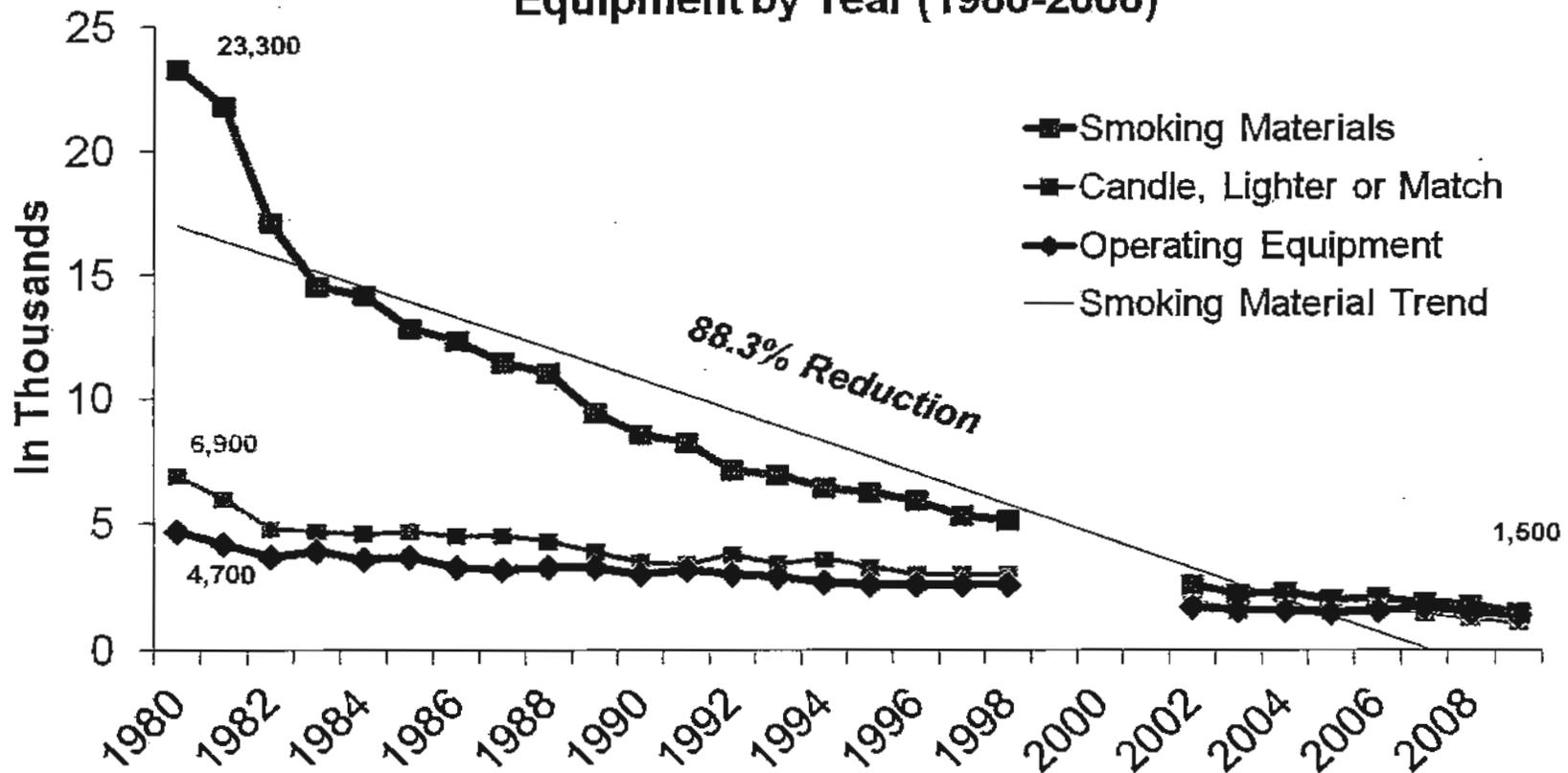


NFPA Data Indicates Sharp Declines In Fire Events Involving Upholstered Furniture¹

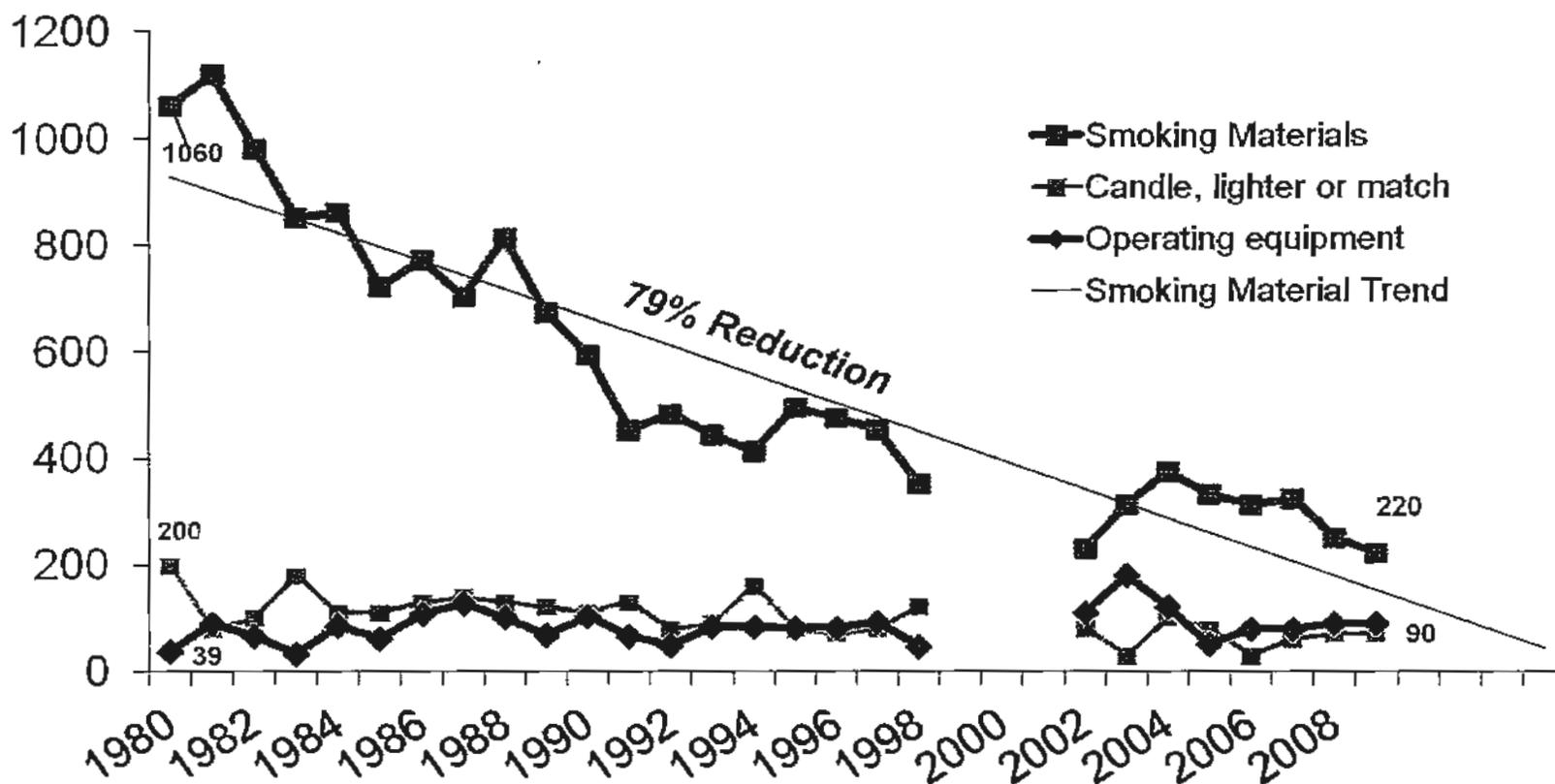
Home Upholstered Furniture Fire Started by: Smoking Materials; Candles, Lighter and Matches; or Operating Equipment by Year (1980-2008)



¹Home Upholstered Furniture Fires, Marty Ahrens, NFPA Fire Analysis and Research, Quincy, MA. August 2011 P.29 Table 11

NFPA Data Indicates Sharp Declines In Deaths Involving Upholstered Furniture¹

Civilian Deaths from Home Upholstered Furniture Fires Started by: Smoking Materials; Candles, Lighter and Matches; or Operating Equipment by Year (1980-2010)



¹Home Upholstered Furniture Fires, Marty Ahrens, NFPA Fire Analysis and Research, Quincy, MA. August 2011 P.30 Table 12

**HOME FIRES THAT BEGAN WITH
UPHOLSTERED FURNITURE**

Marty Ahrens

August 2011



**National Fire Protection Association
Fire Analysis and Research Division**

Abstract

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, NFPA estimates that during 2005-2009, upholstered furniture was the item first ignited in an average of 7,040 reported home structure fires per year. (Homes include one- and two-family dwellings, apartments or other multiple family dwellings, and manufactured housing.) These fires caused an estimated annual average of 500 civilian deaths, 890 civilian injuries, and \$442 million in direct property damage. Upholstered furniture is the leading item first ignited in home fire deaths. Although upholstered furniture fires started by smoking materials have fallen sharply since 1980, smoking materials remain the leading cause of these fires and associated losses.

Keywords: upholstered furniture; small open flame; fires; home fires, fire causes, fire statistics; smoking materials.

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.

Copies of this analysis are available from:

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Home Structure Fires that Began with Upholstered Furniture

In 2005-2009, U.S. fire departments responded to an average of 7,040 home structure fires per year in which upholstered furniture was the first item ignited. These fires caused an annual average of 500 civilian fire deaths, 890 civilian fire injuries, and \$442 million in direct property damage.

On average, one of every 14 reported upholstered furniture fires resulted in death.

Overall, fires beginning with upholstered furniture accounted for 2% of reported home fires but one of every five (19%) home fire deaths.

Major Causes of Upholstered Furniture Fires

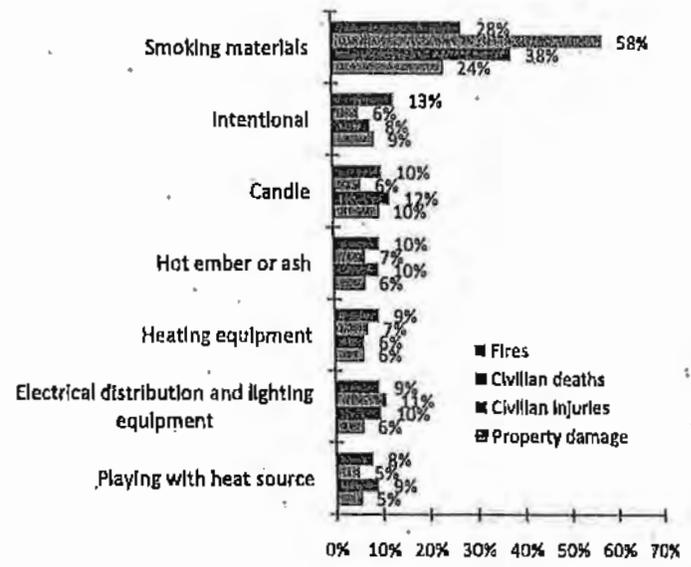
Smoking materials remain the leading cause of upholstered furniture fires and losses. One of every six such fires started by smoking materials resulted in death.

Portable and fixed space heaters were involved in 8% of the upholstered furniture fires and 7% of the associated deaths.

Operating equipment was the heat source in 22% of the fires and 15% of the deaths.

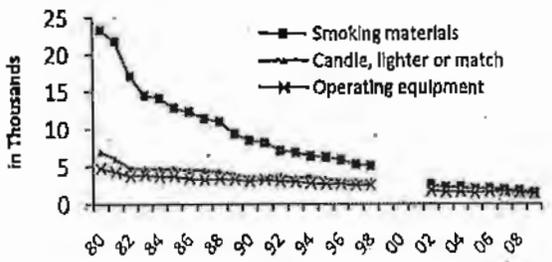
Together, candles, matches and lighters were involved in 21% of the fires and 12% of the deaths.

Electrical failures or malfunctions were factors in 14% of the home upholstered furniture fires and 10% of the deaths. These failures were in all types of electrical appliances, not just electrical distribution or lighting equipment.

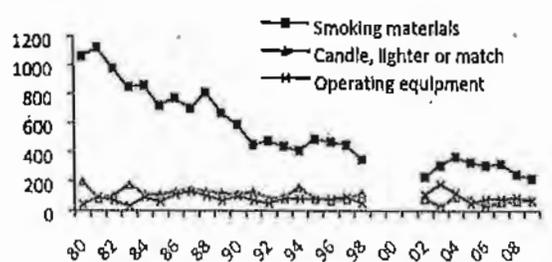


Upholstered furniture fires started by smoking materials and associated deaths fell sharply since 1980. The declines in upholstered furniture fires started by candles, matches or lighters and by operating equipment were not as sharp. No clear trend was seen for upholstered furniture deaths from candles, matches and lighters or operating equipment.

Home Upholstered Furniture Fires Started by: Smoking Materials; Candles, Lighters and Matches; or Operating Equipment; by Year 1980-2009



Civilian Deaths from Home Upholstered Furniture Fires Started by: Smoking Materials; Candles, Lighters and Matches; or Operating Equipment; by Year 1980-2009



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.

Research

Advocacy



Codes & Standards

Public Education

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:

[NFPA 101 - Life Safety Code®](#)

[NFPA 1 - Fire Code](#)

[NFPA 260 - Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components Upholstered Furniture](#)

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.

During 2005-2009, upholstered furniture was the item first ignited in an average of 7,040 reported home structure fires per year. These fires caused an estimated annual average of 500 civilian deaths, 890 civilian injuries, and \$442 million in direct property damage. Overall, fires beginning with upholstered furniture accounted for 2% of reported home fires but 19% of home fire deaths. These statistics were derived from the detailed information collected by 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.

Upholstered furniture fires in the home environment have fallen sharply, dropping 84% from a high of 36,900 in 1980, the first year of usable data, to a 30-year low of 5,900 in 2009. Even with a 67% drop in the number of associated deaths from highs of 1,360 in 1980 and 1981 to a low of 450 in 2009, upholstered furniture remains the leading item first ignited in home fire deaths. During 2005-2009, upholstered furniture was the item first ignited in 2% of reported home fires. These incidents caused one of every five (19%) home fire deaths.

Smoking materials remain the leading heat source in upholstered furniture fires and associated deaths although their share has fallen dramatically over time. In the early 1980s, almost two-thirds (59-64% in 1980-1984) of home

upholstered furniture fires were ignited by smoking materials. These fires caused more than three-quarters (77-82%) of the associated death. During 2005-2009, in contrast, smoking materials caused roughly one-quarter (28%) of the upholstered furniture fires and three of every five (58%) associated deaths. ~~In 2008 and 2009, the two most recent years of available data, only half (49-50%) of the home upholstered furniture deaths resulted from fires started by smoking materials.~~

More than half (53%) of the victims of upholstered furniture fires started by smoking materials in 2005-2009 were in the area of origin and involved in the ignition. An additional 11% were in the area but not involved.

In 1980-1984, candles, lighters or matches caused almost one of every five (17-19%) upholstered furniture fires and 6-16% of the associated deaths. In 2005-2009, candles (10% of the fires and 6% of the deaths), lighters (8% of the fires and 5% of the deaths), and matches (3% of the fires and 1% of the deaths) together caused more than one-third (32%) upholstered furniture fires and 12% of the associated deaths. Someone playing with the candle, lighter or match was a factor in roughly one-third of these small open flame ignitions and associated deaths. In almost one-third of these ignitions, the candle, lighter or match was too close to something that could catch fire. This would be more common with candles than the other two open flames.

Roughly one-quarter of the small open flame ignitions were intentionally set. However, playing with heat source was a contributing factor in most of these intentional fires.

Almost half (46%) of the victims of upholstered furniture fires started by candles, lighters or matches were in the area of origin and involved in ignition. An additional 12% were in the area but not involved.

In 1980-1984, operating equipment caused 13-16% of these fires and 3-9% of the associated deaths. In 2005-2009, operating equipment caused 22% of the home upholstered furniture fires and 15% of the associated deaths. Electrical distribution or lighting equipment was involved in more than one-third of these operating equipment fires and three out of five associated deaths (9% of all home upholstered furniture fires and 11% of the deaths). Cords or plugs were the leading type of equipment involved in upholstered furniture deaths. Heating equipment was involved in roughly one-third of the operating equipment fires and associated deaths (9% of all home upholstered furniture fires and 7% of the associated deaths), with fixed or portable space heaters, including wood stoves, accounting for the majority of heating equipment involved.

Only 19% of the victims of operating equipment fires were in the area of origin and involved in ignition. An additional 8% were in the area but not involved.

Hot embers or ashes caused 10% of the upholstered furniture fires and resulting deaths. Sleep was a factor in 12% of the ignitions and 28% of the associated deaths.

Assessing the probable impact of any one approach to fire safety is challenging. New materials enter the marketplace. Upholstered furniture is a durable product. New furniture is likely to meet current flammability standards. Over time, things get spilled on the furniture, the fabric may wear out, and the furniture may pass to a different household. It is important to remember that these statistics are based on all upholstered furniture, some of which may be very old.

Changes in the environment also complicate the issue. Homes are much more likely to have smoke alarms today than they were in 1980. This means that more fires may be discovered before fire department assistance is required. The Consumer Product Safety Commission (CPSC) required lighters to be child-resistant beginning in 1994, resulting in a drop in fires started by children playing. The increase in candle sales in the 1990s was accompanied by an increase in candle fires. Laws requiring "fire-safe" cigarettes that extinguish when not inhaled have been passed, and as of July 1, 2011, are in effect in all 50 states. Home fire sprinklers can control a fire until the fire department arrives. More information about home fire sprinklers is available at firesprinklerinitiative.org.

Safety Tips

- If you smoke, smoke outside. Be careful when smoking around upholstered furniture. Use large, deep, sturdy ashtrays and do not rest them on a sofa or chair. When lighting cigars, pipes, or cigarettes, make sure sparks from matches do not land on the couch or chair. In addition, whenever there has been smoking in a room, check under cushions and in cracks for discarded butts before going to bed or leaving the home. If you smoke, only smoke when you feel alert. Do not smoke when drowsy, intoxicated or medicated. Never smoke where medical oxygen is used.
- Cigarette ignition-resistant upholstered furniture is more common now, but be aware of potential higher fire risk when purchasing antique or used furniture.
- Keep heaters and upholstered furniture at least three feet (1 meter) away from each other. See the manufacturer's instructions for how to operate and install the appliance safely.
- Do not place furniture near a fireplace or wood stove. Leave adequate space for ventilation. The furniture should be at least three feet (1 meter) away from a heat source.
- Eight percent of upholstered furniture fires were begun by someone, usually a child, playing with fire. Keep matches and lighters up high, out of the reach of children, preferably in a locked cabinet. Encourage children to tell an adult when they find matches and lighters.
- Extinguish all candles when leaving the room or going to sleep. Make sure candles are placed on a stable piece of furniture in sturdy holders that won't tip over.
- Avoid putting cords against or under furniture.

For safety tip sheets on a variety of topics, go to www.nfpa.org/safetytips. For all EMAC tips, go to www.nfpa.org/emac.

Home Fires Beginning with Upholstered Furniture

On average, 7,040 home structure fires began with upholstered furniture each year. During the five-year period of 2005-2009, upholstered furniture was the item first ignited in an estimated average of 7,040 reported home structure¹ fires per year. These fires caused an annual average of 500 civilian deaths, 890 civilian fire injuries, and \$442 million in direct property damage. On average, one of every 14 reported upholstered furniture fires resulted in death.

Upholstered furniture plays two major roles in fire scenarios. It may either be the item first ignited, or it may contribute substantially to the growth of a fire that began with the ignition of something else, such as a newspaper, blanket, or trash. This report focuses primarily on the first as the only data available on secondary fuel sources relates to the material contributing most to flame spread.

One of every five home structure fire deaths resulted from fires that began with upholstered furniture.

During 2005-2009, U.S. fire departments responded to an estimated average of 373,900 home structure fires per year. These incidents caused an average of 2,650 civilian deaths, 12,890 reported civilian fire injuries, and \$7.1 billion in direct property loss per year. The 7,040 fires that began with upholstered furniture accounted for an average of 2% of the reported home structure fires, 19% of the home civilian structure fire deaths, 7% of the civilian structure fire injuries, and 6% of the structure fire direct property loss per year. Although upholstered furniture was the 15th most common item first ignited in reported home fires, it was the leading item first ignited in home fire deaths.²

Trends

Since 1980, these structure fires fell 84%.

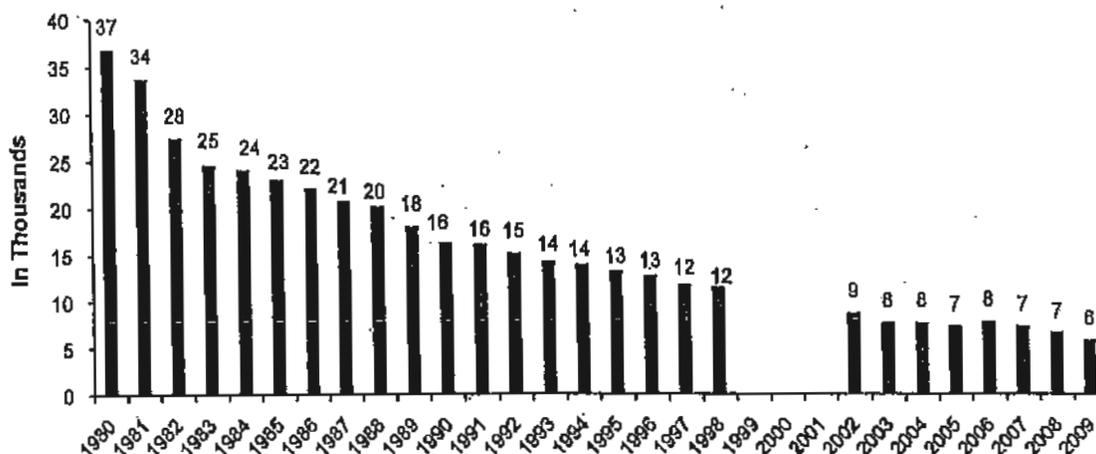
As shown in Table 1 and Figure 1, home structure fires beginning with upholstered furniture fell 84% from a high of 36,900 in 1980 to 5,900 in 2009, the lowest point in the 30 years of data. This is a much larger decrease than the 51% drop seen for total home structure fires over the same period. From 2008 to 2009, upholstered furniture fires fell 13% while total home fires fell only 6%.

