss.



FEMA



The overall response time is another factor that can contribute to how much damage a building may receive. The response times in rural areas can be long because a building may be located farther away from the closest fire station. Urban areas, however, are affected more by traffic patterns, ongoing construction, pedestrians, street layouts (dead ends, curvilinear streets, traffic calming devices such as speed bumps, and the like).⁸ All of these daily aspects of urban living can affect how long it may take for the fire department to reach a burning building. The analysis of response times can be complex and was not undertaken in this short report.

On a fraction of the incident reports sent to the National Fire Incident Reporting System (NFIRS), the desired information for many data items either is not reported or is reported as “unknown.” This lack of data masks the true picture of the fire problem. In some cases, even after the best attempts by fire investigators, the information is truly unknown. In other cases, the information reported as unknown in the initial NFIRS report is not updated after the fire investigation is completed. When the unknowns are large, the credibility of the data suffers. Fire departments need to be more aware of the effect of incomplete data reporting and need to update the initial NFIRS report if additional information is available after investigation. The issues that arose while producing this topical report are discussed in a later section.

This topical report addresses the characteristics of large loss building fires reported to NFIRS from 2007 to 2009. The NFIRS data are used for the analyses presented throughout the report. For the purpose of the report, the term “large loss fires” is synonymous with “large loss building fires.” “Large loss fires” is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category “large loss building fires.”

The large loss fire incidents reported to NFIRS contain a notable number of exposure fires—fires which are the result of another fire. Exposure fire incidents have a majority of the same information as the originating incident, which can skew some of the analyses. In those analyses, such as time of alarm, only the originating incidents were examined and are so noted in the tables or graphics that accompany the analyses.

Type of Fire

Confined and Nonconfined Fires

Building fires are divided into two classes of severity in NFIRS: “Confined fires,” which are those fires confined to

certain types of equipment or objects, and “nonconfined fires,” which are not. Confined building fires are small fire incidents that are limited in extent, staying within pots or fireplaces or certain other noncombustible containers.⁹ Confined fires rarely result in serious injury or large content losses, and are expected to have no significant accompanying property losses due to flame damage.¹⁰ Nonconfined fires account for all large loss building fires.¹¹ The subsequent analysis of large loss fires in this report, therefore, includes only nonconfined fires.

Occupied and Nonactively Occupied Fires

Buildings can be defined as being occupied or nonactively occupied. An occupied building is defined as “occupied or operating,” while a nonactively occupied building is defined as “under construction,” “idle, not routinely used,” “under major renovation,” “vacant and secured,” “vacant and not secured,” or “being demolished.” In large loss building fires, a majority of the large loss fires occurred in occupied buildings (84 percent) while a smaller, yet still considerable proportion of large loss fires, occurred in nonactively occupied (“vacant”) buildings (16 percent). Contrary to some expectations, fires in nonactively occupied buildings are a smaller percentage of large loss fires than they are of nonconfined building fires overall (20 percent).

Type of Property

Buildings are classified into 12 major property types: assembly, eating and drinking establishments, educational, institutional, residential, stores and office buildings, basic industry, manufacturing, storage, detached garages, outside or special property, and other unspecified property.

Residential buildings account for the largest percent (48 percent) of large loss building fires as shown in Table 1. One- and two-family dwellings (29 percent), multifamily dwellings (16 percent), and hotel/motel, commercial (2 percent) account for the majority of fires in this category.

Stores and office buildings account for 16 percent of large loss building fires. Mercantile, business, other (3 percent), motor vehicle or boat sales, services, repairs (3 percent), business offices (2 percent), and food and beverage sales, grocery store (2 percent) are the leading property types in this category.

Manufacturing is the third leading property type at 10 percent. The remaining property types account for 25 percent of large loss building fires.

Table 1. Large Loss Building Fires by Property Type

Property Type	Percent of Large Loss Building Fires
Residential	48.4
Stores and Offices	16.2
Manufacturing	10.2
Storage	7.1
Assembly	5.4
Eating and Drinking	4.6
Basic Industry	2.7
Educational	2.3
Other	1.4
Institutional	1.3
Outside or Special Property	0.3
Detached Garages	0.1
Total	100.0

Source: NFIRS 5.0.

Note: Property use codes for the above property types can be found in the *National Fire Incident Reporting System Complete Reference Guide*, July 2010, http://www.nfirs.fema.gov/documentation/reference/NFIRS_Complete_Reference_Guide_2010.pdf.

