FIRES CAUSED BY SPONTANEOUS COMBUSTION OR CHEMICAL REACTION

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November 2011

National Fire Protection Association
Fire Analysis and Research Division

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Abstract

Fires caused by spontaneous combustion or chemical reaction accounted for an estimated average of 14,070 reported fires per year between 2005 and 2009. These included 3,200 structure fires, 1,150 vehicle fires, 5,250 outside non-trash and unclassified fires, and 4,460 outside trash or rubbish fires. The most common occupancy types for structure fires were residential (50% of fires), storage (12%), mercantile or business (9%) and manufacturing or processing (9%). Half of the vehicle fires (50%) started by spontaneous combustion or chemical reaction occurred in passenger vehicles, and 16% in road freight or transport vehicles. More than one-third of vehicle fires began in the trunk or cargo area. Unclassified organic materials were the most common item first ignited in outside and unclassified fires, (excluding outside trash or rubbish fires) (28%), followed by light vegetation including grass (26%). In outside trash or rubbish fires, wood chips, sawdust, or shavings were the type of material first ignited in 13% of fires.

These estimates are based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

Keywords: fire statistics, spontaneous combustion, spontaneous heating, chemical reaction, spontaneous ignition

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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Executive Summary

Fires caused by spontaneous combustion or chemical reaction accounted for an estimated average of 14,070 fires per year between 2005 and 2009. These included 3,200 structure fires, 1,150 vehicle fires, 5,250 outside non-trash and unclassified fires, and 4,460 outside trash or rubbish fires. The most common occupancy types for structure fires were residential (50% of fires), storage (12%), mercantile or business (9%) and manufacturing or processing (9%). Because the fires are coded as "spontaneous combustion or chemical reaction" there is no way to determine what the exact circumstances were (spontaneous combustion versus some other kind of chemical reaction).

Spontaneous combustion is a byproduct of spontaneous heating, which occurs when a material increases in temperature without drawing heat from its surroundings. If the material reaches its ignition temperature, spontaneous ignition or combustion occurs. Examples of materials that are prone to spontaneous combustion include: oily rags, hay, and other agricultural products.

The statistics in this report are derived from the United States Fire Administration's National Fire Incident Reporting System, (NFIRS), as well as the NFPA annual survey. NFIRS provides the details of fires, and has a code for the "heat source" field which is "Spontaneous combustion, chemical reaction". Because "spontaneous combustion" cannot be separated from other chemical reactions, some fires not caused by "spontaneous heating" are included, but analyzing fires coded this way still gives insight into the problem of spontaneous combustion.

In home structure fires (homes are defined as one- and two-family homes, apartments, and manufactured housing), the garage was the most common area of origin (20% of fires) and oily rags were the most common item first ignited (35%). Abandoned materials were cited as a factor in 34% of home fires, and improper containers or storage was a factor in 33%.

In storage properties, the most common structure use was an outbuilding or shed (35% of fires). Oily rags were the item first ignited in 22% of storage property fires, and agricultural crops, including fruits and vegetables, were first ignited in 20%.

One-quarter (25%) of such fires in mercantile or business properties fires occurred in laundry or dry cleaning occupancies. These fires in mercantile and business properties were less common during "business hours" between 9:00 a.m. and 6:00 p.m. Oily rags were the item first ignited in one-third (34%) of these fires. Improper containers or storage was cited as a factor in 35% of these fires.

Fires caused by spontaneous combustion or chemical reaction in manufacturing properties were more common between 6:00 p.m. and midnight. Oily rags were the item first ignited in one-quarter (26%) of fires, and rubbish, trash, or waste was the item first ignited in 11%.

Half (50%) of the vehicle fires caused by spontaneous combustion or chemical reaction occurred in passenger vehicles. The 16% of fires that occurred in a road freight or transport vehicles caused 25% of the direct property damage. More than one-third (36%) of vehicle fires began in the trunk or cargo area of the vehicle. One-fifth

(20%) of these fires began with flammable or combustible liquids or gases, piping or filter. Nineteen percent began with oily rags.

Outside and unclassified fires (excluding outside trash or rubbish fires) were more likely to be reported during the warmer months and in the afternoon hours (between noon and 6:00 p.m.). Unclassified organic materials were first ignited in 28% of fires, and 26% began with light vegetation, including grass.

Outside trash or rubbish fires were more common during the warmer months (peaking in July), and in the afternoon and early evening hours. Unsurprisingly, the leading item first ignited in these fires was rubbish, trash or waste (22% of fires), followed by oily rags (16%). Abandoned or discarded materials or products was a factor in four-in-ten (41%) of fires of this type.

How can spontaneous combustion be prevented?

Agricultural products: Spontaneous heating in agricultural products can be prevented by control of moisture. Proper drying and adequate airflow will limit heating. Regular checks of temperature should be made.

Oily Rags: Rags that have absorbed oils such as linseed oil or turpentine should be kept in well-covered metal cans and thoroughly dried before collection or transport.[1]

[1]*Fire Protection Handbook*. 20. 1. Quincy, MA: National Fire Protection Association, 2008. 6-288 – 6-292. Print.

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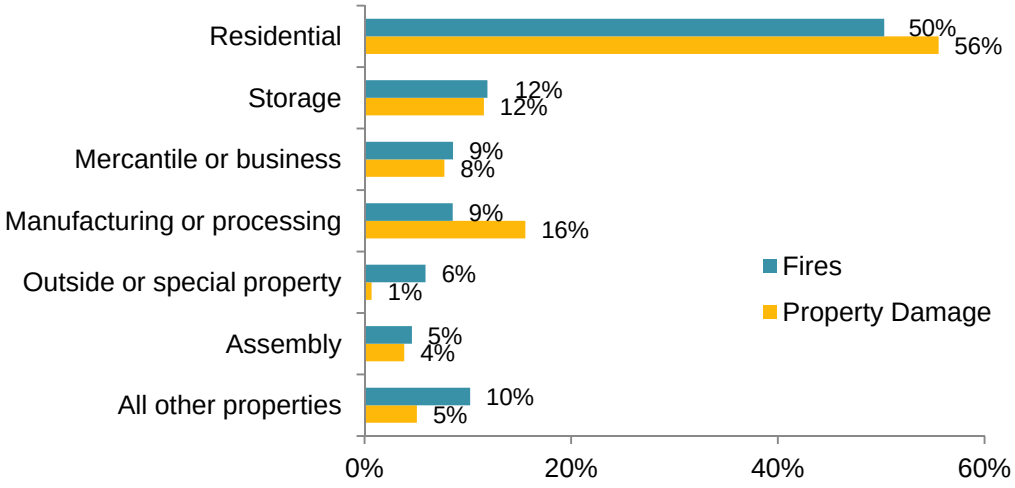
Fires Caused by Spontaneous Combustion or Chemical Reaction Fact Sheet

Fires where the heat source was coded as spontaneous combustion or chemical reaction accounted for an average of 14,070 fires per year between 2005 and 2009. These included

- 3,200 structure fires
- 1,150 vehicle fires
- 5,250 outside non-trash and unclassified fires
- 4,460 outside trash or rubbish fires

Structure Fires Caused by Spontaneous Combustion or Chemical Reaction By Property Use 2005-2009



- In home structure fires, the garage was the most common area of origin (20% of fires) and oily rags were the most common item first ignited (35%).
- In storage properties, agricultural crops, including fruits and vegetables were the item first ignited in 20% of fires. Hay or straw as the most common type of material first ignited (15%) in storage properties.
- One-quarter of fires in mercantile or business properties occurred in laundry or dry cleaning facilities.
- One-quarter of the fires in manufacturing properties began with oily rags.

WHAT IS SPONTANEOUS COMBUSTION?: Spontaneous combustion is a byproduct of spontaneous heating, a process by which a material increases in temperature without drawing heat from its surroundings. If the material reaches its ignition temperature, spontaneous ignition or combustion occurs.

Additional resources can be found at www.nfpa.org

NFPA's Fire Safety Resources

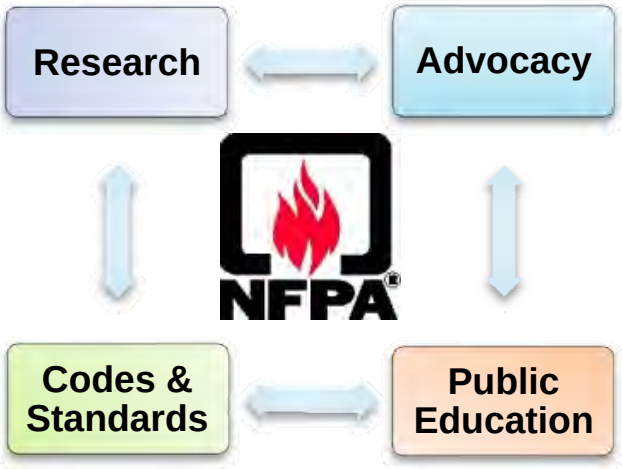
NFPA´s wealth of fire-related research includes investigations of technically significant fire incidents, fire data analysis, and the Charles S. Morgan Technical Library, one of the most comprehensive fire literature collections in the world. In addition, NFPA´s Fire Protection Research Foundation is a source of independent fire test data. Find out more at:

www.nfpa.org/research

Properly installed and maintained smoke alarms are necessary to provide a warning of any fire to all occupants. You can find out more information about smoke alarms here: NFPA Smoke Alarm Information

Home fire sprinkler systems provide even greater protection. These systems respond quickly to reduce the heat, flames, and smoke from a fire until help arrives. More information about home fire sprinklers may be found at www.firesprinklerinitiative.org

Simply put, smoke alarms and fire sprinklers save lives.



NFPA also develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. Among these are:

NFPA1: Fire Code:

NFPA 101: Life Safety Code®:

NFPA 13R: Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height:

For consumers: NFPA has consumer safety information regarding causes, escape planning, fire & safety equipment, and many other topics.

For Kids: Sparky.org has important information for kids delivered via fun games, activities, and cartoons.

For public educators: Resources on fire safety education programs, educational messaging, grants & awards, and many other topics.

Overview
Fires Caused by Spontaneous Combustion or Chemical Reaction

Because the fires are coded as "spontaneous combustion or chemical reaction" there is no way to determine what the exact circumstances were (spontaneous combustion versus some other kind of chemical reaction). This report focuses chiefly on spontaneous combustion, one type of chemical reaction that leads to fires, because leading items first ignited are often consistent with spontaneous combustion. Spontaneous combustion is a byproduct of spontaneous heating, which occurs when a material increases in temperature without drawing heat from its surroundings. If the material reaches its ignition temperature, spontaneous ignition or combustion occurs. Examples of materials that are prone to spontaneous combustion include: oily rags, hay, and other agricultural products[6].

Fires where the heat source was coded as spontaneous combustion or chemical reaction accounted for an average of 14,070 fires per year between 2005 and 2009. These included 3,200 structure fires, 1,150 vehicle fires, 5,250 outside non-trash and unclassified fires, and 4,460 outside trash or rubbish fires. Table A shows fires, civilian deaths, civilian injuries, and property damage by incident type.

Table A.
Fires Caused by Spontaneous Combustion or Chemical Reaction, by Incident Type
2005-2009 Annual Averages

Incident Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Structure fires	3,200	(23%)	6	(93%)	79	(85%)	$118.8	(83%)
Vehicle fires	1,150	(8%)	0	(7%)	6	(6%)	$4.3	(3%)
Outside trash or rubbish fires	4,460	(32%)	0	(0%)	0	(0%)	$1.1	(1%)
Outside non-trash or unclassified fires	5,250	(37%)	0	(0%)	7	(8%)	$18.8	(13%)
Total	14,070	(100%)	7	(100%)	92	(100%)	$143.0	(100%)

Sources: NFIRS 5.0 and NFPA Survey
Sums may not equal totals due to rounding errors

[6] Babrauskas, Vytenis. "Tables and Charts". Fire Protection Handbook. Quincy: National Fire Protection Association, 2008. 6-269 - 6-294.

METHODOLOGY

Statistics were derived from NFIRS 5.0 and NFPA's fire department survey.
Unless otherwise specified, the statistics in this analysis are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies. These estimates are projections based on the detailed information collected in Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

Fires coded as having heat source 72 – "Spontaneous combustion, chemical reaction" are analyzed in this report. A scaling ratio is applied to all calculations based on the proportion of unknown entries in the heat source field. The ratio is calculated separately for confined and non-confined structure fires, outside and other fires, and vehicle fires. Unknowns are allocated proportionally for all other fields, unless otherwise noted. Some common fires are defined as "confined fires" by incident type, and have limited reporting, they are shown separately in tables where applicable. See Appendices A and B for more details

WHAT IS SPONTANEOUS COMBUSTION?

Spontaneous combustion is a byproduct of spontaneous heating, a process by which a material increases in temperature *without* drawing heat from its surroundings. If the material reaches its ignition temperature, spontaneous ignition or combustion occurs.

How does a material spontaneously heat?
Mostly through: exothermic chemical reactions (any chemical reaction that releases heat), biological metabolic reactions (when living things release heat, often as part of respiration, this process can continue even after plants have been harvested), or heat producing physical processes (some materials, like charcoal, release heat when they absorb water). Exothermic chemical reactions are most common.[3]

What types of exothermic reactions usually cause spontaneous combustion?
Generally, spontaneous heating (and eventual ignition) is caused by an oxidation reaction (though polymerization, isomerization, and decomposition are other reactions that can cause spontaneous heating). These reactions are more likely to become problematic in agricultural products that are wet or improperly cured, and those with a high content of oxidizable oils, such as linseed. They also occur in oily rags.

How can spontaneous combustion be prevented?
Agricultural products: Spontaneous heating in agricultural products can be prevented by control of moisture. Proper curing and adequate aeration will prevent heat buildup. Additionally, thermocouples may be used. Regular checks of temperature should be made.

Oily Rags: Rags that have absorbed certain oils, such as linseed oil or turpentine should be kept in well-covered metal cans and thoroughly dried before collection or transport.[4]

[3]Babrauskas, Vytenis. *Ignition Handbook*. Issaquah, WA: Fire Science Publishers, 2003. 373. Print.
[4]*Fire Protection Handbook*. 20. 1. Quincy, MA: National Fire Protection Association, 2008. 6-288 – 6-292. Print.

Section 1.
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction

Spontaneous combustion or chemical reaction was the heat source in 1% of structure fires. Spontaneous combustion or chemical reaction was the heat source in an estimated annual average of 3,200 structure fires that caused $119 million in direct property damage from 2005 to 2009. Half (50%) of these fires occurred in or at residential properties. The other most common property uses were storage (12%), mercantile or business (9%), and manufacturing or processing (9%). Fires at manufacturing or processing properties accounted for 16% of the property damage. Each of these property uses will be analyzed separately in this section, although "residential" will be limited to homes only (homes are defined as one- and two-family homes and apartments). Home fires accounted for 1,480 fires and $65 million in property damage each year. Spontaneous combustion or chemical reaction fires accounted for 0.6% of structure fires overall, but 4.4% of fires in manufacturing or processing facilities, and 1.7% of fires in storage facilities.

Figure 1.
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction
By Property Use 2005-2009

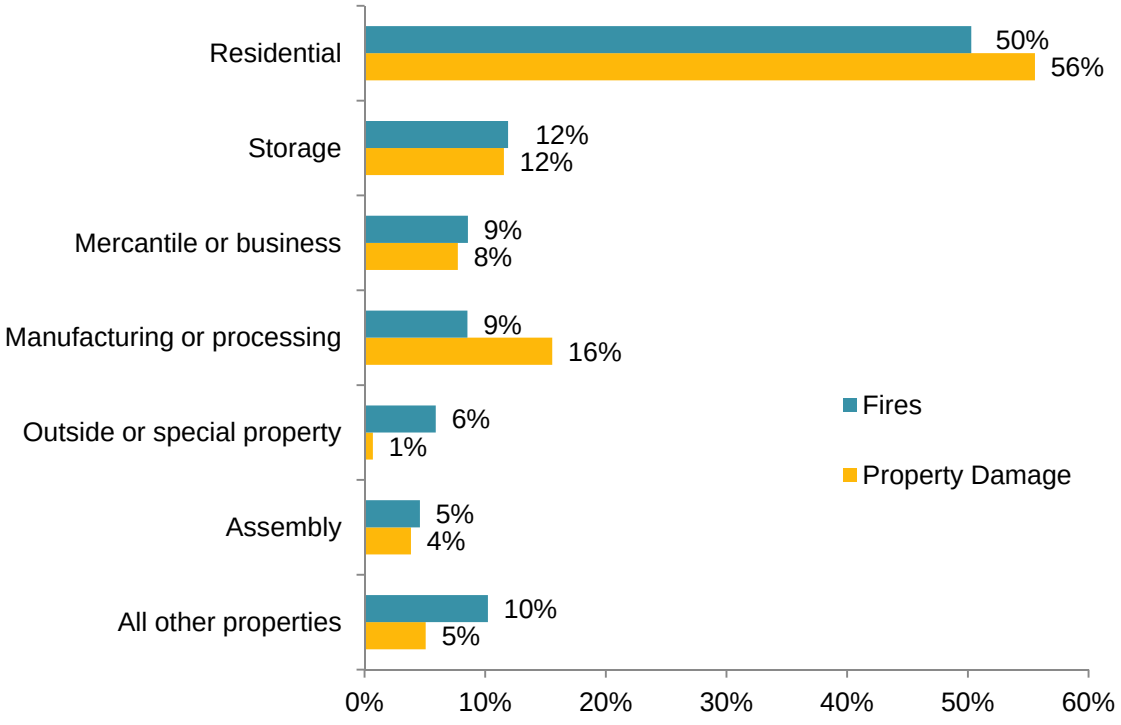


Table 1.
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Property Use
2005-2009 Annual Averages

Property use	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Residential	1,610	(50%)	40	(51%)	$66.0	(56%)
Non-confined fire	1,180	(37%)	40	(51%)	$65.9	(55%)
Confined fire	440	(14%)	0	(0%)	$0.1	(0%)
Storage	380	(12%)	5	(7%)	$13.7	(12%)
Non-confined fire	340	(11%)	5	(7%)	$13.7	(12%)
Confined fire	40	(1%)	0	(0%)	$0.0	(0%)
Mercantile or business	270	(9%)	5	(6%)	$9.2	(8%)
Non-confined fire	190	(6%)	5	(6%)	$9.2	(8%)
Confined fire	80	(3%)	0	(0%)	$0.0	(0%)
Manufacturing or processing	270	(9%)	16	(21%)	$18.5	(16%)
Non-confined fire	180	(6%)	16	(21%)	$18.3	(15%)
Confined fire	90	(3%)	0	(0%)	$0.2	(0%)
Outside or special property	190	(6%)	0	(0%)	$0.8	(1%)
Non-confined fire	50	(2%)	0	(0%)	$0.8	(1%)
Confined fire	140	(4%)	0	(0%)	$0.0	(0%)
Assembly	150	(5%)	3	(4%)	$4.6	(4%)
Non-confined fire	100	(3%)	3	(4%)	$4.5	(4%)
Confined fire	50	(2%)	0	(0%)	$0.0	(0%)
Industrial, utility, defense, agriculture, or mining	100	(3%)	1	(1%)	$3.1	(3%)
Non-confined fire	80	(2%)	1	(1%)	$3.1	(3%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)
Educational	90	(3%)	7	(9%)	$1.7	(1%)
Non-confined fire	40	(1%)	1	(2%)	$1.6	(1%)
Confined fire	50	(2%)	6	(7%)	$0.0	(0%)
Unclassified	80	(2%)	0	(0%)	$1.1	(1%)
Non-confined fire	20	(0%)	0	(0%)	$1.1	(1%)
Confined fire	60	(2%)	0	(0%)	$0.0	(0%)
Health care, detention or correction	60	(2%)	1	(1%)	$0.2	(0%)
Non-confined fire	40	(1%)	1	(1%)	$0.2	(0%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)
Total	3,200	(100%)	79	(100%)	$118.8	(100%)
Non-confined fire	2,210	(69%)	73	(93%)	$118.4	(100%)
Confined fire	990	(31%)	6	(7%)	$0.4	(0%)

Sources: NFIRS and NFPA Survey
Note: Sums may not equal totals due to rounding errors

Section 1A.
Home Structure Fires Caused by Spontaneous-Combustion or Chemical Reaction

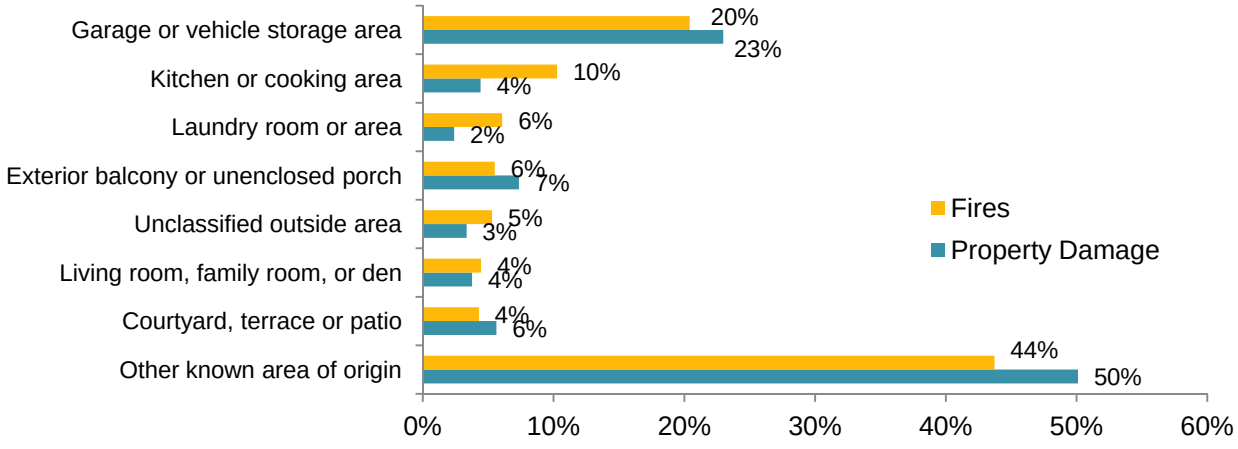
Spontaneous combustion or chemical reaction caused 1,480 home structure fires per year between 2005 and 2009.
These fires were responsible for annual averages of three civilian deaths, 37 civilian injuries and $64.6 million in direct property damage. These represent 0.4% of all home structure fires, 0.3% of home structure fire injuries, and 0.9% of property damage caused by home structure fires.

