Restaurant 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 5,900 restaurant building fires are reported to U.S. fire departments each year and cause an estimated average of 75 injuries and $172 million in property loss.
- Cooking is the leading cause of all restaurant buildings fires at 59 percent. Nearly all of these cooking fires (91 percent) are small, confined fires with limited damage.
- While cooking is the leading cause of all restaurant building fires as well as confined restaurant building fires, electrical malfunction is the leading cause of the larger, nonconfined restaurant building fires.
- Nonconfined restaurant building fires most often start in cooking areas and kitchens (41 percent).
- Deep fryers (9 percent), ranges (7 percent), and miscellaneous kitchen and cooking equipment (5 percent) are the leading types of equipment involved in ignition in nonconfined restaurant building fires.
- Smoke alarms were reported as present in 44 percent of nonconfined restaurant building fires. In addition, full or partial automatic extinguishment systems, mainly sprinklers, were present in 47 percent of nonconfined restaurant building fires.

There are many different types of restaurants from chain restaurants that are found at many locations, including fast food restaurants, to small, family-owned restaurants that limit business to a single location. Restaurants also vary by the different types of food that they prepare and serve to their customers. No matter the type, however, each restaurant poses unique fire risks as it engages in cooking activities and large numbers of customers potentially gather at one time.[1]

From 2007 to 2009, an estimated 5,900 restaurant building fires occurred annually in the United States causing 75 injuries and $172 million in property loss.[2,3,4] Although national estimates resulted in zero restaurant building fire deaths for 2007 to 2009, the potential for fire-related fatalities still exists in these establishments.[5]

This report examines the characteristics of restaurant building fires reported to the National Fire Incident Reporting System (NFIRS) from 2007 to 2009, the most recent data available at the time of this analysis. The NFIRS data are used for the analyses presented throughout the report. For the purpose of the report, the terms "nonresidential fires" and "restaurant fires" are synonymous with "nonresidential building fires" and "restaurant building fires," respectively. "Restaurant fires" is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, "restaurant building fires."

Type of Fire

Building fires are divided into two classes of severity in NFIRS: "confined fires," which are fires confined to certain types of equipment or objects, and "nonconfined fires," which are not. Confined building fires are small fire incidents that are limited in extent, staying within pots or fireplaces or certain other noncombustible containers.[6] 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.[7] Of the two classes of severity, the smaller, confined fires account for 57 percent of restaurant fires. Of these confined fires, cooking is, by far, the predominant type of fire. Nonconfined fires account for the remaining 43 percent of restaurant fires (Table 1).

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

Incident Type	Percent
Confined fires	57.1
Cooking fire, confined to container	46.3
Chimney or flue fire, confined to chimney or flue	3.4
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	1.9
Commercial compactor fire, confined to rubbish	0.2
Trash or rubbish fire, contained	5.0
Nonconfined fires	42.9
Total	100.0

Source: NFIRS 5.0.

Loss Measures

Table 2 presents losses, averaged over the 3-year period of 2007 to 2009, of reported restaurant fires and all other nonresidential fires.[8] The average loss measures for restaurant fires are comparable to those of all other nonresidential fires. The average loss measures for nonconfined restaurant fires, however, are notably higher than the same loss measures for confined restaurant fires. The lower average losses for confined restaurant fires is most likely due to the large number of cooking fires that were confined to cooking vessels and self-extinguished or were extinguished by an occupant of the restaurant before larger losses occurred.

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

Measure	Restaurant Building Fires	**Confined** Restaurant Building Fires	**Nonconfined** Restaurant Building Fires	Nonresidential Building Fires (excluding Restaurant Building Fires)
Average Loss:				
Fatalities/1,000 fires	0.3	0.0	0.8	0.9
Injuries/1,000 fires	10.8	6.9	16.0	10.4
Dollar loss/fire	$25,790	$840	$59,000	$28,130