Loss Measures

Table 2 presents losses, averaged over the 3-year period, of reported large loss building fires.¹² As shown in Table 2, not

only do large loss fires have substantial dollar loss, they also result in more fatalities and injuries per thousand fires than nonlarge loss building fires.

Table 2. Loss Measures for Large Loss, Nonlarge Loss, and All Building Fires (3-year average, 2007–2009)

Measure	Large Loss Building Fires	Nonlarge Loss Building Fires	All Building Fires
Average Loss:			
Fatalities/1,000 fires	29.1	4.5	4.5
Injuries/1,000 fires	93.3	24.5	24.7
Dollar loss/fire	\$2,591,930	\$14,280	\$19,250

Source: NFIRS 5.0.

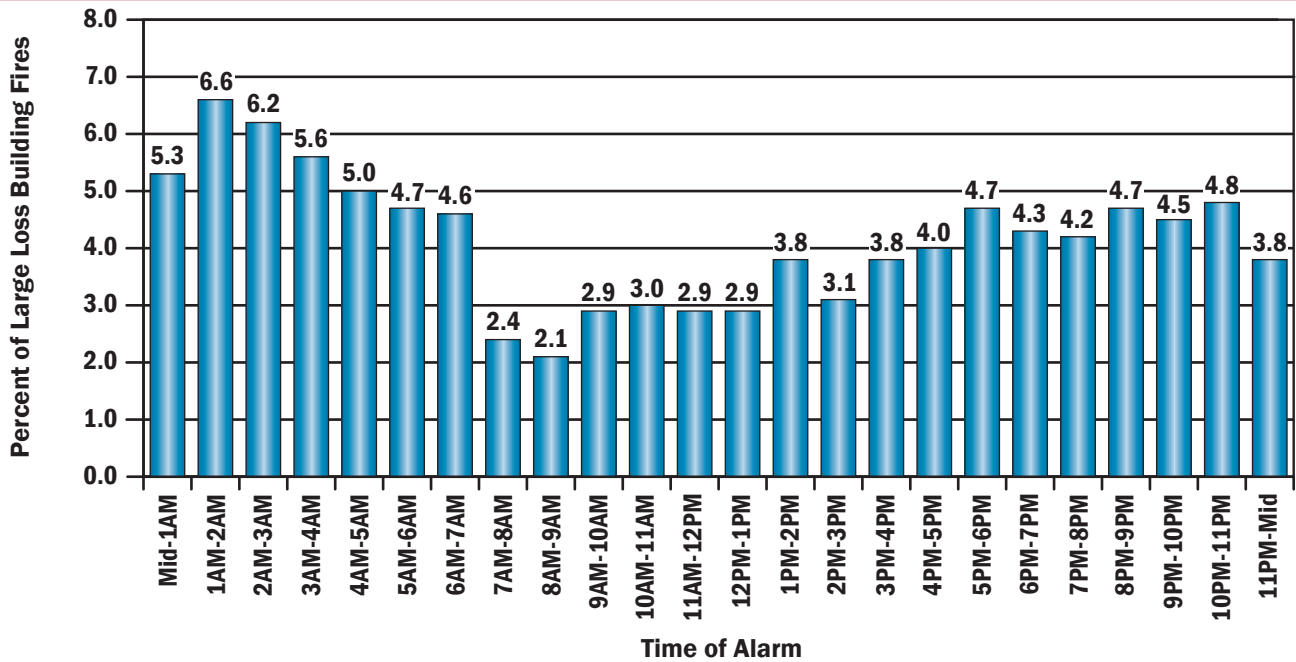
Notes: Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed **per fire** and is rounded to the nearest \$10. Dollar loss has also been converted to reflect total loss per fire in 2009 dollars.

When Large Loss Building Fires Occur

As shown in Figure 1, large loss building fires occur most frequently in the early morning hours, peaking from 1 to 4 a.m. They then gradually decline throughout the midmorning hours until 7 a.m. A sharp decrease is seen from 7 to 9 a.m. with the lowest point being reached between 8 to 9 a.m. The fire incidences then slightly rise and fall for the rest of the morning until a small peak is seen between 1

and 2 p.m. A slight decrease is seen between 2 to 3 p.m., before gradually increasing again until 6 p.m. The fire incidences then slightly fall before peaking again between 8 to 11 p.m. A decrease is then seen from 11 p.m. to midnight. Starting at midnight, the numbers of fires increase again until the peak period begins at 1 a.m. The peak period (1 to 4 a.m.) accounts for 18 percent of all large loss fires.¹³

Figure 1. Large Loss Building Fires by Time of Alarm (2007–2009)