Details collected in NFIRS 5.0 were used to derive the estimates from 1999 on. Due to the small portion of fires originally collected in NFIRS 5.0 during 1999-2001, estimates for these years are omitted from the trend graphs.

¹ Homes include one- and two-family dwellings, manufactured housing, apartments, tenements, flats, townhouses and row houses, regardless of ownership. The term "civilian" describe anyone who is not part of the fire service.

² Marty Ahrens. *Home Structure Fires*, Quincy, MA: NFPA 2011, pp. 42-43.

Figure 1. Home Structure Fires that Began with Upholstered Furniture, by Year



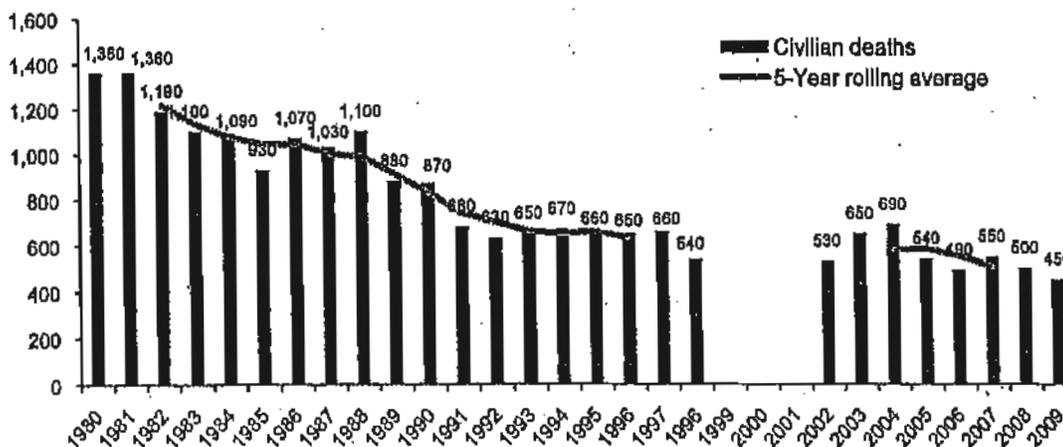
Source: NFIRS and NFPA survey.

Upholstered furniture fire deaths declined sharply in the 1980s, then leveled off.

Deaths resulting from home structure fires beginning with upholstered furniture were at their highest in 1980 and 1981, with an estimated 1,360 such deaths both years. Figure 2 shows that deaths hit a plateau in the 1990s at roughly half the 1980 and 1981 highs. The 450 death toll reported in 2009 is 67% lower than the highs in 1980 and 1981 and 8% lower than in 2008. The solid line shows the five-year rolling average, with the first point above 1982, showing the average for 1980-1984 while the last point, above 2007, shows the 2004-2009 average. Averages including the years 1999, 2000, and 2001 are not shown.

Civilian fire deaths from all home structure fires fell 51% from 1980 to 2009 and 7% from 2008 to 2009.

Figure 2. Civilian Fire Deaths Resulting from Home Structure Fires that Began with Upholstered Furniture, by Year



Source: NFIRS and NFPA survey.

Methodology

Statistics are derived from NFIRS and NFPA's annual 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 or industrial fire brigades. 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. Earlier versions of NFIRS were used to calculate estimates for 1980-1995.

Upholstered furniture was identified by NFIRS item first ignited code 21, which captures upholstered sofas, chairs, and vehicle seats.³ Structure fires were identified by NFIRS incident types in the 10-129 series and homes were identified by NFIRS property use codes 419 and 429. In the analysis that follows, fires and losses with missing or unknown data were generally allocated proportionally among fires with known data.

NFIRS 5.0 includes six categories of *confined* structure fires, identified by incident types 113-118. These include cooking fires confined to the cooking vessel, confined chimney or flue fires, confined incinerator fires, confined (fuel burner or boiler) fires or delayed ignitions, confined commercial compactor fires, and trash or rubbish fires in a structure with no flame damage to the structure or contents. Little more than basic dispatch data and property use is required by the NFIRS 5.0 system for these fires, although full reports are sometimes completed. Other types of structure fires are described as *non-confined* fires, regardless of the extent of flame damage. *Confined* fires are included in the estimates of total upholstered furniture fires and overall trends, but due to the small number of fires with known data, excluded from further analysis. For more details on the methodology used, see Appendix A. Tables supporting the text are provided at the end of this analysis.

Rounding

It is important to remember that the statistics presented are estimates, not actual counts. Rounding is a reminder that the estimates are not precise. However, less rounding was sometimes needed to avoid having too many entries of zero. Property damage was always rounded to the nearest million, and except for trend tables, was not adjusted for inflation. In trend tables, fires were rounded to the nearest hundred. Fires were rounded to the nearest ten in all non-trend tables. Civilian deaths and injuries were rounded to the nearest ten in tables on upholstered furniture fires in general and on trends by different heat sources or groups of heat sources. Casualty estimates were rounded to the nearest one on tables showing 2005-2009 averages of deaths about specific heat sources or groups of heat sources.

³ U.S. Fire Administration National Fire Data Center. National Fire Incident Reporting System 5.0, Complete Reference Guide, January 2008. Online at <http://www.nfirs.fema.gov/documentation/reference/>.

Causes and Circumstances of Home Upholstered Furniture Fires

Not surprisingly, the vast majority of upholstered furniture fires began with fabric.

Table 2 shows that fabric, fiber or finished goods made of cotton, blends, rayon, or wool was the type of material first ignited in roughly three-quarters of home structure fires that began with upholstered furniture. The share was similar of the associated losses. In 14% of the fires and 15% of the deaths, unclassified fabric, textile, or fur was first ignited.

Confined fires were omitted from rest of analysis. Only non-confined fires were included in the analysis of the causes and circumstances. During 2005-2009, an average of 6,760 fires with non-confined fire incident types began with upholstered furniture per year, resulting in an average of 500 civilian deaths, 870 civilian injuries, and \$412 million in direct property damage. Non-confined fires accounted for 96% of non-confined upholstered furniture fires and 100% of the associated losses. An estimated average of 280 fires with confined fire incident types began with upholstered furniture per year, resulting in an average of two injuries and roughly \$30,000 in direct property damage annually. Confined fires were omitted from the following analysis. See the previous box and Appendix A for more details about confined fires.

More than half of upholstered furniture fire deaths resulted from fires in the living room, family room, or den.

Table 3 shows that 39% of these fires started in the living room, family room, or den. These fires caused 56% of the associated civilian deaths, 51% of the civilian injuries, and 32% of the direct property damage. Roughly one-fifth to one-quarter of the fires and associated losses began in an unclassified function area. The 15% that started in a bedroom caused 9% of the deaths.

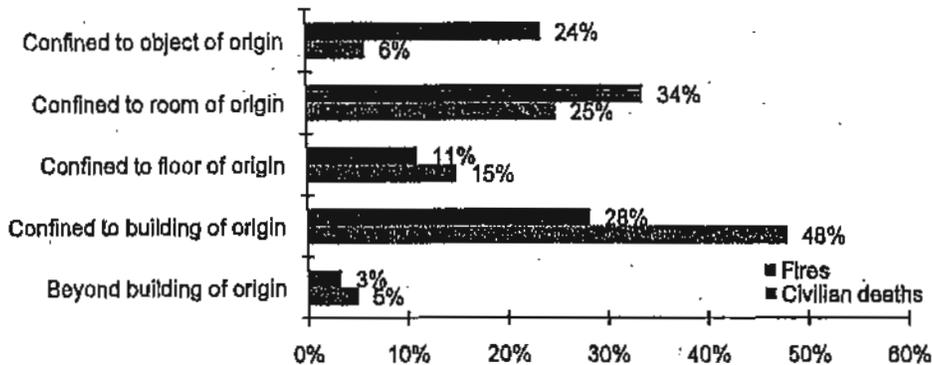
On average, 2,260 upholstered furniture fires per year were outside or unclassified fires or began on the structure's exterior.

In 2005-2009, an annual average of 1,860 fires on home properties began with upholstered furniture and had incident types identifying the fire as outside or unclassified. In addition, an average of 400 home structure fires per year began in outside or open spaces. Table 3 shows that an annual average of 180 (3%) began on exterior balconies or unenclosed porches; 80 (1%) began on a courtyard, terrace or patio; 60 began in an exterior wall; 50 (1%) started in an unclassified outside area. (Only fires accounting for at least 1% of the fires are shown in the table.) Combined, these 2,260 fires caused an average of two civilian deaths, 42 civilian injuries, and \$28 million in direct property damage per year. Such furniture may have been purchased specifically for porch use or other furniture may have been relegated there. The remainder of the analysis focuses on structure fires only.

Flame damage was limited to the room of origin in almost one-third of home upholstered furniture fire deaths.

Figure 3 and Table 4 show that that in more than half (57%) of home structure fires that began with upholstered furniture, flame damage was confined to the object or room of origin. These fires caused one-third (31%) of the associated deaths.

**Figure 3. Home Structure Fires that Began with Upholstered Furniture
By Extent of Flame Damage: 2006-2009**



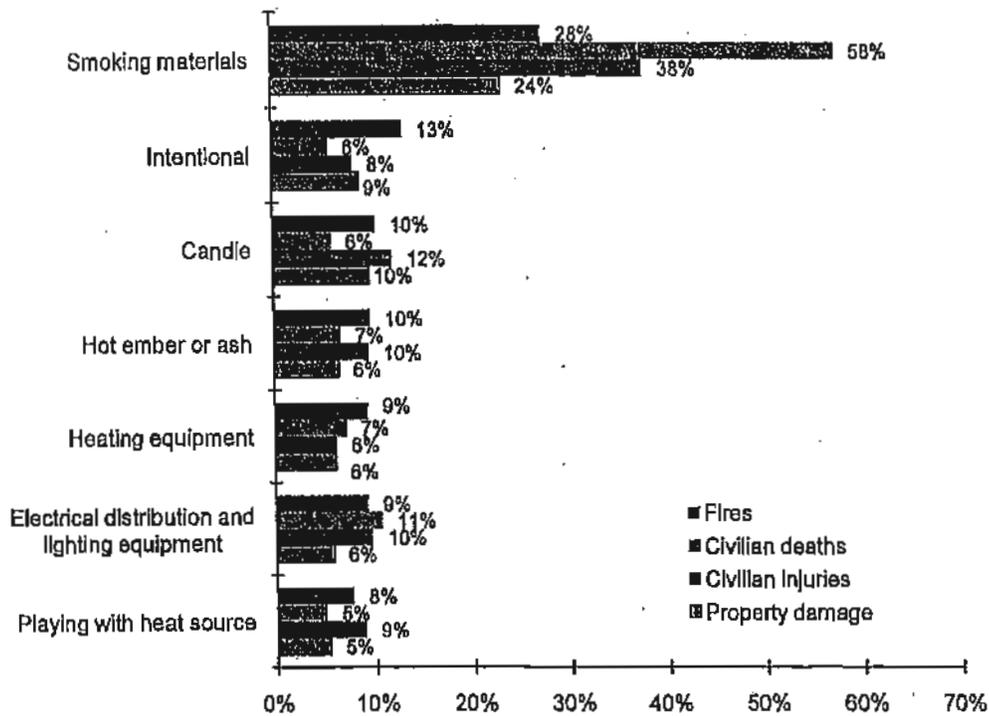
Source: NFIRS and NFPA survey.

Smoking materials are the leading cause of upholstered furniture fires and associated losses. Smoking materials have historically caused the largest number of upholstered furniture fires and associated losses. This was still the case in 2005-2009. Smoking materials were the heat source in an average of 1,870, or 28%, of the home structure fires that began with upholstered furniture per year. These fires resulted in an annual average of 290 (58%) civilian deaths, 340 (38%) of the civilian injuries, and \$104 million (24%) in direct property damage. Smoking materials include cigarettes, cigars or pipes, and undetermined smoking material.⁴ Matches and lighters are not included in this category. Upholstered furniture fires started by smoking materials are examined in more detail later in this report.

Table 5 and Figure 4 show the leading causes of home structure fires that began with upholstered furniture with data summarized from several NFIRS fields. In some cases, the equipment involved in ignition is most relevant; heat source, the field "cause" (as opposed to this summary of "major causes" from multiple fields) and factor contributing to ignition also provide relevant information. The causal factors shown in this graph are not mutually exclusive when they have been pulled from different fields. When some type of equipment is shown as a cause, it means the equipment was involved in the ignition. It need not mean that the equipment was defective or malfunctioned. In many cases, the equipment was used improperly. See Appendix B for details on how the different categories were calculated.

⁴ Estimates for smoking materials, candles, matches and lighters include a proportional source of fires and losses with heat source code 60 "heat from open flame or smoking materials, other."

Figure 4. Major Causes of Home Structure Fires that Began with Upholstered Furniture: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Thirteen percent of the home upholstered fires were intentionally set.

On average, 900 (13%) of the home upholstered furniture fires were intentionally set per year. These incidents caused an average of 30 (6%) of the associated civilian deaths, 70 (8%) of the civilian injuries, and \$39 million (9%) in direct property damage.

Candles started 10% of these fires.

Candles were the heat source in an average of 710 (10%) home upholstered furniture fires per year, resulting in an average of 30 (6%) civilian deaths, 110 (12%) of the civilian injuries, and \$43 million (10%) in direct property damage per year.

Hot embers or ashes also started 10% of these fires.

Hot embers or ashes were the heat source in an average of 660 (10%) home upholstered furniture fires per year, resulting in an average of 30 (7%) civilian deaths, 80 (10%) of the civilian injuries, and \$29 million (6%) in direct property damage per year. The source of these embers or ashes is not specified. This issue is discussed in greater detail later in Appendix C.

Portable or fixed space heaters were involved in 7% of the home upholstered furniture fire deaths.

Heating equipment was involved in an estimated average of 640 (9%) home upholstered furniture fires per year. These fires caused an average of 40 (7%) civilian deaths, 50 (6%) civilian injuries, and \$27 million (6%) in direct property damage. Portable and fixed space

heaters; including wood stoves, were the most common type of heating equipment involved. These heaters were involved in an annual average of 560 (8%) upholstered furniture fires, resulting in an average of 40 (7%) of the associated deaths, as well as 40 (5%) injuries.

Electrical distribution or lighting equipment was involved in 9% of the home upholstered furniture fires.

Electrical distribution or lighting equipment was involved in an annual average of 630 (9%) reported home fires that began with upholstered furniture. These fires caused an average of 50 (11%) civilian deaths, 90 (10%) civilian injuries, and \$25 million (6%) in direct property damage. Lamps and other lighting equipment were involved in an average of 200 fires per year and 20 deaths per year. Cords and plugs accounted were involved in an average of 160 of these fires and 40 of the associated deaths per year. Fixed wiring and related equipment was involved in 240 such incidents per year.

Someone playing with fire started 8% of the home upholstered furniture fires.

Someone, typically a child, playing with fire or other heat source started an average of 520 (8%) home upholstered furniture fires per year. These fires caused an average of 20 (5%) civilian deaths, 80 (9%) civilian injuries, and \$23 million (5%) in direct property damage per year. As mentioned earlier, factors from different fields overlap. Forty-percent of the upholstered furniture fires started by playing were intentionally set.

SPECIFIC CAUSAL FACTORS

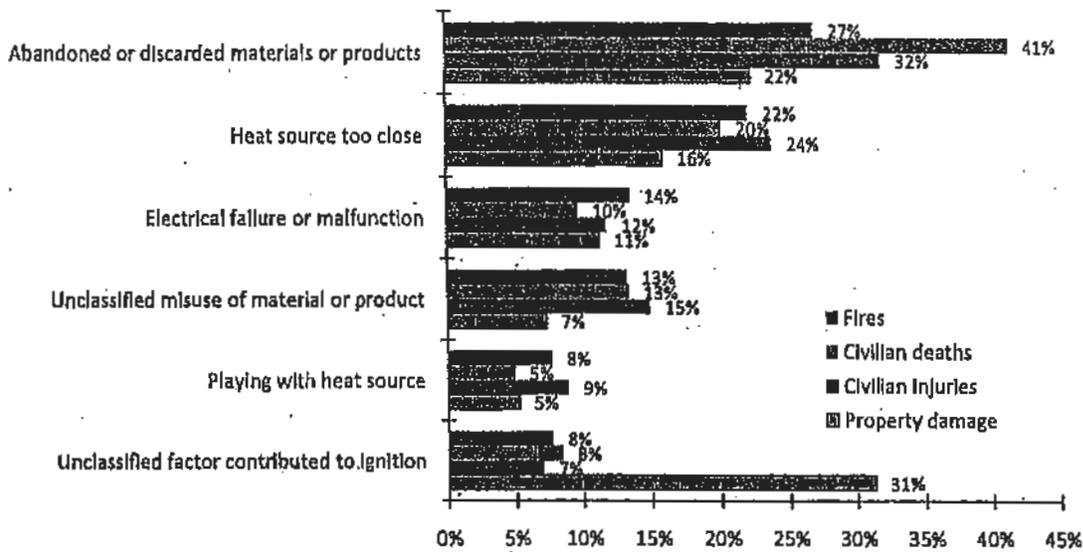
The previous discussion focused on causal factors that by themselves almost describe general scenarios. In this part of the report, results from specific NFIRS causal data elements are examined. The broad categories of cause of ignition, a field in NFIRS, are shown in Table 6. Factors contributing to ignition are shown in Table 7 and human factors contributing to ignition are shown in Table 8. Table 9 provides more information on heat sources while more detailed information on equipment involved in ignition may be found in Table 10.

Abandoned or discarded material was the leading factor contributing to ignition.

The field "factor contributing to ignition" explains how the heat source interacted with the fuel source to start a fire. Figure 5 and Table 7 show that the leading factor for home upholstered furniture fires was abandoned or discarded material or products. The NFIRS *Complete Reference Guide* notes that this "Includes discarded cigarettes, cigars, tobacco, embers, hot ashes, or other burning matter." It "excludes outside fires left unattended."

Upholstered furniture was too close to a heat source such as a candle or heater in roughly one-fifth of the fires and deaths. Electrical failures or malfunctions from all types of equipment powered by electricity, not just electrical distribution or lighting equipment, were factors in 14% of home structure fires that began with upholstered furniture per year as well as 10% of the associated civilian deaths.

Figure 5. Home Structure Fires that Began with Upholstered Furniture by Leading Factor Contributing to Ignition: 2005-2009

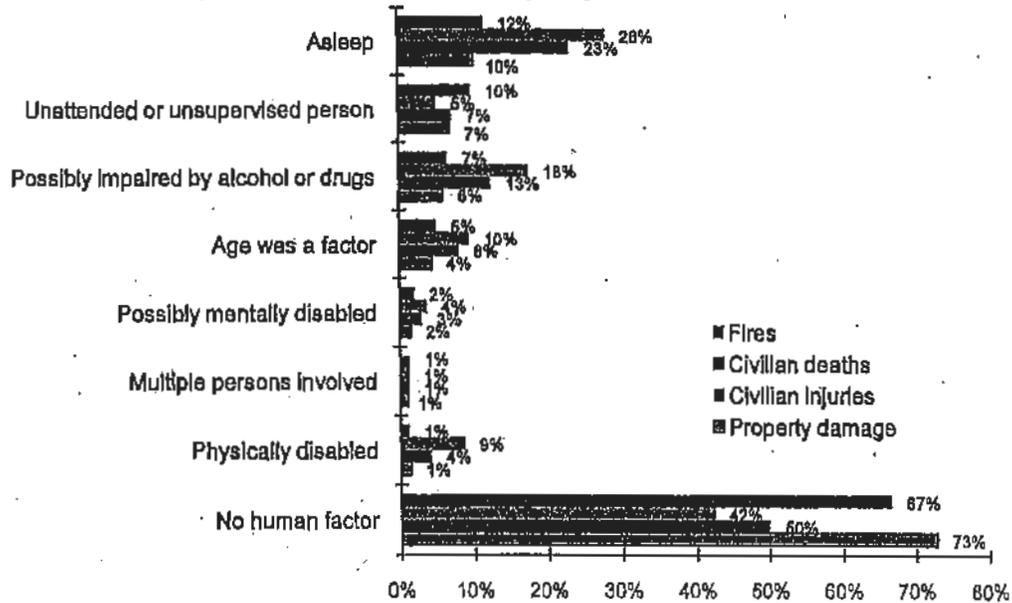


Source: NFIRS 5.0 and NPPA survey.

Sleep was a factor in 12% of the upholstered furniture fires and 28% of the associated deaths.

Figure 6 and Table 8 show that sleep was a human factor contributing to ignition in 12% of these fires and roughly one-quarter of the associated death and injuries. An unattended or unsupervised person was a factor in 10% of these fires.

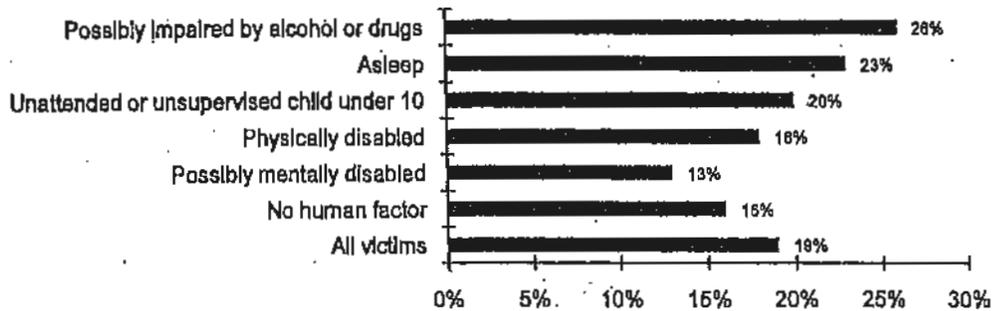
Figure 6. Home Structure Fires that Began with Upholstered Furniture by Human Factor Contributing to Ignition: 2005-2009



Source: NFIRS 5.0 and NPPA survey.