A disproportionate share of fires and damage occurred in one- and two-family homes.
Table 1A shows that between 2005 and 2009, 89% of home fires and 96% of direct property damage caused by fires started by spontaneous combustion or chemical reaction occurred in one- and two-family homes, the rest occurred in apartments. Overall, 71% of home fires and 84% of home fire deaths occur in one- or two-family homes or manufactured housing (the rest occurred in apartments).[7]

Fires started by spontaneous combustion or a chemical reaction were more common in the afternoon and evening, as well as during the summer months.
Table 2A shows that home fires were spaced fairly evenly through the late night and morning hours, but increased in the late afternoon and early evening hours. Table 3A shows that these fires were more common between the months of May and August.

The garage was the most common area of origin for spontaneous combustion or chemical reaction fires in homes.
One in five (20%) of home fires caused by spontaneous combustion or a chemical reaction began in the garage or vehicle storage area (detached garages are not included here). Ten percent began in the kitchen or cooking area, and 6% began in a laundry room. An additional 6% began on an exterior balcony or unenclosed porch. See Figure 1A and Table 4A for additional information.

Figure 1A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction by Area of Origin: 2005-2009



[7] Marty Ahrens, *Home Structure Fires*, Quincy, MA: National Fire Protection Association, 2011, p 1.

Oily rags were the item first ignited in more than one-third of these fires.
More than one-third (35%) of fires began when oily rags were ignited. Seven percent of fires began when a flammable or combustible liquid or gas ignited, 6% began with rubbish or waste, and 5% began with linen other than bedding. See Table 5A for additional information.

Fabrics, fiber, cotton, blends, rayon or wool were the most common type of material first ignited in fires of this type.
One-quarter (25%) of fires were started when an item made of fabric, fiber, cotton, blend, rayon or wool was ignited. Five percent of fires started when an item made of oilcloth was ignited, and 3% of fires started when an unclassified material compounded with oil ignited. It is possible that oilcloth and material compounded with oil may sometimes be entered for the type of material first ignited when the item first ignited was oily rags. See Table 6A for additional information.

Abandoned materials and improper storage were factors in many fires caused by spontaneous combustion or a chemical reaction.
In one-third of these fires (34%), abandoned or discarded materials were a factor contributing to ignition. Improper containers or storage was a factor in another 33% of these fires. Fires with this contributing factor caused 44% of the property damage. Unclassified misuse of a material or product was a factor in one in nine (11%) fires. See Table 7A for more information.

THE INCIDENT DESCRIBED BELOW HAS SEVERAL CHARACTERISTICS COMMONLY SEEN IN THESE FIRES

In a fire in California, rags soaked with wood stain spontaneously ignited in the garage of a two-family house, and the resulting the spread into the dwelling and to the house next door.

Investigators found that the fire began in a pile of rags a resident had used to apply an oil-based stain to wooden items in the garage and grew until it engulfed both homes.

Damage to the house of origin, valued at $600,000, was estimated at $300,000, and damage to its contents, valued at $100,000, was estimated at $50,000. The abutting house, valued at $500,000, and its contents, valued at $100,000, were destroyed. There were no injuries.[6]

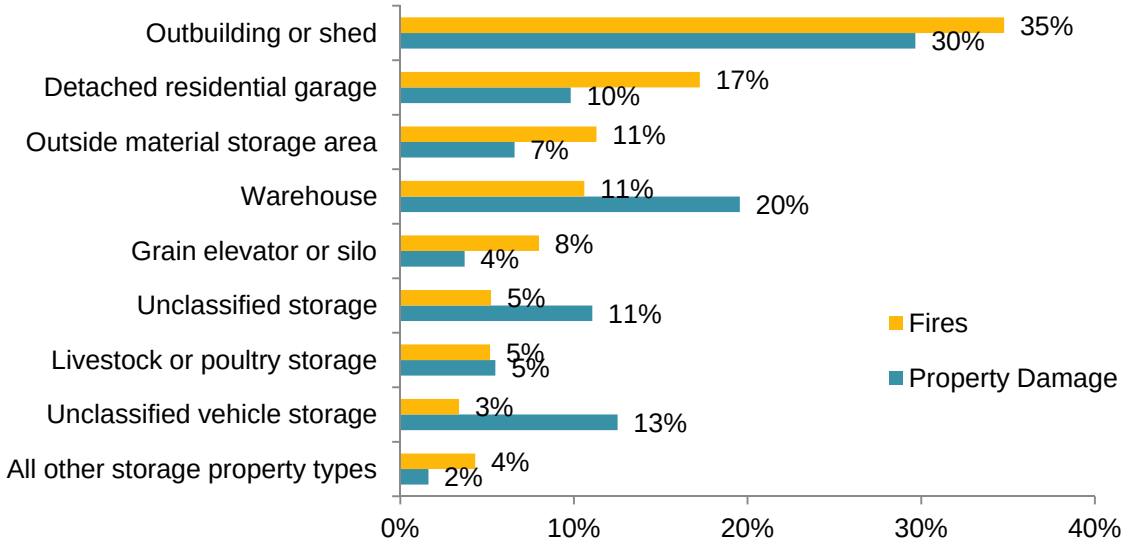
[6]Kenneth J. Tremblay, 2004, "Firewatch," NFPA Journal, September/October, 18. (See full incident description in Appendix C)

Section 1B:
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction in Storage Properties

Storage properties experienced an annual average of 380 structure fires per year started by spontaneous combustion or chemical reaction between 2005 and 2009.
These fires caused annual averages of one civilian death, five civilian injuries, and $13.7 million in direct property damage. Storage properties accounted for 12% of structure fires started by spontaneous combustion or chemical reaction overall. Fires started by spontaneous combustion in storage properties accounted for 2% of all structure fires, 2% of injuries, and 2% of property damage in this property use.

These fires are more common in outbuildings or sheds than other types of storage properties.
Slightly more than one-third (35%) of fires in storage properties occur in outbuildings or sheds, however this is largely due to the fact that 46% of all storage property structure fires occur in outbuildings or sheds. Seventeen percent occur in detached residential garages. Eleven percent of these fires occur in warehouses, but these fires account for 20% of the direct property damage. Spontaneous combustion or chemical reaction caused 2% of all fires in storage properties but 12% of the fires in grain elevators or silos. See Figure 1B below, and Table 1B for more information.

Figure 1B.
Fires Caused by Spontaneous Combustion or Chemical Reaction in Storage Properties by Property Use: 2005-2009

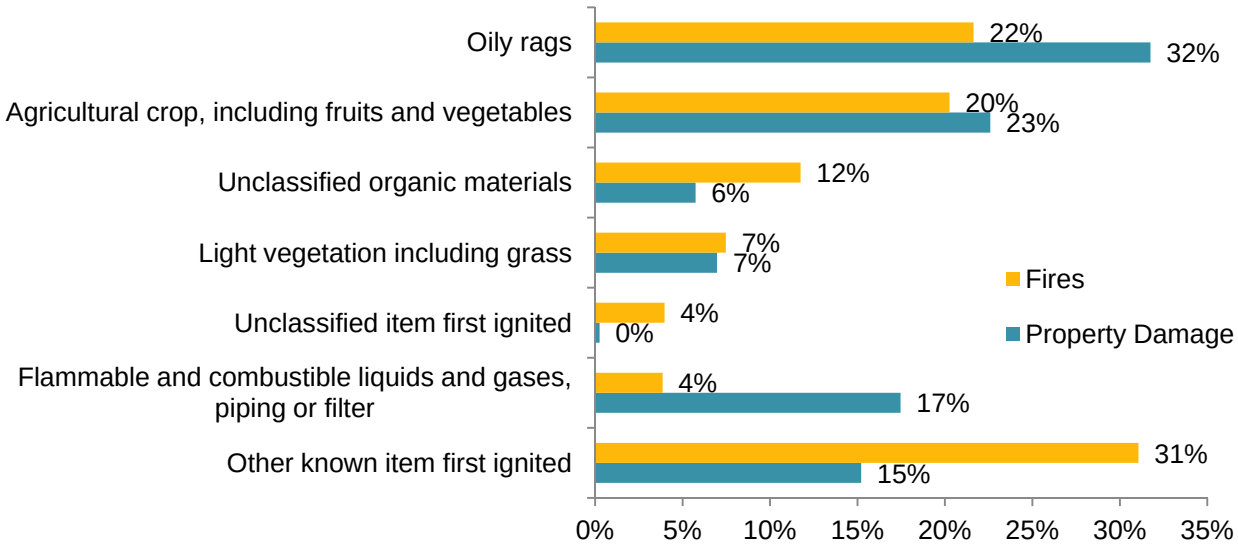


Fires caused by spontaneous combustion or chemical reaction in storage properties were more common during the summer months and the afternoon and early evening hours.
These fires peak between 3:00 p.m. and 9:00 p.m. as one-third (34%) of fires occur during these six hours, (See Table 2B). Half (50%) of the fires in storage properties occurred during the months of May through August. (See Table 3B.)

Most fires in the storage property type are coded as having begun in a "storage-type" area. The "area of origin" field is of somewhat limited use in this property type, but still yields some insights. The most common area of origin was "unclassified storage area" with just over one-quarter (27%) of fires. Seventeen percent of fires began in a garage or vehicle storage area, and 14% began in a storage room, area, tank or bin. (See Table 4B.)

Oily rags and agricultural crops were common items first ignited in these fires. Figure 2B below shows that oily rags were the item first ignited in 22% of fires started by spontaneous combustion or chemical reaction. Plants or plant products were commonly first ignited, as agricultural crops including fruits and vegetables were the item first ignited in one-fifth (20%) of fires. Twelve percent of these fires started with unclassified organic materials, and 7% started with light vegetation, including grass. Flammable or combustible liquids and gases, piping or filters were the item first ignited in 4% of fires, but these fires caused 17% of the direct property damage. (See Table 5B.)

Figure 2B.
Fires Caused by Spontaneous Combustion or Chemical Reaction in Storage Properties by Item First Ignited: 2005-2009



Hay or straw was the most common type of material first ignited. Hay or straw was the type of material first ignited in 15% of fires started by spontaneous combustion or a chemical reaction in storage properties. One in nine fires (11%) began with something made out of fabric, fiber, cotton, blends, rayon or wool. (See Table 6B.)

Unclassified natural conditions and improper storage or containers were the most common factors contributing to ignition
Just over one-quarter of these fires (28%) had an unclassified natural condition contributing to their ignition. Improper containers or storage was a factor in one-quarter (24%) of these fires. Improper storage was a factor in the incident described on the next page. Abandoned or discarded materials or products were a factor in one-fifth (21% of fires). (See Table 7B.)

FIRE PROTECTION DEVICES CONTAIN FIRE IN FURNITURE WAREHOUSE, NORTH CAROLINA

An automatic sprinkler system, a roll-down fire door, and a fire wall prevented a fire from seriously damaging a furniture warehouse.

The fire began among rags soiled with a flammable stain that had been left overnight with other combustible trash in a plastic trash barrel instead of in the metal trash cans with self-closing lids provided for such material. The rags spontaneously ignited, and flames spread to the other rubbish and a work bench, melting a nearby 165°F overhead sprinklers also activated and contained the fire.

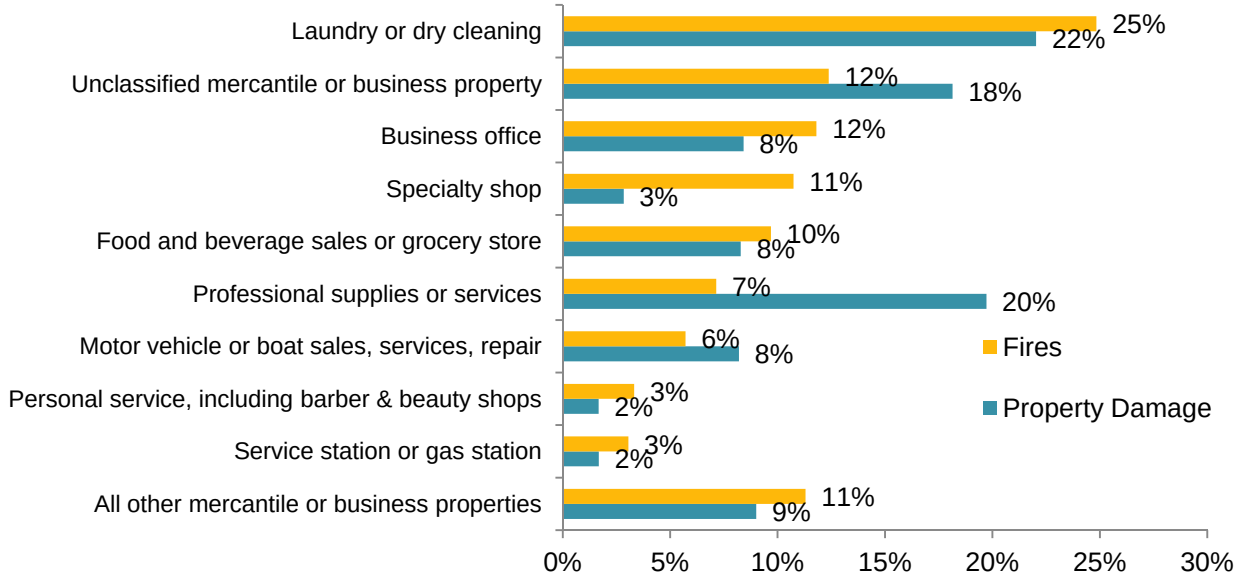
Damage to the building, valued at $85 million, and its contents, valued at $5 million, was estimated at $7,200.[7]

[7]Kenneth J. Tremblay, 1995, "Firewatch", NFPA Journal, November/December, 38. (See full incident description in Appendix C.)

Section 1C:
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction in Mercantile or Business Properties

An estimated 270 structure fires caused by spontaneous combustion or a chemical reaction occurred in mercantile or business properties per year between 2005 and 2009.
These fires caused estimated annual averages of 5 civilian injuries and $9.2 million in property damage per year. One-quarter of fires in these occupancies (25%) occurred in laundry or dry cleaning occupancies (6% of all structure fires in laundry or dry cleaning properties are caused by a chemical reaction or spontaneous combustion). Figure 1C below and Table 1C show additional information.

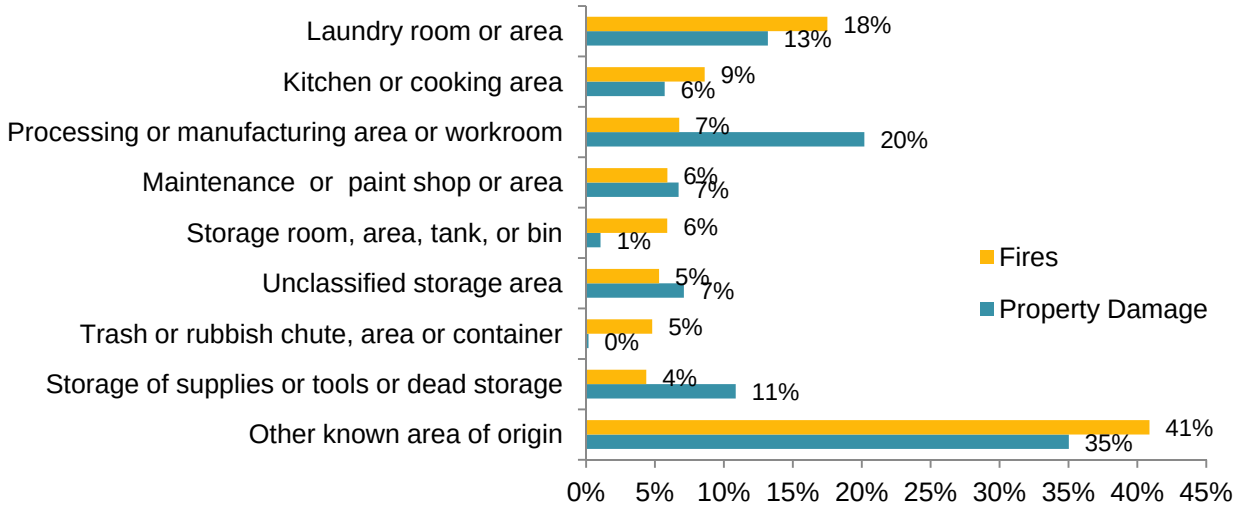
Figure 1C.
Fires Caused by Spontaneous Combustion or Chemical Reaction in Mercantile or Business Properties by Property Use: 2005-2009



These fires are less common during "business hours".
The most common month for these fires is July (11%), however, the next most common month is March (10%) (See Table 2C). Fires in these properties are less likely during the "business hours". Only twenty-nine percent of fires occurred between 9:00 a.m. and 6:00 p.m. This timeframe represents 38% of hours in a day (See Table 3C). Because spontaneous heating takes time to occur, it seems likely that these fires are more common in off hours because no one is around to monitor the situation.

The most common area of origin for these fires was the laundry room.
Nearly one in five (18%) fires began in a laundry room or area. Many of these fires are in laundry or dry cleaning properties. Nine percent of fires began in the kitchen or cooking area. Seven percent of fires began in a process or manufacturing area, or a workroom, but these fires caused 20% of the direct property damage. (See Table 4C and Figure 2C.)