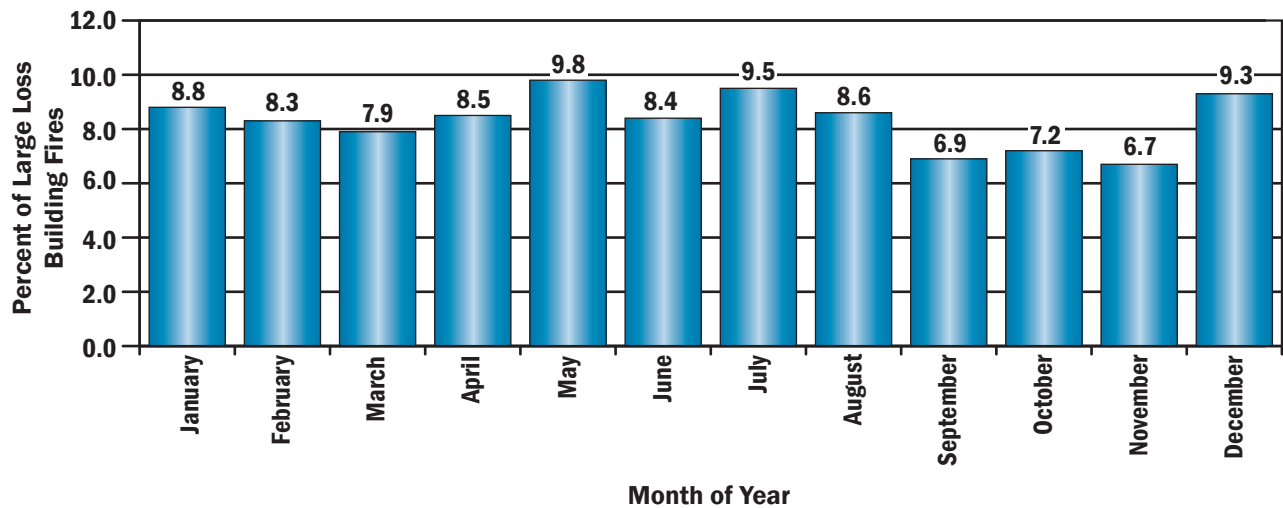
Source: NFIRS 5.0.

Note: For those large loss fires that were the result of an exposure to an existing fire, only originating incidents were used to determine time of alarm.

Figure 2 illustrates that large loss building fires peak twice during the year, once in the spring/early summer and again in the winter. The spring/summer peak, which is the highest peak, occurs during the months of May (10 percent) and

July (10 percent). The second peak in large loss fires is seen during the months of December (9 percent) and January (9 percent). The lowest number of fire incidents is seen in November.

Figure 2. Large Loss Building Fires by Month (2007–2009)



Source: NFIRS 5.0.

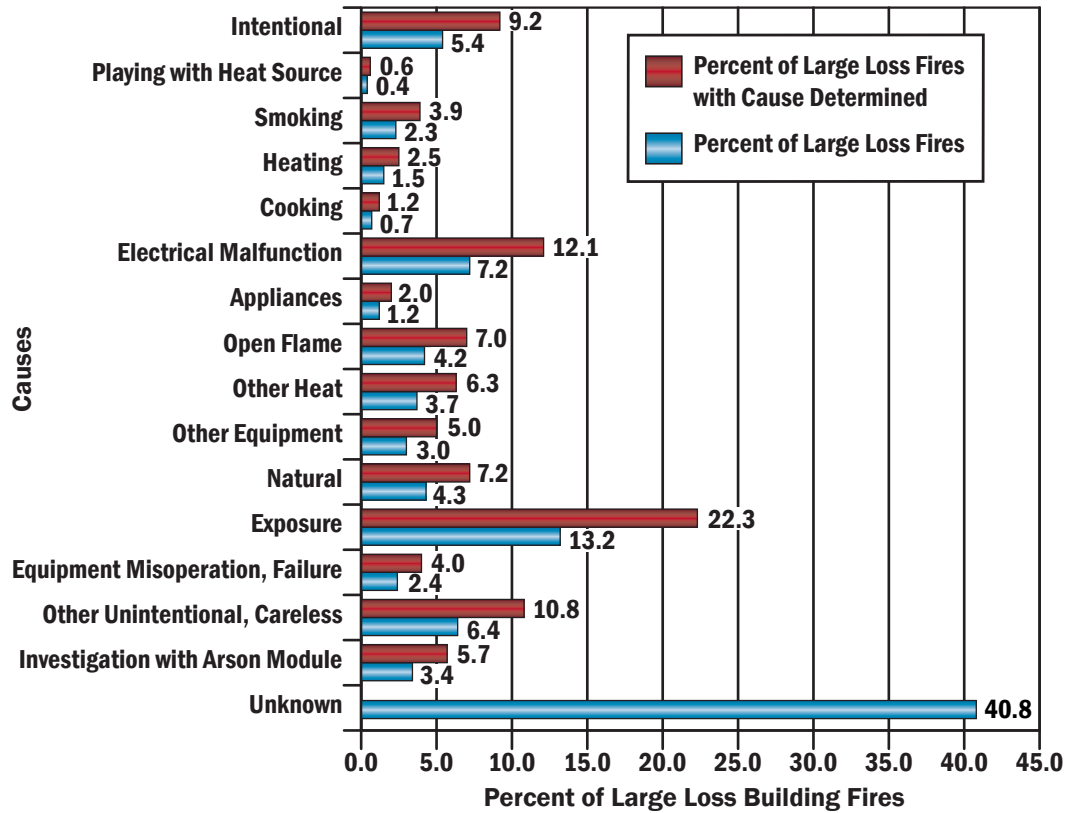
Note: For those large loss fires that were the result of an exposure to an existing fire, only originating incidents were used to determine the incident month.

