

HOME CANDLE FIRES

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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 candles were the heat source in an estimated 15,600 reported home structure fires in 2005. (Homes include one- and two-family dwellings, apartments or other multiple family dwellings, and manufactured housing.) These fires caused an estimated 150 civilian deaths, 1,270 civilian injuries and \$539 million in direct property damage. Although the number of candle fires peaked in 2001 and has been falling since, the 2005 figure was still more than twice as high as in 1990. Roughly two-fifths (38%) of home candle fires started in the bedroom. More than half (55%) of the fires occurred because the candle was too close to something that could burn. Candles used for light appear to pose a greater risk of fatal fire. In 2006, the U.S. Consumer Product Safety Commission (CPSC) deferred action on a petition from the National Association of State Fire Marshals for mandatory standards for candles and candle accessories to allow more time for ASTM to develop voluntary standards and the effectiveness of the standards to be evaluated.

Keywords: candle fires; home fires, fire causes, fire statistics

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Executive Summary

During 2005, candles in U.S. homes caused an estimated 15,600 reported structure fires, 150 civilian deaths, 1,270 civilian injuries, and \$539 million in estimated direct property damage. (Homes include one- and two-family dwellings, apartments and manufactured housing.) In 2005, candles caused 4% of reported home fires, 5% of the civilian home fire deaths, 10% of the civilian home fire injuries, and 8% of the direct property damage in reported home fires

From 1980, the first year of available data, to 1990, the number of home candle fires had been falling. The incidents peaked in 2001 and have been falling since then. Even so, the 15,600 fires reported in 2005 is still more than twice the 6,800 reported in 1990. From 2004 to 2005, these fires fell 8%.

The share of home structure fires (including confined fires) started by candles jumped from 1% in the early 1980's to 5% in 1999 and 2001-2003, partly because total home fires have declined so much since 1980 and partly because candle fires have increased in recent years. In 2004 and 2005, the candle share fell to 4%.

During the four-year period of 2002-2005:

- Roughly two-fifths (38%) of the non-confined home candle fires started in the bedroom. These fires caused 41% of the associated civilian deaths. The 15% of home candle fires that started in the living room, family room, or den caused 21% of the fatalities. (Causal information is typically not required for fires in NFIRS with the confined incident type codes of 113-118. Confined candle fires were included in the trend analysis but omitted from the remaining analyses.)
- Candle fires start with a variety of items. A mattress or bedding was the item first ignited in 11% of the non-confined home candle fires and 23% of the home candle fire deaths. An unclassified type of furniture or utensil was the item first ignited in 12% of these incidents. Ten percent started when a curtain, blind or drapery ignited. Cabinetry was first ignited in 9% of these fires.
- Thirteen percent of the home candle fires occurred in December, 1.6 times the monthly average of 8%. December candle fires often involve combustible seasonal decorations that would not have been present at other times of the year. In other words, the heightened candle fire risk around the winter holidays reflects a combination of increased candle use and more things that can burn in the area around the candles. The top five days for home candle fires were Christmas, Christmas Eve, New Year's Day, New Year's Eve, and Halloween.
- Falling asleep was a factor in 12% percent of the home candle fires and 26% of the associated deaths.

Factors contributing to ignition in 2002-2005:

- More than half (55%) of the home candle fires occurred when some form of combustible material was left or came too close to the candle.
- Unattended equipment or abandoned materials or products were contributing factors in 20% of these fires.
- Four percent were started by people (usually children) playing with the candle.

Using candles for light can be dangerous.

An NFPA study of news clips and fire service reports about identified fatal home candle fires in 1997 and 1998 revealed that candles used for light in the absence of electrical power caused about one of every three of the studied fatal home candle fires. About one in four (24%) of the fatal home candle fires occurred in homes in which the power had been shut off. Seven percent (7%) of the fatal fires occurred during temporary power outages. Participants in Canadian focus groups were more likely to leave candles burning in several rooms during power outages than at other times.

Lacerations were the most common type of candle or candlestick injury.

According to the U.S. Consumer Product Safety Commission's (CPSC's) National Electronic Injury Surveillance System (NEISS), an estimated 12,100 people were seen at hospital emergency rooms for injuries from candles, candle sticks or related items during 2006. Forty-three percent of these injuries were lacerations, 22% were thermal burns, and 12% were scald burns.

ASTM's voluntary standards address candles and accessories.

In 2004, the National Association of State Fire Marshals (NASFM) petitioned the CPSC to set mandatory standards for candles and accessories. In 2006, the CPSC deferred action on the petition to allow more time for ASTM to develop voluntary standards and the effectiveness of the standards to be evaluated.

Table of Contents

Executive Summary	i
Table of Contents	iii
List of Tables and Figures	v
Home Candle Fires Fact Sheet	vii
Home Candle Fires Continue to Fall	1
Detailed Patterns of Home Candle Fires	5
Who Are the Victims of Home Candle Fires?	7
When Do Candle Fires Occur?	8
Candle Fires by Occupancy	10
Candles Used for Light	10
CPSC’s Candle Fire Pilot Study, NEISS Candle Data, and Recalls	12
Massachusetts Candle Study Sought More Detailed Information	14
ASTM’s Candle-Related Standards	15
In 2006, CPSC Voted to Defer Action on Mandatory Safety Standards	16
Other Countries Are Also Concerned about Candle Safety	16
Increasing Candle Safety	18
Statistical Tables	21