Figure 2C.
Fires Caused by Spontaneous Combustion or Chemical Reaction in Mercantile or Business Properties -- by Area of Origin: 2005-2009



Oily rags were most common item first ignited in structure fires started by spontaneous combustion or a chemical reaction in business or mercantile properties.
One-third (34%) of fires began with oily rags. One in five began with linens other than bedding. This makes sense, given the prevalence of laundry fires in these properties. Six percent of fires began with rubbish or waste. (See Table 5C.)

Nearly half of fires in these properties began with a material made out of fabric, fiber, cotton, blends, rayon or wool.
Almost half (46%) of fires began with fabric, fiber, cotton, blends, rayon, or wool, and these fires were responsible for 66% of the property loss. The next largest share was oilcloth, with only 5% of fires. Five percent of fires began with an unclassified material that was compounded with oil. (See Table 6C.)

Improper storage or container was a factor in more than one-third of these fires.
Thirty-five percent of fires had improper container or storage as a contributing factor. In 28% of fires, abandoned or discarded materials or products were a factor. (See Table 7C.)

Pre-soaking heavily oiled fabrics and then spreading them out while they dry are ways to lessen the likelihood of spontaneous ignition fires involving laundry.
According to a report presented to the United States Consumer Product Safety Commission, the best way to clean a heavily oiled towel is to presoak the towel with detergent, then immediately wash it.[8] Another article, published in the journal *Problems of Forensic Sciences*, recommends either running a cooling cycle on the dryer or spreading the materials out to cool (not leaving them heaped within the dryer or in piles on other surfaces.[9]

[8] The Soap and Detergent Association. Removal of Cooking Oil from Cotton Terry Cloth Towels. Presentation to the Consumer Product Safety Commission. September 30, 1996. http://www.cpsc.gov/library/foia/foia97/os/os3.pdf.
[9] Nic Daéid, Niahm, Caroline Maguire, and Alisa Walker. "An Investigation into the Causes of Laundry Fires - Spontaneous Combustion of Residual Fatty Acids." *Problems of Forensic Sciences*. XLVI. (2001): 272-277. Print. <http://www.forensicscience.pl/pfs/46_daeid4.pdf>.

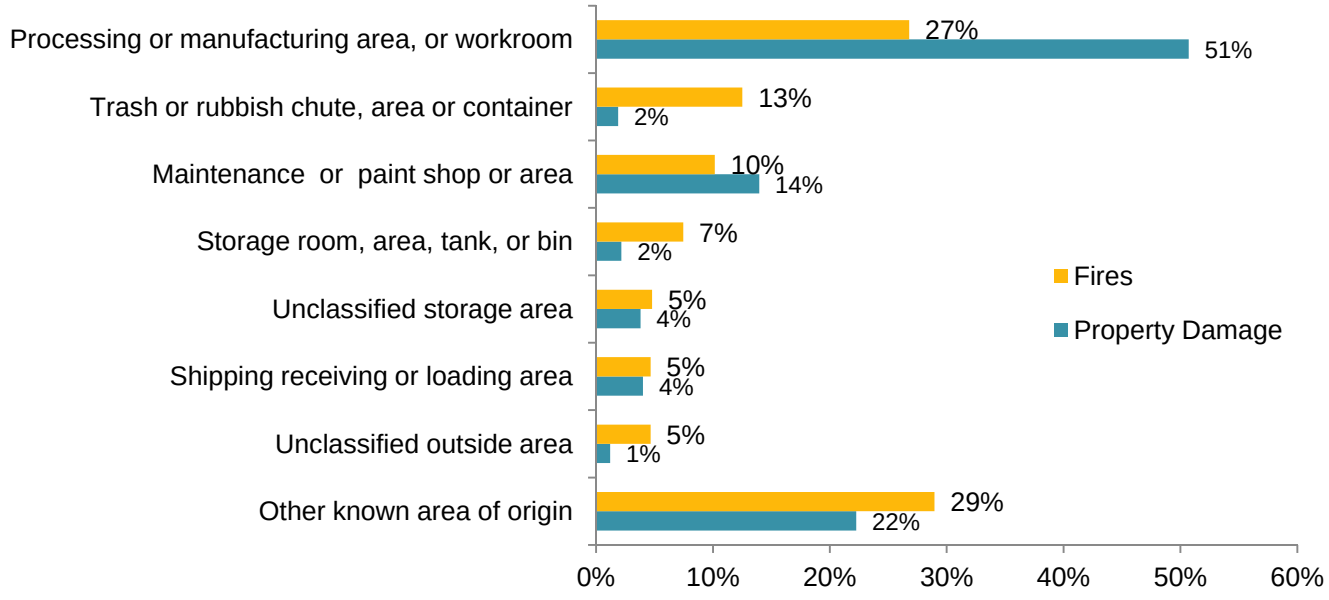
Section 1D:
Structure Fires Caused by Spontaneous Combustion or Chemical Reaction in Manufacturing or Processing Properties

An estimated 270 structure fires caused by spontaneous combustion or a chemical reaction were reported in manufacturing or processing properties per hear between 2005 and 2009. These fires caused estimated averages of one civilian death, 16 civilian injuries and $18.5 million in property damage per year. Even though only 9% of structure fires caused by spontaneous combustion or chemical reaction occurred in these properties, these fires were responsible for 21% of civilian injuries and 16% of property damage.

Spontaneous combustion or chemical reaction fires in manufacturing or processing facilities are slightly more likely during the warm-weather months and in the evening hours.
One-third (34%) of fires occurred between 6:00 p.m. and midnight, which is more than average, as these hours represent 25% of the time in a day. Fires are also slightly more likely to occur between May and August, and much less likely to occur in November or December. (See Tables 1D and 2D.)

The most common area of origin was a processing or manufacturing area or workroom. Slightly more than one-quarter (27%) of fires began in a processing or manufacturing area or workroom; these fires caused half (51%) of the dollar loss. Thirteen percent of fires began in a trash or rubbish chute area or container. One of every ten (10%) incidents began in a maintenance or paint shop area. (See Table 3D.)

Figure 1D.
Structure Fires and Property Damage Caused by Spontaneous Combustion or Chemical Reaction in Manufacturing or Processing Properties by Area of Origin: 2005-2009



Oily rags were the most common item first ignited when spontaneous combustion or a chemical reaction was the cause of a fire in manufacturing or processing properties.
One-quarter (26%) of fires started when oily rags ignited. Rubbish, trash, or waste was the item first ignited in 11% of fires. One in ten fires (10%) began when a flammable or combustible liquid or gas, piping or filter ignited; these fires caused one-third (31%) of the direct property damage. (See Table 4D.)

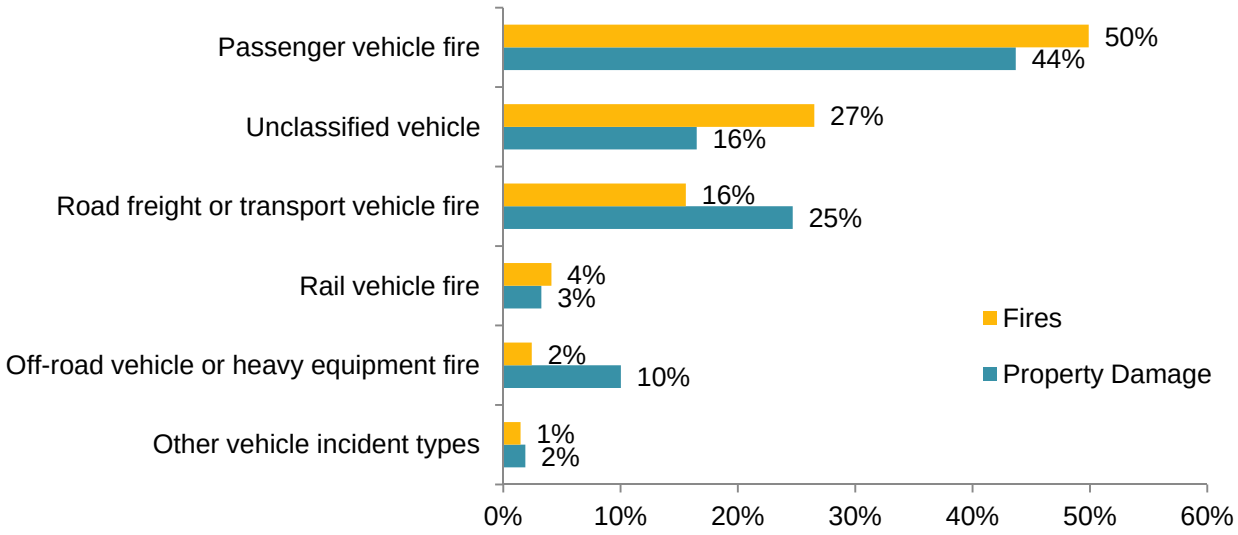
More fires started with fabric, fiber, cotton, blends, rayon, or wool than any other type of material.
Thirteen percent of fires began when something made of fabric, fiber, cotton, blends, rayon or wool ignited (not surprising, given the prevalence of oily rags in the "item first ignited" field. (See Table 5D.)

An improper container or storage method was a factor in almost one-third of fires in manufacturing or processing facilities.
Improper container or storage contributed to ignition in 29% of fires. One-quarter (26%) of the fires involved abandoned or discarded materials or products. (See Table 6D.)

Section 2:
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction

1,150 fires caused by spontaneous combustion or chemical reaction in vehicles were reported to local fire departments per year.
Between 2005 and 2009, spontaneous combustion or chemical reaction caused an estimated annual average 1,150 vehicle fires. These fires were responsible for annual averages of 6 civilian injuries and $4.3 million in property damage. No deaths were reported. Half (50%) of the vehicle fires caused by spontaneous combustion or chemical reaction occurred in passenger vehicles. The 16% of fires that occurred in a road freight or transport vehicles caused 25% of the direct property damage. Figure 2-A has details on fires and property damage by incident type.

Figure 2-A.
Fires Caused by Spontaneous Combustion or Chemical Reaction in Vehicles by Incident Type: 2005-2009



Vehicle fires caused by spontaneous combustion or chemical reaction are more common during the afternoon hours and during the warmer months.
Spontaneous combustion fires in vehicles are more common between the house of noon and 6:00 p.m. and much less common between midnight and 6:00 a.m. (See Table 2-1). These fires are also more common during the warmer months of May through August. (See Table 2-2.)

The most common area of origin for these fires was the trunk or cargo area.
More than one-third (36%) of fires caused by spontaneous combustion or chemical reaction in fires in vehicles began in the trunk or cargo area. One-fifth (22%) of the fires began in the engine, running gear, or wheel area. (See Table 2-3.)

Improper container or storage was cited as a factor in nearly one-quarter of these fires.
One-quarter (24%) of vehicle fires caused by spontaneous combustion or chemical reaction involved an improper container or improper storage. Nearly one-fifth (18%) involved a

mechanical failure or malfunction. Twelve percent of fires had abandoned or discarded materials cited as a factor. (See Table 2-4.)

A flammable or combustible liquid or gas, piping or filter was the most common item first ignited in this type of fire.
One-fifth (20%) of these fires began with flammable or combustible liquids or gases, piping or filter. Nineteen percent began with oily rags, and 9% started with an unclassified item. (See Table 2-5.)

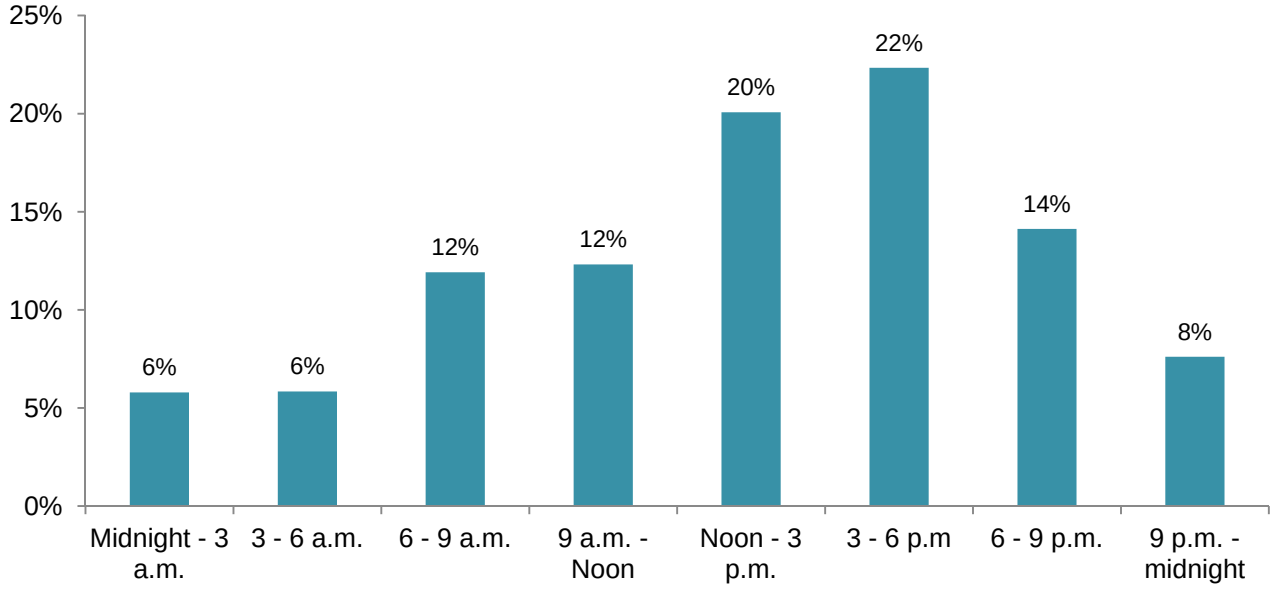
The most common type of material first ignited in vehicle fires caused by spontaneous combustion or chemical reaction was fabric, fiber, cotton, blends, rayon or wool.
Fifteen percent of fires began when something made of fabric, fiber, cotton, blends, rayon or wool ignited. Eight percent of these fires began when something made of plastic ignited. (See Table 2-6.)

Section 3:
Outside Fires (Excluding Trash or Rubbish Fires) Caused by Spontaneous Combustion or Chemical Reaction

Fires started by spontaneous combustion or chemical reaction are more common outside than in or on structures.
Between 2005 and 2009, an average of 5,250 outside (excluding outside trash or rubbish fires) spontaneous combustion fires were reported to local fire departments per year. These fires were responsible for seven injuries and $18.8 million in direct property damage per year. No deaths were reported.

Outdoor spontaneous combustion or chemical reaction fires are more likely to be reported during warmer months and during the afternoon hours.
Figure 3-A and Table 3-1 show that these fires are more common between the hours of noon and 6:00 p.m. In fact, 42% of fires occur during these hours, even though they only make up 25% of the hours in a day. Table 3-2 shows that these fires are more common in the warmer months, reaching a plateau between May and July.

Figure 3-A.
Outside Fires Caused by Spontaneous Combustion or Chemical Reaction by Hour of Alarm: 2005-2009



Unclassified organic material was the most common item first ignited in these fires.
More than one-quarter (28%) of fires began when an unclassified organic material ignited. One-quarter (26%) of these fires began with light vegetation, including grass. Twelve percent began with some sort of agricultural crop; these fires caused 33% of the property damage. In contrast to many structure fires, oily rags were a less common item first ignited, representing only 3% of outdoor fires (excluding outdoor trash or rubbish fires). (See Table 3-3.)

Wood chips, sawdust, or shavings were the most common type of material first ignited in outdoor fires caused by spontaneous combustion or chemical reaction.
One-fifth (20%) of these fires began when something made of wood chips, sawdust, or shavings ignited. One in ten (10%) began with something made of an unclassified natural product, and 9% with hay or straw. (See Table 3-4.)

Fires of this type were common on open lands, beaches, or campsites.
More than one-quarter (27%) of fires began on a property used as open land, beach, or campsite. Twelve percent began at one- or two-family homes, and 10% began on a highway, street, or parking area. Eight percent of these fires began at an unclassified storage property, but they caused 25% of the property damage. (See Table 3-5.)

Many factors play a role in spontaneous combustion of yard trimmings.
According to a literature review published in the journal *Compost Science and Utilization*, spontaneous combustion in yard trimmings is affected by several factors, including moisture content, particle size, type of material, and in what size piles it is stored.[10]

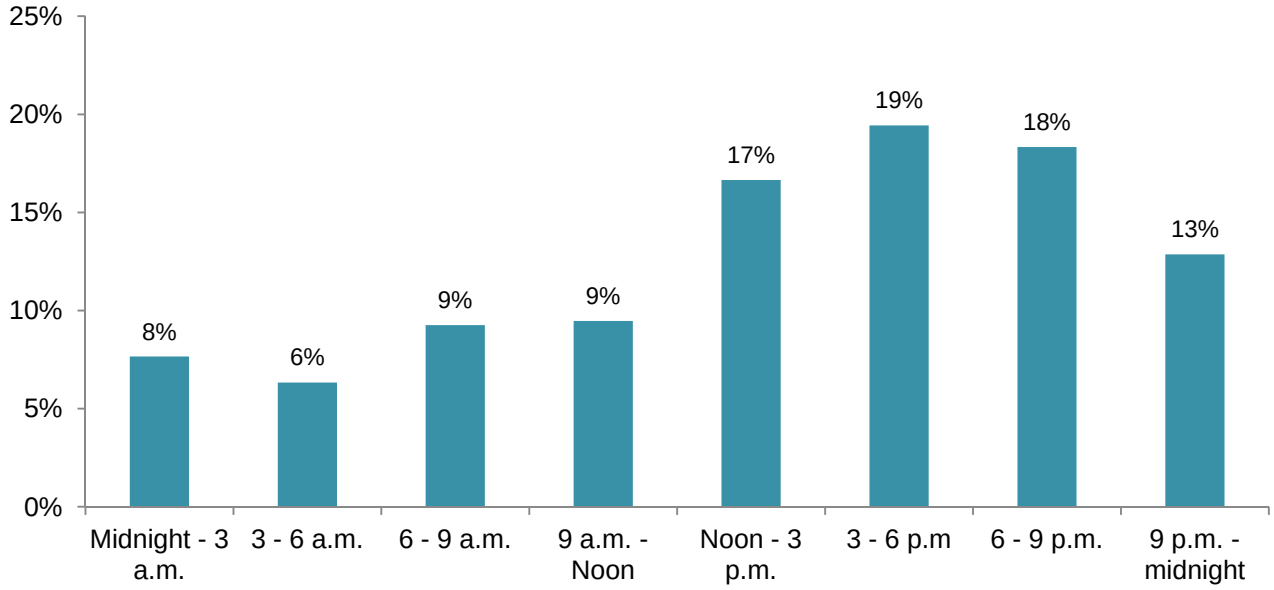
[10]Buggeln, Richard, and Robert Rynk. "Self-Heating In Yard Trimmings: Conditions Leading To Spontaneous Combustion." *Compost Science & Utilization*. 10.2 (2002): 162-182. Print.

Section 4:
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction

Between 2005 and 2009, 4,460 outside trash or rubbish fires caused by spontaneous combustion or a chemical reaction were reported each year.
These fires were not responsible for any civilian deaths or injuries, but caused $1.1 million in direct property damage annually. Fires caused by spontaneous combustion or chemical reaction were responsible for 2% of all outside trash or rubbish fires.

Fires of this type are more common during the warmer months and the afternoon and early evening hours.
Outside trash or rubbish fires caused by spontaneous reaction or a chemical combustion were more common between the hours of noon and 9:00 p.m. (See Table 4-1 and Figure 4-A). Table 4-2 shows that these fires were also more common during the warmer months between May and September, peaking in July.