A related field on the NFIRS Civilian Casualty Report collects data about human factors contributing to injury. In his 2011 report, *Human Factors Contributing to Fatal Injury*, Ben Evarts showed that upholstered furniture was the item first ignited in one-quarter (26%) of the home fire deaths in which a possible impairment by alcohol or drugs played a role. His findings are shown in Figure 7.

Figure 7. Percent of Specific Human Factors Contributing to Fatal Home Fire Injuries in which Upholstered Furniture was the Item First Ignited: 2005-2009

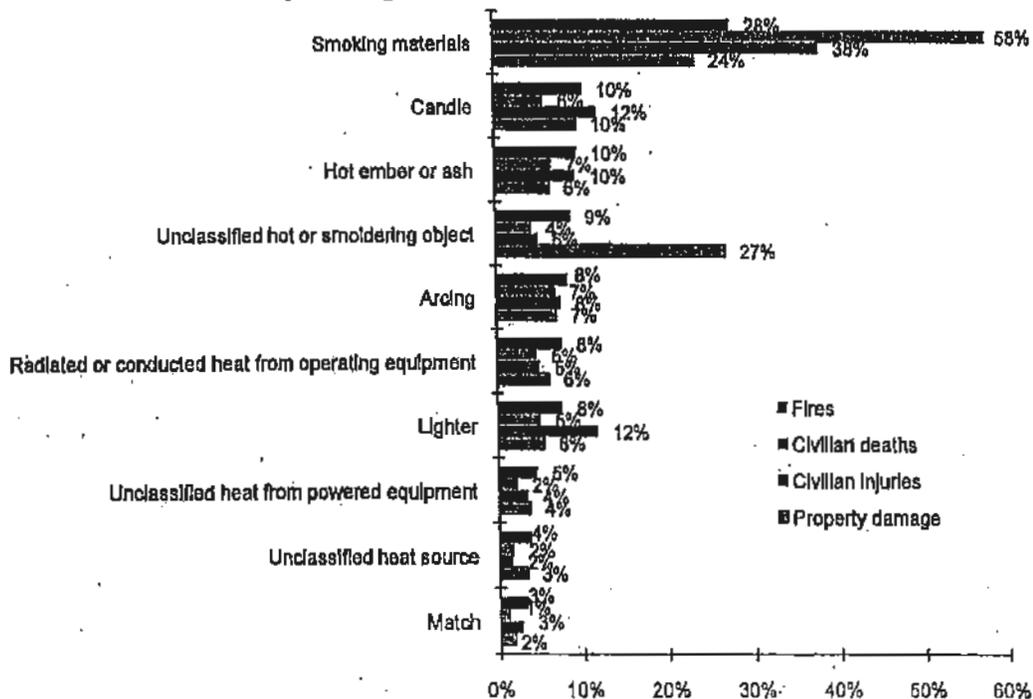


Source: Evarts, 2011.

A wide variety of heat sources started these fires.

Figure 8 and Table 9 show that a wide variety of heat sources are involved in home upholstered furniture fires. Smoking materials, candles, and hot embers or ashes, the three leading heat sources, were discussed earlier.

Figure 8. Home Structure Fires that Began with Upholstered Furniture by Leading Heat Sources: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Small open flames (candles, lighters, and matches) started 22% of the fires that resulted in 12% of the deaths. Operating equipment, including: arcing equipment; radiated or conducted heat from operating equipment; spark, ember or flame from operating equipment; and unclassified heat from powered equipment; together caused 22% of the fires and 17% of the deaths. Both categories are discussed in greater detail in the next section.

Upholstered Furniture Fires Started by Smoking Materials, Candles, Matches or Lighters, and Operating Equipment

Fires and associated losses can be prevented in a variety of ways. The furniture can be made harder to ignite or it can be modified so that if it does ignite, it does not release as much heat or toxic fumes. Heat sources can be modified to reduce the likelihood of ignition, as was done with the 'fire-safe' cigarette. Behavioral changes, such as limiting smoking, can reduce the likelihood that the heat source will come in contact with the furniture. Existing and proposed flammability requirements for upholstered furniture focus on fires started by either smoking materials or small open flames. This part of the analysis focuses on the circumstances of fires started by three categories of heat sources: smoking materials; candles, matches or lighters (small open flames); and operating equipment. Trends for fires and deaths, respectively, for these heat sources are shown in Tables 11 and 12. Because the number and percentage of upholstered furniture fires started by embers or ashes has increased markedly since the introduction of NFIRS 5.0 in 1999, these have been included in the trend tables. Additional information on upholstered furniture fires started by hot embers or ashes is provided in Appendix C. Tables 13-16 show fire and associated loss trends for each of the four heat source categories.

When considering the impact of new approaches to fire safety, it is important to consider how long it will take for new requirements to be widely adopted. In a 2006 report, CPSC's Charles Smith noted that discussions with officials from the upholstered furniture industry and the Department of Commerce reported that a piece of upholstered furniture is expected to last about 16 years.⁵ Note that this is an average and that some households have furniture that is much older. Second hand furniture may also be older.

As noted earlier, the 1,870 home upholstered furniture fires started by smoking materials per year resulted in an annual average of 291 deaths in 2005-2009. On average, one of every six such fires resulted in death.

Candles, lighters, and matches started an estimated average of 1,450 home upholstered

In this section, casualties in non-trend tables are rounded to the nearest one. Because the numbers of fires started by each heat source and the associated casualties are smaller than in upholstered furniture as a whole, in non-trend tables, casualties are rounded to the nearest one so that more meaningful data can be shown.

⁵ Charles L. Smith. *Preliminary Regulatory Analysis of a Draft Proposed Rule to Address Cigarette and Small Open Flame Ignitions of Upholstered Furniture*, CPSC, 2006, p. 23, online at <http://www.cpsc.gov/library/foia/foia07/brief/ufurn1.pdf>.

furniture fires annually, resulting in an average of 61 deaths per year. On average, one of every 24 such fires resulted in death. During this period

- Candles caused an annual average of 710 (10%) fires and 30 (6%) associated deaths;
- Lighters caused 520 (8%) fires and 26 (5%) deaths per year; and
- Matches caused an average of 230 (3%) upholstered furniture fires and 6 (1%) deaths annually.

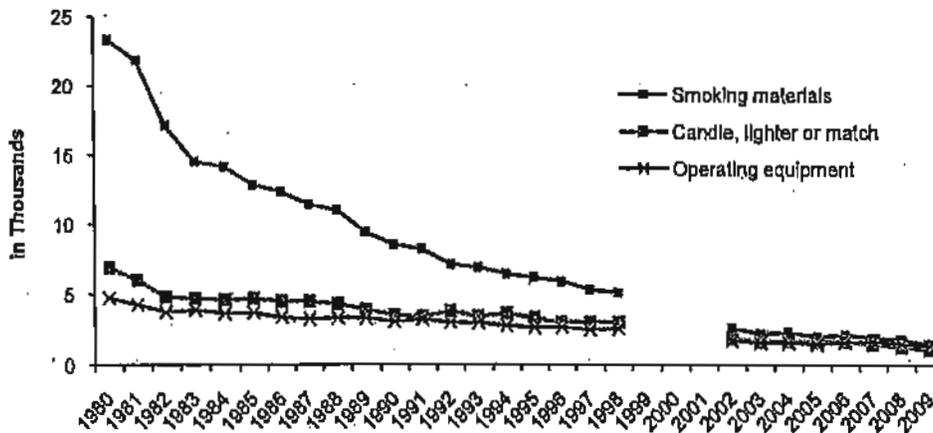
Operating equipment was the heat source in an average of 1,520 upholstered furniture fires per year, resulting in an average of 74 deaths annually. On average, one of every 20 such fires resulted in death. The term “operating equipment” includes four heat sources:

- Arcing, which caused an average of 570 (8%) fires and 35 (7%) associated deaths annually;
- Radiated or conducted heat from operating equipment, which caused an average of 520 (8%) fires per year and 24 (5%) deaths;
- Spark, ember, or flame from operating equipment, which caused an average of 110 (2%) fires per year and four associated deaths (1%); and
- Unclassified heat from powered equipment, which caused 310 (5%) fires and 12 (2%) associated deaths per year.

Sixteen times as many upholstered furniture fires were started by smoking materials in 1980 as in 2009.

Figure 9 and Table 14 show that home upholstered furniture fires started by smoking materials fell 94% from a high of 23,300 in 1980 to a low of 1,500 in 2009. In the early 1980s, smoking equipment started almost two-thirds of these fires. In more recent years, smoking materials caused slightly more than one-quarter of these fires. Several factors played a role in this decrease.

Figure 9: Home Upholstered Furniture Fires Started by: Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Year



Source: NFIRS and NFPA survey.

The Upholstered Furniture Action Council (UFAC) developed voluntary flammability standards to prevent cigarette ignitions of the product. Vytenis Babrauskas noted that beginning in the early 1980s, a hangtag on the product told consumers that the item was manufactured according to these standards. Babrauskas also cited a Consumer Product Safety Commission (CPSC) report noting that that 86% of the furniture being sold in the retail market by the mid-1990s met these requirements and that there was an 85% probability that a cigarette placed on furniture from that period would not ignite it.⁶

Roughly one-third of the adult population smoked in 1979. From 1990 to 2000, roughly one-quarter smoked, while in recent years, one in five adults were current smokers.⁷

CPSC's Charles Smith also noted that upholstered furniture coverings varied over time. Thermoplastics, such as polyester, polyolefin, and nylon, are less prone to cigarette ignition than celluloses, such as cotton and rayon. He also noted that in 1999-2002, roughly half of the upholstered furniture in use had thermoplastic upholstery, roughly one-third had cellulose upholstery, and 16% had leather, wool, or vinyl-coated upholstery. The limited laboratory data indicated that leather, wool, and vinyl-coated fabrics were more resistant to cigarette ignition. He cited survey data indicating that leather had increased to about 30% of the upholstered furniture manufactured in 2001.⁸

Legislation requiring cigarettes to self-extinguish when not inhaled has been passed in all 50 states. New York was the first state to pass this legislation at the end of 2003 with an effective date of June 28, 2004. As of July 1, 2011, the requirements are in effect in all 50 states and the District of Columbia.⁹

Table 15 shows that home upholstered furniture fires started by candles, lighters, or matches fell 84% from a high of 6,900 in 1980 to a low of 1,100 in 2009. Over the years, fires started by these small open flames have generally accounted for one-fifth to one-quarter of the upholstered furniture fires. It is worth noting that home candle fires increased through the 1990s before falling in the early 2000s,¹⁰ while fires and associated losses from children playing with fire declined sharply after CPSC set a mandatory standard for child-resistant lighters. Interestingly, reductions were seen in fires started by both matches and lighters in 1994.¹¹ CPSC developed a draft flammability standard to address small open flame ignitions of upholstered furniture in 2001 and a second draft standard to address both cigarette and small open flame ignitions. The latter is described in detail in Smith's 2006 CPSC report.¹²

⁶ Vytenis Babrauskas. "Upholstered Furniture and Mattresses," *Fire Protection Handbook*®, 20th Edition, Quincy, MA: National Fire Protection Association, 2008, Section 6, Chapter 6.

⁷ National Center for Health Statistics. Table 58. "Current Cigarette Smoking among Adults 18 Years of Age and Over, by Sex, Race, and Age: United States, Selected Years, 1965-2009," *Health, United States, 2010, with Special Feature on Death and Dying*, Hyattsville, MD. 2011. Online at <http://www.cdc.gov/nchs/data/has/has10.pdf#listables>.

⁸ Smith, 2006, p. 21, 32.

⁹ Coalition for Fire-Safe Cigarettes. "States that Have Passed Fire-Safe Cigarette Laws." accessed August 23, 2011.

¹⁰ Marty Ahrens. *Home Candle Fires*, Quincy, MA: NFPA, 2010.

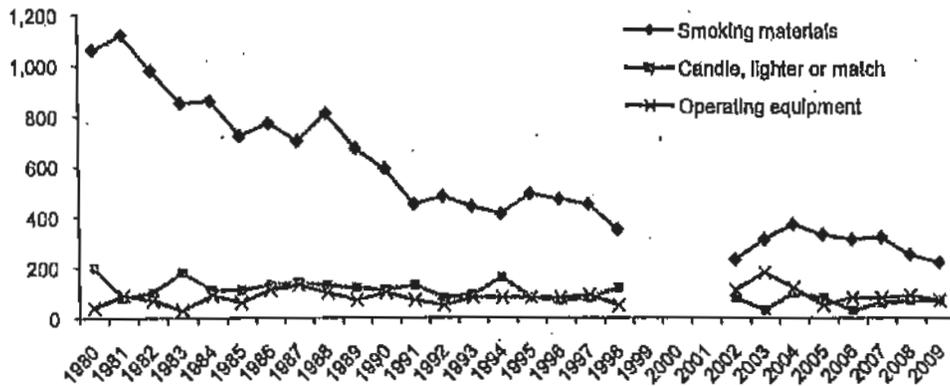
¹¹ John R. Hall, Jr. *Children Playing with Fire*, Quincy, MA: NFPA, 2010.

¹² Smith, 2006.

Table 16 shows that upholstered furniture fires started by operating equipment fell 72% from a high of 4,700 in 1980 to a low of 1,400 in 2009. In 1980 and 1981, roughly one of every eight upholstered furniture fires was started by operating equipment. This increased to one in four in recent years.

Figure 10 shows that the 220 deaths resulting from home upholstered furniture fires started by smoking materials in 2009 was 79% lower than the 1,060 such deaths in 1980. No clear pattern is seen for deaths resulting from upholstered furniture fires started by candles, lighters, or matches or by operating equipment. However, the number of these deaths is much lower than the number from smoking materials.

Figure 10. Civilian Deaths Resulting from Home Upholstered Furniture Fires Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Year

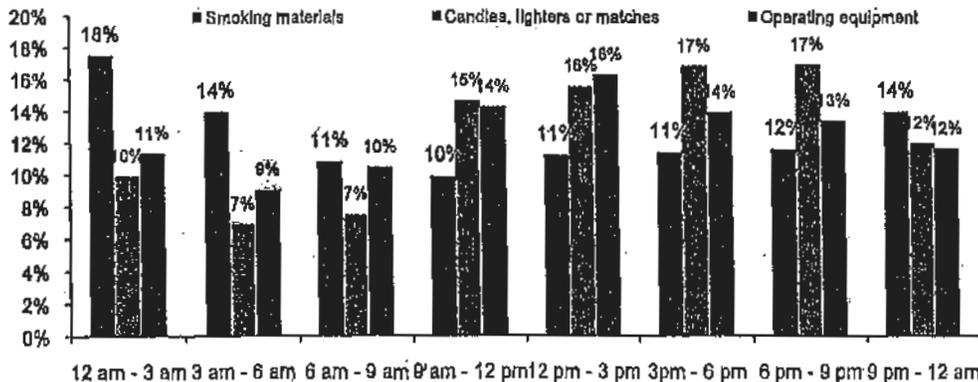


Source: NFIRS and NFPA survey.

Time patterns differ by heat source.

Figure 11 shows that upholstered furniture fires started by smoking materials were more common late at night and in the early morning, while fires started by candles, lighters, or matches and by operating equipment were less common during those hours.

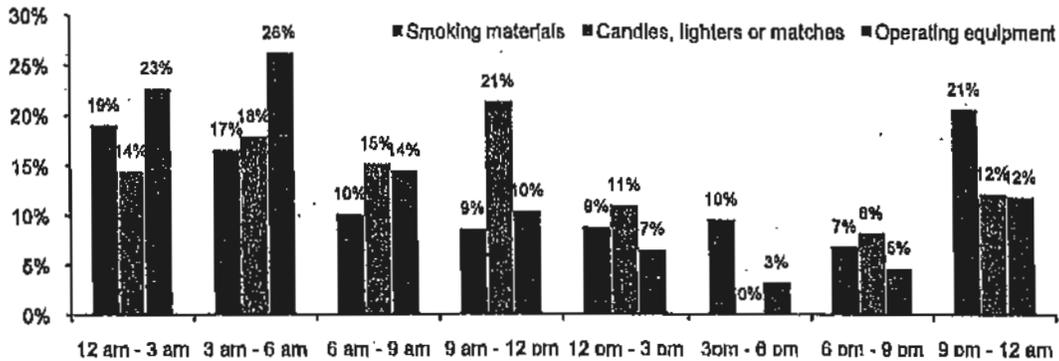
Figure 11. Home Upholstered Furniture Fires Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Time of Alarm: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Fatal fire injuries from upholstered furniture fires started by smoking materials peaked between 9:00 p.m. and midnight while the period from midnight to 3:00 a.m. ranked second. Figure 12 shows that deaths from upholstered furniture fires started by candles, lighters, or matches were most common in fires reported between 9:00 a.m. and noon and fatal injuries from fires started by operating equipment peaked between 3:00 and 6:00 a.m.

Figure 12. Deaths from Home Upholstered Furniture Fires Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Time of Alarm: 2005-2009

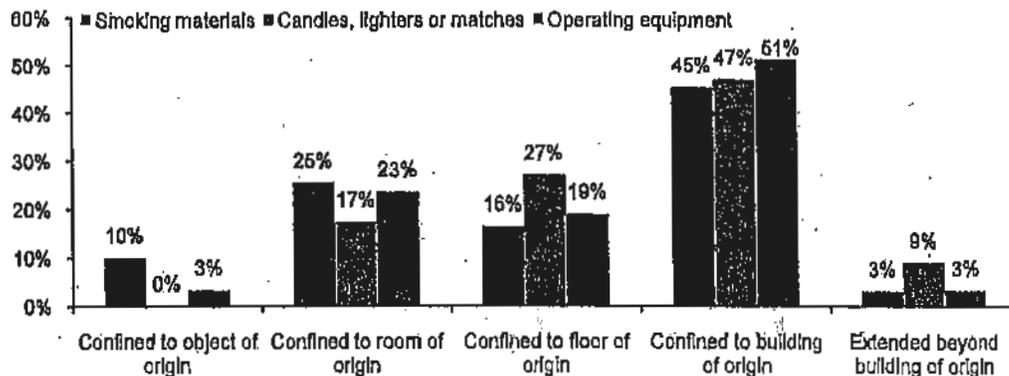


Source: NFIRS 5.0 and NFPA survey.

One-third of smoking material deaths from upholstered furniture fires resulted from fires with flame damage limited to the room of origin.

Tables 17-19 show that upholstered furniture fires started by smoking materials were more likely to have been confined to the object or room of origin (64%) than were fires started by candles, lighters or matches (59%), or fires started by operating equipment (56%). Figure 13 shows that flame damage was confined to the object or room of origin in 35% of the deaths from upholstered furniture fires started by smoking materials compared to only 17% of the deaths resulting from fires started by candles, lighters or matches and 27% of the deaths from fires started by operating equipment.

Figure 13. Home Upholstered Furniture Fire Deaths Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Extent of Flame Damage: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

CAUSAL FACTORS VARY BY HEAT SOURCE.

Smoking materials

Table 20 shows that abandoned or discarded materials or products were contributing factors in almost two-thirds (63%) of the home upholstered furniture fires started by smoking materials. Eighteen percent of these fires and 12% of the deaths resulted from an unclassified misuse of material or product. The smoking materials were too close to the furniture in 13% of the fires and 17% of the associated deaths.

Table 21 shows that sleep was a factor in one-quarter (24%) of these ignitions that resulted in 29% of the deaths and 35% of the injuries. A possible impairment by alcohol or drugs was a factor in 15% of these fires and 25% of the associated deaths. Physical disability was a factor in 2% of the fires and 13% of the resulting deaths. Human factors contributing to fatal fire injury are discussed later in this section.

Candles, lighters, or matches

Table 22 shows that one-quarter (25%) of the upholstered furniture fires started by candles, lighters or matches were intentionally set. These fires caused 23% of the associated deaths and 18% of the injuries. However, playing with a heat source was a contributing factor in 61% of these intentional fires and 71% of the associated intentional deaths.

Overall, playing was a factor in one-third (33%) of the upholstered furniture fires started by candles, lighters or matches as well as one-third of the associated deaths (31%) and injuries (35%). Table 23 shows that the candle, lighter or match was too close to the furniture in 29% of these small open flame fires, 31% of the associated deaths, and 35% of the injuries. An unclassified misuse of material or product was a factor in 13% of the fires, and abandoned or discarded materials or products played a role in 11%.

Human factors contributing to ignition are consistent with the large share of fires started by playing with fire. Table 24 shows that an unattended or unsupervised person was a factor in 21% of the fires, 12% of the deaths, and 18% of the injuries. Age was a factor in 19% of the fires, 31% of the deaths, and 43% of the injuries. Sleep contributed to 8% of these fires that resulted in 23% of the associated deaths and 14% of the injuries.

Operating equipment

The types of equipment that ignited upholstered furniture in non-confined home fires in which the heat source was operating equipment are shown in Table 25. Electrical distribution or lighting equipment was involved in 37% of the operating equipment fires, 59% of the associated deaths, and 51% of the injuries. While fixed wiring or related equipment was involved in 14% of operating equipment fires, no deaths were reported from wiring. Lamps, bulbs or lighting were involved in 11% of these fires and 18% of the associated deaths. Cords or plugs were involved in 10% of these fires but 41% of these deaths. Extension cords were the most common type of cord or plug involved. Overall, cords or plugs were the leading type of operating equipment involved in upholstered furniture deaths from operating equipment.

Heating equipment was also involved in 37% of these operating equipment fires, 34% of the associated deaths and 30% of the associated injuries. Portable or fixed space heaters, including wood stoves, accounted for 34% of the operating equipment fires and deaths, as well as 23% of the associated injuries.