Appendix

A. How National Estimates Are Calculated	37
B. Candle Fires Previously Published in <i>NFPA Journal’s</i> “Fire Watch” Series	43
C. Candle Fire Summaries Previously Published in NFPA’s Catastrophic Fire Studies	61

List of Tables and Figures

Figure 1. Home Candle Fires by Year	1
Figure 2. Civilian Fire Deaths from Home Candle Fires by Year	2
Figure 3. Civilian Injuries from Home Candle Fires by Year	3
Figure 4. Direct Property Damage from Home Candle Fires by Year	3
Figure 5. Home Candle Structure Fires and Deaths by Month	8
Figure 6. Leading Areas of Origin in Home Fires: January-November vs. December	9
Figure 7. Candle-Related Injuries Seen at Hospital Emergency Rooms	13
Figure 8. Emergency Room Visit Rates for Candle-Related Injuries by Age Group	13
Table A. Top Five Days for Reported Non-Confined Home Candle Fires	9
Table 1. Candle Fires in the Home by Year	21
Table 2. Candle Fires in the Home as a Share of All Home Fires	22
Table 3. Home Candle Structure Fires, by Area of Origin	23
Table 4. Home Candle Structure Fires, by Item First Ignited	24
Table 5. Home Candle Structure Fires, by Cause	25
Table 6. Home Candle Structure Fires, by Factor Contributing to Ignition	26
Table 7. Home Candle Structure Fires, by Human Factor Contributing to Ignition	27
Table 8. Home Candle Structure Fires, by Extent of Flame Damage	28
Table 9. Home Candle Structure Fire Deaths and Injuries by Age	29
Table 10. Home Candle Structure Fires by Month	30
Table 11. Home Candle Structure Fires by Day of Week	31
Table 12. Home Candle Fires by Time Period	31
Table 13. Home Candle Structure Fires by Item First Ignited: January-November and December	32
Table 14. Non-Home Candle Structure Fires by Occupancy Class	33
Table 15. Home Candle Fires in the United Kingdom	35



U.S. Home Candle Fires

U.S. fire departments responded to 15,600 home¹ structure fires that were started by candles in 2005. These fires caused

- 150 civilian fire deaths;
- 1,270 civilian fire injuries; and
- \$539 million in direct property damage.



Overall, candles caused 4% of reported home fires, 5% of the home fire deaths, 10% of the home fire injuries, and 8% of the direct property damage in reported home fires

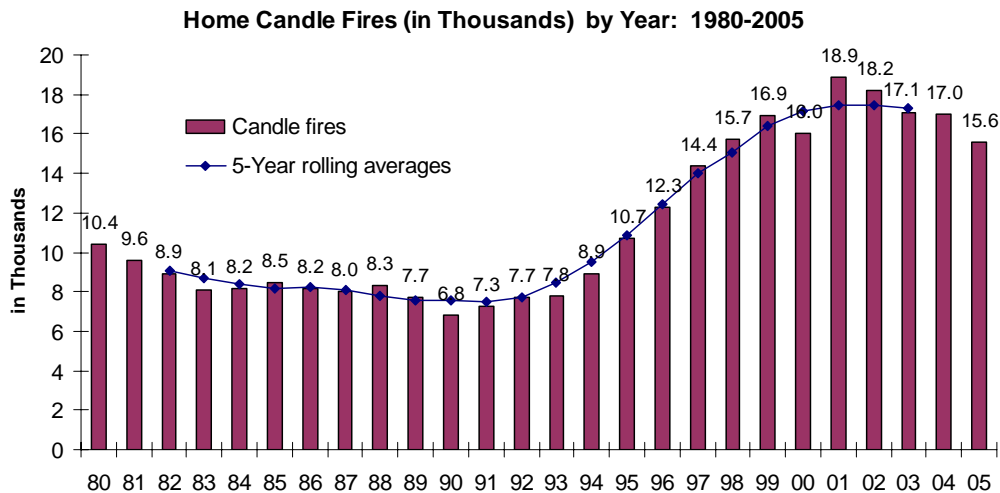
Causes and Circumstances of Home Candle Fires

Details from the U.S. Fire Administration’s National Fire Incident Reporting System show that in 2002-2005:

- On average, one home candle fire was reported every 34 minutes.
- More than half of all candle fires started when something that could burn, such as furniture, mattresses or bedding, curtains, or decorations, was too close to the candle.
- In one-fifth (20%) of the fires, the candles were unattended or abandoned.
- Almost two-fifths of home candle fires begin in the bedroom, although the candle industry found that only 13% of candle users burn candles in the bedroom most often.
- December is the peak time of year for home candle fires. In December, 13% of home candle fires began with decorations compared to 4% the rest of the year.
 - The top five days for home candle fires were Christmas, Christmas Eve, New Year’s Day, New Year’s Eve, and Halloween.

Candle Fire Trends

Although home candle fires fell 8% from 2004 to 2005, more than twice as many were reported in 2005 as in 1990.