Figure 4-A.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction by Hour of Alarm: 2005-2009



Not surprisingly, rubbish, trash, or waste was the most commonly coded item first ignited in these fires.
One-fifth (22%) of these fires began when rubbish, trash, or waste ignited. Oily rags were the item first ignited in 16% of these fires. Unclassified organic materials were first ignited in 15% of fires, and light vegetation, including grass in 11%. (See Table 4-3.)

Wood chips, sawdust, or shavings were the most common type of material first ignited.
In outside trash or rubbish fires started by spontaneous combustion or a chemical reaction, wood chips, sawdust, or shavings were the type of material ignited 13% of the time. Fabric, fiber, cotton, blends, rayon, or wool were first ignited in one in ten (10%) fires. (See Table 4-4.)

Abandoned or discarded materials or products were a factor in more than four-in-ten of these fires.
Abandoned or discarded materials or products were a factor in 41% of these fires. An unclassified natural condition was a factor in 24% of fires, and 18% of outside trash or rubbish fires caused by spontaneous combustion or a chemical reaction involved improper container or storage. (See Table 4-5.)

Table 1A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Property Use
2005-2009 Annual Averages

Property Use	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
One- and two-family homes	1,320	(89%)	34	(93%)	$62.1	(96%)
Non-confined fire	980	(67%)	34	(93%)	$62.0	(96%)
Confined fire	330	(23%)	0	(0%)	$0.1	(0%)
Apartments	160	(11%)	3	(7%)	$2.5	(4%)
Non-confined fire	110	(7%)	3	(7%)	$2.5	(4%)
Confined fire	50	(3%)	0	(0%)	$0.0	(0%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)
Non-confined fire	1,090	(74%)	37	(100%)	$64.5	(100%)
Confined fire	380	(26%)	0	(0%)	$0.1	(0%)

Table 2A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Time of Day
2005-2009 Annual Averages

Time of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	170	(11%)	6	(18%)	$9.6	(15%)
3 - 6 a.m.	140	(10%)	4	(11%)	$8.2	(13%)
6 - 9 a.m.	150	(10%)	3	(7%)	$5.2	(8%)
9 a.m. - Noon	130	(9%)	4	(10%)	$2.4	(4%)
Noon - 3 p.m.	200	(13%)	5	(13%)	$5.3	(8%)
3 - 6 p.m.	250	(17%)	8	(20%)	$8.0	(12%)
6 - 9 p.m.	250	(17%)	4	(10%)	$17.3	(27%)
9 p.m. - midnight	200	(13%)	4	(10%)	$8.6	(13%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118).

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	80	(6%)	2	(4%)	$2.4	(4%)
February	70	(5%)	1	(2%)	$2.6	(4%)
March	110	(7%)	6	(16%)	$4.4	(7%)
April	140	(9%)	10	(26%)	$3.6	(6%)
May	160	(11%)	2	(6%)	$8.1	(13%)
June	170	(11%)	3	(7%)	$12.3	(19%)
July	180	(12%)	2	(6%)	$6.7	(10%)
August	170	(11%)	2	(6%)	$10.3	(16%)
September	140	(9%)	2	(4%)	$4.8	(7%)
October	110	(8%)	4	(10%)	$3.1	(5%)
November	80	(6%)	2	(6%)	$1.4	(2%)
December	80	(5%)	3	(7%)	$4.7	(7%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Area of Origin
2005-2009 Annual Averages

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Garage or vehicle storage area*	300	(20%)	9	(25%)	$14.8	(23%)
Non-confined fire	230	(16%)	9	(25%)	$14.8	(23%)
Confined fire	70	(5%)	0	(0%)	$0.0	(0%)
Kitchen or cooking area	150	(10%)	5	(13%)	$2.9	(4%)
Non-confined fire	100	(7%)	5	(13%)	$2.8	(4%)
Confined fire	50	(4%)	0	(0%)	$0.0	(0%)
Laundry room or area	90	(6%)	1	(3%)	$1.5	(2%)
Non-confined fire	70	(4%)	1	(3%)	$1.5	(2%)
Confined fire	20	(2%)	0	(0%)	$0.0	(0%)
Exterior balcony, unenclosed porch	80	(6%)	1	(1%)	$4.8	(7%)
Non-confined fire	80	(5%)	1	(1%)	$4.8	(7%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified outside area	80	(5%)	2	(5%)	$2.2	(3%)
Non-confined fire	40	(3%)	2	(5%)	$2.2	(3%)
Confined fire	40	(2%)	0	(0%)	$0.0	(0%)
Common room, living room, family room, lounge or den	70	(4%)	2	(6%)	$2.4	(4%)
Non-confined fire	50	(4%)	2	(6%)	$2.4	(4%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Courtyard, terrace or patio	60	(4%)	0	(0%)	$3.6	(6%)
Non-confined fire	40	(3%)	0	(0%)	$3.6	(6%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)
Unclassified function area	50	(3%)	1	(3%)	$1.4	(2%)
Non-confined fire	40	(3%)	1	(3%)	$1.4	(2%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Exterior wall surface	50	(3%)	1	(1%)	$2.9	(4%)
Non-confined fire	40	(3%)	1	(1%)	$2.9	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified storage area	50	(3%)	1	(1%)	$1.7	(3%)
Non-confined fire	30	(2%)	1	(1%)	$1.7	(3%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Bedroom	40	(3%)	5	(15%)	$1.1	(2%)
Non-confined fire	40	(3%)	5	(15%)	$1.1	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Trash or rubbish chute, area or container	30	(2%)	1	(1%)	$1.6	(2%)
Non-confined fire	10	(1%)	1	(1%)	$1.6	(2%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)

Table 4A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Area of Origin
2005-2009 Annual Averages (continued)

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Confined chimney or flue fire	30	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Confined fire	30	(2%)	0	(0%)	$0.0	(0%)
Crawl space or substructure space	30	(2%)	0	(0%)	$2.3	(4%)
Non-confined fire	30	(2%)	0	(0%)	$2.3	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Storage of supplies or tools or dead storage	30	(2%)	0	(0%)	$2.8	(4%)
Non-confined fire	30	(2%)	0	(0%)	$2.8	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Storage room, area, tank, or bin	30	(2%)	0	(0%)	$0.9	(1%)
Non-confined fire	20	(1%)	0	(0%)	$0.9	(1%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Closet	30	(2%)	2	(4%)	$3.3	(5%)
Non-confined fire	20	(2%)	2	(4%)	$3.3	(5%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified structural area	20	(2%)	1	(4%)	$2.0	(3%)
Non-confined fire	20	(1%)	1	(4%)	$2.0	(3%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known area of origin	260	(17%)	6	(17%)	$12.3	(19%)
Non-confined fire	190	(13%)	6	(17%)	$12.3	(19%)
Confined fire	60	(4%)	0	(0%)	$0.0	(0%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)
Non-confined fire	1,090	(74%)	37	(100%)	$64.5	(100%)
Confined fire	380	(26%)	0	(0%)	$0.1	(0%)

*Does not include detached garages coded as separate properties

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118).

Fires with unknown area of origin have been allocated proportionally among fires with known area of origin. All fires with the confined chimney or flue incident type (NFIRS incident type 114) are shown separately. Chimney is no longer an area of origin choice for non-confined fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 5A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Item First Ignited
2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Oily rags	520	(35%)	6	(17%)	$27.6	(43%)
Non-confined fire	360	(24%)	6	(17%)	$27.6	(43%)
Confined fire	160	(11%)	0	(0%)	$0.0	(0%)
Flammable and combustible liquids and gases, piping or filter	100	(7%)	4	(11%)	$3.1	(5%)
Non-confined fire	70	(5%)	4	(11%)	$3.0	(5%)
Confined fire	30	(2%)	0	(0%)	$0.0	(0%)
Rubbish, trash, or waste	90	(6%)	2	(5%)	$2.2	(3%)
Non-confined fire	50	(4%)	2	(5%)	$2.2	(3%)
Confined fire	40	(3%)	0	(0%)	$0.0	(0%)
Linen; other than bedding	70	(5%)	2	(6%)	$2.3	(4%)
Non-confined fire	60	(4%)	2	(6%)	$2.3	(4%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Unclassified organic materials	60	(4%)	1	(3%)	$0.5	(1%)
Non-confined fire	40	(3%)	1	(3%)	$0.5	(1%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Dust, fiber, lint, including sawdust or excelsior	50	(4%)	1	(3%)	$1.0	(2%)
Non-confined fire	40	(3%)	1	(3%)	$1.0	(2%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)
Unclassified item first ignited	50	(3%)	1	(3%)	$2.7	(4%)
Non-confined fire	40	(3%)	1	(3%)	$2.7	(4%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Clothing	50	(3%)	2	(5%)	$3.8	(6%)
Non-confined fire	40	(3%)	2	(5%)	$3.8	(6%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Goods not made up, including fabrics and yard goods	50	(3%)	0	(0%)	$2.4	(4%)
Non-confined fire	40	(2%)	0	(0%)	$2.4	(4%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Unclassified soft goods, or wearing apparel	40	(3%)	1	(3%)	$1.2	(2%)
Non-confined fire	30	(2%)	1	(3%)	$1.2	(2%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Cooking materials, including food	40	(3%)	1	(2%)	$0.6	(1%)
Non-confined fire	20	(1%)	1	(2%)	$0.6	(1%)
Confined fire	20	(2%)	0	(0%)	$0.0	(0%)
Box, carton, bag, basket, barrel	40	(3%)	1	(3%)	$4.2	(7%)
Non-confined fire	30	(2%)	1	(3%)	$4.2	(7%)
Confined fire	10	(0%)	0	(0%)	$0.0	(0%)

Table 5A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Item First Ignited
2005-2009 Annual Averages (continued)

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Light vegetation including grass	30	(2%)	2	(6%)	$0.8	(1%)
Non-confined fire	30	(2%)	2	(6%)	$0.8	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Structural member or framing	30	(2%)	1	(3%)	$0.7	(1%)
Non-confined fire	30	(2%)	1	(3%)	$0.7	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Film or residue, including paint, resin and creosote	30	(2%)	1	(3%)	$2.3	(4%)
Non-confined fire	20	(1%)	1	(3%)	$2.3	(4%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Multiple items first ignited	20	(2%)	2	(6%)	$1.4	(2%)
Non-confined fire	20	(1%)	2	(6%)	$1.4	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known item first ignited	210	(14%)	7	(20%)	$7.7	(12%)
Non-confined fire	180	(12%)	7	(20%)	$7.7	(12%)
Confined fire	30	(2%)	0	(0%)	$0.0	(0%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)
Non-confined fire	1,090	(74%)	37	(100%)	$64.5	(100%)
Confined fire	380	(26%)	0	(0%)	$0.1	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 6A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction,
by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, cotton, blends, rayon or wool	370	(25%)	9	(25%)	$16.9	(26%)
Non-confined fire	280	(19%)	9	(25%)	$16.9	(26%)
Confined fire	90	(6%)	0	(0%)	$0.0	(0%)
Oilcloth	80	(5%)	1	(2%)	$3.5	(5%)
Non-confined fire	50	(3%)	1	(2%)	$3.5	(5%)
Confined fire	30	(2%)	0	(0%)	$0.0	(0%)
Unclassified flammable or combustible liquid	60	(4%)	1	(3%)	$2.6	(4%)
Non-confined fire	40	(3%)	1	(3%)	$2.6	(4%)
Confined fire	20	(2%)	0	(0%)	$0.0	(0%)
Unclassified material compounded with oil	50	(3%)	0	(0%)	$4.0	(6%)
Non-confined fire	30	(2%)	0	(0%)	$4.0	(6%)
Confined fire	20	(1%)	0	(0%)	$0.0	(0%)
Wood chips, sawdust, or shavings	50	(3%)	1	(2%)	$0.9	(1%)
Non-confined fire	40	(2%)	1	(2%)	$0.9	(1%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Applied paint or varnish	50	(3%)	1	(2%)	$3.3	(5%)
Non-confined fire	40	(3%)	1	(2%)	$3.3	(5%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Sawn wood, including all finished lumber	40	(3%)	1	(1%)	$2.6	(4%)
Non-confined fire	40	(3%)	1	(1%)	$2.6	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Multiple types of material	40	(3%)	2	(5%)	$1.7	(3%)
Non-confined fire	30	(2%)	2	(5%)	$1.7	(3%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Plastic	40	(3%)	2	(5%)	$0.8	(1%)
Non-confined fire	40	(3%)	2	(5%)	$0.8	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Natural product, other	40	(3%)	0	(0%)	$0.9	(1%)
Non-confined fire	30	(2%)	0	(0%)	$0.9	(1%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Unclassified fabric, textile, or fur	30	(2%)	0	(0%)	$2.1	(3%)
Non-confined fire	30	(2%)	0	(0%)	$2.1	(3%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified type of material first ignited	30	(2%)	0	(0%)	$1.4	(2%)
Non-confined fire	20	(2%)	0	(0%)	$1.4	(2%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)

Table 6A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction,
by Type of Material First Ignited
2005-2009 Annual Averages (continued)

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Type IIIA combustible liquid	30	(2%)	1	(2%)	$1.8	(3%)
Non-confined fire	20	(1%)	1	(2%)	$1.8	(3%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Class IC flammable liquids	30	(2%)	1	(3%)	$0.8	(1%)
Non-confined fire	20	(1%)	1	(3%)	$0.8	(1%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Paper, including cellulose or waxed paper	30	(2%)	0	(0%)	$1.2	(2%)
Non-confined fire	20	(1%)	0	(0%)	$1.2	(2%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Other known type of material first ignited	200	(13%)	12	(34%)	$9.1	(14%)
Non-confined fire	150	(10%)	12	(34%)	$9.1	(14%)
Confined fire	50	(3%)	0	(0%)	$0.0	(0%)
Not required	310	(21%)	6	(17%)	$11.1	(17%)
Non-confined fire	220	(15%)	6	(17%)	$11.1	(17%)
Confined fire	90	(6%)	0	(0%)	$0.0	(0%)
Total	1,480	(100%)	37	(100%)	$64.6	(100%)
Non-confined fire	1,090	(74%)	37	(100%)	$64.5	(100%)
Confined fire	380	(26%)	0	(0%)	$0.1	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown type of material first ignited have been allocated proportionally among fires with known material first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 7A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Factor Contributing to Ignition 2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Abandoned or discarded material or product	500	(34%)	4	(12%)	$25.0	(39%)
Non-confined fire	360	(24%)	4	(12%)	$25.0	(39%)
Confined fire	140	(10%)	0	(0%)	$0.0	(0%)
Improper container or storage	480	(33%)	10	(27%)	$28.1	(44%)
Non-confined fire	370	(25%)	10	(27%)	$28.1	(44%)
Confined fire	110	(8%)	0	(0%)	$0.0	(0%)
Unclassified misuse of material or product	160	(11%)	5	(13%)	$6.4	(10%)
Non-confined fire	110	(8%)	5	(13%)	$6.4	(10%)
Confined fire	50	(3%)	0	(0%)	$0.0	(0%)
Unclassified factor contributed to ignition	120	(8%)	4	(12%)	$3.4	(5%)
Non-confined fire	100	(7%)	4	(12%)	$3.4	(5%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Unclassified natural condition	90	(6%)	3	(9%)	$2.2	(3%)
Non-confined fire	70	(5%)	3	(9%)	$2.2	(3%)
Confined fire	10	(1%)	0	(0%)	$0.0	(0%)
Failure to clean	50	(4%)	0	(0%)	$0.7	(1%)
Non-confined fire	20	(1%)	0	(0%)	$0.7	(1%)
Confined fire	40	(2%)	0	(0%)	$0.0	(0%)
Heat source too close to combustibles	40	(3%)	3	(7%)	$1.2	(2%)
Non-confined fire	30	(2%)	3	(7%)	$1.2	(2%)
Confined fire	10	(0%)	0	(0%)	$0.0	(0%)
Flammable liquid or gas spilled	20	(2%)	1	(4%)	$0.4	(1%)
Non-confined fire	20	(1%)	1	(4%)	$0.4	(1%)
Confined fire	10	(0%)	0	(0%)	$0.0	(0%)
Washing part or painting with flammable liquid	20	(2%)	1	(4%)	$2.0	(3%)
Non-confined fire	20	(1%)	1	(4%)	$2.0	(3%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)

Table 7A.
Home Structure Fires Caused by Spontaneous Combustion or Chemical Reaction, by Factor Contributing to Ignition 2005-2009 Annual Averages (continued)

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Other known factor contributing to ignition	110	(7%)	7	(18%)	$2.1	(3%)
Non-confined fire	70	(5%)	7	(18%)	$2.1	(3%)
Confined fire	30	(2%)	0	(0%)	$0.0	(0%)
Total fires	1,480	(100%)	37	(100%)	$64.6	(100%)
Non-confined fire	1,090	(74%)	37	(100%)	$64.5	(100%)
Confined fire	380	(26%)	0	(0%)	$0.1	(0%)
Total factors*	1,600	(108%)	39	(106%)	$71.6	(111%)
Non-confined fire	1,180	(80%)	39	(106%)	$71.5	(111%)
Confined fire	420	(28%)	0	(0%)	$0.1	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). *Multiple entries are allowed, resulting in more factor entries than fires.

Sources: NFIRS and NFPA survey. Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

Note: Sums may not equal totals due to rounding errors.

Table 1B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Property Use
2005-2009 Annual Averages

Property Use	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Outbuilding or shed	130	(35%)	2	(34%)	$4.1	(30%)
Detached residential garage*	70	(17%)	1	(28%)	$1.3	(10%)
Outside material storage area	40	(11%)	0	(0%)	$0.9	(7%)
Warehouse	40	(11%)	1	(19%)	$2.7	(20%)
Grain elevator, silo	30	(8%)	0	(0%)	$0.5	(4%)
Storage, other	20	(5%)	0	(0%)	$1.5	(11%)
Livestock, poultry storage	20	(5%)	0	(0%)	$0.8	(5%)
Vehicle storage, other	10	(3%)	0	(0%)	$1.7	(13%)
Parking garage, general vehicle	10	(2%)	1	(19%)	$0.0	(0%)
Residential or self storage units	10	(2%)	0	(0%)	$0.2	(1%)
Other properties in the "storage" category	0	(0%)	0	(0%)	$0.0	(0%)
Total	380	(100%)	5	(100%)	$13.7	(100%)

*Excludes attached residential garages.