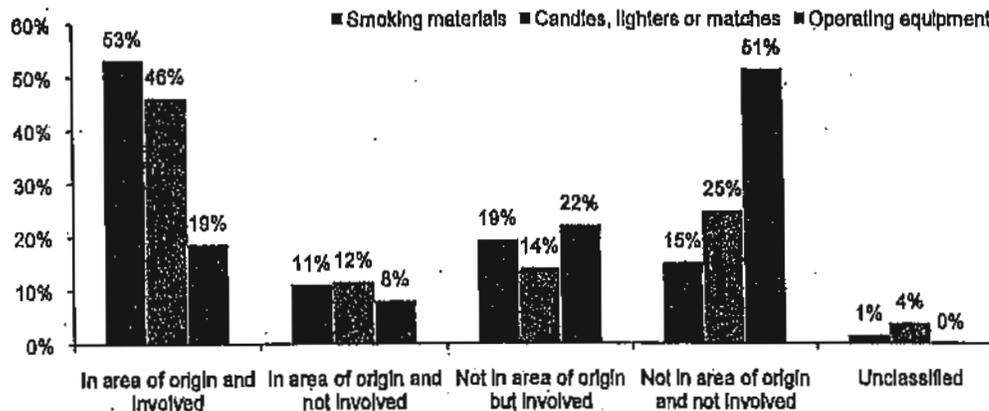
The leading factors contributing to ignition are consistent with the equipment involved in ignition. Table 26 shows that electrical failures or malfunctions were factors in roughly half of the upholstered furniture fires started by operating equipment, including 48% of the fires, 58% of the deaths and injuries, and 53% of the direct property damage. The equipment was too close to the furniture in one-third (33%) of the fires, 22% of the deaths and 29% of the injuries.

Table 27 shows that human factors played less of a role than in the fires started by smoking materials or candles, lighters or matches. Sleep was a factor in 7% of the operating equipment fires and 35% of the associated deaths.

Half of those fatally injured in upholstered fires started by smoking materials were in the area or origin and involved in ignition.

Figure 12 shows that the 53% victims of fatal upholstered furniture fires started by smoking materials were both in the area of origin and involved in ignition. An additional 11% were in the area but not involved. The pattern was similar but slightly less pronounced among the victims of fires started by candles, lighters, and matches, with 46% of the victims in the area and involved in ignition. The situation was reversed for fires started by operating equipment. Half (51%) of these victims were not in the area of origin and not involved. An additional 22% were outside the area of origin when the fire started but involved in ignition.

Figure 14. Home Upholstered Furniture Fire Deaths Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Location at Time of Incident: 2005-2008



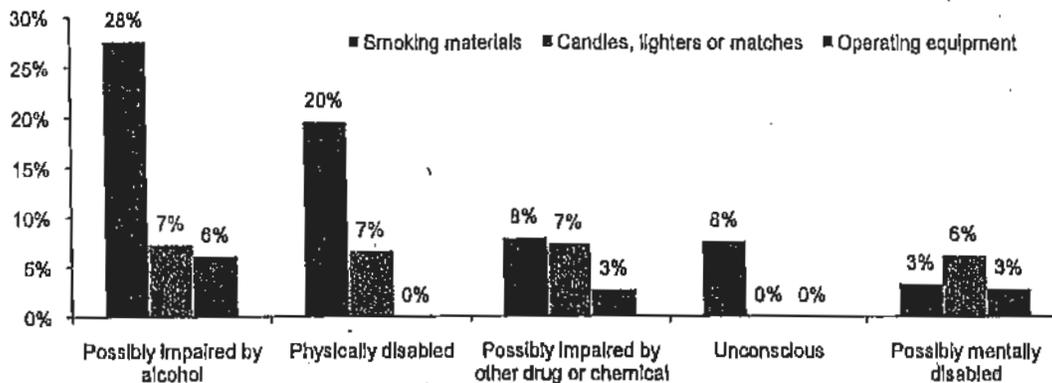
Source: NFIRS 5.0 and NFPA survey.

Victims of fires started by smoking materials were more likely to have had other factors that made escape less likely.

Selected human factors contributing to the fatal fire injury are shown in Figure 15. More than one-quarter (28%) of the victims of upholstered furniture fires started by smoking materials were

possibly impaired by alcohol, while one in five (20%) had some type of physical disability. An additional 8% were unconscious. These factors make it much less likely that someone could react quickly to a sounding alarm or even a fire developing in the furniture he or she was sitting or lying on.

Figure 15. Home Upholstered Furniture Fire Deaths Started by Smoking Materials; Candles, Lighters, or Matches; and Operating Equipment; by Human Factors Contributing to Fatal Injury: 2006-2009



Source: NFIRS 5.0 and NFPA survey.

Upholstered Furniture's Contribution to Flame Spread

Upholstered furniture ranked second in item contributing most to flame spread for fire deaths resulting from fires that spread beyond the room of origin.

Upholstered furniture is often the largest item in the room and as such can be a secondary fuel source for fires that began in a nearby wastebasket, with clothing, trash, newspapers, etc.

NFPA's report, *Home Structure Fires*, showed that during 2005-2009, upholstered furniture was the item contributing most to flame spread in annual averages of:

- 4,000 (5%) of the 88,600 fires per year that spread beyond the room of origin,
- 320 (15%) of the 2,080 associated deaths,
- 580 (10%) of the 65,680 associated civilian injuries, and
- \$257 million of the \$5.9 billion of associated direct property damage.¹³

When the item first ignited was upholstered furniture, the item contributing most to flame spread beyond the room of origin was also upholstered furniture in annual averages of:

- 1,800, or 62%, of the 1,800 fires,
- 220, or 64%, of the 350 deaths,
- 310, or 64%, of the 470 injuries, and
- \$142 million, or 51%, of the \$279 million in direct property damage.

¹³ Marty Ahrens. *Home Structure Fires*, Quincy, MA: NFPA, 2011, p. 46.

When the item contributing most to flame spread was upholstered furniture, the item first ignited was upholstered furniture in two-thirds (66%) of the fires and injuries, three-quarters (75%) of the deaths, and 59% of the direct property damage.

A variety of strategies, including barrier methods, fire retardants, and others, have been proposed to reduce the intensity or slow the growth of fires involving upholstered furniture.

Unfortunately, NFIRS does not have enough detail to develop national estimates of fires and losses involving furniture made with different configurations. Some information resources about these strategies are discussed in the next section.

Additional Information

Vytenis Babrauskas' chapter "Upholstered Furniture and Mattresses" in the 20th edition of NFPA's *Fire Protection Handbook* provides information on materials used in upholstered furniture, flammability standards, smoldering vs. flaming heat sources, and testing.

NFPA has two standards related to flammability testing of upholstered furniture:

- NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture*, and
- NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes*.

Additional information is also available in CPSC staff's *Preliminary Regulatory Analysis of a Draft Proposed Rule to Address Cigarette and Small Open Flame Ignitions of Upholstered Furniture*, online at <http://www.cpsc.gov/library/foia/foia07/brief/ufurn1.pdf>.

Incident descriptions show how these fires can happen.

Appendix D includes a collection of previously published incident descriptions grouped by scenario. Examples are included of fires started by smoking materials, open flames, heating equipment, electrical distribution or lighting equipment, and other causes. In most of these cases, upholstered furniture was the item first ignited. In others, the fire spread to upholstered furniture. These incidents are included to show what *can* happen, not what is typical. The incidents that are included are more likely to be serious than the typical fire. However, narratives can provide more detailed information about how different heat sources actually ignite the furniture.

Safety Tips

- If you smoke, smoke outside. Be careful when smoking around upholstered furniture. Use large, deep, sturdy ashtrays and do not rest them on a sofa or chair. When lighting cigars, pipes, or cigarettes, make sure sparks from matches do not land on the couch or chair. In addition, whenever there has been smoking in a room, check under cushions and in cracks for discarded butts before going to bed or leaving the home. If you smoke, only smoke when you feel alert. Do not smoke when drowsy, intoxicated or medicated. Never smoke where medical oxygen is used.
- Cigarette ignition-resistant upholstered furniture is more common now, but be aware of potential higher fire risk when purchasing antique or used furniture from the mid-1960s or before.

Keep heaters and upholstered furniture at least three feet (1 meter) away from each other. See the manufacturer's instructions for how to operate and install the appliance safely.

- Do not place furniture near a fireplace or wood stove. Leave adequate space for ventilation. The furniture should be at least three feet (1 meter) away from a heat source.
- Eight percent of upholstered furniture fires were begun by someone, usually a child, playing with fire. Children should not be left unsupervised – particularly young children, sometimes as young as two, who play with fire but do not understand the consequences of it. Keep matches and lighters up high, out of the reach of children, preferably in a locked cabinet. Encourage children to tell an adult when they find matches and lighters.
- Extinguish all candles when leaving the room or going to sleep. Make sure candles are placed on a stable piece of furniture in sturdy holders that won't tip over.

For safety tip sheets on a variety of topics, go to www.nfpa.org/safetytips. For all EMAC tips, go to www.nfpa.org/emac.

Table 1.
Home Structure Fires that Began with Upholstered Furniture
by Year 1980-2005

Reported Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Losses in Millions of 2009 Dollars
1980	36,900	1,360	2,970	\$220	\$574
1981	33,800	1,360	2,630	\$218	\$514
1982	27,500	1,190	2,530	\$272	\$604
1983	24,600	1,100	2,700	\$200	\$430
1984	24,100	1,090	2,310	\$217	\$448
1985	23,100	930	2,330	\$225	\$448
1986	22,100	1,070	2,200	\$234	\$458
1987	20,800	1,030	2,150	\$196	\$370
1988	20,200	1,100	2,290	\$223	\$405
1989	18,100	880	2,120	\$229	\$397
1990	16,400	870	2,050	\$257	\$422
1991	16,200	680	2,050	\$290	\$457
1992	15,200	630	1,660	\$188	\$288
1993	14,300	650	1,960	\$231	\$343
1994	14,000	670	1,710	\$234	\$339
1995	13,300	660	1,680	\$239	\$336
1996	12,800	650	1,610	\$249	\$341
1997	11,800	660	1,440	\$213	\$285
1998	11,600	540	1,430	\$225	\$296
1999	8,200 (8,200)	480 (480)	880 (880)	\$217 (\$217)	\$279
2000	9,300 (9,100)	580 (580)	1,390 (1,390)	\$376 (\$376)	\$468
2001	9,700 (9,500)	620 (620)	1,100 (1,100)	\$328 (\$328)	\$397
2002	8,800 (8,600)	530 (530)	980 (980)	\$291 (\$291)	\$348
2003	7,800 (7,500)	650 (650)	960 (960)	\$295 (\$295)	\$344
2004	7,700 (7,600)	690 (690)	810 (810)	\$289 (\$289)	\$329
2005	7,400 (7,100)	540 (540)	940 (940)	\$364 (\$364)	\$400
2006	7,900 (7,500)	490 (490)	890 (890)	\$714 (\$714)	\$760
2007	7,300 (7,000)	550 (550)	820 (810)	\$366 (\$366)	\$378
2008	6,700 (6,500)	500 (500)	960 (960)	\$387 (\$387)	\$386
2009	5,900 (5,600)	450 (450)	830 (830)	\$339 (\$339)	\$339

Note: Numbers in parentheses exclude fires with confined structure fire incident types. Confined fires were first introduced in Version 5.0 of NFIRS in 1999. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 723, "Purchasing Power of the Dollar: 1950 to 2009," U.S. Census Bureau's *Statistical Abstract of the United States: 2011*, 130th Edition, 2010.

Table 2.
Home Structure Fires that Began with Upholstered Furniture
by Type of Material First Ignited
(Excluding fires with confined structure fire incident types)
2005-2009 Annual Averages

Type of Material	Fires	Confined Structure	Multiple Structure	Property Damage (in \$1,000s)
Fabric, fiber, or finished goods made of cotton, blends, rayon or wool	4,860 (72%)	380 (76%)	680 (77%)	\$338 (76%)
Unclassified fabric, textile or fur	940 (14%)	70 (15%)	120 (13%)	\$55 (12%)
Multiple types of material	210 (3%)	20 (4%)	20 (2%)	\$13 (3%)
Plastic	160 (2%)	0 (0%)	10 (1%)	\$6 (1%)
Unclassified type of material	120 (2%)	10 (2%)	10 (1%)	\$6 (1%)
Plastic-coated fabric	90 (1%)	0 (0%)	10 (1%)	\$3 (1%)
Sawn wood, including finished lumber	60 (1%)	0 (0%)	10 (1%)	\$2 (1%)
Unclassified natural product	50 (1%)	0 (1%)	0 (0%)	\$3 (1%)
Unclassified wood or paper	40 (1%)	0 (1%)	0 (0%)	\$3 (1%)
Other known type of material	240 (4%)	10 (2%)	20 (3%)	\$12 (3%)
Total	6,760 (100%)	500 (100%)	890 (100%)	\$442 (100%)

Note: Sums may not equal due to rounding errors.

Source: NFIRS 5.0 and NFPA survey.

Table 3.
Home Structure Fires that Began with Upholstered Furniture
by Area of Origin
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Area of Origin	Fires		(Civilian Deaths)		(Civilian Injuries)		Direct Property Damage (in Millions)	
Living room, family room or den	2,630	(39%)	290	(56%)	450	(51%)	\$140	(32%)
Unclassified function area	1,310	(19%)	120	(23%)	180	(21%)	\$80	(18%)
Bedroom	1,010	(15%)	40	(9%)	100	(12%)	\$43	(10%)
Unclassified structural area	190	(3%)	10	(3%)	10	(1%)	\$13	(3%)
Garage or vehicle storage area*	190	(3%)	0	(0%)	10	(1%)	\$10	(2%)
Exterior balcony, unenclosed porch	180	(3%)	0	(0%)	10	(2%)	\$16	(4%)
Other	170	(3%)	10	(2%)	10	(1%)	\$9	(2%)
Kitchen or cooking area	110	(2%)	10	(2%)	10	(1%)	\$4	(1%)
Lobby or entrance way	90	(1%)	10	(1%)	10	(1%)	\$4	(1%)
Crawl space or substructure space	90	(1%)	0	(1%)	10	(1%)	\$5	(1%)
Courtyard, terrace or patio	80	(1%)	0	(0%)	10	(1%)	\$4	(1%)
Exterior wall surface	60	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Dining room, bar or beverage area, cafeteria	50	(1%)	0	(1%)	0	(0%)	\$3	(1%)
Multiple areas of origin	50	(1%)	0	(0%)	0	(0%)	\$5	(1%)
Wall assembly or concealed space	50	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Ceiling/floor assembly or concealed space	50	(1%)	0	(1%)	10	(1%)	\$83	(19%)
Unclassified outside area	50	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Unclassified means of egress	40	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Unclassified storage area	40	(1%)	0	(0%)	0	(1%)	\$1	(0%)
Other known area	320	(5%)	0	(1%)	30	(3%)	\$14	(3%)
Total	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)

* Does not include dwelling garages coded as a separate property.

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero - it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

**Table 4. Home Structure Fires that Began with Upholstered Furniture
By Extent of Flame Damage
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)**

Extent of Flame Damage	Fires		Chairs/Recliners		Couches/Sectionals		Direct Property Damage (in Millions)	
	Fires	(%)	Fires	(%)	Fires	(%)	Direct Property Damage	(%)
Confined to object of origin	1,590	(24%)	30	(6%)	120	(14%)	\$19	(4%)
Confined to room of origin	2,290	(34%)	130	(25%)	300	(33%)	\$144	(33%)
Confined to floor of origin	750	(11%)	70	(15%)	120	(14%)	\$52	(12%)
Confined to building of origin	1,920	(28%)	240	(48%)	310	(35%)	\$191	(43%)
Beyond building of origin	220	(3%)	30	(5%)	40	(4%)	\$36	(8%)
Total	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)
Extended beyond the room of origin	2,880	(43%)	350	(68%)	470	(53%)	\$279	(63%)

**Table 5.
Home Structure Fires that Began with Upholstered Furniture, by Major Cause
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)**

Major Cause	Fires		Chairs/Recliners		Couches/Sectionals		Direct Property Damage (in Millions)	
	Fires	(%)	Fires	(%)	Fires	(%)	Direct Property Damage	(%)
Smoking materials	1,870	(28%)	290	(58%)	340	(38%)	\$104	(24%)
Intentional	900	(13%)	30	(6%)	70	(8%)	\$39	(9%)
Candle	710	(10%)	30	(6%)	110	(12%)	\$43	(10%)
Hot ember or ash	660	(10%)	30	(7%)	80	(10%)	\$29	(6%)
Heating equipment	640	(9%)	40	(7%)	50	(6%)	\$27	(6%)
Electrical distribution and lighting equipment	630	(9%)	50	(11%)	90	(10%)	\$25	(6%)
Playing with heat source	520	(8%)	20	(5%)	80	(9%)	\$23	(5%)

Note: The major cause table summarizes causal factors pulled from several fields. In some cases, the equipment involved in ignition is most relevant; heat source, the field "cause," and factor contributing to ignition also provide relevant information. The causes shown here are not mutually exclusive when they have been pulled from different fields. Causal factors that lack detail (such as unintentional or failure of equipment or heat source in the cause field, or heat from operating or powered equipment or arcing in the heat source field) were not included in this summary table. The causes shown are those that are well defined, account for at least 2% of the fires, and have clear prevention strategies or have historically been of interest. Sums may not equal due to rounding errors.

Source: NFIRS 5.0 and NFPA survey.

Table 6.
 Home Structure Fires that Began with Upholstered Furniture
 by Cause of Ignition
 2005-2009 Annual Averages
 (Excluding fires with confined structure fire incident types)

Cause	Total		Confined		Unconfined		Average Duration (Hours)	
	Incidents	(%)	Incidents	(%)	Incidents	(%)	Hours	(%)
Unintentional	5,060	(75%)	440	(87%)	740	(84%)	\$365	(82%)
Intentional	900	(13%)	30	(6%)	70	(8%)	\$39	(9%)
Failure of equipment or heat source	600	(9%)	30	(5%)	60	(7%)	\$30	(7%)
Cause, other	170	(3%)	10	(1%)	10	(1%)	\$7	(2%)
Act of nature	30	(0%)	0	(1%)	0	(0%)	\$1	(0%)
Total	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero - it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 7.
Home Structure Fires that Began with Upholstered Furniture
by Factor Contributing to Ignition
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Factor Contributing	Fires	Percentage of Fires	Confined Structure Fires	Percentage of Confined Structure Fires	Structural Damages	Percentage of Structural Damages	Personal Injuries	Percentage of Personal Injuries
					(Million Dollars)		(Million Dollars)	
Abandoned or discarded material or product	1,830	(27%)	210	(41%)	280	(32%)	\$99	(22%)
Heat source too close to combustible	1,500	(22%)	100	(20%)	210	(24%)	\$70	(16%)
Electrical failure or malfunction	910	(14%)	50	(10%)	100	(12%)	\$50	(11%)
Unclassified misuse of material or product	900	(13%)	70	(13%)	130	(15%)	\$32	(7%)
Playing with heat source	520	(8%)	20	(5%)	80	(9%)	\$23	(5%)
Unclassified factor contributed to ignition	520	(8%)	40	(8%)	60	(7%)	\$138	(31%)
Equipment unattended	130	(2%)	0	(0%)	0	(1%)	\$6	(1%)
Unclassified mechanical failure or malfunction	90	(1%)	0	(0%)	0	(1%)	\$4	(1%)
Exposure fire	90	(1%)	0	(0%)	0	(0%)	\$4	(1%)
Unclassified fire spread or control	80	(1%)	10	(3%)	0	(1%)	\$5	(1%)
Collision, knock down, or turn over	60	(1%)	0	(1%)	10	(1%)	\$3	(1%)
Rekindle	50	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Flammable liquid used to kindle fire	50	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Equipment overloaded	40	(1%)	10	(2%)	10	(1%)	\$3	(1%)
Unclassified operational deficiency	40	(1%)	0	(1%)	10	(1%)	\$2	(0%)
Unintentionally turned on or not turned off	40	(1%)	0	(0%)	0	(0%)	\$3	(1%)
Flammable liquid or gas spilled	40	(1%)	10	(2%)	10	(1%)	\$2	(0%)
Other known factor	260	(4%)	10	(1%)	30	(3%)	\$16	(4%)
Total fires	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)
Total entries*	7,130	(106%)	540	(107%)	960	(108%)	\$464	(105%)

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

Note: Sums may not equal due to rounding errors. Fires in which the factor contributing to ignition was coded as "none," unknown, or not reported have been allocated proportionally among fires with known factor contributing to ignition. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 8.
Home Structure Fires that Began with Upholstered Furniture
by Human Factor Contributing to Ignition
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Human Factor	Fires	(%)	Deaths	(%)	Injuries	(%)	Property Damage (in Millions)	(%)
Asleep	800	(12%)	140	(28%)	210	(23%)	\$46	(10%)
Unattended or unsupervised person	670	(10%)	30	(5%)	70	(7%)	\$31	(7%)
Possibly impaired by alcohol or drugs	460	(7%)	90	(18%)	110	(13%)	\$27	(6%)
Age was a factor	340	(5%)	50	(10%)	70	(8%)	\$20	(4%)
Possibly mentally disabled	140	(2%)	20	(4%)	30	(3%)	\$7	(2%)
Multiple persons involved	90	(1%)	10	(1%)	10	(1%)	\$5	(1%)
Physically disabled	80	(1%)	40	(9%)	40	(4%)	\$6	(1%)
No human factor	4,500	(67%)	210	(42%)	440	(50%)	\$322	(73%)
Total fires	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)
Total entries*	7,080	(105%)	590	(117%)	970	(110%)	\$464	(105%)

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

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 9.
Home Structure Fires That Began with Upholstered Furniture, by Heat Source
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Heat Source	Fires	Confined fires	Unconfined fires	Deaths	Property Damage (\$1000s)
Smoking materials	1,870 (28%)	290 (58%)	340 (38%)	\$104 (24%)	
Candle	710 (10%)	30 (6%)	110 (12%)	\$43 (10%)	
Hot ember or ash	660 (10%)	30 (7%)	80 (10%)	\$29 (6%)	
Unclassified hot or smoldering object	600 (9%)	20 (4%)	40 (5%)	\$119 (27%)	
Arcing	570 (8%)	40 (7%)	70 (8%)	\$31 (7%)	
Radiated or conducted heat from operating equipment	520 (8%)	20 (5%)	50 (5%)	\$27 (6%)	
Lighter	520 (8%)	30 (5%)	100 (12%)	\$24 (6%)	
Unclassified heat from powered equipment	310 (5%)	10 (2%)	30 (4%)	\$17 (4%)	
Unclassified heat source	260 (4%)	10 (2%)	10 (2%)	\$15 (3%)	
Match	230 (3%)	10 (1%)	20 (3%)	\$8 (2%)	
Spark, ember or flame from operating equipment	110 (2%)	0 (1%)	10 (1%)	\$6 (1%)	
Multiple heat sources including multiple ignitions	70 (1%)	0 (0%)	0 (0%)	\$4 (1%)	
Flame or torch used for lighting	50 (1%)	0 (1%)	10 (1%)	\$5 (1%)	
Incendiary device	40 (1%)	0 (0%)	0 (0%)	\$1 (0%)	
Fireworks	40 (1%)	0 (0%)	0 (0%)	\$2 (0%)	
Molten or hot material	40 (1%)	0 (0%)	0 (0%)	\$2 (0%)	
Other known heat source	160 (2%)	10 (1%)	10 (1%)	\$6 (1%)	
Total	6,760 (100%)	500 (100%)	890 (100%)	\$442 (100%)	

Note: Sums may not equal due to rounding errors. The statistics on matches, lighters, smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 10.
Home Structure Fires That Began with Upholstered Furniture, by Equipment Involved in Ignition
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Equipment Involved	Fires	(% of fires)	Deaths	(% of deaths)	Confined structure fires	(% of fires)	Deaths	(% of deaths)
No equipment involved	4,850	(72%)	380	(75%)	660	(75%)	\$360	(81%)
Portable or fixed space heater	560	(8%)	40	(7%)	40	(5%)	\$24	(5%)
Fixed wiring and related equipment	240	(4%)	0	(1%)	20	(2%)	\$10	(2%)
Lamp, bulb or lighting	200	(3%)	20	(3%)	40	(4%)	\$8	(2%)
Cord or plug	160	(2%)	40	(7%)	20	(3%)	\$7	(1%)
Cigarette or pipe lighter	100	(1%)	0	(1%)	20	(2%)	\$5	(1%)
Air conditioner	90	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Unclassified equipment involved in ignition	60	(1%)	0	(0%)	10	(1%)	\$5	(1%)
Unclassified portable appliance designed to produce heat	50	(1%)	0	(1%)	0	(0%)	\$2	(1%)
Heating pad	30	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Other known equipment	430	(6%)	30	(6%)	70	(7%)	\$19	(4%)
Total	6,760	(100%)	500	(100%)	890	(100%)	\$442	(100%)

Oxygen administration equipment was involved less than 1% of these fires but an average of 20 (4%) of these deaths per year.