¹Homes are dwellings, duplexes, manufactured homes, apartments, townhouses, rowhouses, and condominiums.
Home Candle Fires, 9/07

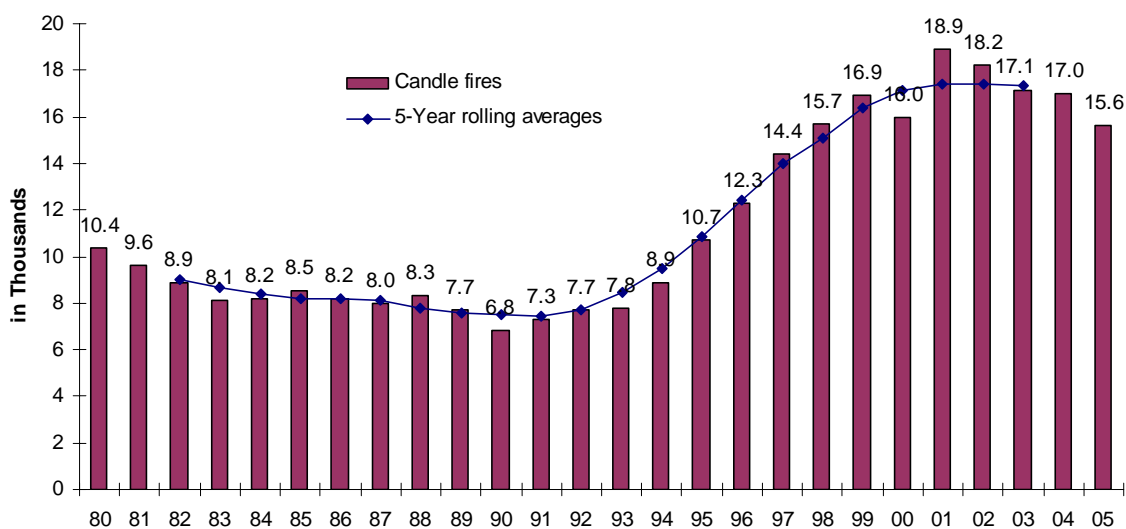
Home Candle Fires

Home Candle Fires Continue to Fall

An estimated 15,600 reported home candle fires caused 150 civilian deaths in 2005. During 2005, an estimated 15,600 home structure fires started by candles were reported to local fire departments. These fires resulted in an estimated 150 civilian deaths, 1,270 civilian injuries and an estimated direct property loss of \$539 million. On average, one home candle fire was reported every 34 minutes.

Unless otherwise noted, the statistics in this report are national estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) in combination with NFPA's annual fire department survey. Homes include dwellings, duplexes, manufactured housing, apartments, town houses and flats. "Condominium" is a type of ownership arrangement, not a type of property, but most condominium homes are apartments. Only fires reported to municipal fire departments are included in these statistics.¹

Figure 1. Home Candle Fires (in Thousands) by Year: 1980-2005



Source: NFIRS and NFPA survey.

¹ In NFIRS 5.0, candles are identified by heat source 66. In older versions of NFIRS, form of heat of ignition code 44 identified candles. Estimates in this analysis include a proportional share of fires which, for 1999-2005, were coded with heat sources of "heat from open flame or smoking material, other" (code 60), and for 1980-1998 were coded with form of heat of ignition codes unclassified or unknown-type heat from open flame or spark (codes 40 and 49). The estimates in the previous year's report for 1999-2004 were based on the non-confined incident share of data from all versions of NFIRS. In this report, the annual averages for 2002-2005 and the estimates per year for 1999-2005 are based on percentages from data collected in NFIRS 5.0. "Confined" structure fires (NFIRS 5.0 incident type 113-118) are included in the trend data but excluded from the more detailed analysis. Although causal information is typically not required for these incidents, it is sometimes provided. Estimates of confined candle fires are projected from the share with heat source data.

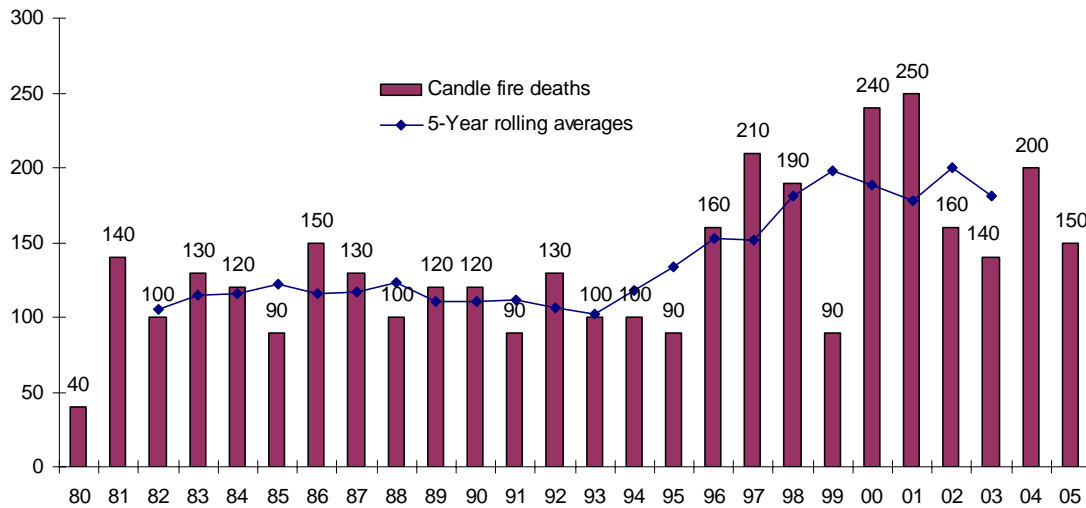
Seven hundred of the 15,600 home candle structure fires had incident types indicating that they were confined structure fires. NFIRS 5.0 has six categories of confined structure fires, including cooking fires confined to the cooking vessel, confined chimney or flue fires, confined incinerator fire, confined 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.

Home candle fires fell 8% from 2004 to 2005.