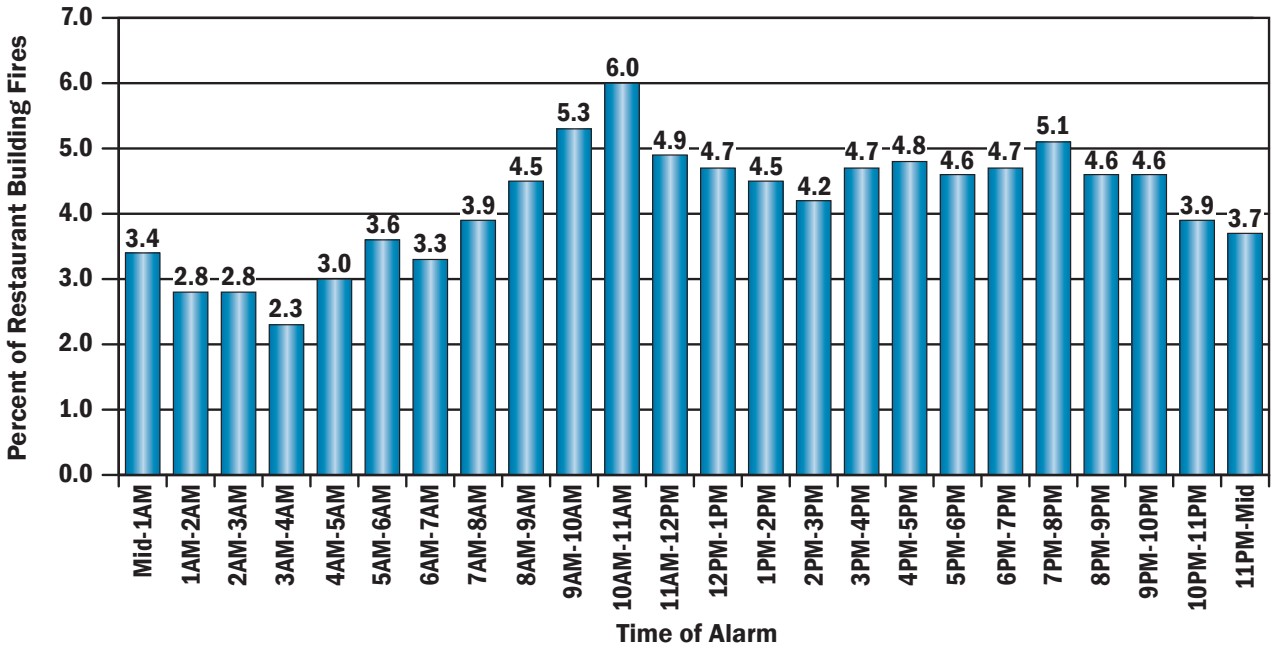
Source: NFIRS 5.0.

Notes: 1) Zero deaths in confined restaurant building fires were reported to NFIRS during 2007–2009; the resulting loss of 0.0 fatalities per 1,000 fires reflects only data reported to NFIRS.
2) Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed ***per fire*** and is rounded to the nearest $10.
3) When calculating the average dollar loss per fire for 2007 to 2009, the 2007 and 2008 dollar loss values were adjusted to their equivalent 2009 dollar loss values to account for inflation.

When Restaurant Building Fires Occur

As shown in Figure 1, restaurant fires occur most frequently in the late morning hours, peaking from 10 to 11 a.m.[9] The frequency of fires remains fairly constant throughout the afternoon and early evening hours with another small peak between 7 and 8 p.m. Fires then decline throughout the late evening hours and are lowest in the early morning hours, when most restaurants are expected to be closed for business, reaching the lowest point from 3 to 4 a.m.

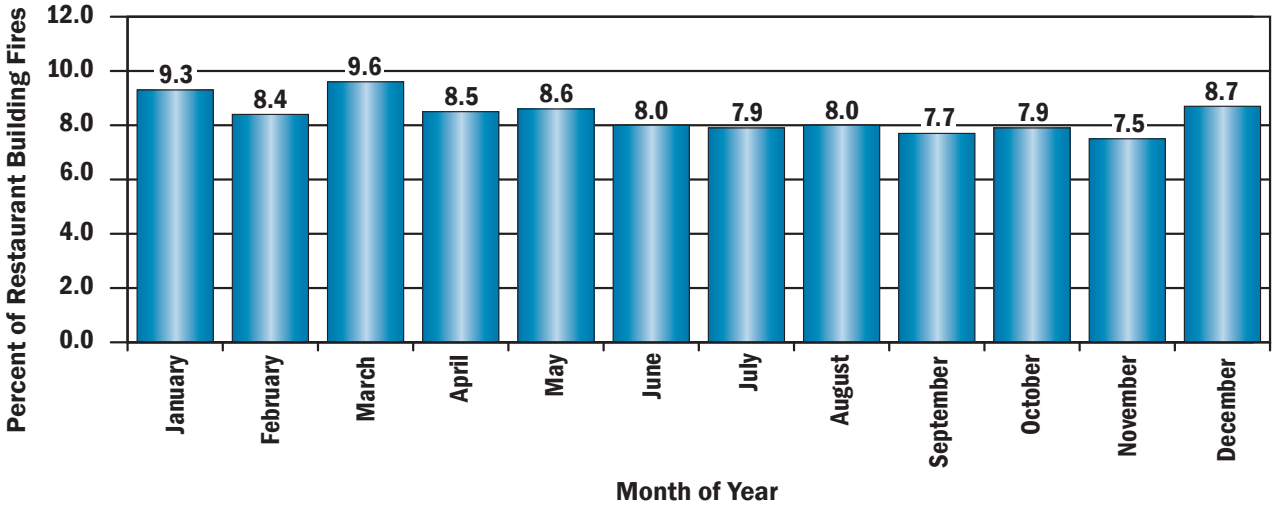
Figure 1. Restaurant Building Fires by Time of Alarm (2007–2009)



Source: NFIRS 5.0.