Note: Fires in which the equipment involved in ignition was unknown or not reported have been allocated proportionally among fires with known equipment involved. Fires in which the equipment involved in ignition was entered as none but the heat source indicated equipment involvement or the heat source was unknown were also treated as unknown and allocated proportionally among fires with known equipment involved. Fires in which the equipment was partially unclassified (i.e., unclassified kitchen or cooking equipment, unclassified heating, cooling or air condition equipment, etc.) were allocated proportionally among fires that grouping (kitchen or cooking equipment; heating, cooling or air conditioning equipment, etc.). Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Table 11.
Home Structure Fires That Began with Upholstered Furniture, by Leading Heat Source and Year
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Year	Smoking Materials	Candle, Lighter or Match	Operating Equipment	Ember or Ash	Subtotal	Total
1980	23,300 (63%)	6,900 (19%)	4,700 (13%)	400 (1%)	35,300 (96%)	36,900 (100%)
1981	21,800 (64%)	6,000 (18%)	4,200 (13%)	300 (1%)	32,400 (96%)	33,800 (100%)
1982	17,100 (62%)	4,800 (17%)	3,700 (14%)	200 (1%)	25,900 (94%)	27,500 (100%)
1983	14,500 (59%)	4,700 (19%)	3,900 (16%)	200 (1%)	23,300 (95%)	24,600 (100%)
1984	14,100 (59%)	4,600 (19%)	3,600 (15%)	200 (1%)	22,500 (93%)	24,100 (100%)
1985	12,800 (55%)	4,700 (20%)	3,700 (16%)	200 (1%)	21,400 (93%)	23,100 (100%)
1986	12,300 (56%)	4,500 (20%)	3,300 (15%)	300 (1%)	20,400 (92%)	22,100 (100%)
1987	11,400 (55%)	4,500 (22%)	3,200 (16%)	300 (1%)	19,400 (93%)	20,800 (100%)
1988	11,000 (54%)	4,300 (21%)	3,300 (16%)	300 (1%)	18,900 (93%)	20,200 (100%)
1989	9,400 (52%)	3,900 (22%)	3,300 (18%)	200 (1%)	16,800 (93%)	18,100 (100%)
1990	8,500 (52%)	3,500 (21%)	3,000 (18%)	200 (1%)	15,200 (93%)	16,400 (100%)
1991	8,200 (51%)	3,400 (21%)	3,200 (20%)	200 (1%)	15,000 (93%)	16,200 (100%)
1992	7,100 (47%)	3,800 (25%)	3,000 (20%)	200 (1%)	14,100 (93%)	15,200 (100%)
1993	6,900 (48%)	3,400 (24%)	2,900 (21%)	200 (1%)	13,400 (94%)	14,300 (100%)
1994	6,400 (46%)	3,600 (26%)	2,700 (19%)	200 (2%)	12,900 (92%)	14,000 (100%)
1995	6,200 (47%)	3,300 (25%)	2,600 (20%)	200 (2%)	12,300 (93%)	13,300 (100%)
1996	5,900 (46%)	3,000 (23%)	2,600 (21%)	200 (1%)	11,700 (92%)	12,800 (100%)
1997	5,300 (45%)	3,000 (25%)	2,500 (21%)	200 (1%)	10,900 (93%)	11,800 (100%)
1998	5,100 (44%)	3,000 (26%)	2,500 (22%)	200 (2%)	10,800 (93%)	11,600 (100%)
1999	3,100 (38%)	2,500 (30%)	1,500 (19%)	400 (5%)	7,600 (92%)	8,200 (100%)
2000	3,100 (35%)	1,900 (21%)	1,600 (18%)	800 (9%)	7,500 (82%)	9,100 (100%)
2001	3,100 (33%)	2,100 (22%)	1,900 (20%)	900 (10%)	8,000 (84%)	9,500 (100%)
2002	2,600 (30%)	1,900 (22%)	1,700 (20%)	900 (10%)	7,000 (82%)	8,600 (100%)
2003	2,200 (29%)	1,600 (22%)	1,600 (21%)	700 (9%)	6,100 (81%)	7,500 (100%)
2004	2,300 (30%)	1,700 (22%)	1,600 (21%)	700 (10%)	6,300 (83%)	7,600 (100%)
2005	2,000 (28%)	1,600 (23%)	1,500 (21%)	700 (10%)	5,800 (81%)	7,100 (100%)
2006	2,100 (28%)	1,700 (22%)	1,600 (21%)	800 (10%)	6,200 (82%)	7,500 (100%)
2007	1,900 (28%)	1,500 (21%)	1,700 (24%)	600 (9%)	5,800 (82%)	7,000 (100%)
2008	1,800 (28%)	1,300 (20%)	1,500 (23%)	600 (10%)	5,200 (80%)	6,500 (100%)
2009	1,500 (27%)	1,100 (20%)	1,400 (24%)	600 (10%)	4,500 (81%)	5,600 (100%)

Note: Sums may not equal due to rounding errors. The statistics on smoking materials and candles, lighters, or matches include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. The category "operating equipment" includes fires with four heat sources: arcing; radiated or conducted heat from operating equipment; spark, ember or flame from operating equipment; and unclassified heat from operating equipment. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution. The subtotal column shows the sum of the fires started by: smoking materials; candles, lighters or matches; operating equipment; and ember or ash. Fires with confined fire incident types were excluded from the totals and percent calculation.

Source: NFIRS and NPPA survey.

Table 12.
Home Structure Fire Deaths That Began with Upholstered Furniture, by Leading Heat Source and Year
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Year	Smoking Materials	Candles, Lighters, or Matches	Operating Equipment	Ember or Ash	Subtotal	Total
1980	1,060 (78%)	200 (15%)	39 (3%)	0 (0%)	1,300 (96%)	1,360 (100%)
1981	1,120 (82%)	80 (6%)	91 (7%)	30 (2%)	1,320 (97%)	1,360 (100%)
1982	980 (82%)	100 (8%)	66 (6%)	10 (1%)	1,160 (97%)	1,190 (100%)
1983	850 (77%)	180 (16%)	33 (3%)	0 (0%)	1,060 (97%)	1,100 (100%)
1984	860 (79%)	110 (10%)	95 (9%)	20 (2%)	1,080 (99%)	1,090 (100%)
1985	720 (77%)	110 (12%)	62 (7%)	0 (0%)	890 (96%)	930 (100%)
1986	770 (72%)	130 (12%)	107 (10%)	0 (0%)	1,010 (94%)	1,070 (100%)
1987	700 (68%)	140 (14%)	128 (12%)	20 (2%)	990 (96%)	1,030 (100%)
1988	810 (74%)	130 (12%)	100 (9%)	10 (1%)	1,050 (96%)	1,100 (100%)
1989	670 (76%)	120 (14%)	68 (8%)	0 (0%)	860 (98%)	880 (100%)
1990	590 (68%)	110 (13%)	103 (12%)	0 (0%)	810 (93%)	870 (100%)
1991	450 (66%)	130 (19%)	66 (10%)	0 (0%)	650 (95%)	680 (100%)
1992	480 (76%)	80 (13%)	49 (8%)	0 (1%)	610 (97%)	630 (100%)
1993	440 (68%)	90 (14%)	84 (13%)	10 (2%)	630 (96%)	650 (100%)
1994	410 (61%)	160 (24%)	84 (13%)	10 (2%)	670 (100%)	670 (100%)
1995	490 (74%)	80 (12%)	82 (12%)	0 (0%)	650 (99%)	660 (100%)
1996	470 (72%)	70 (11%)	82 (13%)	0 (0%)	620 (96%)	650 (100%)
1997	450 (68%)	80 (12%)	92 (14%)	10 (2%)	630 (96%)	660 (100%)
1998	350 (65%)	120 (22%)	46 (9%)	10 (1%)	520 (97%)	540 (100%)
1999	360 (75%)	0 (0%)	60 (13%)	60 (13%)	480 (100%)	480 (100%)
2000	330 (58%)	40 (7%)	140 (24%)	30 (6%)	540 (94%)	580 (100%)
2001	380 (62%)	90 (15%)	130 (21%)	0 (0%)	600 (97%)	620 (100%)
2002	230 (43%)	80 (15%)	110 (20%)	50 (10%)	470 (88%)	530 (100%)
2003	310 (47%)	30 (5%)	180 (28%)	20 (3%)	550 (83%)	650 (100%)
2004	370 (53%)	100 (14%)	120 (17%)	30 (4%)	620 (89%)	690 (100%)
2005	330 (61%)	80 (16%)	50 (10%)	30 (6%)	500 (93%)	540 (100%)
2006	310 (64%)	30 (6%)	80 (17%)	20 (5%)	450 (92%)	490 (100%)
2007	320 (59%)	60 (12%)	80 (14%)	30 (5%)	490 (89%)	550 (100%)
2008	250 (50%)	70 (14%)	90 (18%)	30 (7%)	440 (89%)	500 (100%)
2009	220 (49%)	70 (15%)	70 (15%)	60 (12%)	420 (92%)	450 (100%)

Note: Sums may not equal due to rounding errors. The statistics on smoking materials and candles, lighters, or matches include a proportional share of fire deaths in which the heat source was heat from an unclassified open flame or smoking material. The category "operating equipment" includes deaths from fires with four heat sources: arcing; radiated or conducted heat from operating equipment; spark, ember or flame from operating equipment; and unclassified heat from operating equipment. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution. The subtotal column shows the sum of the deaths from fires started by: smoking materials; candles, lighters or matches; operating equipment; and ember or ash.

Source: NFIRS and NFPA survey.

Table 13.
Home Structure Fires That Began with Upholstered Furniture, by Smoking Materials
by year 1980-2009
(Excluding fires with confined structure fire incident types)

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	
				As Reported	In 2009 Dollars
1980	23,300	1,060	2,050	\$127	\$331
1981	21,800	1,120	1,890	\$136	\$320
1982	17,100	980	1,710	\$187	\$415
1983	14,500	850	1,800	\$110	\$237
1984	14,100	860	1,480	\$124	\$256
1985	12,800	720	1,470	\$122	\$243
1986	12,300	770	1,320	\$120	\$235
1987	11,400	700	1,370	\$100	\$189
1988	11,000	810	1,420	\$114	\$207
1989	9,400	670	1,170	\$112	\$194
1990	8,500	590	1,220	\$141	\$232
1991	8,200	450	1,140	\$131	\$206
1992	7,100	480	850	\$74	\$113
1993	6,900	440	1,060	\$107	\$159
1994	6,400	410	920	\$103	\$149
1995	6,200	490	860	\$109	\$153
1996	5,900	470	920	\$95	\$130
1997	5,300	450	740	\$90	\$120
1998	5,100	350	750	\$89	\$117
1999	3,100	360	190	\$96	\$123
2000	3,100	330	500	\$127	\$158
2001	3,100	380	480	\$128	\$155
2002	2,600	230	280	\$72	\$86
2003	2,200	310	390	\$77	\$90
2004	2,300	370	300	\$79	\$89
2005	2,000	330	360	\$112	\$123
2006	2,100	310	350	\$95	\$101
2007	1,900	320	330	\$117	\$121
2008	1,800	250	320	\$119	\$118
2009	1,500	220	310	\$90	\$90

Note: The statistics include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 723, "Purchasing Power of the Dollar: 1950 to 2009," U.S. Census Bureau's *Statistical Abstract of the United States: 2011*, 130th Edition, 2010.

Table 14.
Home Upholstered Furniture, Fires Started by Candles, Lighters, or Matches
By Year 1980-2009
(Excluding fires with confined structure fire incident types)

Year	Fires	Estimated Deaths	Estimated Injuries	Estimated Property Damage (in millions)	Estimated Total Damage (in millions)
1980	6,900	200	570	\$36	\$94
1981	6,000	80	460	\$35	\$82
1982	4,800	100	430	\$29	\$64
1983	4,700	180	500	\$36	\$77
1984	4,600	110	480	\$39	\$80
1985	4,700	110	450	\$44	\$88
1986	4,500	130	500	\$47	\$92
1987	4,500	140	450	\$45	\$85
1988	4,300	130	430	\$43	\$78
1989	3,900	120	480	\$46	\$80
1990	3,500	110	520	\$48	\$79
1991	3,400	130	560	\$63	\$99
1992	3,800	80	480	\$43	\$66
1993	3,400	90	470	\$53	\$79
1994	3,600	160	510	\$64	\$93
1995	3,300	80	460	\$59	\$83
1996	3,000	70	390	\$58	\$79
1997	3,000	80	520	\$63	\$84
1998	3,000	120	390	\$59	\$78
1999	2,500	0	630	\$68	\$87
2000	1,900	40	470	\$92	\$115
2001	2,100	90	290	\$81	\$98
2002	1,900	80	330	\$75	\$89
2003	1,600	30	220	\$71	\$83
2004	1,700	100	210	\$75	\$86
2005	1,600	80	240	\$95	\$104
2006	1,700	30	240	\$83	\$88
2007	1,500	60	220	\$59	\$61
2008	1,300	70	280	\$80	\$80
2009	1,100	70	200	\$65	\$65

Note: The statistics include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 723, "Purchasing Power of the Dollar: 1950 to 2009," U.S. Census Bureau's *Statistical Abstract of the United States: 2011*, 130th Edition, 2010.

Table 15:
Home Upholstered Furniture Fires Started, by Operating Equipment
by Year: 1980-2009
(Excluding fires with confined structure fire incident types)

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	
				As Reported	In 2009 Dollars
1980	4,700	40	280	\$46	\$119
1981	4,200	90	240	\$36	\$85
1982	3,700	70	300	\$35	\$77
1983	3,900	30	320	\$39	\$84
1984	3,600	90	270	\$39	\$81
1985	3,700	60	270	\$41	\$82
1986	3,300	110	240	\$49	\$96
1987	3,200	130	270	\$39	\$74
1988	3,300	100	240	\$48	\$88
1989	3,300	70	320	\$50	\$86
1990	3,000	100	180	\$46	\$76
1991	3,200	70	260	\$76	\$119
1992	3,000	50	260	\$58	\$88
1993	2,900	80	360	\$50	\$74
1994	2,700	80	200	\$48	\$70
1995	2,600	80	240	\$54	\$77
1996	2,600	80	210	\$65	\$89
1997	2,500	90	160	\$42	\$56
1998	2,500	50	210	\$57	\$75
1999	1,500	60	0	\$30	\$38
2000	1,600	140	100	\$59	\$74
2001	1,900	130	150	\$68	\$82
2002	1,700	110	100	\$66	\$79
2003	1,600	180	130	\$74	\$87
2004	1,600	120	140	\$63	\$72
2005	1,500	50	160	\$74	\$81
2006	1,600	80	150	\$65	\$70
2007	1,700	80	130	\$91	\$94
2008	1,500	90	110	\$103	\$103
2009	1,400	70	190	\$85	\$85

Note: The category "operating equipment" includes fires with four heat sources: arcing; radiated or conducted heat from operating equipment; spark, ember, or flame from operating equipment; and unclassified heat from operating equipment. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Sources: NFIRS and NPPA survey. Inflation adjustments were based on Table No. 723, "Purchasing Power of the Dollar: 1950 to 2009," U.S. Census Bureau's *Statistical Abstract of the United States: 2011*, 130th Edition, 2010.

Table 16.
 Home Upholstered Furniture Fires Started, by Hot Embers or Ashes
 by Year: 1980-2009
 (Excluding fires with confined structure fire incident types)

Year	Fires	Civilian Deaths	Civilian Injuries	As Reported	Total Property Damages (in Millions) In 2009 Dollars
1980	400	0	30	\$2	\$4
1981	300	30	10	\$2	\$5
1982	200	10	10	\$6	\$14
1983	200	0	30	\$3	\$6
1984	200	20	10	\$1	\$3
1985	200	0	0	\$2	\$4
1986	300	0	20	\$2	\$5
1987	300	20	20	\$3	\$5
1988	300	10	70	\$2	\$4
1989	200	0	80	\$3	\$6
1990	200	0	30	\$3	\$5
1991	200	0	30	\$3	\$4
1992	200	0	20	\$3	\$5
1993	200	10	20	\$2	\$3
1994	200	10	10	\$2	\$3
1995	200	0	30	\$3	\$5
1996	200	0	20	\$3	\$4
1997	200	10	0	\$3	\$4
1998	200	10	20	\$3	\$4
1999	400	60	60	\$5	\$7
2000	800	30	160	\$18	\$22
2001	900	0	80	\$14	\$17
2002	900	50	80	\$24	\$28
2003	700	20	120	\$20	\$23
2004	700	30	70	\$19	\$22
2005	700	30	100	\$26	\$29
2006	800	20	80	\$20	\$21
2007	600	30	60	\$35	\$36
2008	600	30	140	\$20	\$20
2009	600	60	60	\$48	\$48

Note: Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 723, "Purchasing Power of the Dollar: 1950 to 2009," U.S. Census Bureau's *Statistical Abstract of the United States: 2011*, 130th Edition, 2010.