As Figure 1 shows, the number of reported home candle fires continued its decline after climbing fairly steadily from 1990 to 2001. Rolling five-year averages are shown by the solid line beginning with the 1980-1984 average above the 1982 column. In 1980, candles started an estimated 10,400 home fires. Candle fires generally declined in the 1980s, falling to a low of 6,800 in 1990. They started climbing in 1991. Candle fires peaked in 2001 at an estimated 18,900. Although candle fires have declined 18% since 2001, the number of candle fires reported in 2005 is still more than twice the low of 6,800 reported in 1990. Table 1 shows the candle fire and loss experience from 1980-2005. For 1999-2005, only NFIRS data originally collected according to the Version 5.0 rules were used.

Figure 2 shows that the number of deaths has fluctuated considerably but that these deaths have generally been more frequent in recent years than in the 1980s and early 1990s.

Figure 2. Home Candle Fire Deaths by Year: 1980-2005



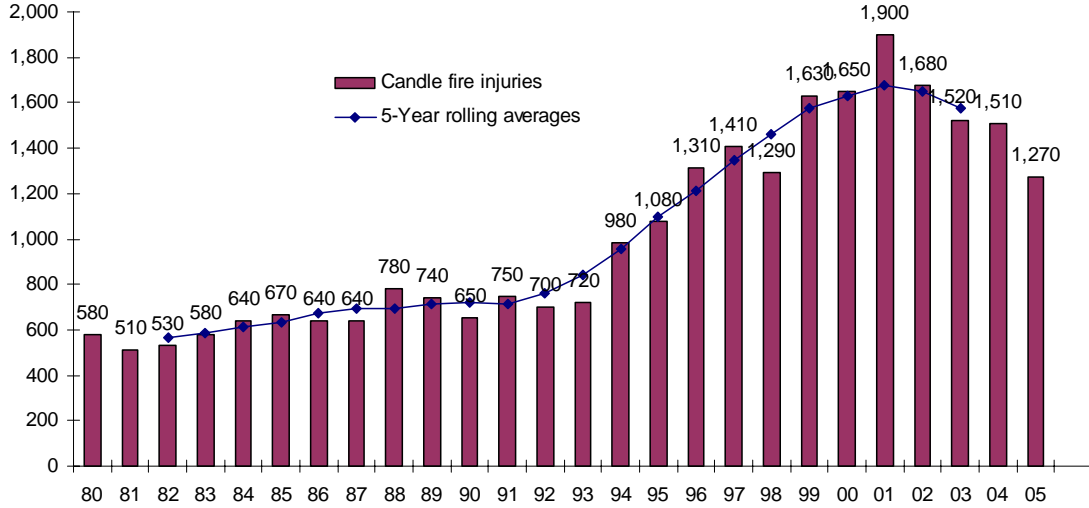
Source: NFIRS and NFPA survey.

Figure 3 shows that civilian injuries caused by home candle fires have continued to decline but remain substantially higher than in the 1980s and early 1990s. The U.S. Consumer Product Safety Commission (CPSC) estimates that between July 1, 2002 and June 30, 2003, hospital emergency rooms treated 3,400 patients for fire injuries caused by candles, twice the number reported to the fire service. The CPSC also estimates that only one-third of the candle fire injuries treated at emergency rooms were incurred at fires attended by the fire department.²

² David Miller, *Estimates of Fire Injuries Treated in Hospital Emergency Departments*, Washington, DC., CPSC, January 2005, pp. 8-9, available on-line at <http://www.cpsc.gov/LIBRARY/NEISSFire.pdf>.

The NEISS estimate of reported fire injuries is much higher than the NFIRS national estimate. Although it is not unusual for injuries to be unreported or discovered late at reported fires, the uncertainty range for the NEISS estimate extends from zero or near zero to nearly twice the estimate.

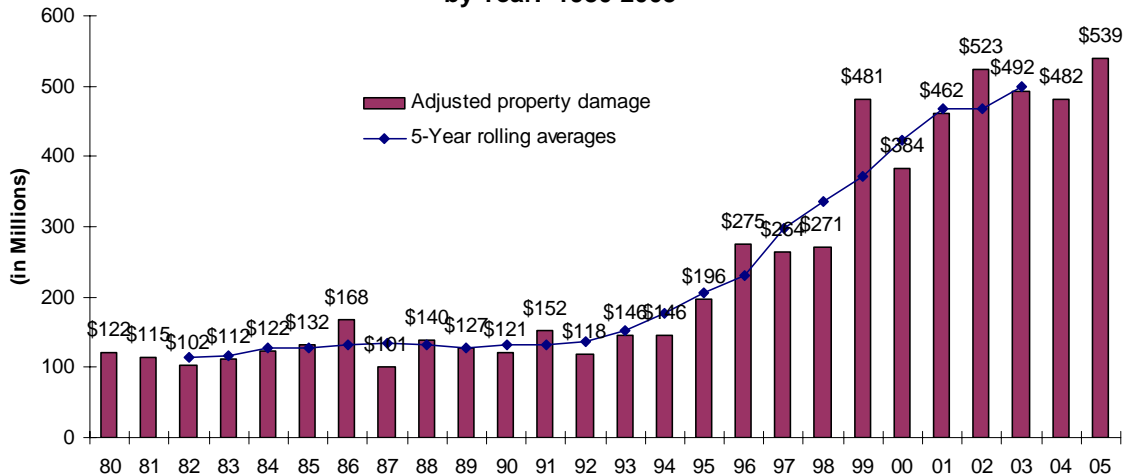
Figure 3. Home Candle Fire Injuries by Year: 1980-2005



Source: NFIRS and NFPA survey.