Table 2B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Time of Day
2005-2009 Annual Averages

Time of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	40	(9%)	1	(14%)	$1.5	(11%)
3 - 6 a.m.	30	(8%)	0	(9%)	$1.6	(12%)
6 - 9 a.m.	50	(14%)	0	(9%)	$1.7	(12%)
9 a.m. - Noon	50	(13%)	1	(20%)	$0.5	(4%)
Noon - 3 p.m.	40	(11%)	0	(0%)	$0.7	(5%)
3 - 6 p.m.	70	(18%)	2	(30%)	$1.9	(14%)
6 - 9 p.m.	60	(16%)	0	(9%)	$4.9	(36%)
9 p.m. - midnight	40	(11%)	0	(9%)	$0.8	(6%)
Total	380	(100%)	5	(100%)	$13.7	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	20	(6%)	0	(9%)	$2.5	(18%)
February	10	(2%)	1	(10%)	$0.1	(0%)
March	20	(4%)	0	(9%)	$0.3	(2%)
April	30	(7%)	1	(19%)	$0.4	(3%)
May	50	(12%)	0	(9%)	$0.9	(7%)
June	50	(12%)	0	(0%)	$1.7	(13%)
July	50	(13%)	0	(0%)	$3.0	(22%)
August	50	(13%)	1	(23%)	$2.0	(15%)
September	40	(10%)	1	(10%)	$1.1	(8%)
October	30	(9%)	0	(0%)	$0.6	(5%)
November	20	(6%)	0	(9%)	$0.5	(4%)
December	20	(5%)	0	(0%)	$0.7	(5%)
Total	380	(100%)	5	(100%)	$13.7	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin
2005-2009 Annual Averages

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified storage area	100	(27%)	1	(19%)	$4.1	(30%)
Non-confined fire	90	(25%)	1	(19%)	$4.1	(30%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Garage or vehicle storage area*	60	(17%)	2	(32%)	$2.0	(14%)
Non-confined fire	60	(15%)	2	(32%)	$2.0	(14%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Storage room, area, tank, or bin	50	(14%)	1	(10%)	$0.6	(5%)
Non-confined fire	50	(13%)	1	(10%)	$0.6	(5%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Storage of supplies or tools or dead storage	50	(13%)	0	(0%)	$1.2	(9%)
Non-confined fire	50	(13%)	0	(0%)	$1.2	(9%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Trash or rubbish chute, area or container	20	(5%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Unclassified outside area	20	(4%)	0	(0%)	$0.2	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(1%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Exterior wall surface	10	(3%)	0	(9%)	$0.3	(2%)
Non-confined fire	10	(3%)	0	(9%)	$0.3	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified area of origin	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Shipping receiving or loading area	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Maintenance or paint shop or area	10	(2%)	0	(0%)	$0.2	(1%)
Non-confined fire	10	(1%)	0	(0%)	$0.2	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Processing or manufacturing area, or workroom	10	(2%)	0	(0%)	$0.2	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)

Table 4B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction by Area of Origin
2005-2009 Annual Averages (continued)

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified structural area	10	(2%)	0	(0%)	$2.4	(17%)
Non-confined fire	10	(2%)	0	(0%)	$2.4	(17%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known area of origin	30	(8%)	1	(29%)	$2.4	(18%)
Non-confined fire	30	(8%)	1	(29%)	$2.4	(18%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Total	380	(100%)	5	(100%)	$13.7	(100%)
Non-confined fire	340	(90%)	5	(100%)	$13.7	(100%)
Confined fire	40	(10%)	0	(0%)	$0.0	(0%)

*Does not include detached garages coded as separate properties

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118).

Fires with unknown area of origin have been allocated proportionally among fires with known area of origin. All fires with the confined chimney or flue incident type (NFIRS incident type 114) are shown separately. Chimney is no longer an area of origin choice for non-confined fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 5B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Item First Ignited
2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Oily rags	80	(22%)	1	(18%)	$4.4	(32%)
Non-confined fire	70	(19%)	1	(18%)	$4.4	(32%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Agricultural crop, including fruits and vegetables	80	(20%)	0	(0%)	$3.1	(23%)
Non-confined fire	80	(20%)	0	(0%)	$3.1	(23%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified organic materials	40	(12%)	0	(0%)	$0.8	(6%)
Non-confined fire	40	(10%)	0	(0%)	$0.8	(6%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Light vegetation, including grass	30	(7%)	0	(0%)	$1.0	(7%)
Non-confined fire	20	(6%)	0	(0%)	$1.0	(7%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified item first ignited	20	(4%)	0	(9%)	$0.0	(0%)
Non-confined fire	10	(3%)	0	(9%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Flammable or combustible liquids or gas, piping or filter	10	(4%)	0	(9%)	$2.4	(17%)
Non-confined fire	10	(3%)	0	(9%)	$2.4	(17%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Rubbish, trash, or waste	10	(4%)	0	(0%)	$0.2	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(2%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Multiple items first ignited	10	(3%)	2	(33%)	$0.1	(1%)
Non-confined fire	10	(3%)	2	(33%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Dust, fiber, lint, including sawdust or excelsior	10	(2%)	0	(0%)	$0.2	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Linen other than bedding	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified storage supplies	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Baled goods or material	10	(2%)	0	(0%)	$0.2	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)

Table 5B
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Item First Ignited
2005-2009 Annual Averages (continued)

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Other known item first ignited	70	(18%)	2	(30%)	$1.3	(9%)
Non-confined fire	60	(16%)	2	(30%)	$1.3	(9%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Total	380	(100%)	5	(100%)	$13.7	(100%)
Non-confined fire	340	(90%)	5	(100%)	$13.7	(100%)
Confined fire	40	(10%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 6B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction
by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Hay or straw	60	(15%)	0	(0%)	$2.6	(19%)
Non-confined fire	50	(14%)	0	(0%)	$2.6	(19%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Fabric, fiber, cotton, blends, rayon, or wool	40	(11%)	0	(9%)	$0.8	(6%)
Non-confined fire	40	(10%)	0	(9%)	$0.8	(6%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Multiple types of material	10	(4%)	1	(24%)	$0.1	(1%)
Non-confined fire	10	(3%)	1	(24%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified natural product	10	(4%)	0	(0%)	$0.3	(2%)
Non-confined fire	10	(4%)	0	(0%)	$0.3	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Plastic	10	(3%)	0	(0%)	$1.4	(10%)
Non-confined fire	10	(2%)	0	(0%)	$1.4	(10%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified material compounded with oil	10	(3%)	0	(0%)	$1.0	(7%)
Non-confined fire	10	(3%)	0	(0%)	$1.0	(7%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Grain, natural fiber, (preprocess)	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Oilcloth	10	(3%)	0	(0%)	$0.6	(4%)
Non-confined fire	10	(2%)	0	(0%)	$0.6	(4%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Wood chips, sawdust, or shavings	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified flammable or combustible liquid	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Sawn wood, including all finished lumber	10	(2%)	0	(9%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(9%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Applied paint or varnish	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 6B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction, by Type of Material First Ignited
2005-2009 Annual Averages (continued)

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified fabric, textile, or fur	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Not Required	130	(34%)	0	(9%)	$3.3	(24%)
Non-confined fire	120	(31%)	0	(9%)	$3.3	(24%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Other known type of material first ignited	50	(12%)	2	(48%)	$3.1	(23%)
Non-confined fire	40	(11%)	2	(48%)	$3.1	(23%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Total	380	(100%)	5	(100%)	$13.7	(100%)
Non-confined fire	340	(90%)	5	(100%)	$13.7	(100%)
Confined fire	40	(10%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown type of material first ignited have been allocated proportionally among fires with known type of material first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 7B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction by Factor Contributing to Ignition 2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified natural condition	110	(28%)	1	(10%)	$2.9	(21%)
Non-confined fire	100	(26%)	1	(10%)	$2.9	(21%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Improper container or storage	90	(24%)	0	(0%)	$2.2	(16%)
Non-confined fire	90	(24%)	0	(0%)	$2.2	(16%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Abandoned or discarded materials or products	80	(21%)	1	(21%)	$2.5	(18%)
Non-confined fire	60	(17%)	1	(21%)	$2.5	(18%)
Confined fire	20	(4%)	0	(0%)	$0.0	(0%)
Unclassified factor contributed to ignition	50	(12%)	1	(15%)	$4.2	(31%)
Non-confined fire	40	(11%)	1	(15%)	$4.2	(31%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified misuse of material or product	20	(6%)	0	(0%)	$0.5	(4%)
Non-confined fire	20	(6%)	0	(0%)	$0.5	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Heat source too close to combustibles	10	(2%)	2	(32%)	$0.1	(1%)
Non-confined fire	10	(2%)	2	(32%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Failure to clean	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Mechanical failure or malfunction	10	(2%)	1	(11%)	$0.0	(0%)
Non-confined fire	10	(2%)	1	(11%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Flammable liquid or gas spilled	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Other known factor contributing to ignition	30	(8%)	1	(10%)	$1.5	(11%)
Non-confined fire	30	(7%)	1	(10%)	$1.5	(11%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 7B.
Structure Fires in Storage Properties Caused by Spontaneous Combustion or Chemical Reaction by Factor Contributing to Ignition 2005-2009 Annual Averages (continued)

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Total	380	(100%)	5	(100%)	$13.7	(100%)
Non-confined fire	340	(90%)	5	(100%)	$13.7	(100%)
Confined fire	40	(10%)	0	(0%)	$0.0	(0%)
Total factors*	410	(107%)	5	(100%)	$14.1	(103%)
Non-confined fire	370	(97%)	5	(100%)	$14.1	(103%)
Confined fire	40	(10%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

*Multiple entries are allowed, resulting in more factor entries than fires. Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 1C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Property Use 2005-2009 Annual Averages

Property Use	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Laundry or dry cleaning	70	(25%)	1	(22%)	$2.0	(22%)
Unclassified mercantile or business	30	(12%)	0	(10%)	$1.7	(18%)
Business office	30	(12%)	1	(16%)	$0.8	(8%)
Specialty shop	30	(11%)	0	(0%)	$0.3	(3%)
Grocery store or other food and beverage sales	30	(10%)	0	(10%)	$0.8	(8%)
Professional supplies, services	20	(7%)	0	(0%)	$1.8	(20%)
Motor vehicle or boat sales, services or repair	20	(6%)	0	(11%)	$0.8	(8%)
Personal service, including barber and beauty shops	10	(3%)	1	(20%)	$0.2	(2%)
Service station or gas station	10	(3%)	0	(0%)	$0.2	(2%)
Recreational, hobby, home repair or pet store	10	(3%)	0	(0%)	$0.0	(0%)
Household goods, sales, or repairs	10	(2%)	0	(0%)	$0.1	(1%)
Unclassified general retail	10	(2%)	0	(0%)	$0.4	(5%)
Other known mercantile or business properties	10	(4%)	0	(11%)	$0.3	(3%)
Total	270	(100%)	5	(100%)	$9.2	(100%)

Table 2C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Time of Day 2005-2009 Annual Averages

Time of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	40	(15%)	0	(11%)	$2.8	(30%)
3 - 6 a.m.	30	(12%)	0	(0%)	$2.2	(24%)
6 - 9 a.m.	40	(14%)	0	(0%)	$0.3	(4%)
9 a.m. - Noon	20	(9%)	0	(0%)	$0.1	(1%)
Noon - 3 p.m.	20	(9%)	1	(31%)	$0.8	(9%)
3 - 6 p.m.	30	(11%)	1	(21%)	$1.2	(13%)
6 - 9 p.m.	50	(17%)	2	(37%)	$1.0	(11%)
9 p.m. - midnight	40	(15%)	0	(0%)	$0.7	(8%)
Total	270	(100%)	5	(100%)	$9.2	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction,
by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	20	(6%)	0	(0%)	$0.7	(7%)
February	20	(8%)	0	(0%)	$0.7	(8%)
March	30	(10%)	1	(12%)	$1.3	(14%)
April	20	(8%)	1	(16%)	$0.5	(5%)
May	20	(9%)	0	(11%)	$1.1	(12%)
June	30	(9%)	0	(10%)	$1.0	(11%)
July	30	(11%)	0	(0%)	$1.5	(17%)
August	20	(7%)	1	(21%)	$1.0	(11%)
September	20	(8%)	1	(20%)	$0.2	(2%)
October	20	(7%)	0	(0%)	$0.6	(7%)
November	20	(8%)	0	(0%)	$0.3	(3%)
December	20	(7%)	0	(11%)	$0.2	(2%)
Totals	270	(100%)	5	(100%)	$9.2	(100%)

Sources: NFIRS and NFPA survey.
Note: Sums may not equal totals due to rounding errors.

Table 4C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin
2005-2009 Annual Averages

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Laundry room or area	50	(18%)	0	(11%)	$1.2	(13%)
Non-confined fire	30	(12%)	0	(11%)	$1.2	(13%)
Confined fire	20	(5%)	0	(0%)	$0.0	(0%)
Kitchen or cooking area	20	(9%)	0	(0%)	$0.5	(6%)
Non-confined fire	10	(3%)	0	(0%)	$0.5	(6%)
Confined fire	20	(5%)	0	(0%)	$0.0	(0%)
Processing or manufacturing area, or workroom	20	(7%)	1	(16%)	$1.9	(20%)
Non-confined fire	20	(6%)	1	(16%)	$1.9	(20%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Maintenance or paint shop or area	20	(6%)	0	(0%)	$0.6	(7%)
Non-confined fire	10	(5%)	0	(0%)	$0.6	(7%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Storage room, area, tank, or bin	20	(6%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(4%)	0	(0%)	$0.1	(1%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified storage area	10	(5%)	0	(0%)	$0.7	(7%)
Non-confined fire	10	(5%)	0	(0%)	$0.7	(7%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Trash or rubbish chute, area or container	10	(5%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Storage of supplies or tools or dead storage	10	(4%)	0	(10%)	$1.0	(11%)
Non-confined fire	10	(4%)	0	(10%)	$1.0	(11%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Shipping receiving or loading area	10	(4%)	0	(0%)	$0.7	(7%)
Non-confined fire	10	(3%)	0	(0%)	$0.7	(7%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Office	10	(4%)	0	(0%)	$0.7	(7%)
Non-confined fire	10	(2%)	0	(0%)	$0.7	(7%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Sales or showroom area	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 4C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin
2005-2009 Annual Averages (continued)

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Closet	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified equipment or service area	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Lobby or entrance way	10	(2%)	0	(0%)	$0.2	(2%)
Non-confined fire	0	(1%)	0	(0%)	$0.2	(2%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified area of origin	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Garage or vehicle storage area	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Heating equipment room	0	(2%)	0	(11%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(11%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified function area	0	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known area of origin	40	(15%)	2	(53%)	$1.2	(13%)
Non-confined fire	30	(12%)	2	(53%)	$1.2	(13%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Total	270	(100%)	5	(100%)	$9.2	(100%)
Non-confined fire	190	(70%)	5	(100%)	$9.2	(100%)
Confined fire	80	(30%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118).

Fires with unknown area of origin have been allocated proportionally among fires with known area of origin. All fires with the confined chimney or flue incident type (NFIRS incident type 114) are shown separately. Chimney is no longer an area of origin choice for non-confined fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 5C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Item First Ignited 2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Oily rags	90	(34%)	0	(10%)	$3.8	(41%)
Non-confined fire	70	(25%)	0	(10%)	$3.8	(41%)
Confined fire	30	(9%)	0	(0%)	$0.0	(0%)
Linen, other than bedding	60	(22%)	0	(11%)	$2.5	(27%)
Non-confined fire	40	(15%)	0	(11%)	$2.5	(27%)
Confined fire	20	(7%)	0	(0%)	$0.0	(0%)
Rubbish, trash, or waste	20	(6%)	0	(0%)	$0.2	(2%)
Non-confined fire	0	(2%)	0	(0%)	$0.2	(2%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Unclassified soft goods or wearing apparel	10	(4%)	0	(0%)	$0.5	(6%)
Non-confined fire	10	(4%)	0	(0%)	$0.5	(6%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Flammable and combustible liquids and gases, piping or filter	10	(4%)	2	(47%)	$0.4	(4%)
Non-confined fire	10	(3%)	2	(47%)	$0.4	(4%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified item first ignited	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Clothing	10	(3%)	1	(22%)	$0.5	(6%)
Non-confined fire	10	(3%)	1	(22%)	$0.5	(6%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Goods not made up, including fabrics and yard goods	10	(3%)	0	(0%)	$0.5	(6%)
Non-confined fire	10	(2%)	0	(0%)	$0.5	(6%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Cooking materials, including food	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(0%)	0	(0%)	$0.1	(1%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Multiple items first ignited	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Box, carton, bag, basket, barrel	10	(2%)	0	(10%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(10%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified organic materials	0	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)

Table 5C. Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Item First Ignited
2005-2009 Annual Averages (continued)

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Other known item first ignited	30	(12%)	0	(0%)	$0.7	(7%)
Non-confined fire	30	(10%)	0	(0%)	$0.7	(7%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Total	270	(100%)	5	(100%)	$9.2	(100%)
Non-confined fire	190	(70%)	5	(100%)	$9.2	(100%)
Confined fire	80	(30%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 6C.
Structure Fires in Mercantile or Business Properties Caused by Spontaneous Combustion or Chemical Reaction: by Type of Material First Ignited 2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, cotton, blends, rayon, or wool	130	(46%)	2	(43%)	$6.0	(66%)
Non-confined fire	100	(36%)	2	(43%)	$6.0	(66%)
Confined fire	30	(10%)	0	(0%)	$0.0	(0%)
Oilcloth	10	(5%)	0	(0%)	$0.2	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.2	(2%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Unclassified material compounded with oil	10	(5%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Multiple types of material	10	(3%)	0	(0%)	$0.3	(3%)
Non-confined fire	0	(1%)	0	(0%)	$0.3	(3%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified type of material first ignited	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(2%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified flammable or combustible liquid	10	(2%)	0	(11%)	$0.1	(1%)
Non-confined fire	10	(2%)	0	(11%)	$0.1	(1%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Cardboard	10	(2%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Plastic	0	(2%)	0	(10%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(10%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Wood chips, sawdust, shavings	0	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known type of material first ignited	40	(14%)	2	(36%)	$1.1	(12%)
Non-confined fire	30	(10%)	2	(36%)	$1.1	(12%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)

Table 6C.
Structure Fires in Mercantile or Business Properties Caused by Spontaneous Combustion or Chemical Reaction: by Type of Material First Ignited 2005-2009 Annual Averages (continued)

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Not Required	50	(17%)	0	(0%)	$1.2	(14%)
Non-confined fire	30	(10%)	0	(0%)	$1.2	(14%)
Confined fire	20	(6%)	0	(0%)	$0.0	(0%)
Total	270	(100%)	5	(100%)	$9.2	(100%)
Non-confined fire	190	(70%)	5	(100%)	$9.2	(100%)
Confined fire	80	(30%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown type of material first ignited have been allocated proportionally among fires with known type of material first ignited. Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 7C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction, by Factor Contributing to Ignition
2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Improper container or storage	100	(35%)	0	(0%)	$4.6	(51%)
Non-confined fire	60	(23%)	0	(0%)	$4.6	(50%)
Confined fire	30	(13%)	0	(0%)	$0.0	(0%)
Abandoned or discarded materials or products	80	(28%)	1	(18%)	$1.1	(12%)
Non-confined fire	50	(19%)	1	(18%)	$1.1	(12%)
Confined fire	20	(9%)	0	(0%)	$0.0	(0%)
Unclassified factor contributed to ignition	30	(11%)	0	(0%)	$2.7	(29%)
Non-confined fire	30	(10%)	0	(0%)	$2.7	(29%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified misuse of material or product	20	(8%)	1	(20%)	$0.4	(4%)
Non-confined fire	10	(5%)	1	(20%)	$0.4	(4%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Unclassified natural condition	20	(6%)	0	(0%)	$0.3	(4%)
Non-confined fire	20	(6%)	0	(0%)	$0.3	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Equipment unattended	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Failure to clean	10	(2%)	0	(0%)	$0.2	(3%)
Non-confined fire	0	(2%)	0	(0%)	$0.2	(2%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Heat source too close to combustibles	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified operational deficiency	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Washing part or painting with flammable liquid	0	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Other known factor contributing to ignition	20	(8%)	3	(62%)	$0.4	(4%)
Non-confined fire	10	(5%)	3	(62%)	$0.4	(4%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)

Table 7C.
Structure Fires in Mercantile or Business Properties
Caused by Spontaneous Combustion or Chemical Reaction, by Factor Contributing to Ignition (continued)
2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Total	270	(100%)	5	(100%)	$9.2	(100%)
Non-confined fire	190	(70%)	5	(100%)	$9.2	(100%)
Confined fire	80	(30%)	0	(0%)	$0.0	(0%)
Total factors*	290	(107%)	5	(100%)	$9.8	(107%)
Non-confined fire	200	(75%)	5	(100%)	$9.8	(107%)
Confined fire	90	(32%)	0	(0%)	$0.0	(0%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

*Multiple entries are allowed, resulting in more factor entries than fires.
Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 1D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Time of Day
2005-2009 Annual Averages