Figure 2 illustrates that although there is little fluctuation in the number of fires from month to month, the number of restaurant fires is highest from December through March. The incidence of restaurant fires peaks in March at 10 percent and then declines throughout the remainder of the year until December.

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



Source: NFIRS 5.0.

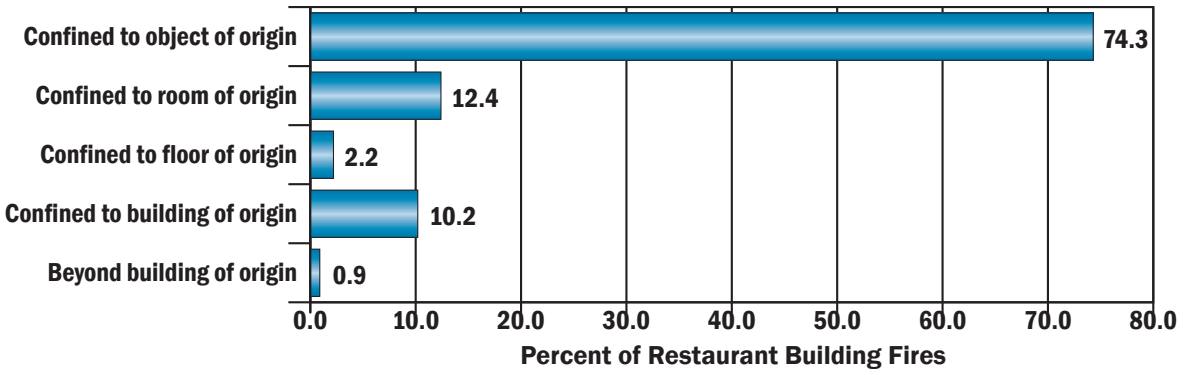
Causes of Restaurant Building Fires

Cooking, not surprisingly, as it is the primary activity of business, is the leading cause of restaurant fires at 59 percent. Nearly all of these cooking fires (91 percent) are small, confined fires with limited damage. Electrical malfunctions and heating, each at 8 percent, are the next leading causes of restaurant fires. Seventy-nine percent of the heating fires are confined fires and almost 100 percent of the electrical malfunction fires are large, nonconfined fires.[10]

Fire Spread in Restaurant Building Fires

Seventy-four percent of restaurant fires are confined to the object of origin (Figure 3). Included in these fires are those coded as "confined fires" in NFIRS. An additional 12 percent are confined to the room of origin. The remaining 13 percent of restaurant fires extend beyond the room of origin.

Figure 3. Extent of Fire Spread in Restaurant Building Fires (2007–2009)



Source: NFIRS 5.0.

Confined Fires

Confined fires are allowed abbreviated NFIRS reporting and many details of these fires that are not required are not reported. As previously discussed, however, it is known that confined fires account for 57 percent of all restaurant fires. Cooking (87 percent) and heating (10 percent) are the top two causes of confined restaurant fires accounting for a total of 97 percent of these types of fires.