Direct property damage from home candle fires, adjusted for inflation, rose 12% from an estimated \$482 million in 2004 to \$539 million in 2005. Table 1 and Figure 4 show that direct property damage, when adjusted for inflation, was fairly stable through the 1980s and early 1990s. It rose to a new level in 1996-1998. Losses were even higher in 1999-2005, although the fluctuation was not as great.

Figure 4. Property Damage from Home Candle Fires (in Millions) by Year: 1980-2005



Source: NFIRS and NFPA survey.

Candles caused a larger share of home fires in recent years than in the past.

Partly because total home fires have declined so much since 1980 and partly because candle fires have increased so much since 1990, the share of home structure fires

(including confined fires) started by candles climbed from 1% in the early 1980's to 5% in 1999 and 2001-2003. The share fell to 4% in 2004 and 2005. (See Table 2.) In 2005, candles caused 5% of the civilian home fire deaths, 10% of the civilian home fire injuries, and 8% of the direct property damage in reported home fires.

National Candle Association collects statistics on the candle market.

According to the National Candle Association (NCA), retail candle sales in the United States are estimated at \$2 billion per year, excluding accessories such as holders. In the United States, more than 400 commercial, religious and institutional organizations manufacture candles. Women make more than 95% of all candle purchases. Roughly 35% of the candle business is seasonal around the Christmas holiday. Forty-two percent (42%) of the candle users said they most often burned candles in the living room, 18% used candles most frequently in the kitchen, and 13% most commonly used them in the bedroom. The three most popular consumer candles are votives, container or jar candles, and pillar candles.³

CPSC staff briefing provides additional background on the industry and costs.

Staff at the U.S. Consumer Product Safety Commission compiled information about the candle industry from a variety of sources. NCA members produce more than 90% of the candles made in the U.S. They note that Reference USA has identified 189 candle manufacturers in the U.S. with all but two having under 500 employees; most have fewer than five. CPSC also noted that domestic factory shipments of candles (in 2004 dollars) rose from \$403 million in 1992 to \$998 million in 2002. In 2002, U.S. consumption (wholesale) of candles was \$1.4 billion.

Imports totaled \$435 million (in 2004 dollars) during calendar year 2005. In 1990, imports from the China accounted for 19% of the imported candles. This rose to 48% in 2004, but fell sharply in 2005, most likely due to a pending ruling from the Department of Commerce that includes more candles under an antidumping order. In 1992, imports accounted for 14.5% of the candles sold. This rose to 32.7% in 2002. During the same period, imports from China tripled from 4.6% of candles consumed in the U.S. in 1992 to 13.2% in 2002.⁴

CPSC also estimated that candle fires cost society an average of \$1.12 billion (in 2004 dollars) per year in 1999-2002 based on the cost of medical care for candle injuries, an assigned statistical value of \$5 million per death, and the property losses from these incidents. Most of the cost was due to the deaths.

Canadian focus groups provide more detail about how candles are used.

In 2005, Health Canada commissioned the Environics Research Group to conduct Intensive/Interactive Workshop focus groups with three groups of people between 18 and 30 years old and three groups with people between 31 and 71 years of age about fire safety awareness, candle usage, and product labeling. A total of 42 people participated.

³ Information was found at the National Candle Association's web site, http://www.candles.org/about_facts.html, on September 4, 2007.

⁴ U.S. Consumer Product Safety Commission Candle Petition Product Team. *Petition CP 04-1 HP 04-1 Requesting Mandatory Fire Safety Standards for Candles and Candle Accessories Briefing Package*, July 2006, accessed online at <http://www.cpsc.gov/volstd/candles/candles.html> on September 4, 2007.

All said candles were used in their homes at least once a month. Some were deeply interested in candles, some used them as romantic signals, some found candlelight relaxing, some used them for odor management and to reduce bugs outside. Candles were also used in power outages. Candles in the living room were burned at night for appearance and scent. Decorative candles in the living room were treated like art and rarely burned. Candles were used in the kitchen for odor control and atmosphere. Women were more likely than men to take baths by candlelight.

A few participants used floating candles in the tub. In the bedroom, candles set romantic and/or relaxing moods. A few participants like to read by candlelight before going to sleep. Some admitted to falling asleep while candles were burning; most knew that this was dangerous.

Parents of teens and young adult daughters expressed concern about how this group used candles as they sometimes found wax on dressers. Many use candles differently when young children are present. Many feel that they minimize the risk of candle fire by choosing proper candle holders, safer types of candles and a non-flammable surface. However, when they entertain, they often leave candles burning throughout the house. In social situations, candles are burned when children are present even when no one is providing direct supervision of either the children or the candles. Less attention seems to be paid to safety when candles are used outside, with candles placed in a wide variety of locations, at times including steps and paths. Citronella candles are used to keep mosquitoes away. Some use candles when camping.⁵

In March 2006, Health Canada's Consumer Product Safety Commission engaged Decima Research, Inc to conduct an online survey of Canadian's candle usage practices, related fire safety issues and labeling preferences. Roughly 1,100 people completed the survey. Eighty-four percent used candles regularly, most often in either the living room or den or in the dining room. Those who recalled seeing warning labels on candles were more likely to use safe practices.⁶

Detailed Patterns of Home Candle Fires, Excluding Confined Fires

The following statistics are based on the details from non-confined home structure fires reported to local fire departments in NFIRS 5.0 during 2002-2005. During that four-year period, an estimated average of 16,000 reported non-confined home candle fires caused an average of 160 civilian fire deaths, 1,490 civilian fire injuries and \$486 million in direct property damage per year.⁷ Because causal data is typically not required for

⁵ Environics Research Group Limited. *Canadians' Behaviour Surrounding Candle Use and Fire Safety, A Qualitative Exploration: Final Report*, Toronto Ontario, Canada. Study prepared for Health Canada, January 2006.