Time of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	30	(12%)	1	(3%)	$3.9	(21%)
3 - 6 a.m.	30	(11%)	1	(6%)	$0.6	(3%)
6 - 9 a.m.	30	(12%)	0	(0%)	$0.9	(5%)
9 a.m. - Noon	30	(12%)	5	(29%)	$1.9	(10%)
Noon - 3 p.m.	20	(9%)	3	(16%)	$0.8	(4%)
3 - 6 p.m.	30	(11%)	6	(34%)	$3.7	(20%)
6 - 9 p.m.	50	(19%)	0	(0%)	$4.3	(23%)
9 p.m. - midnight	40	(15%)	2	(12%)	$2.4	(13%)
Total	270	(100%)	16	(100%)	$18.5	(100%)

Table 2D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	20	(8%)	3	(19%)	$2.2	(12%)
February	20	(8%)	0	(3%)	$0.8	(4%)
March	20	(8%)	0	(0%)	$1.9	(10%)
April	20	(9%)	6	(35%)	$2.5	(14%)
May	30	(10%)	0	(3%)	$2.5	(14%)
June	30	(10%)	3	(16%)	$1.4	(8%)
July	30	(10%)	2	(15%)	$1.2	(7%)
August	30	(12%)	1	(6%)	$1.7	(9%)
September	20	(8%)	0	(0%)	$1.0	(6%)
October	20	(7%)	0	(3%)	$2.6	(14%)
November	10	(5%)	0	(0%)	$0.2	(1%)
December	10	(5%)	0	(0%)	$0.4	(2%)
Total	270	(100%)	16	(100%)	$18.5	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin
2005-2009 Annual Averages

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Processing or manufacturing area, or workroom	70	(27%)	14	(84%)	$9.4	(51%)
Non-confined fire	60	(23%)	14	(84%)	$9.2	(50%)
Confined fire	10	(4%)	0	(0%)	$0.2	(1%)
Trash or rubbish chute, area or container	30	(13%)	1	(3%)	$0.3	(2%)
Non-confined fire	10	(2%)	1	(3%)	$0.3	(2%)
Confined fire	30	(10%)	0	(0%)	$0.0	(0%)
Maintenance or paint shop or area	30	(10%)	0	(3%)	$2.6	(14%)
Non-confined fire	30	(9%)	0	(3%)	$2.6	(14%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Storage room, area, tank, or bin	20	(7%)	0	(0%)	$0.4	(2%)
Non-confined fire	20	(6%)	0	(0%)	$0.4	(2%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified storage area	10	(5%)	0	(0%)	$0.7	(4%)
Non-confined fire	10	(4%)	0	(0%)	$0.7	(4%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Shipping receiving or loading area	10	(5%)	0	(0%)	$0.7	(4%)
Non-confined fire	10	(4%)	0	(0%)	$0.7	(4%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified outside area	10	(5%)	0	(0%)	$0.2	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.2	(1%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Laboratory	10	(3%)	1	(7%)	$1.1	(6%)
Non-confined fire	0	(1%)	1	(7%)	$1.1	(6%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Unclassified area of origin	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Machinery room or area or elevator machinery room	10	(3%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified equipment or service area	10	(2%)	0	(0%)	$0.9	(5%)
Non-confined fire	10	(2%)	0	(0%)	$0.9	(5%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)

Table 3D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin
2005-2009 Annual Averages (continued)

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Laundry room or area	10	(2%)	0	(0%)	$0.3	(2%)
Non-confined fire	0	(1%)	0	(0%)	$0.3	(2%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Storage of supplies or tools or dead storage	10	(2%)	0	(0%)	$0.9	(5%)
Non-confined fire	10	(2%)	0	(0%)	$0.9	(5%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified technical processing area	10	(2%)	0	(3%)	$0.2	(1%)
Non-confined fire	0	(1%)	0	(3%)	$0.2	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified function area	0	(2%)	0	(0%)	$0.4	(2%)
Non-confined fire	0	(1%)	0	(0%)	$0.4	(2%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Other known area of origin	30	(10%)	0	(0%)	$0.1	(1%)
Non-confined fire	20	(6%)	0	(0%)	$0.1	(1%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Total	270	(100%)	16	(100%)	$18.5	(100%)
Non-confined fire	180	(67%)	16	(100%)	$18.3	(99%)
Confined fire	90	(33%)	0	(0%)	$0.2	(1%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118).

Fires with unknown area of origin have been allocated proportionally among fires with known area of origin. All fires with the confined chimney or flue incident type (NFIRS incident type 114) are shown separately. Chimney is no longer an area of origin choice for non-confined fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction,
by Item First Ignited: 2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Oily rags	70	(26%)	2	(12%)	$4.4	(24%)
Non-confined fire	50	(18%)	2	(12%)	$4.2	(23%)
Confined fire	20	(8%)	0	(0%)	$0.2	(1%)
Rubbish, trash, or waste	30	(11%)	0	(0%)	$0.3	(2%)
Non-confined fire	10	(3%)	0	(0%)	$0.3	(2%)
Confined fire	20	(8%)	0	(0%)	$0.0	(0%)
Unclassified item first ignited	30	(11%)	2	(13%)	$1.1	(6%)
Non-confined fire	20	(7%)	2	(13%)	$1.1	(6%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Flammable and combustible liquids and gases, piping or filter	30	(10%)	11	(65%)	$5.8	(31%)
Non-confined fire	20	(8%)	11	(65%)	$5.8	(31%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Film or residue, including paint, resin and creosote	20	(7%)	0	(0%)	$0.9	(5%)
Non-confined fire	10	(5%)	0	(0%)	$0.9	(5%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Material being used to make a product	10	(5%)	2	(10%)	$0.6	(3%)
Non-confined fire	10	(4%)	2	(10%)	$0.6	(3%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Dust, fiber, lint, including sawdust or excelsior	10	(5%)	0	(0%)	$0.1	(0%)
Non-confined fire	10	(3%)	0	(0%)	$0.1	(0%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Linen other than bedding	10	(4%)	0	(0%)	$0.5	(3%)
Non-confined fire	10	(2%)	0	(0%)	$0.5	(3%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified organic material	10	(2%)	0	(0%)	$0.4	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.4	(2%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Multiple items first ignited	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Cooking materials, including food	10	(2%)	0	(0%)	$0.1	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 4D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction by Item First Ignited
2005-2009 Annual Averages (continued)

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Box, carton, bag, basket, or barrel	0	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Agricultural crop, including fruits and vegetables	0	(2%)	0	(0%)	$1.9	(10%)
Non-confined fire	0	(2%)	0	(0%)	$1.9	(10%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known item first ignited	30	(12%)	0	(0%)	$2.3	(12%)
Non-confined fire	20	(9%)	0	(0%)	$2.3	(12%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Total	270	(100%)	16	(100%)	$18.5	(100%)
Non-confined fire	180	(67%)	16	(100%)	$18.3	(99%)
Confined fire	90	(33%)	0	(0%)	$0.2	(1%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 5D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, cotton, blends, rayon, or wool	40	(13%)	0	(0%)	$1.9	(10%)
Non-confined fire	30	(10%)	0	(0%)	$1.9	(10%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Unclassified type of material first ignited	20	(7%)	0	(0%)	$1.6	(9%)
Non-confined fire	10	(5%)	0	(0%)	$1.6	(9%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Applied paint, varnish	10	(5%)	0	(0%)	$1.0	(6%)
Non-confined fire	10	(3%)	0	(0%)	$1.0	(6%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Plastic	10	(5%)	0	(0%)	$0.7	(4%)
Non-confined fire	10	(2%)	0	(0%)	$0.7	(4%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Multiple types of material	10	(5%)	1	(3%)	$0.2	(1%)
Non-confined fire	10	(2%)	1	(3%)	$0.2	(1%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Oilcloth	10	(5%)	0	(0%)	$0.4	(2%)
Non-confined fire	10	(3%)	0	(0%)	$0.4	(2%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified flammable or combustible liquid	10	(4%)	7	(40%)	$4.0	(22%)
Non-confined fire	10	(3%)	7	(40%)	$4.0	(22%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified combustible metal, including magnesium	10	(4%)	2	(14%)	$1.5	(8%)
Non-confined fire	10	(2%)	2	(14%)	$1.4	(8%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Wood chips, sawdust, or shavings	10	(4%)	2	(10%)	$0.1	(1%)
Non-confined fire	0	(1%)	2	(10%)	$0.1	(1%)
Confined fire	10	(3%)	0	(0%)	$0.0	(0%)
Unclassified volatile solid or chemical	10	(4%)	0	(0%)	$0.7	(4%)
Non-confined fire	10	(4%)	0	(0%)	$0.7	(4%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Adhesive, resin, tar, glue, asphalt, pitch	10	(3%)	5	(33%)	$0.3	(1%)
Non-confined fire	10	(2%)	5	(33%)	$0.3	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 5D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Type of Material First Ignited
2005-2009 Annual Averages (continued)

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Paper, including cellulose, waxed paper	10	(3%)	0	(0%)	$0.1	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(1%)
Confined fire	0	(2%)	0	(0%)	$0.0	(0%)
Unclassified fabric, textile or fur	10	(3%)	0	(0%)	$0.4	(2%)
Non-confined fire	10	(2%)	0	(0%)	$0.4	(2%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified material compounded with oil	10	(3%)	0	(0%)	$0.8	(4%)
Non-confined fire	0	(2%)	0	(0%)	$0.8	(4%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Solid chemical, included are explosives	10	(2%)	0	(0%)	$0.5	(3%)
Non-confined fire	10	(2%)	0	(0%)	$0.5	(3%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Cardboard	10	(2%)	0	(0%)	$0.0	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Unclassified processed wood or paper	0	(2%)	0	(0%)	$0.2	(1%)
Non-confined fire	0	(1%)	0	(0%)	$0.2	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Other known type of material first ignited	30	(10%)	0	(0%)	$2.0	(11%)
Non-confined fire	20	(6%)	0	(0%)	$2.0	(11%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Not required	50	(17%)	0	(0%)	$1.9	(10%)
Non-confined fire	40	(13%)	0	(0%)	$1.7	(9%)
Confined fire	10	(4%)	0	(0%)	$0.2	(1%)
Total	270	(100%)	16	(100%)	$18.5	(100%)
Non-confined fire	180	(67%)	16	(100%)	$18.3	(99%)
Confined fire	90	(33%)	0	(0%)	$0.2	(1%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown type of material first ignited were allocated proportionally among fires with known type of material first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 6D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Factors Contributing to Ignition
2005-2009 Annual Averages

Factors Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Improper container or storage	80	(29%)	4	(25%)	$3.7	(20%)
Non-confined fire	50	(19%)	4	(25%)	$3.5	(19%)
Confined fire	30	(10%)	0	(0%)	$0.2	(1%)
Abandoned or discarded materials or products	70	(26%)	1	(5%)	$4.3	(23%)
Non-confined fire	40	(15%)	1	(5%)	$4.3	(23%)
Confined fire	30	(11%)	0	(0%)	$0.0	(0%)
Unclassified factor contributed to ignition	30	(10%)	4	(25%)	$0.4	(2%)
Non-confined fire	20	(7%)	4	(25%)	$0.4	(2%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Unclassified natural condition	20	(6%)	0	(0%)	$0.7	(4%)
Non-confined fire	10	(3%)	0	(0%)	$0.7	(4%)
Confined fire	10	(2%)	0	(0%)	$0.0	(0%)
Unclassified operational deficiency	10	(5%)	0	(0%)	$1.3	(7%)
Non-confined fire	10	(4%)	0	(0%)	$1.3	(7%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Failure to clean	10	(5%)	0	(0%)	$2.1	(11%)
Non-confined fire	10	(5%)	0	(0%)	$2.1	(11%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Mechanical failure or malfunction	10	(5%)	8	(50%)	$2.8	(15%)
Non-confined fire	10	(5%)	8	(50%)	$2.8	(15%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified misuse of material or product	10	(4%)	0	(0%)	$0.1	(1%)
Non-confined fire	10	(3%)	0	(0%)	$0.1	(1%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Heat source too close to combustibles	10	(2%)	0	(0%)	$0.1	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Equipment not being operated properly	10	(2%)	0	(0%)	$0.9	(5%)
Non-confined fire	0	(1%)	0	(0%)	$0.9	(5%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)
Design deficiency	10	(2%)	0	(0%)	$0.1	(0%)
Non-confined fire	0	(1%)	0	(0%)	$0.1	(0%)
Confined fire	0	(1%)	0	(0%)	$0.0	(0%)

Table 6D.
Structure Fires in Manufacturing Properties
Caused by Spontaneous Combustion or Chemical Reaction
by Factors Contributing to Ignition
2005-2009 Annual Averages (continued)

Factors Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Manufacturing deficiency	0	(2%)	0	(0%)	$1.6	(9%)
Non-confined fire	0	(2%)	0	(0%)	$1.6	(9%)
Confined fire	0	(0%)	0	(0%)	$0.0	(0%)
Other known factor contributing to ignition	20	(8%)	0	(0%)	$1.0	(6%)
Non-confined fire	10	(4%)	0	(0%)	$1.0	(6%)
Confined fire	10	(4%)	0	(0%)	$0.0	(0%)
Total fires	270	(100%)	16	(100%)	$18.5	(100%)
Non-confined fire	180	(67%)	16	(100%)	$18.3	(99%)
Confined fire	90	(33%)	0	(0%)	$0.2	(1%)
Total factors*	290	(106%)	17	(105%)	$19.2	(104%)
Non-confined fire	190	(71%)	17	(105%)	$19.0	(103%)
Confined fire	100	(35%)	0	(0%)	$0.2	(1%)

Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

*Multiple entries are allowed, resulting in more factor entries than fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 2-1.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Hour of Day
2005-2009 Annual Averages

Hour of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	80	(7%)	1	(12%)	$0.6	(13%)
3 - 6 a.m.	60	(5%)	1	(13%)	$0.3	(8%)
6 - 9 a.m.	120	(11%)	1	(13%)	$0.5	(12%)
9 a.m. - Noon	140	(13%)	1	(24%)	$0.4	(10%)
Noon - 3 p.m.	220	(19%)	0	(0%)	$0.7	(17%)
3 - 6 p.m.	230	(20%)	2	(25%)	$0.7	(17%)
6 - 9 p.m.	180	(16%)	1	(13%)	$0.5	(11%)
9 p.m. - midnight	120	(10%)	0	(0%)	$0.5	(11%)
Total	1,150	(100%)	6	(100%)	$4.3	(100%)

Table 2-2.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	70	(6%)	0	(0%)	$0.3	(6%)
February	70	(6%)	1	(13%)	$0.2	(4%)
March	90	(8%)	0	(8%)	$0.4	(10%)
April	90	(8%)	0	(0%)	$0.2	(5%)
May	130	(11%)	0	(0%)	$0.5	(13%)
June	120	(10%)	1	(13%)	$0.5	(11%)
July	130	(11%)	1	(16%)	$0.4	(8%)
August	110	(10%)	1	(13%)	$0.1	(3%)
September	110	(9%)	1	(25%)	$0.4	(9%)
October	90	(8%)	0	(0%)	$0.7	(15%)
November	80	(7%)	0	(0%)	$0.4	(9%)
December	60	(6%)	1	(13%)	$0.2	(5%)
Total	1,150	(100%)	6	(100%)	$4.3	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 2-3.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Area of Origin: 2005-2009 Annual Averages

Area of Origin	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Cargo or trunk area of vehicle	420	(36%)	2	(25%)	$1.7	(40%)
Engine area, running gear or wheel area of vehicle	250	(22%)	1	(13%)	$0.8	(18%)
Unclassified vehicle area	150	(13%)	3	(49%)	$0.7	(16%)
Passenger area of vehicle	90	(8%)	1	(13%)	$0.3	(8%)
Unclassified area of origin	50	(4%)	0	(0%)	$0.1	(2%)
Unclassified outside area	40	(3%)	0	(0%)	$0.1	(1%)
Exterior surface of vehicle	30	(3%)	0	(0%)	$0.0	(1%)
On or near highway, public way or street	20	(2%)	0	(0%)	$0.0	(1%)
Other known area of origin	100	(9%)	0	(0%)	$0.5	(12%)
Total	1,150	(100%)	6	(100%)	$4.3	(100%)

Fires with unknown area of origin have been allocated proportionally among fires with known area of origin.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 2-4.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Factor Contributing to Ignition: 2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Improper container or storage	270	(24%)	0	(0%)	$1.5	(35%)
Mechanical failure or malfunction	210	(18%)	1	(19%)	$0.6	(14%)
Abandoned or discarded materials or products	140	(12%)	3	(43%)	$0.5	(11%)
Unclassified natural condition	130	(12%)	0	(0%)	$0.2	(5%)
Unclassified factor contributed to ignition	90	(8%)	1	(19%)	$0.4	(9%)
Unclassified misuse of material or product	80	(7%)	2	(38%)	$0.3	(6%)
Electrical failure or malfunction	70	(6%)	0	(0%)	$0.1	(2%)
Flammable liquid or gas spilled	50	(5%)	0	(0%)	$0.2	(5%)
Heat source too close to combustibles	20	(2%)	0	(0%)	$0.1	(2%)
Failure to clean	20	(2%)	0	(0%)	$0.1	(2%)
Collision, knock down, run over, or overturn	20	(2%)	0	(0%)	$0.1	(2%)
Other known factor contributing to ignition	100	(9%)	0	(0%)	$0.5	(11%)
Total factors*	1,210	(105%)	7	(119%)	$4.5	(104%)
Total Fires	1,150	(100%)	6	(100%)	$4.3	(100%)

Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

*Multiple entries are allowed, resulting in more factor entries than fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 2-5.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Item First Ignited
2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Flammable and combustible liquids and gases, piping or filter	230	(20%)	0	(0%)	$0.5	(12%)
Oily rags	220	(19%)	1	(19%)	$0.8	(19%)
Unclassified item first ignited	100	(9%)	1	(19%)	$0.2	(4%)
Rubbish, trash, or waste	80	(7%)	1	(19%)	$0.3	(7%)
Electrical wire or cable insulation	70	(7%)	0	(0%)	$0.4	(10%)
Unclassified organic materials	60	(5%)	0	(0%)	$0.0	(1%)
Linen; other than bedding	50	(4%)	0	(0%)	$0.4	(10%)
Agricultural crop, including fruits and vegetables	40	(3%)	0	(0%)	$0.1	(2%)
Multiple items first ignited	30	(3%)	1	(24%)	$0.2	(6%)
Light vegetation including grass	30	(3%)	0	(0%)	$0.1	(3%)
Dust, fiber, lint, including sawdust or excelsior	30	(3%)	0	(0%)	$0.2	(3%)
Upholstered furniture or vehicle seat	30	(2%)	0	(0%)	$0.2	(4%)
Clothing	20	(2%)	0	(0%)	$0.0	(1%)
Box, carton, bag, basket, barrel	20	(2%)	0	(0%)	$0.1	(2%)
Unclassified soft goods, or wearing apparel	20	(2%)	1	(19%)	$0.1	(2%)
Other known item first ignited	130	(11%)	0	(0%)	$0.6	(15%)
Total	1,150	(100%)	6	(100%)	$4.3	(100%)

Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 2-6.
Vehicle Fires Caused by Spontaneous Combustion or Chemical Reaction
by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, cotton, blends, rayon, or wool	170	(15%)	1	(19%)	$0.9	(20%)
Plastic	90	(8%)	1	(19%)	$0.4	(10%)
Unclassified flammable or combustible liquid	80	(7%)	1	(24%)	$0.3	(7%)
Gasoline	70	(6%)	0	(0%)	$0.1	(2%)
Multiple types of material	60	(5%)	1	(19%)	$0.2	(6%)
Unclassified flammable gas	40	(4%)	0	(0%)	$0.1	(2%)
Unclassified type of material first ignited	40	(3%)	0	(0%)	$0.0	(1%)
Unclassified material compounded with oil	40	(3%)	0	(0%)	$0.3	(7%)
Coal, coke, briquettes, peat	30	(3%)	0	(0%)	$0.0	(0%)
Hay or straw	30	(3%)	0	(0%)	$0.1	(3%)
Wood chips, sawdust, shavings	30	(2%)	0	(0%)	$0.2	(4%)
Cooking oil, transformer or lubricating oil	20	(2%)	0	(0%)	$0.0	(0%)
Unclassified volatile solid or chemical	20	(2%)	0	(0%)	$0.3	(6%)
Other natural product	20	(2%)	0	(0%)	$0.0	(0%)
Unclassified fabric, textile, or fur	20	(2%)	0	(0%)	$0.1	(3%)
Applied paint or varnish	20	(2%)	0	(0%)	$0.1	(2%)
Other known type of material first ignited	120	(11%)	1	(19%)	$0.5	(11%)
Not required	240	(21%)	0	(0%)	$0.7	(16%)
Total	1,150	(100%)	6	(100%)	$4.3	(100%)

Fires with unknown type of material first ignited have been allocated proportionally among fires with known type of material first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3-1.
Outside Fires (Excluding Trash or Rubbish Fires)
Caused by Spontaneous Combustion or Chemical Reaction
by Hour of Day
2005-2009 Annual Averages

Hour of Day	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	300	(6%)	0	(0%)	$1.0	(5%)
3 - 6 a.m.	310	(6%)	0	(5%)	$5.1	(27%)
6 - 9 a.m.	630	(12%)	1	(19%)	$1.2	(6%)
9 a.m. - Noon	650	(12%)	1	(12%)	$3.6	(19%)
Noon - 3 p.m.	1,050	(20%)	1	(20%)	$0.9	(5%)
3 - 6 p.m.	1,170	(22%)	3	(36%)	$2.9	(15%)
6 - 9 p.m.	740	(14%)	1	(9%)	$3.0	(16%)
9 p.m. - midnight	400	(8%)	0	(0%)	$1.1	(6%)
Total	5,250	(100%)	7	(100%)	$18.8	(100%)

Sources: NFIRS and NFPA survey.