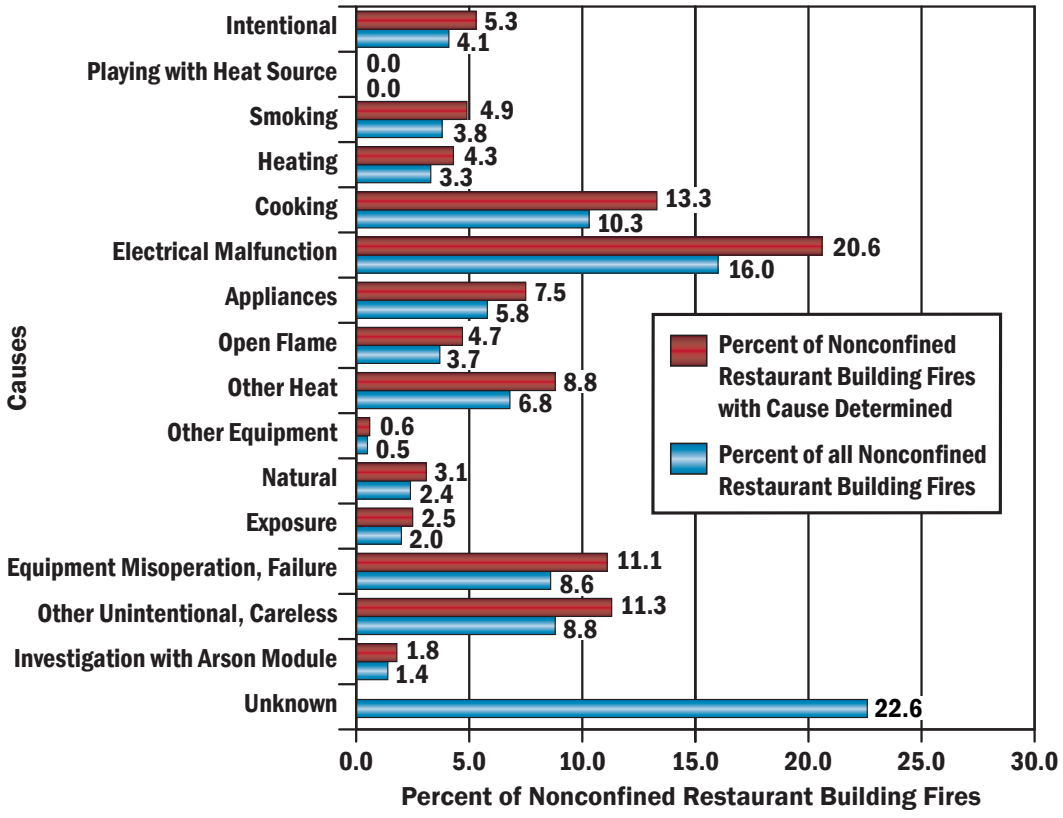
Nonconfined Fires

The next sections of this topical report address nonconfined restaurant fires, the larger and more serious fires, where more detailed fire data are available as they are required to be reported in NFIRS.

Causes of Nonconfined Restaurant Building Fires

While cooking is the leading cause of all restaurant fires as well as confined restaurant fires, it is the second leading cause of nonconfined restaurant fires at 13 percent. Rather, electrical malfunction, at 21 percent, is the leading cause of nonconfined restaurant fires. Carelessness or other unintentional actions and equipment misoperations and failures are the next leading causes, both at 11 percent (Figure 4).

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



Source: NFIRS 5.0.

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

Nonconfined restaurant fires most often start, by far, in cooking areas and kitchens (41 percent) as shown in Table 3. The next leading areas of fire origin, but less common, are fires that start in roof surface areas (6 percent), wall surface areas (6 percent), wall assembly areas (4 percent), attics (4 percent), bathroom areas (3 percent), and ducts (3 percent).

As a reminder, these areas of fire origin do not include areas associated with confined fires. Because confined cooking fires are a substantial percentage of all restaurant fires, it is likely that the kitchen is the leading area of fire origin for all restaurant fires.

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

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	40.8
Roof surface, exterior	5.8
Wall surface, exterior	5.5
Wall assembly, concealed wall space	3.7
Attic	3.7
Bathroom, lavatory, check room	3.2
Ducts	2.6

Source: NFIRS 5.0.

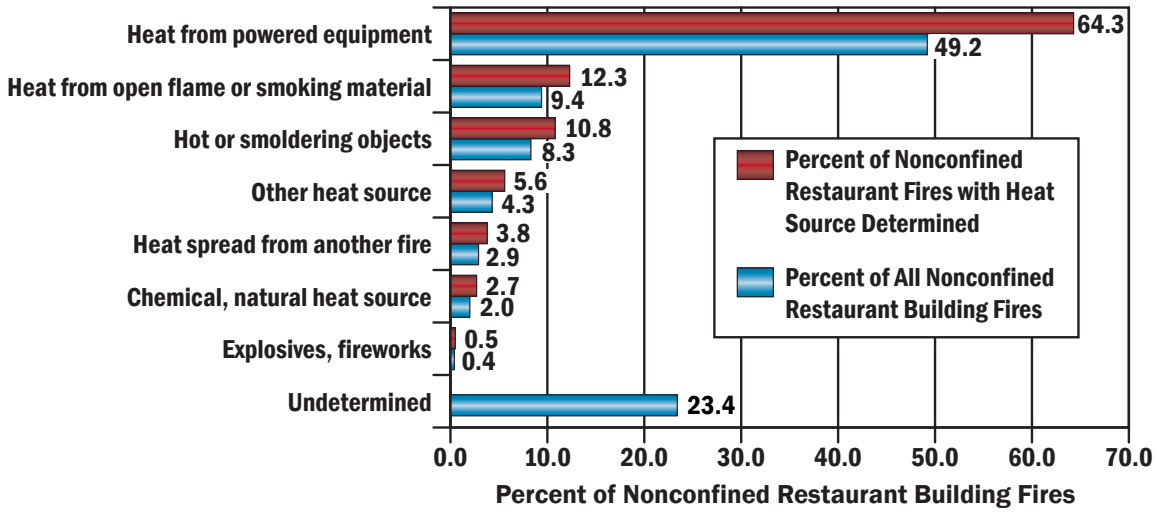
How Nonconfined Restaurant Building Fires Start (Heat Source)

Figure 5 shows sources of heat for nonconfined restaurant fires. The "heat from powered equipment" category accounts for 64 percent of nonconfined restaurant fires. Within this category, electrical arcing accounts for 20 percent, radiated or conducted heat from operating equipment accounts for 17 percent, heat from other powered equipment accounts for 16 percent, and spark, ember, or flame from operating equipment accounts for 11 percent of all nonconfined restaurant fires.