Causes of Large Loss Building Fires

Twenty-two percent of all large loss fires with cause information provided are exposure fires as shown in Figure 3. The next 3 leading causes combined account for 32 percent of large loss fires: electrical malfunctions (12 percent), other unintentional, careless actions (11 percent), and

intentionally set fires (9 percent).¹⁴ In 41 percent of all large loss fires, the cause is unknown. This large percentage of unknown causes may be due to the fact that these fires grow so large and are widespread that it may be difficult for a firefighter to determine the exact fire cause. As noted in the next section, 88 percent of large loss fires extend beyond the floor of origin.

Figure 3. Large Loss Building Fires by Cause (2007–2009)



Source: NFIRS 5.0.

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

Fire Spread in Large Loss Building Fires

Eighty-eight percent of large loss fires extend beyond the floor of origin (Table 3), while only 12 percent of the fires are contained to the floor of origin or smaller area. By

comparison, nonlarge loss fires are limited in fire spread. A much smaller percent of nonlarge loss fires (20 percent) extend beyond the floor of origin, while a larger percent (80 percent) are contained to the floor of origin or smaller area.

Table 3. Fire Spread for Large Loss and Nonlarge Loss Building Fires (2007–2009)

Fire Spread	Percent of Large Loss	Percent of Nonlarge Loss
Beyond floor of origin	87.8	20.3
Contained to floor or smaller area	12.2	79.7

Source: NFIRS 5.0.

Where Large Loss Building Fires Start (Area of Origin)

Seven percent of large loss building fires start in the attic or vacant, crawlspace above the top story (Table 4). Cooking

areas, kitchens (6 percent) are the next leading areas of fire origin. Fires that begin in storage areas (5 percent), on exterior balconies, unenclosed porches (5 percent), or in processing/manufacturing areas, workrooms (5 percent) are the next leading areas of fire origin.

Table 4. Leading Areas of Fire Origin in Large Loss Building Fires (2007–2009)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Attic: vacant, crawlspace above top story	7.4
Cooking area, kitchen	5.7
Storage area, other	5.3
Exterior balcony, unenclosed porch	5.2
Processing/Manufacturing area, workroom	5.0

Source: NFIRS 5.0.

Note: Only originating incidents were used to determine area of fire origin.

Unfortunately, information on the items first ignited could not be provided as more than half of the incidents, 55 percent, specified “unknown” as the item first ignited.

How Large Loss Building Fires Start (Heat Source)