Table 3-2.
Outside Fires (Excluding Trash or Rubbish Fires)
Caused by Spontaneous Combustion or Chemical Reaction
by Month
2005-2009 Annual Averages

Month	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
January	240	(5%)	0	(0%)	$0.5	(3%)
February	200	(4%)	0	(0%)	$2.0	(10%)
March	350	(7%)	1	(8%)	$0.8	(4%)
April	550	(11%)	1	(13%)	$0.2	(1%)
May	640	(12%)	1	(17%)	$1.8	(9%)
June	620	(12%)	1	(7%)	$3.9	(20%)
July	630	(12%)	0	(4%)	$1.1	(6%)
August	600	(11%)	3	(36%)	$1.7	(9%)
September	520	(10%)	1	(11%)	$2.8	(15%)
October	380	(7%)	0	(0%)	$0.4	(2%)
November	320	(6%)	0	(0%)	$2.6	(14%)
December	200	(4%)	0	(4%)	$1.1	(6%)
Total	5,250	(100%)	7	(100%)	$18.8	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 3-3.
Outside Fires (Excluding Trash or Rubbish Fires)
Caused by Spontaneous Combustion or Chemical Reaction, by Item First Ignited
2005-2009 Annual Averages

Item First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified organic materials	1,460	(28%)	0	(0%)	$0.4	(2%)
Light vegetation including grass	1,350	(26%)	0	(0%)	$0.8	(4%)
Agricultural crop, including fruits and vegetables	620	(12%)	0	(0%)	$6.2	(33%)
Chips, including wood chips	320	(6%)	0	(0%)	$1.3	(7%)
Heavy vegetation including trees	260	(5%)	1	(8%)	$0.0	(0%)
Unclassified item first ignited	210	(4%)	1	(10%)	$4.5	(24%)
Oily rags	180	(3%)	1	(9%)	$0.4	(2%)
Dust, fiber, lint, including sawdust or excelsior	160	(3%)	0	(5%)	$0.0	(0%)
Flammable and combustible liquids and gases, piping or filter	100	(2%)	2	(27%)	$0.2	(1%)
Other known item first ignited	590	(11%)	3	(42%)	$5.1	(27%)
Total	5,250	(100%)	7	(100%)	$18.8	(100%)

Table 3-4.
Outside Fires (Excluding Trash or Rubbish Fires)
Caused by Spontaneous Combustion or Chemical Reaction, by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material First Ignited	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Wood chips, sawdust, or shavings	1,050	(20%)	0	(0%)	$3.3	(17%)
Unclassified natural product	550	(10%)	0	(0%)	$0.6	(3%)
Hay or straw	450	(9%)	0	(0%)	$4.4	(23%)
Fabric, fiber, cotton, blends, rayon, or wool	170	(3%)	1	(10%)	$0.5	(3%)
Unclassified type of material first ignited	130	(2%)	0	(0%)	$0.1	(0%)
Other known type of material ignited	760	(15%)	5	(70%)	$7.7	(41%)
Not required	2,140	(41%)	1	(20%)	$2.2	(12%)
Total	5,250	(100%)	7	(100%)	$18.8	(100%)

Sources: NFIRS and NFPA survey.
Note: Sums may not equal totals due to rounding errors.

Fires with unknown type of material first ignited have been allocated proportionally among fires with known type of material first ignited. Sources: NFIRS and NFPA survey.

Table 3-5.
Outside Fires (Excluding Trash or Rubbish Fires)
Caused by Spontaneous Combustion or Chemical Reaction
by Property Use
2005-2009 Annual Averages

Property Use	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Open land, beach, or campsite	1,430	(27%)	1	(7%)	$1.4	(8%)
One- or two-family dwelling	620	(12%)	1	(8%)	$0.5	(2%)
Highway, street, or parking area	520	(10%)	0	(0%)	$0.0	(0%)
Unclassified storage	440	(8%)	2	(27%)	$4.8	(25%)
Unclassified or unknown-type special property	320	(6%)	0	(0%)	$0.0	(0%)
Agriculture	260	(5%)	0	(0%)	$2.0	(10%)
Manufacturing or processing	240	(5%)	1	(18%)	$2.6	(14%)
Office, bank or mail facility	110	(2%)	1	(11%)	$0.0	(0%)
Construction site, or oil or gas field,	90	(2%)	0	(0%)	$1.3	(7%)
Apartment or multi-family dwelling	90	(2%)	0	(4%)	$0.0	(0%)
Dump or sanitary landfill	90	(2%)	0	(0%)	$0.0	(0%)
Unclassified or unknown-type mercantile or business	90	(2%)	0	(0%)	$0.1	(0%)
Unclassified property use	80	(2%)	0	(5%)	$0.0	(0%)
Other known property use	870	(17%)	1	(20%)	$6.1	(32%)
Total	5,250	(100%)	7	(100%)	$18.8	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4-1.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction
by Hour of Day
2005-2009 Annual Averages

Hour	Fires		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	340	(8%)	$0.0	(2%)
3 - 6 a.m.	280	(6%)	$0.0	(1%)
6 - 9 a.m.	410	(9%)	$0.0	(3%)
9 a.m. - Noon	420	(9%)	$0.0	(4%)
Noon - 3 p.m.	740	(17%)	$0.4	(35%)
3 - 6 p.m.	870	(19%)	$0.1	(6%)
6 - 9 p.m.	820	(18%)	$0.4	(39%)
9 p.m. - midnight	570	(13%)	$0.1	(9%)
Total	4,460	(100%)	$1.1	(100%)

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4-2.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction
by Month
2005-2009 Annual Averages

Month	Fires		Direct Property Damage (in Millions)	
January	250	(6%)	$0.0	(1%)
February	240	(5%)	$0.1	(7%)
March	310	(7%)	$0.0	(3%)
April	430	(10%)	$0.1	(5%)
May	440	(10%)	$0.2	(15%)
June	540	(12%)	$0.6	(55%)
July	610	(14%)	$0.0	(3%)
August	470	(10%)	$0.0	(2%)
September	430	(10%)	$0.0	(3%)
October	330	(7%)	$0.0	(3%)
November	210	(5%)	$0.0	(3%)
December	200	(5%)	$0.0	(1%)
Total	4,460	(100%)	$1.1	(100%)

Sources: NFIRS and NFPA survey.
Note: Sums may not equal totals due to rounding errors.

Table 4-3.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction by Item First Ignited: 2005-2009 Annual Averages

Item First Ignited	Fires		Direct Property Damage (in Millions)	
Rubbish, trash, or waste	990	(22%)	$0.1	(8%)
Oily rags	730	(16%)	$0.1	(13%)
Unclassified organic material	680	(15%)	$0.3	(31%)
Light vegetation, including grass	480	(11%)	$0.1	(13%)
Dust, fiber, lint, including sawdust or excelsior	260	(6%)	$0.0	(1%)
Flammable or combustible liquids and gases, piping or filter	200	(4%)	$0.0	(4%)
Unclassified item first ignited	170	(4%)	$0.0	(1%)
Linen; other than bedding	130	(3%)	$0.2	(21%)
Heavy vegetation, including trees	130	(3%)	$0.0	(0%)
Film or residue, including paint, resin and creosote	80	(2%)	$0.0	(0%)
Chips, including wood chips	80	(2%)	$0.0	(0%)
Goods not made up, including fabrics and yard goods	80	(2%)	$0.0	(0%)
Other known item first ignited	460	(10%)	$0.1	(9%)
Total	4,460	(100%)	$1.1	(100%)

Fires with unknown item first ignited have been allocated proportionally among fires with known item first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4-4.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction by Type **of Material First Ignited: 2005-2009 Annual Averages**

Type of Material First Ignited	Fires		Direct Property Damage (in Millions)	
Wood chips, sawdust, or shavings	590	(13%)	$0.1	(12%)
Fabric, fiber, cotton, blends, rayon, or wool	450	(10%)	$0.3	(28%)
Unclassified natural product	360	(8%)	$0.3	(32%)
Multiple types of material	320	(7%)	$0.0	(4%)
Unclassified type of material first ignited	180	(4%)	$0.0	(1%)
Applied paint or varnish	160	(3%)	$0.0	(1%)
Oilcloth	150	(3%)	$0.0	(1%)
Hay or straw	130	(3%)	$0.0	(1%)
Unclassified material compounded with oil	110	(2%)	$0.0	(2%)
Plastic	80	(2%)	$0.0	(3%)
Cardboard	70	(2%)	$0.0	(0%)
Sawn wood, including all finished lumber	70	(2%)	$0.0	(0%)
Other known type of material first ignited	620	(14%)	$0.1	(8%)
Not required	1,170	(26%)	$0.1	(8%)
Total	4,460	(100%)	$1.1	(100%)

Fires with unknown type of material first ignited have been allocated proportionally among fires with known type of material first ignited.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Table 4-5.
Outside Trash or Rubbish Fires Caused by Spontaneous Combustion or Chemical Reaction, by Factor Contributing to Ignition
2005-2009 Annual Averages

Factor Contributing to Ignition	Fires		Direct Property Damage (in Millions)	
Abandoned or discarded material or product	1,810	(41%)	$0.2	(16%)
Unclassified natural condition	1,070	(24%)	$0.7	(66%)
Improper container or storage	830	(18%)	$0.1	(8%)
Unclassified factor contributed to ignition	360	(8%)	$0.0	(4%)
Outside/open fire for debris or waste disposal	170	(4%)	$0.0	(1%)
Unclassified misuse of material or product	140	(3%)	$0.0	(0%)
Failure to clean	100	(2%)	$0.0	(0%)
High wind	90	(2%)	$0.0	(0%)
Other known factor contributing to ignition	270	(6%)	$0.1	(9%)
Total factors*	4,840	(109%)	$1.1	(105%)
Total fires	4,460	(100%)	$1.1	(100%)

Fires with unknown factor contributing, or factor contributing listed as "None" have been allocated proportionally among fires with known factors contributing to ignition.

*Multiple entries are allowed, resulting in more factor entries than fires.

Sources: NFIRS and NFPA survey.

Note: Sums may not equal totals due to rounding errors.

Appendix A.
How National Estimates Statistics are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.
NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.
Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city

departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

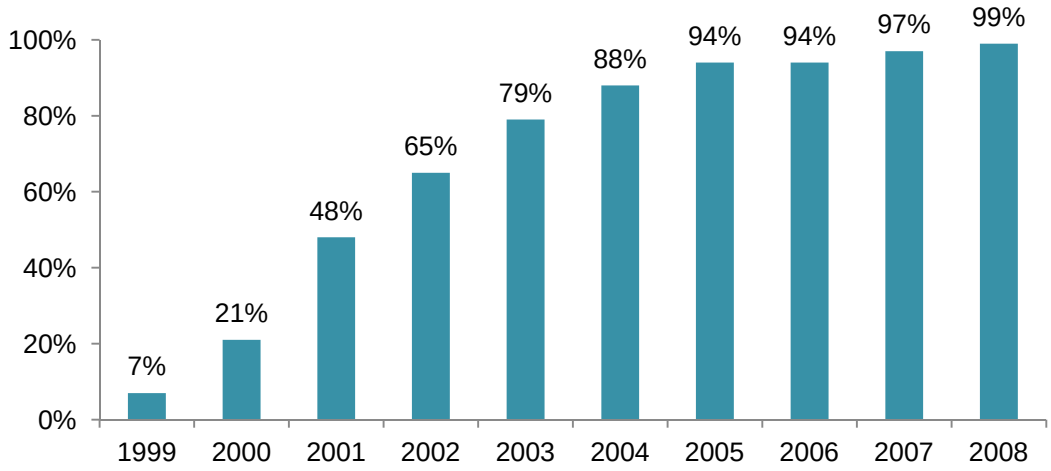
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at www.nfpa.org/osds or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections
NFIRS totals (Version 5.0)

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the

advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types. Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term "all fires" refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Cause of Ignition: This field is used chiefly to identify intentional fires. "Unintentional" in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or "other" (unclassified)." The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

Factor Contributing to Ignition: In this field, the code "none" is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for "not reported" when no factors are recorded. "Not reported" is treated as an unknown, but the code "none" is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, "mechanical failure or malfunction." This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;
26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.

Entries in "electrical failure, malfunction" (factor contributing to ignition 30-39) may also be combined into one entry, "electrical failure or malfunction." This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
30. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: "Heat from open flame or smoking material, other." NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette;
62. Pipe or cigar;
63. Heat from undetermined smoking material;
64. Match;
65. Lighter: cigarette lighter, cigar lighter;
66. Candle;
67 Warning or road flare, fuse;
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping "smoking materials" includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to "the piece of equipment that provided the principal heat source to cause ignition." However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

$$\frac{\text{All fires}}{\text{(All fires – blank – undetermined – [fires in which EII =NNN and heat source <>40-99])}}$$

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

Code Grouping	EII Code	NFIRS definitions
Central heat	132	Furnace or central heating unit
	133	Boiler (power, process or heating)
Fixed or portable space heater	131	Furnace, local heating unit, built-in
	123	Fireplace with insert or stove
	124	Heating stove
	141	Heater, excluding catalytic and oil-filled
	142	Catalytic heater
	143	Oil-filled heater
Fireplace or chimney	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Wiring, switch or outlet	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	214	Wiring from meter box to circuit breaker
	216	Electrical branch circuit
	217	Outlet, receptacle
	218	Wall switch
Power switch gear or overcurrent protection device	215	Panel board, switch board, circuit breaker board

Code Grouping	EII Code	NFIRS definitions
	219	Ground fault interrupter
	222	Overcurrent, disconnect equipment
	227	Surge protector
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight
	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast
	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
	243	Decorative or landscape lighting – low voltage
	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment
Portable cooking or warming equipment	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
	641	Breadmaking machine

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.

Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as "mattresses and bedding." In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as "clothing." In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply "bedroom." Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.

Appendix B.
Methodology and Definitions Used in "Leading Cause" Tables

The cause table reflects relevant causal factors that accounted for at least 2% of the fires in a given occupancy. Only those causes that seemed to describe a scenario are included. Because the causal factors are taken from different fields, some double counting is possible. Percentages are calculated against the total number of structure fires, including both confined and non-confined fires. Bear in mind that every fire has at least three "causes" in the sense that it could have been prevented by changing behavior, heat source, or ignitability of first fuel, the last an aspect not reflected in any of the major cause categories. For example, several of the cause categories in this system refer to types of equipment (cooking, heating, electrical distribution and lighting, clothes dryers and washers, torches). However, the problem may be not with the equipment but with the way it is used. The details in national estimates are derived from the Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0). This methodology is based on the coding system used in Version 5.0 of NFIRS. The *NFIRS 5.0 Reference Guide*, containing all of the codes, can be downloaded from http://www.nfirs.fema.gov/documentation/reference/. Actual estimates are projections based derived from NFPA"s annual fire department experience survey and the procedures below.

Cooking equipment and heating equipment are calculated by summing non-confined fires identified by equipment involved in ignition and relevant confined fires. Confined fires will be shown if they account for at least 1% of the incidents. **Confined cooking fires** (cooking fires involving the contents of a cooking vessel without fire extension beyond the vessel) are identified by NFIRS incident type 113;

Confined heating equipment fires include **confined chimney or flue fires (**incident type 114) and **confined fuel burner or boiler** fires (incident type 116). The latter includes delayed ignitions and incidents where flames caused no damage outside the fire box. The two types of confined heating fires may be combined or listed separately, depending on the numbers involved.

Contained trash or rubbish fires with no flame damage to structure or its contents are identified by incident type 118. No cause can be ascertained for these incidents, but they account for a substantial share of the incidents in some occupancies. When appropriate, these fires are generally shown at the bottom of a cause table.

Confined or contained fires (incident type 113-118) are excluded from the remaining estimates. Unknown data is allocated proportionally among non-confined fires. Reports on specific causal factors may include analysis of confined fires and consequently have higher estimates of specific causes,

Intentional fires are identified by fires with a "1" (intentional) in the field "cause." The estimate includes a proportional share of fires in which the cause was undetermined after investigation, under investigation, or not reported. All fires with intentional causes are included in this category regardless of the age of the person involved. Intentional include those of an incendiary nature and those resulting from a deliberate misuse of the heat source. No age restriction is applied.

Fires caused by **playing with heat source** (typically matches or lighters) are identified by code 19 in the field "factor contributing to ignition." It appears that "none" is often being used in place of "unknown." Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally. Because factor contributing to ignition is not required for intentional fires, the share unknown, by these definitions, is somewhat larger than it should be.

The heat source field is used to identify fires started by: **smoking materials** (cigarette, code 61; pipe or cigar, code 62; and heat from undetermined smoking material, code 63); **candles** (code 66), **lightning** (code 73); and **spontaneous combustion or chemical reaction** (code 72). Fires started by heat from unclassified open flame or smoking materials (code 60) are allocated proportionally among the "other open flame or smoking material" codes (codes 61-69) in an allocation of partial unknown data. This includes smoking materials and candles. This approach results in any true unclassified smoking or open flame heat sources such as incense being inappropriately allocated. However, in many fires, this code was used as an unknown.

The equipment involved in ignition field is used to find several cause categories. This category includes equipment that functioned properly and equipment that malfunctioned.

Identified cooking equipment refers to equipment used to cook, heat or warm food (codes 620-649 and 654). Fire in which ranges, ovens or microwave ovens, food warming appliances, fixed or portable cooking appliances, deep fat fryers, open fired charcoal or gas grills, grease hoods or ducts, or other cooking appliances) were involved in the ignition are said to be caused by cooking equipment. Food preparation devices that do not involve heating, such as can openers or food processors, are not included here. A proportional share of fires involving unclassified cooking kitchen and cooking equipment (code 600) are included here.