The "heat from open flame or smoking material" category accounts for 12 percent of nonconfined restaurant fires. This category includes items such as heat from miscellaneous open flame or smoking materials (5 percent) and cigarettes (4 percent).

"Hot or smoldering objects" is the third largest category at 11 percent. This category includes items such as miscellaneous hot or smoldering objects (6 percent), and hot embers or ashes (3 percent).

Figure 5. Sources of Heat in Nonconfined Restaurant Building Fires by Major Category (2007–2009)



Source: NFIRS 5.0.

Equipment Involved in Nonconfined Restaurant Building Fires

The three leading types of equipment involved in ignition of nonconfined restaurant fires, as shown in Table 4, are deep fryers (9 percent), ranges (7 percent), and miscellaneous kitchen and cooking equipment (5 percent).[11] The next leading items include electrical wiring, grills, hibachis, barbecues, other heating, ventilation and air-conditioning equipment, and clothes dryers.

Table 4. Leading Equipment Involved in Ignition of Nonconfined Restaurant Building Fires (2007–2009)

Equipment Involved in Ignition	Percent (Unknowns Apportioned)
Deep fryer	9.2
Range with or without oven or cooking surface	7.1
Other kitchen and cooking equipment	5.0
Other electrical wiring	3.0
Grill, hibachi, barbecue	2.9
Other heating, ventilation, and air-conditioning equipment	2.7
Clothes dryer	2.7

Source: NFIRS 5.0.

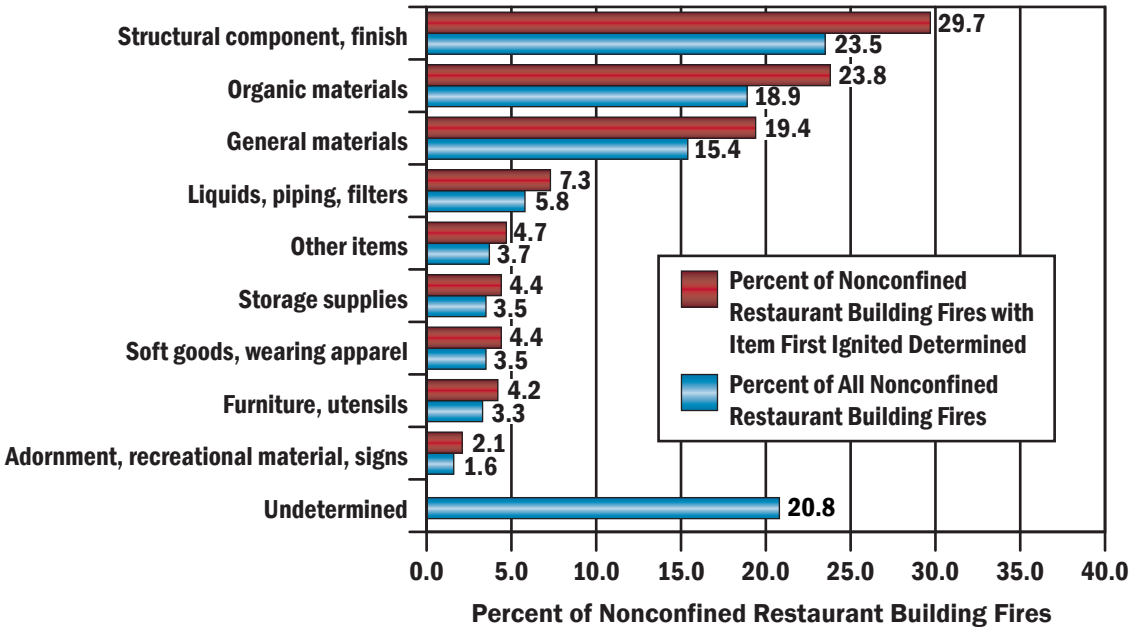
Notes: Fire incidents that have equipment involved in ignition reported as none (Equipment Involved in Ignition code 'NNN'), but have a heat source reported as operating equipment (Heat Source codes 10 to 13) are presumed to have some type of unknown equipment involved in ignition.