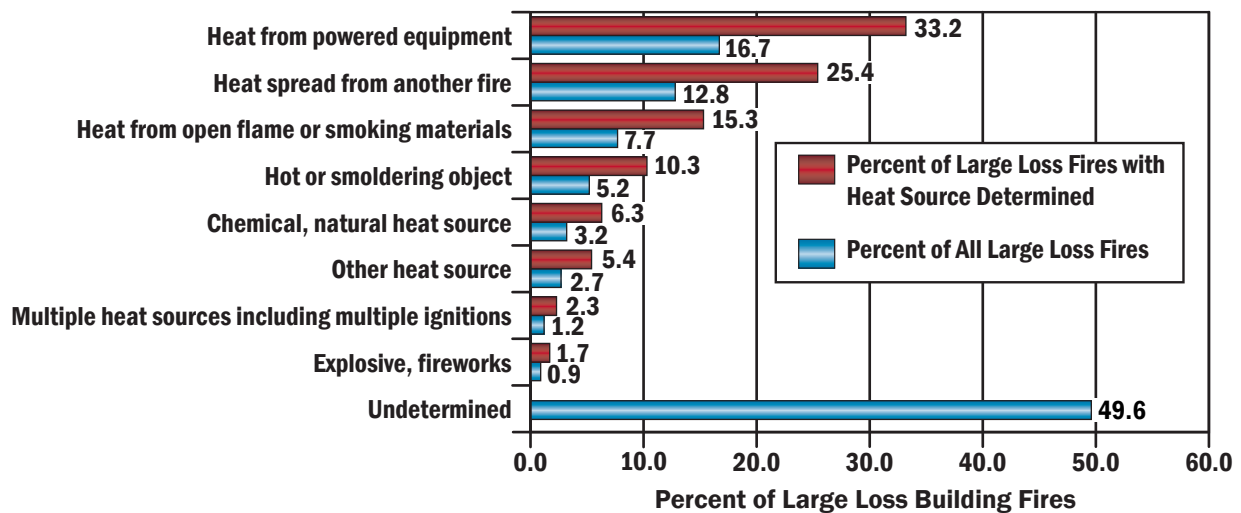
Figure 4 shows sources of heat categories in large loss fires. The “heat from powered equipment” category, predominately electrical distribution-related equipment, accounts for 33 percent of all large loss fires. Within this category, electrical arcing accounts for 12 percent, heat from other powered equipment accounts for 8 percent, sparks, embers, or flames

from operating equipment account for 7 percent, and radiated or conducted heat from operating equipment account for 7 percent of all large loss fires.

The “heat spread from another fire” category accounts for 25 percent of large loss fires. This category includes heat spread from another fire, other (16 percent), flying brand, ember, or spark (7 percent), heat from direct flames or convection currents, and radiated heat from another fire (1 percent each).

The heat source was coded as “undetermined” in 50 percent of the large loss fire incidents in NFIRS submitted between 2007 and 2009.

Figure 4. Sources of Heat Categories in Large Loss Building Fires (2007–2009)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Large Loss Building Fires

Table 5 shows the categories of factors contributing to ignition in large loss fires. By far, the leading category is “fire spread or control” (34 percent). Exposure fires (30 percent), fire spread or control, other (3 percent), and rekindle (1 percent) account for the majority of the fires in this category.

The “misuse of material or product” category is a contributing factor in 27 percent of large loss fires. Abandoned or discarded materials or products (8 percent), heat source too close to combustibles (7 percent), misuse of material or product, other (4 percent), cutting or welding too close to combustibles (3 percent), and flammable liquid or gas spilled (2 percent) are the leading specific factors contributing to ignition in this category.

The category “electrical failure, malfunction” is the third leading factor at 17 percent. The remaining categories are contributing factors in 31 percent of large loss fires.

Table 5. Factors Contributing to Ignition for Large Loss Building Fires by Major Category (Where Factors Contributing to Ignition are Specified, 2007–2009)

Factors Contributing to Ignition Category	Percent of Large Loss Building Fires
Fire spread or control	33.5
Misuse of material or product	26.9
Electrical failure, malfunction	16.8
Other factors contributing to ignition	8.2
Mechanical failure, malfunction	7.7
Natural condition	7.5
Operational deficiency	5.7
Design, manufacture, installation deficiency	1.6

Source: NFIRS 5.0.

Notes: 1) Includes only incidents where factors that contributed to the ignition of the fire were specified.

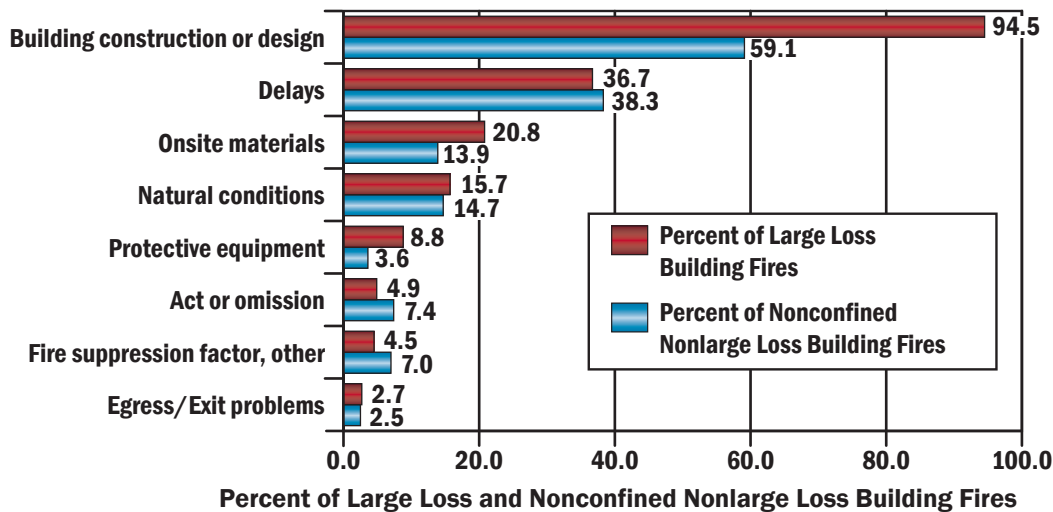
2) Multiple factors contributing to fire ignition may be noted for each incident; total will exceed 100 percent.