⁶ Decima Research. *Canadians' Behaviour Surrounding Candle Use and Fire Safety: A Quantitative Exploration*, Study done for Health Canada, March 2006.

⁷ The average of non-confined home candle structure fires during 2002-2005 is the sum of candle fires obtained from separate heat source runs for a) one-and two-family dwellings, including manufactured housing and b) apartments, including condominiums. This average was based on the candle share of total number of scaled up incidents divided by four rather than the average of four years' individual estimates. Trend tables were derived from separate analyses of NFIRS 5.0 confined and non-confined home fires, without further breakdown by

confined fires, (incident type 113-118), these incidents were excluded from this portion of the analysis.

Where do candle fires start?

Thirty-eight percent (38%) of non-confined home candle fires started in bedrooms. These fires caused 41% of the associated deaths and half (49%) of the associated injuries. The 15% that started in living rooms, family rooms, or dens, caused 21% of the deaths. Fourteen percent (14%) started in bathrooms or lavatories, 9% started in unclassified function areas, and 8% began in kitchens or cooking areas.

What do candles ignite?

Candle fires start with a variety of items. An unclassified type of furniture or utensil was the item first ignited in 12% of these incidents. Eleven percent began with a mattress or bedding; these fires caused 23% of the home candle fire deaths. Ten percent started when a curtain, blind or drapery ignited. Cabinetry was first ignited in 9% of these fires. Upholstered furniture was first ignited in 6% of the fires; these incidents caused 15% of the home candle fire deaths. An additional 6% of the fires began with interior wall coverings, excluding drapes. Decorations were first ignited in 5% of the fires.

See Table 4 for more detailed information about the item first ignited in home candle fires.

Winter decoration fires are unusually likely to begin with candles. In 2000-2004, candles were the heat source in 59% of the home structure fires that began with decorations.⁸ In addition, candles started 12% of the home structure fires that began with Christmas trees during the same period.⁹

How big is the candle problem in terms of the different materials ignited?

Kimberly D. Rohr's report, *Products First Ignited in U.S. Home Fires*,¹⁰ provides information on the frequency of different heat sources in 1999-2002 home structure fires involving a wide variety of different kinds of materials.

Candles provided the heat of ignition in:

- 36% of the curtain and drape fires;
- 21% of the cabinetry fires;
- 18% of the linen other than bedding (towels, tablecloths, etc.) fires;
- 13% of the paper and magazine fires;
- 12% of the toy and game fires;
- 11% of the fires starting with unfinished fabrics and goods that are not made up;
- 10% of the mattress and bedding fires;
- 9% of the upholstered furniture fires;
- 7% of the floor covering fires;
- 7% of the appliance housing or casing fires;

property use. Therefore, annual averages may differ from the average of estimates shown in Table 1. A detailed explanation of how national estimates are calculated can be found in Appendix A.

⁸ Marty Ahrens, *Home Structure Fires that Began with Decorations*, Quincy, MA: NFPA, Fire Analysis and Research Division, November 2006, pp. 10, 12.

⁹ Marty Ahrens, *Home Christmas Tree and Holiday Light Fires*, Quincy, MA: NFPA, Fire Analysis and Research Division, November 2006, p. 10.

¹⁰ Kimberly D. Rohr, *Products First Ignited in U.S. Home Fires*, Quincy, MA: NFPA, Fire Analysis and Research Division, April 2005.

- 7% of the interior wall covering fires;
- 6% of the fires starting with clothing worn by a person;
- 6% of the box, bag and barrel fires; and
- 5% of the fires starting with clothing that was not being worn.

How do home candle fires start?

This question sounds deceptively simple, but pieces of the answer can be found in several different variables. Ninety-five percent (95%) of the home candle fires were unintentional, 2% were intentional, and 1% resulted from the failure of the equipment or heat source. That could refer to a holder or the candle itself. See Table 5 for more details.

In more than half (55%) of the home candle fires reported in 2002-2005, the fire started because the candle was too close to some combustible material. These fires caused 69% of the associated deaths and 61% of the injuries. The candle was unattended or abandoned in one-fifth (20%) of the incidents. Unclassified misuse of the material or product was a factor in 12% of these fires, an unclassified factor contributed in 6%, and 4% of the incidents were caused by people, often children, playing with candles. A more detailed listing of factors contributing to ignition can be found in Table 6. These percentages include a proportional share of fires in which the factor contributing to ignition was coded as “none,” “undetermined,” or was not reported at all. Multiple factors may be recorded in this field, resulting in totals greater than 100%.

Table 7 shows that in 12% of the home candle fires, 26% of the associated civilian deaths, and 29% of the injuries, the occupants were asleep when the fire occurred. In 21% of the fires, an unattended or unsupervised person was a factor. However, it is possible that in at least some of these fires, the “unattended” actually refers to the candle. The incident reports noted that no human factors contributed to 61% of the fires, 55% of the civilian deaths and 51% of the civilian injuries.

Flame damage was confined to the room of origin in three-quarters of these fires.

Table 8 shows the extent of flame damage in home candle fires, excluding incidents reported as confined fires. In one out of four fires (26%), the damage was confined to the object of origin. In half (50%) of the incidents, flame damage extended beyond the original object but was confined to the room of origin. Flame damage extended beyond the room of origin in only 24% of the fires.