Identified heating equipment (codes 120-199) includes central heat, portable and fixed heaters (including wood stoves), fireplaces, chimneys, hot water heaters, and heat transfer equipment such as hot air ducts or hot water pipes. Heat pumps are not included. Unclassified heating, ventilation and air condition equipment (code 100) is included here because a larger share of the whole category involved heating rather than air conditioning or ventilation equipment. A proportional share of fires involving unclassified heating, ventilation, and air conditioning equipment (code 100) are included here.

Electrical distribution and lighting equipment (codes 200-299) include: fixed wiring; transformers; associated overcurrent or disconnect equipment such as fuses or circuit breakers; meters; meter boxes; power switch gear; switches, receptacles and outlets; light fixtures, lamps, bulbs or lighting; signs; cords and plugs; generators, transformers, inverters, batteries and battery charges.

Torch, burner or soldering iron (codes 331-334) includes welding torches, cutting torches, Bunsen burners, plumber furnaces, blowtorches, and soldering equipment.

Clothes dryer or washer (codes 811, 813 and 814) includes clothes dryers alone, washer and dryer combinations within one frame, and washing machines for clothes.

Electronic, office or entertainment equipment (codes 700-799) includes: computers and related equipment; calculators and adding machines;, telephones or answering machines; copiers; fax machines; paper shredders; typewriters; postage meters; other office equipment; musical instruments; stereo systems and/or components; televisions and cable TV converter boxes,, cameras, excluding professional television studio cameras, video equipment and other electronic equipment. Older versions of NFIRS had a code for electronic equipment that included radar, X-rays, computers, telephones, and transmitter equipment. Because this code was so broad, it unfortunately converts to equipment involved undetermined.

Shop tools and industrial equipment excluding torches, burners or soldering irons (codes 300-330, 335-399) includes power tools; painting equipment; compressors; atomizing equipment; pumps; wet/dry vacuums; hoists, lifts or cranes; powered jacking equipment; water or gas drilling equipment; unclassified hydraulic equipment; heat-treating equipment; incinerators, industrial furnaces, ovens or kilns; pumps; compressors; internal combustion engines; conveyors; printing presses; casting, molding; or forging equipment; heat treating equipment; tar kettles; working or shaping machines; coating machines; chemical process equipment; waste recovery equipment; power transfer equipment; power takeoff; powered valves; bearings or brakes; picking, carding or weaving machines; testing equipment; gas regulators; separate motors; non-vehicular internal combustion engines; and unclassified shop tools and industrial equipment.

Medical equipment (codes 410-419) includes: dental, medical or other powered bed, chair or wheelchair; dental equipment; dialysis equipment; medical monitoring and imaging equipment; oxygen administration equipment; radiological equipment; medical sterilizers, therapeutic equipment and unclassified medical equipment.

Mobile property (vehicle) describes fires in which some type of mobile property was involved in ignition, regardless of whether the mobile property itself burned. Mobile property includes: highway-type vehicles such as cars, trucks, recreational vehicles, and motorcycles; trains, trolleys and subways; boats and ships; aircraft; industrial, agricultural and construction vehicles; and riding lawn mowers, snow removal vehicles and tractors.

Exposures are fires that are caused by the spread of or from another fire. These fires are identified by factor contributing to ignition 71. This code is automatically applied for all fires with exposure numbers greater than zero. As with playing with fire, Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally.

Appendix C.
Selected Published Incidents

The following are selected published incidents involving spontaneous combustion. Included are short articles from the "Firewatch" or "Bi-monthly" columns in *NFPA Journal* or it predecessor *Fire Journal* and incidents from either the large-loss fires report or catastrophic fires report. If available, investigation reports or NFPA Alert Bulletins are included and provide detailed information about the fires.

It is important to remember that this is anecdotal information. Anecdotes show what can happen; they are not a source to learn about what typically occurs.

NFPA's Fire Incident Data Organization (FIDO) identifies significant fires through a clipping service, the Internet and other sources. Additional information is obtained from the fire service and federal and state agencies. FIDO is the source for articles published in the "Firewatch" column of the *NFPA Journal* and many of the articles in this report.

Wood Patio Furniture Fuels Fire ignited by Oil-Soaked Rags, California
Two end sections of a 22-unit, 330-by-90-foot building were destroyed when improperly disposed of combustibles ignited spontaneously. The single-story, mixed-occupancy building with concrete tilt-up walls, a roof deck, and a built-up covering was not equipped with fixed fire-protection devices.

A passerby reported the fire at 5:11 a.m. after smelling smoke in the vicinity of the building. When fire fighters arrived to investigate, they discovered a fire in a unit that housed a furniture manufacturing facility.

A large quantity of teak patio furniture fueled the two-alarm fire, which destroyed an adjoining marine products business before firefighters were able to bring it under control.

Fire investigators believe that cloth rags used to apply teak oil to the furniture had been discarded in a plastic bucket and had smoldered for an unknown period of time until they reached their ignition temperature. They ignited spontaneously, and fire spread to the stored wood patio furniture and beyond.

Two firefighters were injured during operations: One was hit in the abdomen by a stream from a deck gun; the other sustained injuries to both knees while pulling a hose.

The loss was estimated at $750,000, $600,000 in damage to contents alone.

Neal Courtney, 1991, "Firewatch", *NFPA Journal*, November/December, 25.

Sprinklers Douse Restaurant Fire Caused by Spontaneous Combustion, California
An automatic, supervised sprinkler system extinguished a fire in a restaurant that was closed for the night. Notified by the activation of the system, the fire department responded, overhauled the fire scene, and shut down the system.

The fire department responded to a central station alarm reporting a water flow at 3:09 a.m. A single-story, unprotected wood-frame building 3 1/2 minutes later. When crew members observed light smoke coming from the back of the building, they called for a full assignment.

Two additional engine companies, a squad, a medical unit, and a chief officer responded at 3:14 a.m. Firefighters established a water supply by connecting to a hydrant next to the building, supported the sprinkler system through the fire department connection, and advanced a 150-foot attack line into the structure.

Firefighters had to force open three padlocked doors with bolt cutters to gain entry to a storage area at the back of the restaurant, where they found cotton towels that had been burning. A single sprinkler had extinguished the fire. The wet-pipe system had activated, notified the fire department, and extinguished the fire. Damage was limited.

Fire officials believe that cotton rags dipped in vegetable oil and used to season a barbecue grill were stored in a cardboard box in the storage room before being cleaned. The oily rags apparently ignited spontaneously and activated the sprinkler.

The restaurant, which was valued at $375,000, sustained $50 in damage.

Kenneth J. Tremblay, 1993, "Firewatch", *NFPA Journal*, July/August, 28.

Single Sprinkler Controls Fire in Paint Distribution Warehouse, California

Automatic sprinklers in an industrial distribution warehouse controlled a small fire when oily rags ignited spontaneously. Responding fire fighters only had to extinguish the small fire that was being controlled by a single sprinkler.

The single-story distribution warehouse, which contained many products, was of tilt-up construction with concrete walls and a wood roof. A wet-pipe automatic sprinkler system covered the entire building, and a central station alarm company monitored water flow.

At 7:35 p.m., the fire department received a call from someone at a neighboring business who reported smoke coming from the warehouse roof.

Arriving firefighters observed smoke coming from a roof vent and entered the building. They discovered the fire in the area where cans of paint and stain were stored on pallets in rack storage. In the adjacent work area, reclaimed cans of stain and paint were relabeled and, if necessary because of compromise to the can, cleaned up and re-closed. A single sprinkler was controlling the fire but had not extinguished it completely. Firefighters put out the remaining fire.

Fire officials found cloth rags and open 5- and 1-gallon cans of oil-based house stain. The fire had been confined to the bottom of the wood pallets. Based on an examination of the scene and statements of the warehouse manager, officials believe the fire started spontaneously among the soiled rags and then spread to the wood pallets. It continued to increase in size until a single sprinkler activated.

The operators of the warehouse said that it was their policy to clean spills using a mixture of rock and sand, not rags. However, rags were used to clean off the cans, and investigators observed at least one instance where they were used to clean a spill, as well.

The improper disposal of the rags with ordinary trash created an environment that was conducive to the start of fires.

The combined loss to the building and its contents reportedly was $35,000, according to news accounts.

Kenneth J. Tremblay, 1993, "Firewatch", *NFPA Journal*, July/August, 26.

Fire Protection Devices Contain Fire in Furniture Warehouse, North Carolina
An automatic sprinkler system, a roll-down fire door, and a fire wall prevented a fire from seriously damaging a furniture warehouse.

The three-story, 114,000-square-foot warehouse was of unprotected, noncombustible, concrete-block-on-steel-frame construction and was divided in half by a 4-hour fire wall with protected openings. It contained a full-coverage, wet-pipe sprinkler system with a monitored water-flow alarm.

In addition to storage, the building housed offices and an area on the first floor where damaged furniture was repaired and refinished before shipping. At the time of the fire, the building was closed for the night and a security guard was on duty.

The fire began among rags soiled with a flammable stain that had been left overnight with other combustible trash in a plastic trash barrel instead of in the metal trash cans with self-closing lids provided for such material. The rags spontaneously ignited, and flames spread to the other rubbish and a work bench, melting a nearby 165°F overhead sprinklers also activated and contained the fire.

The central station received the alarm and notified the fire department at 2:00 a.m. The security guard met the arriving firefighters and confirmed the fire. Using a 1 3/4-inch handline and a portable fire extinguisher, firefighters extinguished the blaze. They then began ventilation and helped the building owners remove water from the structure.

Firefighters later determined that several small aerosol paint cans near the area of fire origin overheated during the blaze and ruptured. The cans then propelled themselves into adjacent walls and the close fire door. This door had been inspected several times by the fire marshal, and a few months earlier, before the company moved into the building, the door had failed three times during testing.

The fire inspector said that, ""had the fire door failed to close, the burning aerosol cans would have been propelled through the opening and into the other side of the 4-hour rated partition. Had this happened, the fire could have reached such a magnitude that the sprinkler system might have been ineffective.""

Damage to the building, valued at $85 million, and its contents, valued at $5 million, was estimated at $7,200.

Kenneth J. Tremblay, 1995, "Firewatch", *NFPA Journal*, November/December, 38.

Cleaning Rags Ignite Spontaneously, California
Fire destroyed a hardware store when paper towels soaked with a flammable wood stain spontaneously ignited.

The 7,200-square-foot (699-square-meter), one-story building was constructed of unprotected wood framing. It was unsprinklered and had no fire detectors.

A passerby noticed smoke coming from the store and called the fire department at 7:28 a.m. Arriving firefighters ventilated the building, which caused the smoldering fire to burn aggressively. It took firefighters using exterior hose lines and master streams four hours to extinguish the blaze.

The day before the fire, a hardware store employee was showing an organic-based wood stain to a customer when he accidentally spilled it. He cleaned the spill with paper towels, then threw them into a 32-gallon (121.1-liter) plastic trash receptacle filled with other paper trash. Temperatures as high as 95°F (35°C) and lack of ventilation in the building allowed the stained towels to rapidly decompose and create enough heat to ignite. The flames then spread to other combustibles, consuming the oxygen in the store, and the fire then smoldered for approximately 20 hours until the building was ventilated.

The structure, valued at $225,000, and its contents, valued at $300,000, were a total loss. There were no injuries.

Kenneth J. Tremblay, 1999, "Firewatch", *NFPA Journal*, July/August, 21-22.

State: Connecticut
Dollar Loss: $30,000,000
Date: November
Time: 1:37 a.m.

Property Characteristics and Operating Status:
This three-story composting storage plant was of unprotected noncombustible construction. The ground floor area wasn't reported. Although the facility was closed at the time of the fire, maintenance workers were in the building.

Fire Protection Systems:
The plant had smoke and heat detectors, which for some reason didn't operate. The coverage wasn't reported. The plant didn't have an automatic suppression system.

Fire Development:
In this plant, wood chips are mixed with sewerage and stored to decompose. The heat from decomposition in this pile ignited the product and the fire spread to a plastic curtain, that in turn, dropped and ignited more products. At the time of the fire, the pile was unattended. No injuries were reported.

Contributing Factors:
None reported.
Stephen G. Badger and Thomas Johnson, 2000, “1999 Large-Loss Fires and Explosions”, *NFPA Fire Journal*, November/December, 83.

Single Sprinkler Controls Big-Box Retail Fire, Washington
A large home supply store suffered minor losses after a sprinkler activated during the night and extinguished a fire that began spontaneously in oil-soaked refuse.

The single-story building had concrete tilt-up walls, with open web steel roof trusses and a plywood roof deck with a built-up covering. Ti was 560 feet (171 meters) long, 275 feet (84 meters) wide, and 25 feet (8 meters) high. The building had a heat detection system and five separate sprinkler systems. Three wet-pipe systems provided coverage to the main part of the building, while a fourth covered the rack storage area. A dry-pipe system covered the loading docks and canopy. A public fire service communication station monitored all the systems.

Firefighters responded to a water flow alarm at 11:58 p.m., four hours after the last employee left for the evening. When they arrived, they found that a cardboard box on the loading dock had ignited and a single sprinkler had extinguished the fire.

Investigators found that rags used to clean up a spill of linseed oil-based paint or stain earlier in the day had been placed in a cardboard box and left by the loading dock.

This type of spontaneous ignition fire had occurred before, only two weeks earlier, but employees had used fire extinguishers to put it out and hadn't called the fire department.

The building was valued at $15 million, and its contents at $9 million. The structure suffered $1,000 in damage, with content loss estimated at $2,000.

Kenneth J. Tremblay, 2000, "Firewatch", *NFPA Journal*, March/April, 16.

Oily Rags Ignite, California
Rags soaked with wood stain spontaneously ignited in the garage of a two-family house, and the resulting of the spread into the dwelling and to the house next door.

The unsprinklered wood-framed house, which had an apartment in the basement, was 58 feet (17.7 meters) long and 36 feet (11 meters) wide, and had an asphalt-shingled roof. Information about smoke alarms was unreported.

Firefighters, responding three minutes after the 12:33 a.m. 911 call, found the garage fully involved and flames spreading to the living space above it, the exterior wooden siding, and a car parked in front. A single-family home next door was also burning. Fire crews extinguished the fire with the help of additional resources.

Investigators found that the fire began in a pile of rags a resident had used to apply an oil-based stain to wooden items in the garage and grew until it engulfed both homes.

Damage to the house of origin, valued at $600,000, was estimated at $300,000, and damage to its contents, valued at $100,000, was estimated at $50,000. The abutting house, valued at $500,000, and its contents, valued at $100,000, were destroyed. There were no injuries.

Kenneth J. Tremblay, 2004, “Firewatch,” *NFPA Journal*, September/October, 18.

Sprinklers Save Wood-Finishing Company, New Hampshire
Two sprinklers controlled a fire that began when cardboard, pallets, insulation, and empty containers of oil-based paints and thinners spontaneously ignited in room on the loading dock of a wood-finishing company that had closed for the night.

The one-story building had concrete block walls and a bowstring wooden-truss roof covered in rolled asphalt. It was protected by a wet-pipe automatic sprinkler system monitored by the municipal fire alarm system.

The fire department received the alarm at about 8:30 p.m. and arrived within minutes to find the exterior water motor gong operating and light smoke coming from the roof on one side of the building. Using keys from a key safe, firefighters entered the building and advanced a hose line to the loading dock and trash room. There, they found two sprinklers controlling the flames and extinguished the fire using the hose line and portable pressurized water extinguishers.

Investigators determined that oil-laden waste ignited spontaneously.

Neither the building, valued at $907,700, nor its contents, valued at $150,000, was damaged. There were no injuries.

Kenneth J. Tremblay, 2004," Firewatch", *NFPA Journal*, May/June, 24.

Washington
Dollar Loss: $5,500,000
Month: August
Time: 8:27 PM

Property Characteristics and Operating Status:
This two-story metal products plant was of heavy timber construction and covered 45,000 square feet (4,180 square meters). The plant was operating when the fire broke out.

Fire Protection Systems:
No automatic detection or suppression systems were present.

Fire Development:
A spontaneous ignition of rags in the spray booth area caused the fire, which spread throughout the building and through the roof.

Contributing Factors and Other Details:
Loss to building was $3,000,000 and loss to contents was $2,500,000.

Stephen G. Badger, 2004, “Large-Loss Fires for 2003 ” *NFPA Journal*, November/December, 53.

Fire Spreads to Building, Ohio
Reclaimed resin products in a processing pit outside a warehouse ignited and quickly spread to the building, which was loaded with combustibles.

The single-story, wood-frame warehouse was 300 feet (91 meters) long and 100 feet (30 meters) wide. It had metal siding and a metal roof, and was protected by a smoke detection system. There were no sprinklers.

A warehouse employee discovered the fire and called 911 at 10:15 a.m. as the building was evacuated. The fire department arrived three minutes later. The blaze quickly spread from the processing pit to the warehouse roof, where a strong wind fanned the flames along the entire length of the building within 10 minutes of the firefighter's arrival. Once inside the building, the fire ignited paper and plastic products.

Responding firefighters saw heavy, black smoke coming from the scene and placed their deck gun in service. The incident commander ordered a defensive attack and requested several aerial ladders from other fire departments. Firefighters brought the fire under control in about two hours.

Investigators believe that a spontaneous chemical reaction started the fire in the resin-processing pit. Once ignited, the blaze jumped to the nearby warehouse and engulfed it.

The warehouse, valued at $500,000, and its contents, valued at $200,000, were a total loss. There were no injuries.

Kenneth J. Tremblay, 2005, "Firewatch", *NFPA Journal*, January/February, 20.

Oily Rags Ignite Fire in Cabinet Shop, California
Before it could be extinguished, a fire in a cabinet shop caused $200,000 in fire losses. A stack of oily rags left under a staircase heated spontaneously and burned undetected while the shop was closed for the weekend. A passerby alerted the fire department, they responded within five minutes, located the seat of the fire, and extinguished the flames.

The steel-frame building with metal walls and roof covered approximately 4,500 square feet (418 square meters). Mainly a single-story building, one part included a mezzanine with office above. There were no sprinklers or fire detection system installed.

The fire occurred in the section of the plant where wooden cabinets were stained and finished.

Once the fire started, it spread to nearby cabinets and the office at the top of the stairs. When the fire department arrived, smoke was coming from the warehouse section of the building. Forcing entry into several doors, firefighters advanced a hose line into the building and extinguished the flames. Other crews ventilated the building, overhauled and investigated the cause of the fire. The building, valued at $750,000, had $100,000 in loss and the contents valued at $500,000 suffered $100,000 in loss. There were no injuries.

Kenneth J. Tremblay, 2007, “Firewatch”, *NFPA Journal*, November/December, 22.

Sprinkler Controls Fire Started by Oily Rags, Illinois
The contents of a garage and storage area in a mixed-use strip mall ignited and burned until a sprinkler operated and controlled the fire before firefighters arrived.

The single-story building, which measured 200 feet (61 meters) by 75 feet (23 meters), was constructed of concrete block walls over a concrete slab with a metal truss roof and a built-up roof deck covered by a rubber membrane. The mall had a wet-pipe sprinkler system connected directly to fire dispatch.

The sprinkler flow activation alerted firefighters to the blaze, and they immediately responded to complete extinguishment and to ventilate the strip mall.

Investigators determined that oily rags, left in a pile in the storage area by a business owner who had been refinishing a deck, spontaneously ignited and that the fire grew until it produced enough heat to activate the sprinkler.

The building's contents were damaged, for an estimated loss of approximately $2,000. The building itself was undamaged. There were no injuries.

Kenneth J. Tremblay, 2011, "Firewatch", *NFPA Journal*, July/August, 21-22.