What Ignites First in Nonconfined Restaurant Building Fires

Thirty percent of the items first ignited in nonconfined restaurant fires with item first ignited determined fall under the "structural component, finish" category (Figure 6). This category includes exterior roof and sidewall covering as well as structural member or framing. The next leading categories, "organic materials" and "general materials," account for 24 percent and 19 percent, respectively, of nonconfined restaurant fires. These categories include items such as cooking materials, electrical wire and cable insulation, and trash.

Cooking materials (20 percent), electrical wire, cable insulation (11 percent), and structural member and framing (8 percent) are the specific items most often first ignited in nonconfined restaurant fires. Grease (including fat, butter, margarine, and lard) and cooking oil were the types of material first ignited in nonconfined restaurant fires where cooking materials were the items first ignited.[12]

Figure 6. Item First Ignited in Nonconfined Restaurant Building Fires (2007–2009)

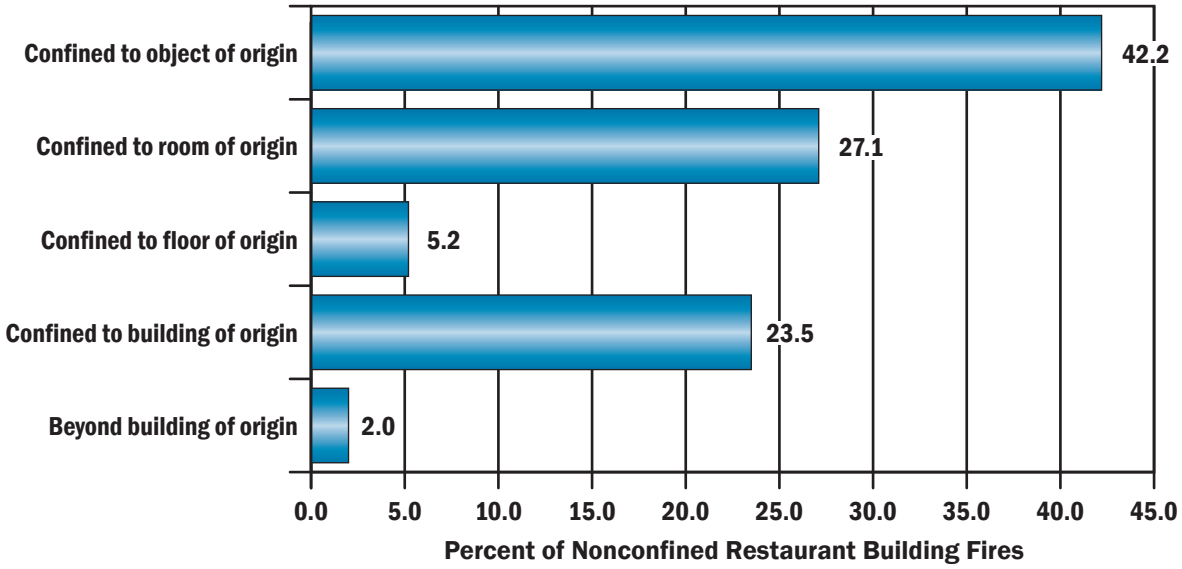


Source: NFIRS 5.0.

Fire Spread in Nonconfined Restaurant Building Fires

Figure 7 shows the fire spread in nonconfined restaurant fires. Forty-two percent of these nonconfined fires are limited to the object of fire origin and do not spread further into the room. An additional 27 percent of fires are confined to the room of origin. The remaining 31 percent of nonconfined restaurant fires extend beyond the room of origin.

Figure 7. Extent of Fire Spread in Nonconfined Restaurant Building Fires (2007–2009)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined Restaurant Building Fires

Table 5 shows the categories of factors contributing to ignition in nonconfined restaurant fires. The leading category of factors contributing to ignition is the "misuse of material or product" (28 percent). Within this category, heat source too close to combustible materials and abandoned or discarded materials account for 11 percent and 9 percent of all nonconfined restaurant fires, respectively.

The "electrical failure, malfunction" category is a contributing factor in 27 percent of nonconfined restaurant fires. "Operational deficiency" at 23 percent and "mechanical failure, malfunction" at 13 percent are the next leading categories.

Miscellaneous electrical failures and malfunctions (12 percent), failure to clean (12 percent), and heat source too close to combustible materials (11 percent) are the specific factors that most contribute to the ignition of nonconfined restaurant fires.

Table 5. Factors Contributing to Ignition for Nonconfined Restaurant Building Fires (Where Factors Contributing to Ignition are Specified, 2007–2009)

Factors Contributing to Ignition Category	Percent of Nonconfined Restaurant Building Fires
Misuse of material or product	28.1
Electrical failure, malfunction	27.1
Operational deficiency	23.2
Mechanical failure, malfunction	12.7
Other factors contributing to ignition	5.7
Fire spread or control	4.9
Design, manufacture, installation deficiency	3.1
Natural condition	1.3

Source: NFIRS 5.0.