Who Are the Victims of Home Candle Fires?

Young children and older adults had highest death risk from candle fires.

Table 9 shows the age distribution of people killed and injured by home candle fires during 2002-2005, the casualty rate per million population, the relative risk of death or injury from home candle fires compared to the age group’s share of the general population, and the age distribution of the general population. The relative risk was calculated by dividing the percentage of fire deaths (or injuries) per age group by the percentage of the general population in that age group. A relative risk of 1.0 means that the percentage of deaths or injuries matches the percentage of the population.

For most fire causes, children under age five and older adults age 65 or over face the highest risk of fire death. This was also true for candles with children under five having a risk 1.7 times that of the general population and adults 65 or older facing a risk 2.2 times as high. Individuals between 20 and 49 faced the lowest risk of death from candle fires. Individuals in the 20-34 age group faced the highest risk of injury from these fires.

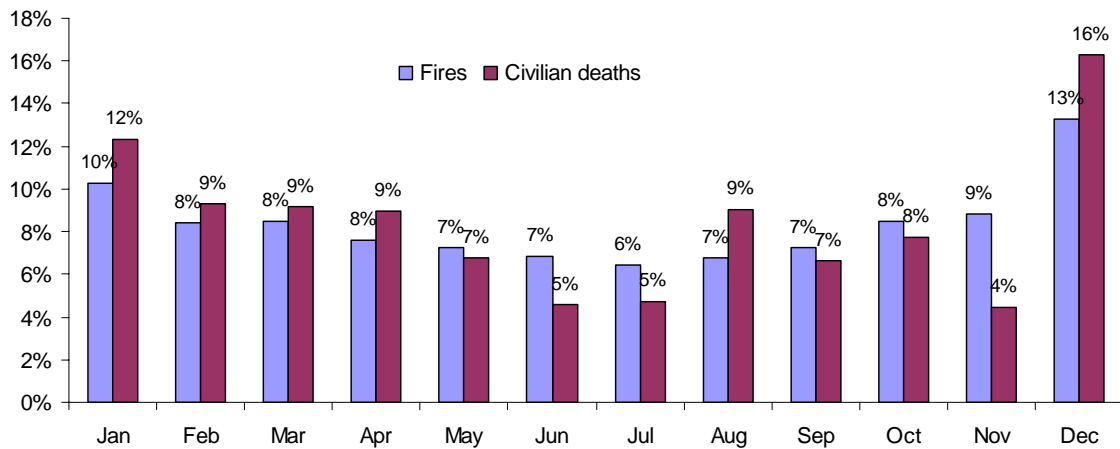
Males accounted for 57% of home fire fatalities and 53% of injuries from fires of all causes. However, 54% of the people killed by home candle fires were female, as were 57% of those injured. Statistics about deaths and injuries from all fire causes were obtained from the NFPA report, *Characteristics of Home Fire Victims*.¹¹

When Do Candle Fires Occur?

December was the peak month.

Figure 5 and Table 10 show that 13% of home candle fires and 16% of the associated deaths occurred in December. For fires, this was 1.6 times the 8% monthly average and twice the monthly average of deaths. January ranked second in number of home candle fires and deaths. July had the smallest number of these fires.

**Figure 5. Home Candle Structure Fires and Deaths by Month: 2002-2005
Excluding Confined Fires**



Source: NFIRS and NFPA survey

Christmas was the peak day, with an estimated 140, or 0.9%, of the 16,000 non-confined home candle fires in 2002-2005. (If all days had an equal share of the fires, the daily share would be $1/365.2 = 0.3\%$.) Sixteen percent of the home structure fires on Christmas were started by candles, three times the candle share for the full year. Table A shows that the top four days for these incidents were around Christmas and New Year's, while Halloween ranked fifth.

¹¹ John R. Hall, Jr., *Characteristics of Home Fire Victims*, Quincy, MA: NFPA, Fire Analysis and Research Division, July 2005, pp. 2-3, 26

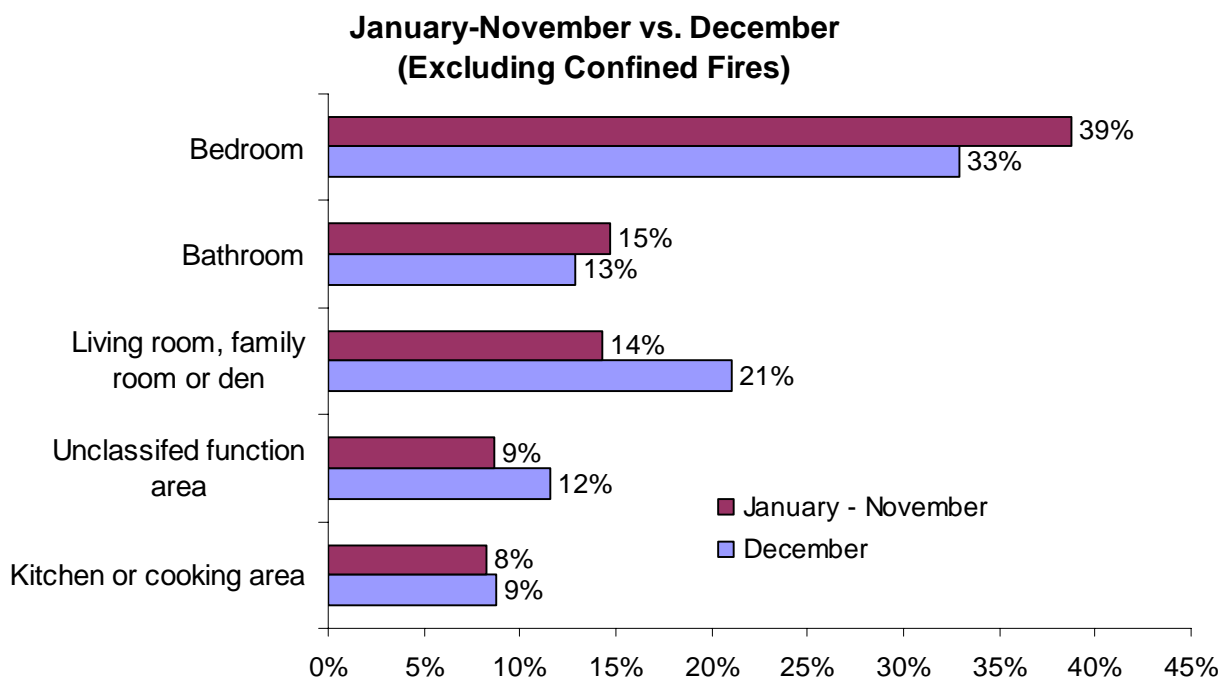
**Table A. Top Five Days for Reported Non-Confined Home Candle Structure Fires
2002-2005 Annual Averages**