Table 17.
Home Upholstered Furniture Fires Started, by Smoking Materials, by Extent of Flame Damage
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Extent of Flame Damage	Fires	Confined to origin	Confined to room of origin	Confined to floor of origin	Confined to building of origin	Beyond building of origin	Total	Property Damage (in Millions)
Confined to object of origin	600 (32%)	29 (10%)	57 (17%)					\$4 (4%)
Confined to room of origin	600 (32%)	74 (25%)	111 (33%)					\$19 (18%)
Confined to floor of origin	190 (10%)	48 (16%)	44 (13%)					\$15 (14%)
Confined to building of origin	440 (23%)	132 (45%)	112 (33%)					\$56 (54%)
Beyond building of origin	50 (3%)	9 (3%)	12 (4%)					\$11 (10%)
Total	1,870 (100%)	291 (100%)	337 (100%)					\$104 (100%)

Table 18.
Home Upholstered Furniture Fires Started by Candles, Lighters, or Matches
by Extent of Flame Damage
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Extent of Flame Damage	Fires	Confined to origin	Confined to room of origin	Confined to floor of origin	Confined to building of origin	Beyond building of origin	Total	Property Damage (in Millions)
Confined to object of origin	340 (24%)	0 (0%)	29 (12%)					\$3 (4%)
Confined to room of origin	510 (35%)	11 (17%)	77 (33%)					\$13 (17%)
Confined to floor of origin	150 (10%)	16 (27%)	32 (14%)					\$10 (13%)
Confined to building of origin	410 (28%)	29 (47%)	87 (37%)					\$43 (56%)
Beyond building of origin	40 (3%)	5 (9%)	11 (5%)					\$7 (9%)
Total	1,450 (100%)	61 (100%)	237 (100%)					\$76 (100%)

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero -- it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 19.
Home Upholstered Furniture Fires
Started by Operating Equipment, by Extent of Flame Damage
2005-2009 Annual Averages
 (Excluding fires with confined structure fire incident types)

Extent of Flame Damage	Total		Confined Damage		Beyond Building		Total	
	Incidents	(%)	Incidents	(%)	Incidents	(%)	Damage (\$)	(%)
Confined to object of origin	280	(19%)	2	(3%)	15	(10%)	\$4	(5%)
Confined to room of origin	570	(38%)	17	(23%)	57	(38%)	\$17	(20%)
Confined to floor of origin	170	(11%)	14	(19%)	22	(15%)	\$15	(18%)
Confined to building of origin	440	(29%)	38	(51%)	47	(31%)	\$41	(51%)
Beyond building of origin	50	(3%)	2	(3%)	8	(6%)	\$4	(5%)
Total	1,520	(100%)	74	(100%)	149	(100%)	\$81	(100%)

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 20.
Home Upholstered Furniture Fires
Started by Smoking Materials, by Factor Contributing to Ignition
2005-2009 Annual Averages
 (Excluding fires with confined structure fire incident types)

Factor contributing to ignition	Fires	Percentage of fires	Confined structure fires	Percentage of confined structure fires	Confined structure fires	Percentage of confined structure fires	Ignition Property Losses (in \$1000s)	Percentage of ignition losses
Abandoned or discarded material or product	1,190	(63%)	179	(61%)	194	(58%)	\$74	(71%)
Unclassified misuse of material or product	340	(18%)	35	(12%)	69	(20%)	\$14	(14%)
Heat source too close to combustibles	240	(13%)	49	(17%)	57	(17%)	\$10	(10%)
Unclassified factor contributed to ignition	110	(6%)	26	(9%)	20	(6%)	\$4	(4%)
Playing with heat source	20	(1%)	0	(0%)	2	(1%)	\$0	(0%)
Unclassified fire spread or control	10	(1%)	7	(2%)	3	(1%)	\$1	(1%)
Improper container or storage	10	(1%)	0	(0%)	2	(1%)	\$0	(0%)
Other known factor	50	(2%)	12	(4%)	12	(3%)	\$4	(4%)
Total fires	1,870	(100%)	291	(100%)	337	(100%)	\$104	(100%)
Total entries*	1,950	(104%)	307	(106%)	358	(106%)	\$107	(103%)

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

Note: Sums may not equal due to rounding errors. Fires in which the factor contributing to ignition was coded as "none," unknown, or not reported have been allocated proportionally among fires with known factor contributing to ignition. Estimates of zero mean that the actual number rounded to zero -- it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 21.
Home Upholstered Furniture Fires Started by Smoking Materials, by Human Factor Contributing to Ignition
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Human Factor Contributing to Ignition	Fires	(%)	Confined Structure Fires	(%)	Confined Structure Fires	(%)	Direct Property Damage (in millions)	(%)
Asleep	440	(24%)	86	(29%)	116	(35%)	\$26	(25%)
Possibly impaired by alcohol or drugs	280	(15%)	72	(25%)	74	(22%)	\$20	(20%)
Unattended or unsupervised person	170	(9%)	17	(6%)	17	(5%)	\$7	(6%)
Age was a factor	70	(4%)	35	(12%)	16	(5%)	\$3	(3%)
Possibly mentally disabled	60	(3%)	13	(5%)	16	(5%)	\$3	(3%)
Physically disabled	50	(2%)	38	(13%)	19	(6%)	\$3	(3%)
Multiple persons involved	20	(1%)	4	(1%)	8	(2%)	\$2	(2%)
No human factor	950	(51%)	103	(36%)	127	(38%)	\$52	(50%)
Total fires	1,870	(100%)	291	(100%)	337	(100%)	\$104	(100%)
Total entries*s	2,040	(109%)	367	(126%)	395	(117%)	\$115	(111%)

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

Table 22.
Home Upholstered Furniture Fires Started by Candles, Lighters, or Matches
by Cause: 2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Cause	Fires	(%)	Confined Structure Fires	(%)	Confined Structure Fires	(%)	Direct Property Damage (in millions)	(%)
Unintentional	1,080	(71%)	57	(77%)	119	(79%)	\$63	(78%)
Intentional	380	(25%)	17	(23%)	27	(18%)	\$15	(19%)
Unclassified cause of ignition	40	(2%)	0	(0%)	3	(2%)	\$2	(2%)
Failure of equipment or heat source	10	(1%)	0	(0%)	2	(1%)	\$0	(1%)
Total	1,520	(100%)	74	(100%)	149	(100%)	\$81	(100%)

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero - it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 23.
Home Upholstered Furniture Fires Started by Candles, Lighters, or Matches
by Factor Contributing to Ignition: 2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Factor Contributing to Ignition	Fires	Confined Structure Fires	Confined Structure Fires	Confined Structure Fires	Confined Structure Fires	Confined Structure Fires	Confined Structure Fires
Playing with heat source	470 (33%)	22 (37%)	74 (31%)	\$23 (30%)			
Heat source too close to combustibles	430 (29%)	19 (31%)	82 (35%)	\$24 (32%)			
Unclassified misuse of material or product	180 (13%)	7 (12%)	40 (17%)	\$10 (13%)			
Abandoned or discarded material or product	160 (11%)	5 (8%)	28 (12%)	\$8 (11%)			
Unclassified factor contributed to ignition	100 (7%)	3 (5%)	15 (6%)	\$4 (5%)			
Equipment unattended	30 (2%)	0 (0%)	3 (1%)	\$2 (2%)			
Collision, knock down, or overturn	30 (2%)	3 (5%)	2 (1%)	\$1 (2%)			
Unclassified fire spread or control	20 (2%)	0 (0%)	1 (0%)	\$3 (4%)			
Animal	20 (1%)	0 (0%)	0 (0%)	\$2 (2%)			
Flammable liquid used to kindle fire	20 (1%)	0 (0%)	1 (0%)	\$1 (1%)			
Exposure fire	10 (1%)	0 (0%)	0 (0%)	\$1 (1%)			
Flammable liquid or gas spilled	10 (1%)	3 (5%)	2 (1%)	\$0 (0%)			
Unclassified operational deficiency	10 (1%)	0 (0%)	4 (2%)	\$0 (0%)			
Other known factor	40 (3%)	0 (0%)	8 (3%)	\$3 (3%)			
Total fires	1,450 (100%)	61 (100%)	237 (100%)	\$76 (100%)			
Total entries*	1,530 (106%)	63 (103%)	260 (110%)	\$81 (107%)			

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

Note: Sums may not equal due to rounding errors. Fires in which the factor contributing to ignition was coded as "none," unknown, or not reported have been allocated proportionally among fires with known factor contributing to ignition. Estimates of zero mean that the actual number rounded to zero -- it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 24.
Home Upholstered Furniture Fires Started by Candles, Lighters, or Matches
by Human Factor Contributing to Ignition: 2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Human Factor Contributing to Ignition	Fires	Fires as a % of Total	Human Factor Contributing to Ignition	Fires as a % of Total	Human Factor Contributing to Ignition	Fires as a % of Total	Human Factor Contributing to Ignition	Fires as a % of Total
Unattended or unsupervised person	300	(21%)	7	(12%)	42	(18%)	\$16	(22%)
Age was a factor	270	(19%)	19	(31%)	48	(20%)	\$16	(21%)
Asleep	120	(8%)	14	(23%)	33	(14%)	\$8	(10%)
Possibly impaired by alcohol or drugs	70	(5%)	5	(8%)	15	(6%)	\$3	(4%)
Possibly mentally disabled	50	(4%)	2	(4%)	10	(4%)	\$3	(4%)
Multiple persons involved	30	(2%)	0	(0%)	3	(1%)	\$2	(3%)
Physically disabled	20	(1%)	3	(4%)	8	(3%)	\$2	(2%)
No human factor	700	(48%)	19	(31%)	102	(43%)	\$35	(46%)
Total fires	1,450	(100%)	61	(100%)	237	(100%)	\$76	(100%)
Total entries*	1,560	(108%)	69	(113%)	262	(111%)	\$84	(111%)

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

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero -- it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 25.
Home Upholstered Furniture Fires Started by Operating Equipment
by Equipment Involved in Ignition
2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Equipment Involved in Ignition	Fires	Confined Structure	Property Damage (in millions)	Property Damage				
		(%)	(%)	(%)	(%)	(%)		(%)
Electrical distribution or lighting equipment	570	(37%)	44	(59%)	75	(51%)	\$27	(33%)
Fixed wiring and related equipment	220	(14%)	0	(0%)	204	(13%)	\$11	(13%)
Lamp, bulb or lighting	160	(11%)	13	(18%)	27	(18%)	\$7	(8%)
Cord or plug	150	(10%)	31	(41%)	22	(15%)	\$8	(10%)
Transformer and power supplies	30	(2%)	0	(0%)	6	(4%)	\$1	(2%)
Heating equipment	560	(37%)	26	(34%)	45	(30%)	\$28	(35%)
Fixed or portable space heater, including wood stoves	510	(34%)	26	(34%)	35	(23%)	\$26	(32%)
Heat lamp	20	(1%)	0	(0%)	2	(1%)	\$0	(1%)
Fireplace or chimney	10	(1%)	0	(0%)	6	(4%)	\$1	(1%)
Central heat	10	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Water heater	10	(1%)	0	(0%)	2	(1%)	\$0	(0%)
Heat tape	0	(0%)	0	(0%)	0	(0%)	\$0	(0%)
Electronic, office or entertainment equipment	60	(4%)	0	(0%)	7	(5%)	\$5	(6%)
Cooking equipment	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Portable cooking or warming equipment	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Other known cooking equipment	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Shop tools or industrial equipment, including torches	20	(1%)	0	(0%)	0	(0%)	\$2	(2%)
Air conditioner	80	(5%)	0	(0%)	2	(1%)	\$2	(2%)
Unclassified portable appliance designed to produce heat	40	(3%)	2	(3%)	2	(1%)	\$4	(4%)
Fan	40	(2%)	0	(0%)	0	(0%)	\$1	(2%)
Heating pad	30	(2%)	0	(0%)	0	(0%)	\$3	(3%)
Electric blanket	20	(1%)	0	(0%)	7	(5%)	\$1	(1%)
Unclassified equipment involved in ignition	10	(1%)	0	(0%)	2	(1%)	\$4	(5%)
Hair dryer	10	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Curling iron or curler warmer	10	(1%)	0	(0%)	4	(3%)	\$0	(0%)
Clothes iron	10	(1%)	0	(0%)	0	(0%)	\$0	(1%)

Table 25.
**Home Upholstered Furniture Fires Started by Operating Equipment
 by Equipment Involved in Ignition**
 2005-2009 Annual Averages
 (Excluding fires with confined structure fire incident types)
 (Continued)

Equipment Involved in Ignition	Fires	(%)	Deaths	(%)	Injuries	(%)	Property Damage (\$100,000s)	(%)
Other known equipment	50	(3%)	3	(4%)	5	(3%)	\$3	(3%)
Total	1,520	(100%)	74	(100%)	149	(100%)	\$81	(100%)

Note: Fires in which the equipment involved in ignition was unknown or not reported have been allocated proportionally among fires with known equipment involved. Fires in which the equipment involved in ignition was entered as none but the heat source indicated equipment involvement or the heat source was unknown were also treated as unknown and allocated proportionally among fires with known equipment involved. Fires in which the equipment was partially unclassified (i.e., unclassified kitchen or cooking equipment, unclassified heating, cooling or air condition equipment, etc.) were allocated proportionally among fires that grouping (kitchen or cooking equipment; heating, cooling or air conditioning equipment, etc.). Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 26.
Home Upholstered Furniture Fires Started by Operating Equipment
by Factor Contributing to Ignition: 2005-2009 Annual Averages
(Excluding fires with confined structure fire incident types)

Factor Contributing to Ignition	Fires	(%)	Deaths	(%)	Injuries	(%)	Property Damage (\$100,000s)	(%)
Electrical failure or malfunction	730	(48%)	43	(58%)	87	(58%)	\$43	(53%)
Heat source too close to combustibles	500	(33%)	17	(22%)	44	(29%)	\$23	(29%)
Unclassified mechanical failure or malfunction	70	(4%)	0	(0%)	4	(3%)	\$3	(4%)
Equipment unattended	60	(4%)	2	(2%)	2	(1%)	\$2	(3%)
Unclassified misuse of material or product	40	(3%)	5	(6%)	3	(2%)	\$2	(2%)
Equipment overloaded	40	(3%)	9	(13%)	8	(6%)	\$2	(3%)
Unclassified factor contributed to ignition	30	(2%)	2	(2%)	1	(0%)	\$3	(4%)
Unintentionally turned on or not turned off	30	(2%)	0	(0%)	1	(0%)	\$3	(3%)
Equipment not being operated properly	20	(1%)	0	(0%)	1	(1%)	\$2	(3%)
Worn out	20	(1%)	0	(0%)	3	(2%)	\$2	(2%)
Collision, knock down, or overturn	10	(1%)	0	(0%)	4	(3%)	\$1	(1%)
Abandoned or discarded material or product	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified operational deficiency	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Leak or break	10	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Playing with heat source	10	(1%)	2	(2%)	2	(1%)	\$1	(1%)
Other known equipment	50	(4%)	2	(2%)	5	(3%)	\$2	(3%)
Total fires	1,520	(100%)	74	(100%)	149	(100%)	\$81	(100%)
Total entries*	1,630	(107%)	81	(109%)	165	(110%)	\$89	(110%)

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

Note: Sums may not equal due to rounding errors. Fires in which the factor contributing to ignition was coded as "none," unknown, or not reported have been allocated proportionally among fires with known factor contributing to ignition. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 27.
**Home Upholstered Furniture Fires Started by Operating Equipment
 by Human Factor Contributing to Ignition: 2005-2009 Annual Averages**
 (Excluding fires with confined structure fire incident types)

Human Factor Contributing to Ignition	Fires	% of Total Fires	Deaths	% of Total Deaths	Property Damaged (\$ millions)	% of Total Property Damaged
Asleep	110	(7%)	26	(35%)	30	(8%)
Unattended or unsupervised person	100	(7%)	2	(3%)	4	(5%)
Possibly impaired by alcohol or drugs	20	(1%)	3	(4%)	2	(1%)
Age was a factor	20	(1%)	2	(3%)	5	(2%)
Possibly mentally disabled	10	(1%)	1	(2%)	2	(1%)
Physically disabled	0	(0%)	2	(3%)	5	(1%)
Multiple persons involved	0	(0%)	0	(0%)	0	(0%)
No human factor	1,270	(83%)	44	(59%)	103	(83%)
Total entries	1,520	(100%)	74	(100%)	149	(100%)
Total factors	1,530	(101%)	80	(108%)	151	(101%)

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

Note: Sums may not equal due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

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.

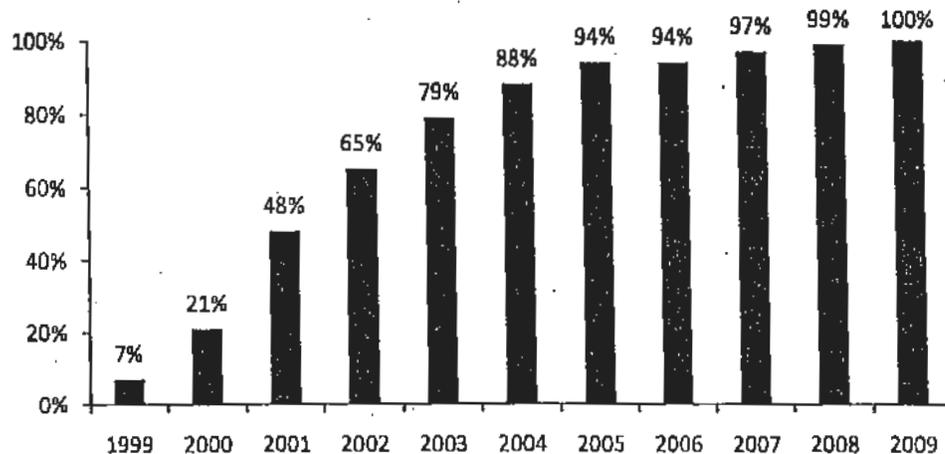
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific 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 <http://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:

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

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. 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.

Fires with unknown data are allocated proportionally.

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.

Estimates of upholstered furniture fires were created using scaling ratios and allocation of unknowns or missing data.

Over the five-year period of 2005-2009, a total of 14,535 raw non-confined home structure fires that began with upholstered furniture were reported to NFIRS 5.0. These fires resulted in raw totals of 571 civilian deaths, 1,680 civilian injuries, and \$602.5 million in direct property damage. These totals were multiplied by

- a) the residential scaling ratios derived from NFPA survey totals divided by NFIRS totals, and then
- b) total non-confined home structure fires divided by the total such fires with known item first ignited,

to obtain estimated averages of 6,760 home upholstered furniture fires per year, resulting in average of 500 civilian deaths, 890 civilian injuries and \$447 million in direct property damage annually.

The same procedure was applied to confined fires. During 2005-2009, 119 confined upholstered furniture fires were reported to the raw NFIRS database per year, resulting in no deaths, two civilian injuries, and \$45,000 direct property damage. With unknowns and missing data allocated proportionally, confined upholstered furniture fires averaged 280 per year with minimal associated losses. These confined fires were included in trend estimates but excluded from all further analyses.

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. The cause of ignition was known in 75% of the non-confined upholstered furniture fires, 72% of the civilian deaths, 74% of the civilian injuries, and 78% of the direct property damage.

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. Factor contributing to ignition was unknown or not reported in 41% of the non-confined upholstered furniture fires, 44% of the civilian deaths, 34% of the civilian injuries, and 33% of the direct property damage.

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:

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

All fires in range 60-69
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. Heat source code 60 was used with 4% of the non-confined upholstered furniture fires, deaths, injuries, and property damage. The heat source was completely unknown or not reported in 24% of the non-confined upholstered furniture fires, 29% of the civilian deaths, 20% of the civilian injuries, and 20% of the direct property damage.

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

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

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
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector
	228	Battery charger or rectifier
	229	Battery (all types)
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

The equipment involved in ignition was known in 25% of the non-confined upholstered furniture fires, 28% of the civilian deaths, 32% of the civilian injuries, and 40% of the direct property damage.

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. The area of origin was known in 99% of the non-confined upholstered furniture fires and associated losses.

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 U.S. Fire Administration's National Fire Incident Reporting System (NFIRS). 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/>.

Cooking equipment and heating equipment are calculated by summing fires identified by equipment involved in ignition and relevant confined fires. Confined fires will be shown if they account for at least 2% 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.

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. Earlier versions of NFIRS included codes for incendiary and suspicious. Intentional fires were deliberately set; they may or may not be incendiary in a legal sense. 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." 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.

Cooking equipment in non-confined fire 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. As noted in Appendix A, a proportional share of unclassified kitchen and cooking equipment (code 600) is included here.

Heating equipment in non-confined fire (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. As noted in Appendix A, a proportional share of unclassified heating, ventilation and air condition equipment (code 100) is 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. As noted in Appendix A, a proportional share of shop tools and industrial equipment (code 300) is included here.

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. As noted in Appendix A, a proportional share of unclassified personal and household equipment (code 800) is included here.

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.

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. . As noted in Appendix A, a proportional share of shop tools and industrial equipment (code 300) is included here.

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. As noted in Appendix A, a proportional share of commercial and medical equipment (code 400) is included here.

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 involved codes 2 and 3).

Exposures are fires that are caused by the spread of or from another fire. These were identified by factor contributing to ignition code 71. This code is automatically applied when the exposure number is greater than zero.

Appendix C
Home Upholstered Furniture Fires Started by Hot Embers or Ashes

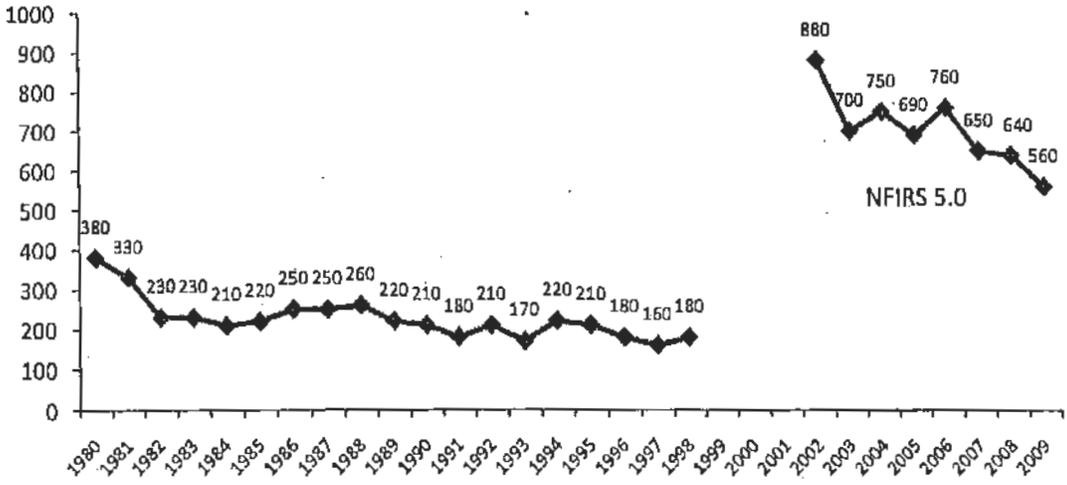
Frequency of fires started by hot embers or ashes increased in NFIRS 5.0

During 2005-2009, hot embers or ashes started an average of 660 (10%) home upholstered furniture fires per year, causing an average of 34 (7%) deaths annually. On average, one of every 19 such fires resulted in death. The *NFIRS 5.0 Complete Reference Guide* notes that the category of hot ember or ash includes hot coals, coke and charcoal as well as sparks or embers from a chimney that ignite the roof of the same structure. It excludes flying brands, embers, sand sparks, and embers accidentally escaping from operating equipment. Unfortunately, we do not know the source of these sparks or embers.

In earlier versions of NFIRS, cigarettes and other smoking materials (form of heat of ignition 30-39) occurred in the code choice list before embers or ashes (form of heat of ignition 53). Through most of the 1980s and 1990s, hot embers or ashes started 1-20% of the home upholstered furniture fires and were the heat source in 0-2% of the associated deaths. These percentages increased at about the same time that NFIRS 5.0 was adopted. In NFIRS 5.0, hot ember or ash is heat source 43 while smoking materials are captured by heat source 61-63.

It is possible that some portion of the embers or ashes in these fires were from smoking materials, whether directly off a cigarette or coming from an ashtray or related receptacle. Table A.C-1 and Figure A.C-1 show the trend for home structure fires started by embers or ashes. Table A-2 and Figure A.C-2 show the associated fire death trend. The totals in both tables represent the sum of the two categories. The percentages are the percent of the upholstered furniture fires started by these heat sources.