Factors Contributing to Fire Suppression in Large Loss Building Fires

Figure 5 shows the categories of factors contributing to fire suppression in large loss building fires (all of which are nonconfined fires) and nonconfined nonlarge loss building fires. The leading category for both large loss and nonconfined nonlarge loss fires is “building construction or

design.” The percentage of factors contributing to fire suppression in this category are much higher, 95 percent, for large loss building fires than for nonconfined nonlarge loss building fires (59 percent). “Delays” are the second leading category for large loss and nonconfined nonlarge loss building fires. This category makes up 37 percent of large loss and 38 percent of nonconfined nonlarge loss building factors contributing to fire suppression.

Figure 5. Factors Contributing to Fire Suppression for Large Loss Building Fires and Nonconfined Nonlarge Loss Building Fires by Major Category (Where Factors Contributing to Fire Suppression are Specified, 2007–2009)



Source: NFIRS 5.0.

Notes: 1) Includes only incidents where factors that contributed to the suppression of the fire were specified.

2) Multiple factors contributing to fire suppression may be noted for each incident; total will exceed 100 percent.

3) For those large loss fires and nonconfined nonlarge loss fires that were the result of an exposure to an existing fire, only originating incidents were used in the suppression factor analysis.

Alerting/Suppression Systems in Large Loss Building Fires

Smoke Alarm Data

Smoke alarm data presented in Table 6 and Table 7 are the raw counts from the NFIRS data set and are not scaled to National estimates of smoke alarms in large loss fires. In addition, NFIRS does not allow for the determination of the type of smoke alarm—that is, if the smoke alarm was photoelectric or ionization—or the location of the smoke alarm with respect to the area of fire origin.

Overall, smoke alarms were present in 38 percent of large loss fires and were known to have operated in 25 percent of the fires. By comparison, smoke alarms were present in 39 percent of nonconfined nonlarge loss fires and operated in 22 percent. In 22 percent of large loss fires, there were no smoke alarms present. In another 40 percent of these fires, firefighters were unable to determine if a smoke alarm was present (Table 6).

Smoke alarms are present more often in large loss residential building fires than in nonresidential large loss building fires (47 percent versus 30 percent).

Table 6. NFIRS Smoke Alarm Presence in Large Loss Building Fires (NFIRS, 2007-2009)

Presence of Smoke Alarms	Count	Percent
Present	693	38.0
None present	402	22.1
Undetermined	727	39.9
Total Incidents	1,822	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 large loss building fires. They are presented for informational purposes.

Smoke Alarms in Occupied Buildings

One of the most important values of smoke alarms is detecting smoldering fires before they break into open flame or produce large volumes of smoke. Smoke alarms were reported as present in 41 percent of large loss fires in occupied buildings (Table 7). Smoke alarms are known to have operated in 28 percent of large loss fires in occupied buildings and were known to be absent in 20 percent. Firefighters were unable to determine if a smoke alarm was present in another 39 percent of these fires.

When operational status is considered for large loss fires in occupied buildings, the percentage of smoke alarms reported as present (41 percent) consists of:

- smoke alarms present and operated—28 percent;
- present, but did not operate—3 percent (fire too small, 0.7 percent; alarm did not operate, 3 percent); and
- present, but operational status unknown—10 percent.

When the subset of incidents where smoke alarms were reported as present is analyzed separately, smoke alarms were reported to have operated in 67 percent of the incidents. The alarms failed to operate, however, in 6 percent of the incidents, and in another 2 percent of incidents, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in an additional 25 percent of the incidents.