Notes: 1) Includes only incidents where factors that contributed to the ignition of the fire were specified.
2) Multiple factors contributing to fire ignition may be noted for each incident; total will exceed 100 percent.

Alerting/Suppression Systems in Restaurant Building Fires

Technologies to detect and extinguish fires have been a major contributor to the drop in fire fatalities and injuries over the past 30 years. Smoke alarm data are available for both confined and nonconfined fires, although, for confined fires, the data are very limited in scope. As different levels of data are collected on smoke alarms in confined and nonconfined fires, the analyses are performed separately. Note that the data presented in Tables 6 to 8 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms in restaurant 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.

Smoke Alarms in Nonconfined Restaurant Building Fires

Smoke alarms were reported as present in 44 percent of nonconfined restaurant fires (Table 6). In 30 percent of nonconfined restaurant fires, there were no smoke alarms present. In another 26 percent of these fires, firefighters were unable to determine if a smoke alarm was present.

When the alarm operational status is considered, the percentage of smoke alarms reported as present (44 percent) consists of:

- smoke alarms present and operated–20 percent;
- smoke alarms present, but did not operate–16 percent (alarm did not operate, 3 percent; fire too small, 13 percent); and
- smoke alarms present, but operational status unknown–9 percent.[13]

When the subset of incidents where smoke alarms were reported as present are analyzed separately and as a whole, smoke alarms were reported to have operated in 45 percent of the incidents and failed to operate in 6 percent. In 29 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 20 percent of these incidents.

Table 6. NFIRS Smoke Alarm Data for Nonconfined Restaurant Building Fires (NFIRS, 2007–2009)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		665	12.8
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	622	12.0
		Smoke alarm alerted occupants, occupants failed to respond	41	0.8
		No occupants	296	5.7
		Smoke alarm failed to alert occupants	18	0.3
		Undetermined	62	1.2
	Smoke alarm failed to operate		141	2.7
	Undetermined		450	8.7
None present			1,553	29.9
Undetermined			1,342	25.9
Total Incidents			5,190	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 restaurant building fires. They are presented for informational purposes.

Smoke Alarms in Confined Restaurant Building Fires

Less information about smoke alarm status is collected for confined fires, but the data still give important insights about the effectiveness of alerting occupants in these types of fires. Smoke alarms operated and alerted occupants in 32 percent of the reported confined restaurant fires (Table 7). Occupants were not alerted by smoke alarms in 25 percent of confined restaurant fires.[14] In 43 percent of these confined fires, the smoke alarm effectiveness was unknown.

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

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	2,223	32.2
Smoke alarm did not alert occupants	1,703	24.7
Unknown	2,982	43.2
Total Incidents	6,908	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 restaurant building fires. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Automatic Extinguishment Systems in Nonconfined Restaurant Building Fires

Overall, full or partial Automatic Extinguishing Systems (AESs), mainly sprinklers, were present in 47 percent of nonconfined restaurant fires (Table 8). AESs were not present in 42 percent of nonconfined restaurant fires. The larger presence of AESs in restaurants is not surprising as the model building codes adopted by many States and local jurisdictions require the installation of automatic sprinkler protection in many new restaurants.[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 AESs in nonconfined restaurant fires.

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

AES Presence	Count	Percent
AES present	2,238	43.1
Partial system present	181	3.5
AES not present	2,168	41.8
Unknown	603	11.6
Total Incidents	5,190	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 restaurant building fires. They are presented for informational purposes.

Examples

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

- August 2010: The Bossier City Fire Department responded to an early morning fire at a fast food restaurant in Bossier City, LA. An investigation by the Bossier City Fire Department's Fire Prevention Bureau found the fire was caused by a piece of kitchen equipment that had been left on overnight. The fire was contained to that piece of equipment and to the exhaust chimney. The restaurant was closed at the time of the fire, the structure sustained no damage, and there were no reported injuries.[16]
- July 2010: Firefighters from three separate fire departments battled flames at a restaurant in Hermosa Beach, CA, after a fire broke out around 7 p.m. in the kitchen's vent system. Although the cause had not yet been released, officials suspect it was a grease fire. Damage remained isolated to the kitchen area and no one was injured.[17]
- May 2010: Fire damaged a restaurant in Pittsburgh, PA, that opened in 1960 and was known as a local historic landmark. Firefighters credited the restaurant's sprinkler system with saving the restaurant after one of the kitchen coolers caught fire. No one was hurt in the fire, but restaurant managers estimated that $20,000 to $30,000 worth of food had to be thrown away. In addition, the restaurant lost appliances and plastic racks, which melted from the heat of the fire.[18]
- January 2010: Firefighters battled an early morning fire that destroyed a family-owned restaurant in Santa Ana, CA. The fire started in the kitchen after an employee accidentally left the grill on for more than 5 hours and radiant heat caught surrounding combustibles on fire. The restaurant was closed when the fire broke out and no injuries were reported.[19]

NFIRS Data Specifications for Restaurant 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.