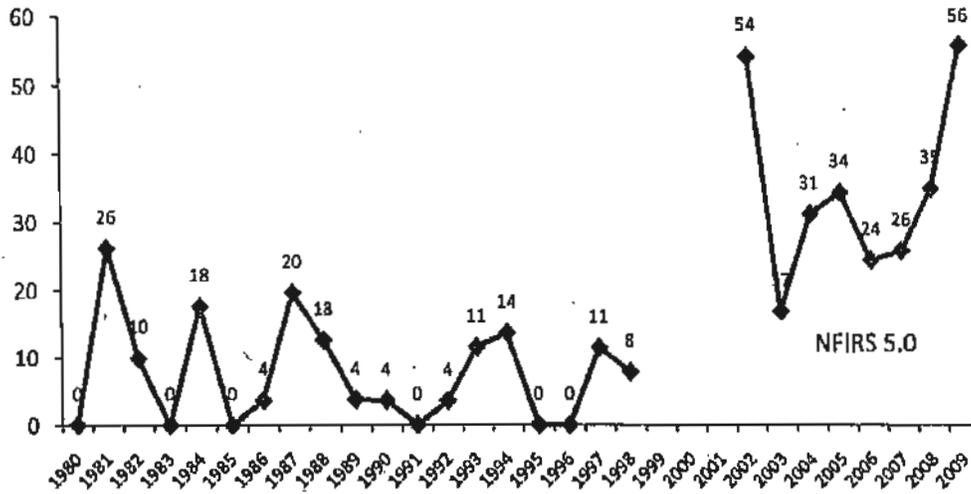
Figure A.C-1 Home Structure Fires Started by Embers or Ashes, by Year: 1980-2009



Source: NFIRS and NFPA survey.

If fires started by embers or ashes are added to fires started by smoking materials, the total number of home upholstered furniture fire started by these heat sources fell by 91% from 23,700 in 1980 to 2,100 in 2009.

Figure A.C.-2. Civilian Deaths from Home Structure Fires Started by Embers or Ashes by Year: 1980-2009



Source: NFIRS and NFPA survey.

If hot embers or ashes do frequently come from smoking materials, the totals in Tables A.C.-1 and A.C.-2 could be considered upper bounds for fires started by smoking materials, including *all* embers or ashes. This is almost certainly an overestimate.

Table A.C-1.
Home Upholstered Furniture Fires Started by Smoking Materials and Embers or Ashes
by Year 1980-2009
(Excluding fires with confined structure fire incident types)

Year	Smoking Materials	Embers or Ashes	Total
1980	23,300 (63%)	400 (1%)	23,700 (64%)
1981	21,800 (64%)	300 (1%)	22,100 (65%)
1982	17,100 (62%)	200 (1%)	17,300 (63%)
1983	14,500 (59%)	200 (1%)	14,700 (60%)
1984	14,100 (59%)	200 (1%)	14,300 (59%)
1985	12,800 (55%)	200 (1%)	13,000 (56%)
1986	12,300 (56%)	300 (1%)	12,600 (57%)
1987	11,400 (55%)	300 (1%)	11,700 (56%)
1988	11,000 (54%)	300 (1%)	11,300 (56%)
1989	9,400 (52%)	200 (1%)	9,600 (53%)
1990	8,500 (52%)	200 (1%)	8,700 (53%)
1991	8,200 (51%)	200 (1%)	8,400 (52%)
1992	7,100 (47%)	200 (1%)	7,300 (48%)
1993	6,900 (48%)	200 (1%)	7,100 (49%)
1994	6,400 (46%)	200 (2%)	6,600 (47%)
1995	6,200 (47%)	200 (2%)	6,400 (48%)
1996	5,900 (46%)	200 (1%)	6,100 (48%)
1997	5,300 (45%)	200 (1%)	5,500 (46%)
1998	5,100 (44%)	200 (2%)	5,300 (46%)
1999	3,100 (38%)	400 (5%)	3,600 (43%)
2000	3,100 (34%)	800 (9%)	4,000 (43%)
2001	3,100 (32%)	900 (10%)	4,100 (42%)
2002	2,600 (29%)	900 (10%)	3,400 (39%)
2003	2,200 (28%)	700 (9%)	2,900 (37%)
2004	2,300 (29%)	700 (10%)	3,000 (38%)
2005	2,000 (26%)	700 (9%)	2,700 (36%)
2006	2,100 (27%)	800 (10%)	2,900 (36%)
2007	1,900 (27%)	600 (9%)	2,600 (36%)
2008	1,800 (27%)	600 (9%)	2,500 (36%)
2009	1,500 (27%)	600 (10%)	2,100 (37%)

Note: Percents are based on non-confined home upholstered furniture fires of all causes. Sums may not equal due to rounding errors. The statistics on smoking materials include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Source: NFIRS and NFPA survey.

Table A.C.-2
Deaths from Home Upholstered Furniture Fires Started by Smoking Materials and Embers or Ashes
by Year 1980-2009
 (Excluding fires with confined structure fire incident types)

Year	Smoking Materials	Embers or Ashes	Total
1980	1,060 (78%)	0 (0%)	1,060 (78%)
1981	1,120 (82%)	30 (2%)	1,150 (84%)
1982	980 (82%)	10 (1%)	990 (83%)
1983	850 (77%)	0 (0%)	850 (77%)
1984	860 (79%)	20 (2%)	880 (81%)
1985	720 (77%)	0 (0%)	720 (77%)
1986	770 (72%)	0 (0%)	770 (72%)
1987	700 (68%)	20 (2%)	720 (70%)
1988	810 (74%)	10 (1%)	820 (75%)
1989	670 (76%)	0 (0%)	670 (77%)
1990	590 (68%)	0 (0%)	590 (68%)
1991	450 (66%)	0 (0%)	450 (66%)
1992	480 (76%)	0 (1%)	480 (77%)
1993	440 (68%)	10 (2%)	450 (69%)
1994	410 (61%)	10 (2%)	420 (63%)
1995	490 (74%)	0 (0%)	490 (74%)
1996	470 (72%)	0 (0%)	470 (72%)
1997	450 (68%)	10 (2%)	460 (70%)
1998	350 (65%)	10 (1%)	360 (66%)
1999	360 (75%)	60 (13%)	420 (88%)
2000	330 (58%)	30 (6%)	360 (63%)
2001	380 (62%)	0 (0%)	380 (62%)
2002	230 (43%)	50 (10%)	280 (53%)
2003	310 (47%)	20 (3%)	330 (50%)
2004	370 (53%)	30 (4%)	400 (57%)
2005	330 (61%)	30 (6%)	360 (68%)
2006	310 (64%)	20 (5%)	340 (69%)
2007	320 (59%)	30 (5%)	350 (64%)
2008	250 (50%)	30 (7%)	280 (57%)
2009	220 (49%)	60 (12%)	280 (62%)

Note: Percents are based on deaths from home upholstered furniture fires of all causes. Sums may not equal due to rounding errors. The statistics on smoking materials include a proportional share of fire deaths in which the heat source was heat from an unclassified open flame or smoking material. Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Source: NFIRS and NFPA survey.

Published incidents provide information about what can happen, not what is typical. Articles from NFPA publications about specific incidents illustrate some of the ways in which upholstered fire catches fire or is involved in fire. These incidents were taken from the "Firewatch" Columns and annual studies of catastrophic fires in *NFPA Journal*. These incidents tend to be more serious than the typical fire.

Smoking Materials

No Batteries Found in Smoke Alarms in Fatal Fire, Florida

A man in his 60s died of smoke inhalation when a fire that started in the living room filled his single-family house with smoke as he slept. His body was discovered by a deputy sheriff who responded to a 911 call from a Meals-on-Wheels driver who'd become worried because the man had not answered his door in two days.

The one-story, single-family house was constructed of wood and concrete and had a wood-framed roof covered by asphalt shingles. There were no sprinklers, and the three smoke alarms installed in the kitchen, the hallway, and the master bedroom had no batteries.

Fire department investigators discovered a distinctive V-pattern burn that clearly showed that the fire started in an upholstered couch and burned until it burned itself out. They also noted that high heat left the walls very dark from about the 5-foot (2-meter) level to the ceiling and stained the floor throughout the house. When they found an ashtray with cigarette butts and open beer cans around the couch, they determined that the victim had dropped a lit cigarette on the couch before going to bed.

The house, which was valued at \$100,000, and its contents, valued at \$20,000, sustained an estimated \$5,000 in damage

Kenneth J. Tremblay, 2011, "Firewatch," *NFPA Journal*, May/June, 33-34.

Smoking Material Fire Kills Two, Utah

Two women, one 90 years old and the other 55, died when a fire started by smoking materials that had been improperly disposed of ignited a recliner, filling their single-family home with smoke.

The single-story, wood-frame house, which was 40 feet (12 meters) long and 30 feet (9 meters) wide, had concrete block walls and a pitched wooden roof covered with asphalt shingles. A battery-operated smoke alarm had been installed in the first-floor hallway, but firefighters said they did not hear it operating during their initial search and rescue operations. There were no sprinklers.

The former husband of one of the women, who visited frequently and acted as their caretaker, arrived around 10:15 a.m. When he opened the door, he found smoke filling the house. He called 911 and told the arriving crews that the two women, who were both physically disabled, were probably inside.

Firefighters found the first victim in the bathroom off the master bedroom on the first floor and quickly took her outside for emergency medical treatment. A second crew found the other woman in a basement bedroom on the floor next to the bed. She was pronounced dead at the scene.

Investigators determined that the fire started in the basement family room in an upholstered recliner, on the arm of which they found a full ashtray that was leaning in a bit toward the seat. After the fire consumed the available oxygen, it almost self-extinguished. Firefighters put out the smoldering remains.

The women died of smoke inhalation. The house, valued at \$100,000, and its contents, valued at \$30,000, sustained undetermined damages.

Kenneth J. Tremblay, 2011, "Firewatch," *NFPA Journal*, March/April, 23-24.

Alcohol a Factor in Death, Texas

A 58-year-old man died of smoke inhalation in a house fire that investigators believe was caused by a discarded cigarette.

The one-story, wood-frame, single-family home, built on a concrete slab foundation, had a brick veneer and an asphalt-shingled roof. Firefighters found a battery-operated smoke alarm on the wall in the hallway, but it had no battery. There were no sprinklers.

A neighbor who smelled smoke called 911 at 11:05 p.m., and the single engine the fire department sent to investigate called for a full first-alarm assignment. Responding firefighters, who forced the front door after seeing fire venting from the rear of the home, discovered that the fire was confined to the living room and extinguished it before it spread any further. They discovered the victim during a primary search and took him to the hospital, where he was pronounced dead.

Investigators determined that a discarded cigarette started the fire in an upholstered chair. Near the chair, they discovered several coffee cans holding cigarette butts, as well as several alcohol containers. Alcohol was a contributing factor in the victim's death.

The house and its contents, together valued at \$85,000, sustained damage estimated at \$75,000.

Kenneth J. Tremblay, 2008, "Firewatch", *NFPA Journal*, November/December, 18-19.

Cigarette Starts Fatal Fire, Minnesota

A 67-year-old woman died as a result of a fire in her apartment that began when a cigarette she dropped ignited paper on the floor. The three-story, wood-frame apartment building, which was 325 feet (99 meters) long and 75 feet (23 meters) wide, had a wood truss roof that was covered by asphalt shingles.

A central station alarm company monitored smoke detectors in the common hallways and heat detectors in all the units. The heat detection system operated properly. Hardwired smoke detectors had also been installed in the apartments, but they did not have battery backup. The building had a standpipe connection but no sprinklers.

Firefighters responding to a 5:27 a.m. call from the alarm company found smoke coming from a rear-facing balcony on the third floor. The first-due engine company connected to a hydrant to support the standpipe system, while other crews attached a hose line to the standpipe and advanced to the apartment of origin. Forcing the door, they entered the one-bedroom unit and found flames travelling across the ceiling. They played the hose stream on the flames and extinguished the fire.

Firefighters found the victim lying on the floor against her bed, unconscious but still breathing. They took her to the hospital, where doctors discovered she had suffered smoke inhalation and second- and third-degree burns to her right side, upper torso, and face. She was transferred to a burn center but died a week later.

Investigators determined that the fire began in the living room near an upholstered chair when the woman dropped a cigarette on paper on the floor nearby. The resulting fire spread to the chair and other items before it was extinguished.

Autopsy results indicated that the woman had a blood alcohol level of .189, which may have contributed to her death. The investigators believe she fell asleep, dropped her cigarette, awoke during the fire, and tried unsuccessfully to escape. The apartment's smoke alarm may not have operated, since investigators found that the circuit to which it was wired had tripped.

The building was valued at \$3 million, and its contents were valued at \$1 million. Damage to the building is estimated at \$20,000, while damage to the contents is estimated at \$10,000. There were no other deaths or injuries.

Kenneth J. Tremblay, 2008, "Firewatch," *NFPA Journal*, July/August 20-21.

Smoking on Oxygen Causes Deadly Fire, Colorado

A 72-year-old woman who often smoked, even though she was on a home-assisted oxygen breathing apparatus, died in her home in an early-morning fire caused by her smoking materials.

The ranch-style, wood-frame house, which was 30 feet (9 meters) long and 28 feet (8 meters) wide, had exterior brick walls and an asphalt roof. It had neither smoke alarms nor sprinklers. The single-family home was occupied by the victim and two other adults.

One of the occupants awoke to the fire and called 911 at 4:12 a.m. Arriving police officers tried to enter through the front door, but they were driven back by high concentrations of heat and smoke.

However, one officer was able to remove a number of oxygen cylinders stored near the doorway, while others helped two occupants get out of the house through a front bedroom window. The fire quickly filled the living room window and the front door.

Fire crews arrived within five minutes of alarm and found heavy flames coming from the front and rear of the building. Just as an engine company was preparing to enter the front door with a hose line, they saw a white flash, heard a "whoosh" sound, and were driven back. A firefighter who fell on the ice while stepping away from the house injured his knee.

Meanwhile, knocking down the blaze as they went through the house, the interior fire crew found the body of the 72-year-old woman, who had obvious burn injuries.

Investigators discovered that the fire started in the living room where the victim often slept and where they found an oxygen concentrator, a lift chair, a wheel chair, and other items the victim used. They determined that a cigarette ignited her upholstered chair and that the fire spread from the living room to the kitchen and bedrooms.

The woman, who was terminally ill, often smoked in the living room and had occasional episodes of unconsciousness during which she dropped her cigarette on the furniture, resulting in burn marks. She normally lit her first cigarette of the day around 4:00 a.m., which is consistent with the fire's time frame.

As the victim often watched television with the volume turned up, the other two occupants slept with their doors closed, a barrier that provided enough time for their rescue.

The home, valued at \$140,000, and its contents, valued at \$20,000, sustained damages estimated at \$70,000 and \$16,000, respectively.

Kenneth J. Tremblay, 2008, "Firewatch," *NFPA Journal*, March/April, 27-28.

Occupants Trying to Remove Burning Sofa Blocks Exit, Massachusetts

Instead of calling the fire department and then escaping from a fire, occupants of an apartment decided to remove a burning couch. The fire eventually blocked the exits, the home filled with smoke. Two of the four occupants were visitors and unfamiliar with the home's layout. The visitors died in the fire, while the two others escaped.

The fire occurred within a three-story, five-unit apartment building constructed of wood framing with an asphalt-shingled roof. The building had a hardwired smoke-detection system, but no sprinklers.

A discarded cigarette started a smoldering fire within an upholstered sofa in the first-floor unit's living room. Smoke triggered the detector and it alerted the occupants who tried to remove the

burning sofa from the home. Reaching the kitchen, smoke from the fire became too much and two of the occupants exited through a front door. A female visitor, 23, had her obvious exit blocked and unfamiliar with the layout was overcome by smoke. Firefighters found her in an open closet. The second victim, a 24-year-old male visitor, attempted to escape through a bathroom but was also overcome by smoke.

The delay in alerting the fire department allowed the fire to grow. Arriving firefighters found heavy fire venting from the windows. The fire was rapidly controlled after two hose lines for fire attack were deployed. Other crews completed ventilation, and conducted a search and rescue.

The building suffered \$75,000 in loss with contents having an estimated loss of \$35,000. There were no other injuries during the incident.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, March/April, 20-21.

Cigar Ignites Upholstered Chair in Fatal Fire, Maryland

An 80-year-old man whose upholstered chair ignited shortly after he lit a cigar suffered burns that led to his death nearly a month later.

The fire occurred in an 11-story, fire-resistive apartment building measuring 100 feet (30 meters) by 100 feet (30 meters). The structure, which had concrete floors and walls and a masonry exterior, was protected by a wet-pipe sprinkler system and a smoke detection system.

The victim said he lit a cigar while sitting in the chair in his eighth-floor apartment, and the next thing he saw was a flash. When the fire spread from the chair to the victim's shirt, he took off the burning shirt and dropped it to the floor, allowing the fire spread to the carpet. Although burned, he managed to go to a neighbor's apartment for help.

Responding firefighters, who received the 911 call at 4:19 p.m., found that a sprinkler had already extinguished the fire by the time they arrived. Investigators determined that dropped or discarded smoking materials ignited the inside of the chair.

The victim suffered second- and third-degree burns to his upper torso, face, and head. He lived for almost a month before succumbing to his injuries. The apartment, valued at \$200,000, sustained a \$30,000 loss; its contents, valued at \$30,000, sustained damages of \$10,000.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, May/June, 38.

Carelessly Discarded Cigarette Leads to Fatal Fire, Nebraska

A cigarette carelessly discarded in an overstuffed chair started a fire that killed a 46-year-old woman in her apartment.

The two-story, four-unit apartment building, which was 60 feet (18 meters) long and 30 feet (9 meters) wide, had brick exterior walls. There were smoke alarms in each unit, but they weren't part of a monitored fire-detection system. There were no sprinklers.

At 10:12 p.m., firefighters received a call from a neighbor who thought she heard a smoke detector sounding. Fire crews arrived minutes later and were directed to a smoke-filled, second-floor unit, where they found the unconscious woman. Paramedics transported her to the local hospital.

The fire was confined to the living room chair, although smoke damaged other parts of the apartment. Investigators found cigarette butts, empty cigarette packages, and burn marks throughout the apartment and determined that the victim had dropped a cigarette, which ignited the chair. The woman, who died of smoke inhalation, had a chronic illness that may have prevented her from escaping.

Although the unit of origin suffered heavy smoke damage, the rest of the building had only moderate smoke and heat damage. Losses to the building, valued at \$160,000, were estimated at \$5,000. Its contents, valued at \$10,000, sustained a \$5,000 loss.

Kenneth J. Tremblay, 2002, "Firewatch," *NFPA Journal*, November/December 18.

Cigarette Started Catastrophic Upholstered Furniture Fire, Michigan

In May 1999, a Michigan fire department was alerted at 4:45 a.m. to a fire in a two-story, single-family dwelling of unprotected wood-frame construction. Six people died in this fire.

A discarded cigarette ignited a couch in an enclosed porch that was used as a family room. The occupants thought they'd extinguished the fire, but it continued to smolder, burst into flames, and spread throughout the house.

The house had smoke alarms that worked on all levels. There was no alarm in the room of fire origin, though it wasn't required. Two of the victims were disabled and three others, who were visitors, were asleep and intoxicated.

Excerpted and adapted from Robert S. McCarthy, 2000, "1999 Catastrophic Fires," *NFPA Journal*, September/October, 56.

Open Flame or Intentional

Candles Ignite Deadly Fire, New Jersey

Several candles used for illumination and located throughout the home are believed to have started a deadly fire that killed a woman and two children. The utility company disconnected electrical power to the home earlier in the afternoon due to non-payment.

The homeowner stated they were using candles about the house, but that all were extinguished before they retired for the evening. The single-family, one-story home did not have smoke alarms or sprinklers.

A dog woke an occupant who opened her bedroom door and found smoke and heat within the home. She called her daughter who responded and then exited the home using a rear door. The daughter called back to her mother that she couldn't make it out, as the mother tried to re-enter the home.

The fire department received the alarm at 2:11 a.m. and responded within nine minutes to find the home well involved, especially the living area. After the fire was controlled they found a 9-year old boy in one bedroom, a 28-year old female, and a 2-year old boy together in another bedroom.

Investigators believe that a candle on a wall-mounted holder fell and ignited a couch. Fire traveled horizontally throughout the house and trapped three of the occupants who succumbed of smoke inhalation. Three firefighters also received injuries during suppression. The estimated losses and the home's value were not reported.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, July/August 27-28.

Child Ignites Fire in Apartment that Kills Four People, Georgia

Four people died in a fire that started when a child playing with a lighter ignited a sofa. The first-floor apartment fire quickly involved the entire unit when the fire department arrived.

Firefighters entered a bedroom, performed a search, and quickly left when the fire got worse.

The two-story apartment building measured 30 feet (9 meters) by 60 feet (18 meters) and contained four units. It was a wooden-frame building with a brick veneer and a wooden-decked roof covered by asphalt shingles. Investigators were unable to locate any smoke detection equipment. There were no sprinklers.

The fire was detected by an occupant who called 911 at 7:56 p.m. Firefighters arrived five minutes later and found fire coming from windows and doors at the front and rear of the building. Witnesses reported several people trapped, as the first arriving crew entered a front bedroom window to do a quick search. Two 1-3/4-inch hose lines were advanced into the front door to extinguish the fire.

During the overhaul, firefighters found the bodies of two boys, 8 and 5, and a 9-year-old girl. Details of an adult who also died at the scene are unavailable. There were no firefighter injuries.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, May/June 34.

Candle Fire in Basement Apartment Kills Man, Nebraska

A candle left burning on the floor in a rented basement room that had no smoke alarm started a fire that eventually burned itself out, but not before fatally injuring the room's occupant.

The fire occurred in a single-story, wood framed house with two living units on the first floor. Each unit also had a bedroom in the basement that was rented out to a single occupant. The only smoke alarm in the unsprinklered house, which measured 50 feet (15.2 meters) by 20 feet (6 meters), was in the first-floor hallway near sleeping areas.