Table 7. NFIRS Smoke Alarm Data for Large Loss Building Fires (NFIRS, 2007-2009) Occupied Buildings

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		10	0.7
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	243	15.9
		Smoke alarm alerted occupants, occupants failed to respond	18	1.2
		No occupants	101	6.6
		Smoke alarm failed to alert occupants	9	0.6
		Undetermined	50	3.3
	Smoke alarm failed to operate		40	2.6
Undetermined		154	10.0	
None present			307	20.0
Undetermined			601	39.2
Total Incidents			1533	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 occupied large loss building fires. They are presented for informational purposes. The total may not add to 100 percent due to rounding. "Fire too small to activate smoke alarm" category may be incorrectly coded as noted in the Data Issues section.

Automatic Extinguishment System Data

Overall, full or partial Automatic Extinguishing Systems (AES), mainly sprinklers, were present in just 14 percent of large loss fires (Table 8). Sprinklers are more likely to be present in nonresidential building large loss fires (16 percent) than in residential building large loss fires (8 percent).

The lack of suppression equipment (sprinklers) in large loss properties is not unexpected since almost half of all large loss fires occur in residential buildings. It has not been until recently that certain localities require the installation of sprinkler systems in all new home construction.¹⁵ Note that the data presented in Table 8 are the raw counts from the NFIRS data set and are not scaled to National estimates of AES in large loss fires.

Table 8. NFIRS Automatic Extinguishing System (AES) Presence in Large Loss Building Fires (2007-2009)

Presence of Automatic Extinguishing Systems	Count	Percent
AES present	214	11.7
Partial system present	33	1.8
AES not present	1,259	69.1
Unknown	316	17.3
Total Incidents	1,822	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 large loss building fires. They are presented for informational purposes. Totals may not add to 100 percent due to rounding.

Data Issues

The high level of “undetermined” or “unknown” entries in the various data elements in the large loss incidents in NFIRS masks the true picture of large loss fires. For example, 50 percent of the large loss entries listed heat source as “undetermined,” 55 percent listed the item first ignited as “undetermined,” and insufficient information was provided to determine the fire cause in 40 percent of these large loss incidents. These large percentages of unknowns cause the credibility of the data to suffer.

The issue of inconsistent data further clouded the analyses. A noteworthy number of incidents are coded as “confined to the object of origin” for fire spread. While some large loss fires may indeed be confined to highly valuable large machinery or an occasional piece of artwork, it is highly unlikely that fires resulting in \$1 million or more stayed confined to the object of origin. To determine if these fires were in fact “confined to the object of origin,” an Internet search was undertaken on a random set of the incidents under the observation that fires resulting in such a large dollar loss would have likely been reported in the media. Of the dozen fires researched, none were reported as “confined to the object of origin” fires, since either the entire floor of a building or the entire building itself was consumed by flames.

In addition, in a small (but troublesome) number of fires, smoke alarms did not operate as the “fire was too small.” Most of these particular fires (6 of 10) were noted as confined to the object of origin or to the room of origin.

When information is reported incorrectly or incompletely, the fire problem cannot be analyzed to its full extent.

Examples

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

- October 2010: A fire in a Franklin, TN, home resulted in \$2.5 million worth of damage. The cause of the fire is still unknown, but the fire began in a patio fireplace. The family of four present in the house at the time of the fire was able to escape safely. Four firefighters were injured while fighting the fire; two of them were treated at the scene and two were sent to the hospital for minor injuries.¹⁶
- June 2010: A Palo Alto, CA, two-alarm house fire caused between \$1 and \$2 million worth of damage. The family of four living in the house was awoken by their son when he heard the smoke alarm. The fire is believed to have been started by an unattended candle or cigarette the son left in a second-story room. The fire was brought under control in about 45 minutes and no deaths or injuries were reported.¹⁷

- June 2010: A fire that started in a Carmel, IN, shopping mall is believed to have been caused by lightning. Investigators have determined that the fire started in a restaurant located at the north end of the mall. There were no deaths or injuries as a result of the fire, but investigators estimate that the fire caused over \$5 million worth of damage.¹⁸
- May 2009: A fire that started in a Gallery Furniture storage warehouse located in Houston, TX, resulted in at least \$15 million worth of damage. Investigators have determined that the fire was caused by arson. Thirty to 40 employees were present when the fire broke out. The fire was determined to have been started in an area only accessible to employees. There were no injuries or deaths as a result of the fire.¹⁹

NFIRS Data Specifications for Large Loss Building Fires

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

Large loss fires are defined as:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are excluded to avoid double counting of incidents.
- Incident Types 111, 112, 120, 121, 122, and 123:

Incident Type	Description
111	Building fire
112	Fires in structure other than in a building
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 2007–2009 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and 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 “structure” commonly referred to buildings. To coincide with this concept, the definition of a building 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). Such fires are referred to as “buildings” to distinguish these buildings from other structures that may include fences, sheds, and other uninhabitable structures. Confined fire incidents without a structure type specified are presumed to be buildings. Nonconfined fire incidents without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

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

- Property use is used to differentiate residential and non-residential buildings:
 - 400–499 are residential properties,
 - Properties uses outside of 400–499 are considered to be “not residential” or nonresidential.
- Structure Type:
 - For Incident Types 111, 112, and 120–123:
 - 1—Enclosed building, and
 - 2—Fixed portable or mobile structure.
- Fires resulting in total dollar loss of \$1 million or more.

The analyses contained in this report reflect the current methodologies used by the U.S. Fire Administration (USFA). The USFA is committed to providing the best and most current information on the United States fire problem, continually examining its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

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

- ³ Buildings include, but are not limited to, assembly buildings, eating and drinking establishments, educational buildings, institutional buildings, residential buildings, stores and office buildings, basic industry buildings, manufacturing buildings, storage buildings, detached garages, outside or special property buildings and other.
- ⁴ Total loss is comprised of the combined total of property loss and content loss.
- ⁵ James M. Dalton, Robert G. Backstrom, and Steve Kerber, "Structural Collapse: The Hidden Dangers of Residential Fires," fireengineering.com, October 1, 2009. <http://www.fireengineering.com/index/articles/display/9770307568/articles/fire-engineering/volume-162/issue-10/features/structural-collapse.html> (accessed November 2, 2010).
- ⁶ Gregory Havel, "Construction Concerns: Truss Failure," fireengineering.com, December 29, 2008. <http://www.fireengineering.com/index/articles/display/348315/articles/fire-engineering/featured-content/2008/12/construction-concerns-truss-failure.html> (accessed November 2, 2010).
- ⁷ Gerard J. Naylis, "Storage Practices in Warehouses and Distribution Centers," fireengineering.com, February 1, 1999. <http://www.fireengineering.com/index/articles/display/60826/articles/fire-engineering/volume-152/issue-2/departments/industrial-fire-safety/storage-practices-in-warehouses-and-distribution-centers.html> (accessed December 1, 2010).
- ⁸ William R. Sager, "Gridlocked: Poor Circulation Hurts Emergency Response," fireengineering.com, February 1, 2008. <http://www.fireengineering.com/index/articles/display/320693/articles/fire-engineering/volume-161/issue-2/features/gridlocked-poor-circulation-hurts-emergency-response.html> (accessed November 10, 2010).
- ⁹ In NFIRS, confined fires are defined by Incident Type codes 113 to 118.
- ¹⁰ 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.
- ¹¹ There were 10 confined, large loss fires present in NFIRS. Confined fires are defined as small incident fires that are limited in extent and rarely result in serious injury or large content losses. They also are defined as having no significant accompanying property losses due to flame damage. Because of these definitional constraints, the large loss confined fires were not included in the analysis.
- ¹² 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 $(1,000 \times (35/900)) = 38.9$ deaths per 1,000 large loss building fires and the fire injury rate would be $(1,000 \times (100/900)) = 111.1$ injuries per 1,000 large loss building fires. The fire death rate computed from National estimates would be $(1,000 \times (2,690/470,300)) = 5.7$ deaths per 1,000 nonlarge loss building fires and the fire injury rate would be $(1,000 \times (14,325/470,300)) = 30.5$ injuries per 1,000 nonlarge loss building fires. The fire death rate computed from National estimates would be $(1,000 \times (2,725/471,200)) = 5.8$ deaths per 1,000 building fires and the fire injury rate would be $(1,000 \times (14,425/471,200)) = 30.6$ injuries per 1,000 building fires.
- ¹³ 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.
- ¹⁴ The USFA cause hierarchy was used to determine the cause of large loss fire incidents: http://www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.
- ¹⁵ "Maryland County Law Mandates Sprinkler Systems in Single-Family Homes," firechief.com, October 15, 2003. http://firechief.com/awareness/firefighting_maryland_county_law/ (accessed November 10, 2010).
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- ¹⁹ Taylor Timmins, "Gallery Furniture owner 'shocked and stunned' that fire was arson," txcn.com, May 28, 2009. http://www.txcn.com/sharedcontent/dws/txcn/houston/stories/khou090528_tnt_gallery-furniture-fire-arson.25986392.html (accessed October 25, 2010).