Restaurant building 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 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.

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are excluded to avoid double counting of incidents.
- Property use 161:

Property Use	Description
161	Restaurant or cafeteria

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

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

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

Notes:

[1] U.S. Fire Administration (USFA), *Restaurant Fires*, October 2004, pg. 1, http://www.usfa.dhs.gov/downloads/pdf/statistics/v4i3.pdf.

[2] National estimates are based on 2007–2009 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and nonresidential 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.

[3] Restaurant buildings are a subset of nonresidential structures and refer to enclosed buildings on restaurant properties. This report examines restaurant building fires to distinguish buildings from other types of structures on restaurant properties that may include fences and open platforms. In NFIRS, version 5.0, restaurant building fires are defined as structure fires where the Structure Type code is 1 or 2 (enclosed building, a fixed portable or mobile structure) with a restaurant property use. In addition, confined fire incidents that have a restaurant property use, but do not have a structure type specified are presumed to be buildings. Nonconfined fire incidents that have a restaurant property use, but do not have a structure type specified are considered to be invalid incidents (structure type is a required field for nonconfined fire incidents) and are not included.

[4] When calculating the average 2007–2009 national estimate of restaurant building fire property loss, the 2007 and 2008 dollar loss values were adjusted to their equivalent 2009 dollar loss values to account for inflation.

[5] When rounded to the nearest 5 as explained in endnote #2, the national estimate of two restaurant building fire deaths results in an estimated zero restaurant building fire deaths for 2007–2009.

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

[7] NFIRS distinguishes between "content" and "property" loss. Content loss includes loss to the contents of a structure due to damage by fire, smoke, water, and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for Incident Type code 118) and hence, there was no property damage (damage to the structure itself) from the flames. There could be, however, property damage as a result of smoke, water, and overhaul.

[8] 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*(0/5,900)) = 0.0 deaths per 1,000 restaurant building fires and the fire injury rate would be (1,000*(75/5,900)) = 12.7 injuries per 1,000 restaurant building fires.

[9] 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.

[10] The USFA cause hierarchy is designed for structure fires. Buildings are a subset of structures. The cause hierarchy was used to determine the cause of restaurant building fire incidents. The cause definitions can be found at: http://www.usfa.fema.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.

[11] Fire incidents that have equipment involved in ignition reported as none (Equipment Involved in Ignition code 'NNN'), but have a heat source reported as operating equipment (Heat Source codes 10 to 13) are presumed to have some type of unknown equipment involved in ignition.

[12] The Type of Material First Ignited field is required only if the Item First Ignited code is 00 or <70. In this case, the Item First Ignited code is 76 (cooking materials). In 36 percent of the cooking material fires, the Type of Material First Ignited was either coded as unknown or missing (null value). When the incidents with unknown types of material ignited are distributed in the same proportion as the incidents with known values, grease and cooking oil were the type of materials first ignited in 85 percent of the nonconfined restaurant fires where cooking materials were the items first ignited. If the unknowns are not apportioned, this percentage would decrease to 54 percent.

[13] Total does not equal 44 percent due to rounding.

[14] In confined fires, the entry "smoke alarm did not alert occupants" can mean: no smoke alarm was present, the smoke alarm was present but did not operate, the smoke alarm was present and operated but the occupant was already aware of the fire, or there were no occupants present at the time of the fire.

[15] International Building Code (IBC) and NFPA 5000, *Building Construction and Safety Code*.

[16] "Fire at Wendy's Restaurant on Airline Drive," www.bossiercity.org, August 19, 2010, http://www.bossiercity.org/news/FIRE-AT-WENDYS-RESTAURANT-ON-AIRLINE-DRIVE--August-19-2010-485/ (accessed January 3, 2011).

[17] Jacqueline Howard, "Manhattan FD Responds to Hermosa Restaurant Fire," www.manhattanbeach.patch.com, July 4, 2010, http://manhattanbeach.patch.com/articles/manhattan-fd-responds-to-hermosa-restaurant-fire (accessed January 3, 2011).

[18] "Fire Damages 5-star Mt. Washington Restaurant," www.thepittsburghchannel.com, May 10, 2010, http://www.thepittsburghchannel.com/r/23504070/detail.html (accessed January 3, 2011).

[19] Denisse Salazar, "Fire Destroys Mexican Restaurant," www.articles.ocregister.com, January 8, 2010, http://articles.ocregister.com/2010-01-08/crime/24634358_1_mexican-restaurant-accidental-fire-heavy-smoke-and-fire (accessed January 3, 2011).