One of the basement renters smelled smoke and alerted the other occupants before calling the fire department at 6:08 a.m. He did not know whether the other basement renter, a 28-year-old man, was home at the time but told first responders he might be.

Fire crews arriving six minutes later found light smoke coming from the building but could see no fire. When they searched the lower level, they found that the blaze in the victim's room had nearly extinguished itself. Searching further, they found the man leaning against a clothes dryer in his room, overcome by smoke.

Investigators determined that the candle ignited a sofa and that the fire spread to a table and other combustibles, producing heavy smoke. The coroner's report stated that the victim died of severe carbon monoxide poisoning and had levels of an illegal substance and alcohol in his blood at the time of his death. All the house's other occupants, who were sleeping at the time, escaped unharmed.

Damage to the \$200,000 structure was approximately \$6,000.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, January/February, 18.

Child-Playing Fire Kills Two Family Members, New York

A 6-year-old playing with fire ignited a couch, and the resulting blaze trapped his mother and two younger siblings in their apartment. Although the fire was primarily confined to the foam-filled sofa, it created enough smoke to block their exit. The child who started the fire got out of the apartment unharmed.

The fire occurred in a seven-story, 80-unit apartment building of fire resistive construction that measured 250 feet by 150 feet (76 by 46 meters). The building had a hardwired fire detection system that provided only a local alarm.

A call to 911 at 6:44 p.m. alerted the fire department, and firefighters were advancing hose lines to the unit of origin on the sixth floor within a few minutes of their arrival. They quickly controlled the fire and rescued the 41-year-old mother and her 3- and 5-year-old children within 8 to 10 minutes of dispatch or an estimated 16 to 18 minutes after ignition. Firefighters were able to revive the mother, but the two children died of smoke inhalation.

The fire began when the 6-year-old ignited some toilet paper while playing with the kitchen stove and carried it into the living room. When his mother entered the apartment from the rear, the boy hid the burning paper, either under a sofa cushion or under the sofa. The flames ignited

the couch. The boy ran from the apartment, as his mother went to try to rescue her two younger children, who were trapped in a back room.

Damage to the building, valued at \$2.5 million, was estimated at \$10,000. Damage to its contents came to \$2,000. Two firefighters were injured fighting the fire. One suffered a knee injury and the other a back injury.

Kenneth J. Tremblay, 2000, "Firewatch," *NFPA Journal*, September/October 22-23.

Heating Equipment

Heater Starts Fatal Fire, Ohio

A six-year-old boy died of smoke inhalation in a fire that began when a heater ignited a couch on the screened porch of his single-family, wood-frame home. The two-story house, which had an asphalt roof, was 50 feet (15 meters) long and 30 feet (9 meters) wide. It had no smoke alarms.

The residents awoke at some point during the fire and tried to extinguish the flames using water from the kitchen before someone finally called 911 at 3:25 a.m. Firefighters arrived to find the room of origin totally involved in flames.

The location of the boy was not reported. The house, valued at \$65,000, and its contents, valued at \$10,000, were nearly destroyed.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, November/December, 21.

Portable Heater Fire Kills Occupant, New York

A 65-year-old man died when a portable electric heater placed too close to the recliner in which he was sleeping ignited the chair or his blanket.

The two-story, wood-frame single family home, which was 36 feet (11 meters) long and 25 feet high (8 meters), had no smoke alarms or sprinklers.

At 4 a.m. a passerby called 911 after seeing flames 4 feet (1.2 meters) long coming from the windows of the house.

At some point during the fire, the victim tried to escape. He was found on the floor behind a door where he had succumbed to smoke inhalation and burns.

The house, valued at \$9,000, and its contents, valued at \$20,000, were destroyed.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, January/February, 20.

Furniture on Floor Furnace Ignites Fatal Fire, California

A 29-year-old man died and a woman was injured in an early-morning fire that began after a sofa placed over a floor furnace in the man's single-family home ignited and burned undetected. The one-story, wood-frame house, which measured 36 feet (11 meters) by 40 feet (12 meters), had no smoke alarms or sprinklers.

Firefighters responding to the 3:34 a.m. 911 call found the woman outside the burning house from which she had escaped by crawling through a bedroom window, sustaining numerous lacerations. Fire crews who entered the house in search of the other occupant found him in the bathtub, dead of smoke inhalation. Apparently, he had become aware of the fire but went to look for his cat rather than escape. The cat was found dead in one of the bedrooms.

Investigators found that the furnace's thermostat had been turned up and determined that the heat had caused the sofa to ignite. The fire burned in a V-pattern from the living room to other areas of the home and down to a crawl space below.

Damage to the house, valued at \$700,000, was estimated at \$200,000. Its contents, valued at \$400,000, were destroyed.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, September/October, 32.

Smoke Alarm Alerts Occupant, Rhode Island

Smoke from a fast-moving fire in the living room of an apartment in a three-family house activated a smoke alarm, alerting the structure's occupant.

The three-story, wood-frame dwelling measured 30 feet (9 meters) by 26 feet (8 meters). Battery-operated smoke alarms had been installed in the apartment of origin, but there were no fire sprinklers.

The fire began around 10 a.m. when radiant heat from a portable electric space heater on a living room coffee table ignited the fabric of two couches. A smoke alarm alerted the occupant, who tried to control the fire with a portable fire extinguisher until smoke forced him from the room. The fire caused the apartment's windows to fail, and the exterior wood siding ignited before the fire department arrived.

Fire companies used master streams to knock down the heavy fire, then completed extinguishment using several hose lines on each floor. The \$200,000 building and its contents, valued at \$40,000, were destroyed. There were no injuries.

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, January/February 15.

Kerosene heater ignited upholstered chair in catastrophic fire, North Carolina

In April 1999, a North Carolina fire department was notified at 11:55 a.m. of a fire in a single-family manufactured home of unprotected wood-frame construction. Five people died in this fire, including one child under age six.

An unvented kerosene heater ignited an upholstered chair in the living room, and the resulting fire spread throughout the home. There were no smoke alarms to warn the victims, who were all asleep when the fire broke out.

Excerpted and adapted from Robert S. McCarthy, 2000, "1999 Catastrophic Fires," *NFPA Journal*, September/October, 58.

Electrical Distribution or Lighting Equipment

Extension Cord Involved in Sofa Ignition Catastrophic Fire, North Carolina

In March 2006, a North Carolina fire department was notified at 4:00 a.m. of a fire in a 1½-story, single-family home of unprotected ordinary construction. Five people died in this fire, including one child under age six.

The fire originated in the living room. A couch was positioned against an extension cord plug. Pressure from the arm support flattened the plug causing a short circuit in the wiring. The short circuit ignited the couch. Fire burned into the fabric and foam cushion, producing heavy black smoke. Four of the victims were located in a first-story bedroom with doors closed. The fifth victim was found near the doorway. He had attempted to extinguish the fire with water from a sink.

There was a delay in reporting the fire, and one occupant attempted to extinguish the fire rather than evacuate. The remains of a smoke alarm was found, with battery installed, but it is undetermined if it activated.

Excerpted and adapted from Stephen G. Badger, 2007, "U.S. Multiple-Death Fires for 2006," *NFPA Journal*, September/October, 58.

Damaged Extension Cord Started Catastrophic Fire, Pennsylvania

In March 2006, a Pennsylvania fire department was notified at 2:30 a.m. of a fire in a two-story, single-family row house of unprotected ordinary construction. Five people died in this fire, including two children under age six. No smoke alarms or sprinklers were present.

An extension cord to a space heater was under a chair and was damaged by the weight of the chair. The damaged overloaded cord ignited the chair. The fire spread to a nearby sofa then vented out the first-story front room. The fire also extended up an open stairway to the second-story hallway.

A heavy security screen and security storm door hindered escape of the victims and delayed the firefighters in their fire attack and rescue. The only exit was a front door. One victim had jumped and was found outside, while another was located on the first-story, and the other three were in a second-story bedroom.

Excerpted and adapted from Stephen G. Badger, 2007, "U.S. Multiple-Death Fires for 2006," *NFPA Journal*, September/October, 58 (adapted).

Overheated Power Strip Ignited Couch in Catastrophic Fire, Michigan

In July 2003, a Michigan fire department was notified at 10:00 p.m. of a fire in a two-story single-family dwelling of unprotected ordinary construction. The fire killed six people, including four children under the age of six. No smoke alarms or sprinklers were present.

A power strip for a window air-conditioning unit was pinned between a wall and couch. It overheated and ignited the couch, window treatments, and penetrated the joist space. The victims were in bed in second-story bedrooms and had no warning of the fire.

Excerpted and adapted from Stephen G. Badger, 2004, "Catastrophic Multi-Death Fires of 2003," *NFPA Journal*, September/October, 68-9.

Other or Undetermined Sources of Upholstered Furniture Ignition or Fire Spread to Upholstered Furniture

Fireplace Starts Fatal Fire, California

A 91-year-old woman died and her 89-year-old husband was injured in a fire that began as the man burned newspapers, old mail, and trash in the fireplace of their second-floor apartment.

The walls of the six-unit, wood-frame apartment building, which was 50 feet (15 meters) wide and 75 feet (23 meters) long, consisted of plaster over wood lath. Stairwells at the front and rear of the building provided egress to two apartments on each level. Smoke alarms had been installed in the common stairwells and the individual units. There were no sprinklers.

The fire department received the alarm at 11:52 a.m. and arrived minutes later to find fire blowing out of the windows and threatening exposures and the floor above. The man, who had managed to escape from the unit, met firefighters and reported that his wife was still in the apartment.

Advancing hose lines to the second floor, firefighters knocked the spreading fire down and entered the apartment, where they found the body of the victim in the hallway by the front door near the room of origin.

The woman's husband told investigators that he was burning paper and trash in his fireplace when some of the burning paper spilled onto the floor and ignited nearby combustibles. He tried to extinguish the fire with wet towels and water, but it grew quickly, spreading to upholstered furniture. Calling for his wife, he left the building by the rear staircase.

The building, valued at \$4.5 million, sustained \$800,000 in damage. The contents were valued at \$600,000, and sustained \$400,000 damage. The victim's husband was burned, but no one else was injured.

Ken Tremblay, 2009, "Firewatch," *NFPA Journal*, November/December, 24-25.

Heating Pad Starts Fatal Fire, Kansas

A woman died in an early morning fire that began in an upholstered recliner in the family room of her single-family house.

The single-story, wood-frame dwelling had three bedrooms, a kitchen, a living room and a garage that had been converted into a family room. Its hardwired smoke detectors with battery backup operated as designed. There were no sprinklers.

A passerby discovered the fire and alerted police officers at a convenience store around 1:20 a.m. The officers responded to the scene and notified the 911 dispatcher of the situation. The officers then forced the front door open and removed the woman, who was lying on the living room love seat just inside the door. By that time, however, she had sustained fatal smoke inhalation injuries.

Within minutes, fire crews arrived to find fire coming from the home and police outside with the victim. While some firefighters advanced a 1 3/4-inch (4-centimeter) hose line through the front door, others tended to the victim, established a water supply, and ventilated the building. Crews searching for additional victims reported high heat and heavy smoke.

Investigators determined that portions of an electric heating pad that the woman had used in the recliner to soothe her chronic back pain had been forced into the folds of the chair's padding. The bent pad overheated and eventually ignited, and the fire burned until all combustible items in the room reached ignition temperature, flashing over before the fire department arrived.

The home sustained an \$80,000 loss, and its contents, valued at \$40,000, were destroyed.

Ken Tremblay, 2009, "Firewatch", *NFPA Journal*, September/October, 26.

House fire kills one child, injures another, Idaho

A 2-year-old girl and her 18-month-old brother who had been left alone in their home were unable to help themselves when a fire that started on the front porch burned through the single-family house.

The wood-frame dwelling, which was 46 feet (14 meters) long and 28 feet (8.5 meters) wide, had a battery-operated smoke alarm in a hallway, but investigators could not determine whether it operated. There were no sprinklers.

Firefighters received the alarm from a passerby at 2:21 p.m. While en route, they received follow-up reports from dispatch stating the house was fully involved.

Three minutes after they were dispatched, the first-arriving engine company noted heavy fire on the outside front of the home and reported that the windows were just starting to fail, allowing the fire into the structure. Firefighters advanced a hose line and knocked down the heavy fire at the front of the building before repositioning their hose line to the rear of the building. Forcing entry through the locked kitchen door, they approached the fire from the unburned side of the living room and quickly extinguished the blaze.

Interior crews conducting a primary search found the boy in a crib in a first-floor bedroom, and another company found the girl in a crib in a second bedroom. Both were treated for smoke inhalation, but the girl died of her injuries. Several teams of firefighters searched the house several more times for an adult who was reported to have been inside, but found none. Neither parent was home at the time of the fire.

Investigators determined that the blaze began near two upholstered chairs on the porch where the children's parents went to smoke but could not discover the cause.

Most of the fire damage was limited to the front of the house and front rooms on the first floor, although there was smoke damage throughout. Damage to the house, valued at \$80,000, was estimated at \$50,000. The contents, valued at \$7,000, were destroyed. Both of the children's parents were charged with involuntary manslaughter in the little girl's death.

Kenneth J. Tremblay, 2009, *Firewatch, NFPA Journal*, May/June, 36+38.

Sprinklers Douse High-Rise Fire, Minnesota

Two sprinklers activated and extinguished a fire in an apartment in a 20-story apartment building. At the time of the fire, the occupant of the second-floor apartment was not at home.

Each floor of the 149-unit building covered about 15,000 square feet (4,572 square meters) and was protected by a sprinkler system and fire detection system.

Firefighters received the alarm at 5:54 a.m. and responded to the apartment to find that the fire had already been extinguished. A small burned area in the living room contained the melted remains of a portable box-type fan and an upholstered swivel chair.

The apartment's occupant told investigators that the fan had been operating normally when he left the apartment about five hours earlier. The investigator determined that it malfunctioned and tipped over, igniting the carpeting and chair.

Losses were estimated at \$10,000. There were no injuries.

Kenneth J. Tremblay, 2006, *Firewatch, NFPA Journal*, July/August, 27.

Smoke Detectors Save Occupants From Fast-Moving Fire, Pennsylvania

Seven people owe their lives to an automatic fire detection system installed in a single-family home used for student housing. An intentionally set fire on the first floor quickly traveled up the stairs to the second and third floors, blocking the primary exit for the occupants. Four occupants on the second floor had no choice but to fall from second floor windows to escape. Two third-floor occupants were trapped and suffered smoke inhalation injuries.

The three-story wooden-frame dwelling measured 55 feet (16 meters) by 16 feet (4 meters) and had an asphalt-shingle roof. An automatic smoke detection system provided coverage in the bedrooms and common hallways. There were no sprinklers.

An occupant used an open flame device to ignite a blanket resting on top of an upholstered couch. The fire spread to the couch and throughout the living room before advancing vertically to upper floors. Two occupants of the second floor suffered trauma; two others from the same floor had smoke inhalation. The first-floor occupant also suffered smoke inhalation. The building, valued at \$100,000, was a total loss.

Kenneth J. Treinblay, 2007, "Firewatch," *NFPA Journal*, May/June 32-33.

Porch Fire Spreads into House, Massachusetts

Smoking materials dropped on a couch on the porch of a single-family house started a fire that spread into the home, trapping and killing an 89-year-old man. A passerby rescued three other occupants, and firefighters responding to a 911 call from the house saved a fourth.

The two-story, wood-frame house, which was 34 feet (10.4 meters) long and 24 feet (7.3 meters) wide, was unsprinklered. Smoke alarms had been installed in the basement and on the second floor, but their operation during the fire was not reported.

Investigators determined that the carelessly disposed of smoking materials ignited a couch on the porch. The fire then spread to other furnishings, aerosol cans, and a 20-pound (9-kilogram) propane cylinder, the contents of which contributed to the fire spread into the house.

The house, valued at \$125,000, sustained structural losses of \$80,000, and damage to its contents, valued at \$80,000, came to \$40,000.

The man firefighters rescued died of burns and smoke injuries about two months after the fire. The passerby who rescued the three occupants suffered smoke inhalation and burns, as did two firefighters.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, January/February, 18.

Intentional Porch Fire Spreads through Window to Ignite an Upholstered Couch in Catastrophic Fire, Pennsylvania

In November 2003, a Pennsylvania fire department was notified at 3:42 a.m. of a fire in a two-story single-family dwelling of unprotected ordinary construction. The fire killed five people, including one child under six. Two smoke alarms were present, but one had a dead battery and the other had no battery.

This fire was set on a porch at the front door and extended to the porch roof and into the house via a front window where it ignited a foam-padded sofa. Smoke and flames extended via the stairway to the second story. Four victims were found on the second story.

Excerpted and adapted from Stephen G. Badger, 2004, "Catastrophic Multi-Death Fires of 2003," *NFPA Journal*, September/October, 70.

Fireworks inside a Residence Ignite Deadly Fire, Missouri

A 6-year old boy and a 40-year old male died when fireworks ignited the interior of their home. Investigators believe hot embers from fireworks ignited an upholstered sofa and quickly spread, trapping the occupants. Firefighters fought through the fire and heavy smoke coming from the front door and quickly found one victim and later a second, but both had succumbed to smoke inhalation and burn injuries.

The single-family home was constructed of wood framing with a wooden roof and asphalt shingles. The 1,200-square-foot (111-square-meter) home lacked smoke alarms and sprinklers.

The fire department received a call from a passerby at 11:50 p.m. and arrived five minutes later to find police on scene reporting a person possibly trapped. As flames came out the front door and window, firefighters advanced a hose line into the front door knocking down the heavy fire as they went.

Within 10 feet (3 meters) of the door, the first victim was found and removed to the front lawn. Firefighters suppressed the fire and continued the primary search. A second victim was found in the kitchen and removed. The fire was contained to the first floor and the dwelling ventilated as the investigation began. Damages to the home were not reported.

Kenneth J. Tremblay, 2007, "Firewatch," *NFPA Journal*, September/October 26.

Four Die in House Fire, West Virginia

A family of four died in an early-morning fire that spread from the first-floor living room to the upper floors. By the time firefighters arrived, the house was engulfed in flames, and the fire was threatening the houses on either side.

The single-family, wood-framed home was two stories high with wood siding and a metal roof. It was 30 feet (9 meters) wide. No smoke detection equipment was found, and there were no fire sprinklers.

A passerby discovered the fire, and woke the neighbors, and tried to get the occupants out of the house. The fire department received the 911 call at 3:08 a.m. Arriving firefighters established a water supply and used two 1 3/4-inch hose lines to protect the exposures. A second engine company also established a water supply and advanced additional hose lines to back up the first responders. They tried to enter the house, but heavy fire drove them out, and the incident commander ordered a defensive approach.

Investigators determined that the fire began in the living room couch, but they couldn't determine what started it.

A man and a woman, both 44, and two boys, ages 14 and 11, succumbed to smoke inhalation. The house, valued at \$40,000 and its contents, valued at \$15,000 were destroyed.

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, March/April 19.

No Injuries in Early Morning Apartment Fire, Michigan

Seventy-five residents of an apartment building for older adults were evacuated safely even though smoke and flames spread to two floors and the attic during an early morning fire. Firefighters and sprinklers were able to limit fire spread to one interior fire division.

The L-shaped, 72-unit apartment building contained 24 units per floor, and the two wings were connected by a central common area. Each wing had a center corridor nearly 142 feet (43 meters) long by 58 feet (18 meters) wide. The common areas, which measured 94 feet by 58 feet (29 meters by 18 meters), included a day room, a lobby, a mechanical room, and storage rooms. The apartments and common area had hard-wired smoke detectors monitored by a central station alarm company. Standpipes and a partial wet-pipe sprinkler system protected the hallways and common areas.

At 1:56 a.m., the fire department received a 911 call reporting smoke on the second floor. Arriving three minutes later, firefighters noted smoke coming from the roof and second floor and, with the help of police officers, began evacuating the building and rescuing occupants from balconies.

The first five responding firefighters were joined by roughly 270 other emergency workers. They provided numerous ambulances and dry school buses that transported the residents from a temporary staging area in a nearby parking lot to the hospital, where the cafeteria was used as a temporary processing center. Five residents were treated for smoke inhalation.

The blaze began in an unoccupied second-floor apartment, where an unknown heat source ignited an upholstered chair. The fire spread to nearby curtains and out the open patio door, allowing the flames to spread up the building's wall to a third-floor apartment and the attic.

Using numerous resources, including a fire partition in the attic and a pre-incident plan, firefighters stopped the blaze from spreading into the common area and the building's other wing. The activation of 20 sprinklers also helped prevent the fire from spreading and protected the hallways for evacuation.

The \$1.6 million building suffered \$850,000 in damage. Contents, valued at \$1.5 million, sustained a \$750,000 loss. No firefighters were injured.

Kenneth J. Tremblay, 2001, "Firewatch," *NFPA Journal*, July/August 24.

Sprinklers Extinguish Fire in Home Oxygen Unit, Arizona

Careless disposal of smoking materials contributed to the smoke-inhalation death of a woman in her single-family home, despite the activation of two sprinklers that extinguished the flames.

The single-story, wood-frame house, which measured 50 feet (15 meters) by 40 feet (12 meters), had a stucco exterior and a tile roof. The home had a wet-pipe residential sprinkler system and a local smoke alarm, but neither system was monitored, and the smoke alarm may not have activated during the fire.

Investigators believe that smoking materials carelessly disposed of in a wastebasket ignited paper. When the occupant discovered the fire, she moved the wastebasket to the sink to extinguish it, but not before the fire burned through plastic oxygen tubing running under the basket. Flames spread along the oxygen-enriched tubing, igniting an upholstered stool and the oxygen generator in the first-floor living room. The fire was finally extinguished by two sprinklers, which operated above each burning item.

Water flowing from under the garage alerted a neighbor, who called the fire department at 9:30 a.m. Responding firefighters discovered the woman in the bathroom, where she had succumbed to smoke inhalation.

The house and its contents, valued at \$200,000, suffered an estimated loss of \$40,000

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, November/December, 17.