Rank	Date	Fires	Percent
1.	December 25	140	0.9%
2.	December 24	110	0.7%
3.	January 1	100	0.6%
4.	December 31	90	0.5%
5.	October 31	80	0.5%

Source: NFIRS and NFPA survey.

Table 11 shows that home candle fires were most common on Saturdays and Sundays. Table 12 shows that the period from 6:00 to 9:00 p.m. was the peak period for home candle fires. The period from 9:00 to midnight ranked second and the interval from 3:00 to 6:00 p.m. ranked third. The smallest number of these fires occurred between 6:00 and 9:00 a.m.

Figure 6. Leading Areas of Origin in Home Candle Fires in 2002-2005



Source: NFIRS and NFPA survey.

December candle fires follow a somewhat different pattern.

As mentioned previously, candles are associated with Christmas and other December holidays, including Hanukkah, Kwanzaa, and New Year’s Eve. Although the bedroom was the leading areas of origin for home candle fires all year, Figure 6 shows that this pattern was not as pronounced in December. From January through November, 39% of the candle fires started in bedrooms. Only 33% of the December candle fires started there. In December, 21% of the home candle fires started in living rooms, family rooms, or dens, compared to 14% during the rest of the year.

Table 13 shows that decorations were the leading item first ignited in December. During the rest of year, decorations ranked ninth. This is consistent with the industry pattern of seasonal business. It also suggests that seasonal candle fires often involve combustible seasonal decorations that would not have been present at other times of the year. In other words, the heightened candle fire risk around the winter holidays reflects a combination of increased candle use and a more combustible environment around those candles.

Candle Fires by Occupancy

Eleven percent of candle fires occurred in non-home properties.

During 2002-2005, candle fires started an estimated annual average of 18,000 non-confined structure fires in properties of all types, including homes and non-home properties. These fires caused an average of 190 civilian fire deaths, 1,570 civilian fire injuries, and an estimated \$539 million in direct property damage. Eighty-nine percent (89%) of the reported structure fires started by candles occurred in homes.

Table 14 provides more detail on candle fires in non-home occupancies. An average of 2,000 non-confined, non-home structure fires were reported per year, resulting in an average of 24 civilian deaths, 80 civilian injuries, and \$53 million in direct property damage. Twenty-seven percent of the candle fires in non-home properties occurred in unclassified or unknown-type residential properties; 8% occurred in hotels or motels; 6% occurred in unclassified storage properties; 5% occurred in dormitories, fraternities, sororities, or barracks; and an additional 5% occurred in office, bank or mail properties.

Candles Used for Light

The risk of a fatal candle fire appears higher when candles are used for light.

NFPA's Fire Incident Data Organization (FIDO) provides more detail on certain fires. While the collection is not complete or representative, information is available through FIDO that is not available through NFIRS. In 1997 and 1998, a clipping service was asked to notify NFPA of all fatal fires in the U.S. Additional information on the causes and circumstances was sought from fire departments. Sixty-eight fatal home candle fires during this time were identified. Some of these fires killed more than one person. These incidents were reviewed to determine the role of power problems in candle fire fatalities.

According to reports from the fire service, fire investigators or the newspapers, the power had been shut off in 16, or 24%, of the fatal candle fires. In five other cases (7%), candles were used during a temporary power outage. In another case, a blown fuse caused the victim to believe her power had been shut off for non-payment as she couldn't remember paying the bill, and in one case, no explanation was given for the lack of power. Adding these incidents together, a lack of electrical power was a factor in 23, or one-third, of the fatal home candle fires in this group. Some of the candle fires from *NFPA Journal's* "Fire Watch" series and most of the catastrophic (multiple fire death) candle fires at the back of this report involve candles used for light due to lack of power, due to either a temporary situation or a termination of service.

In a study done for NFPA in the fall of 2004, 24% of the 77% of the respondents who said they use candles, or 18% of the total respondents, reported that they used candles when the power goes out.¹² A review of the candle fires included in NFPA's studies of catastrophic fires (five or more deaths in residential properties, three or more in non-residential) found that candles had been used in the absence of electrical power in 10 of the 13 (three-quarters) catastrophic home candle fires from 1992 to 2006. Two recent examples are shown below. Details about these and other catastrophic home candle fires are found in Appendix C.

- In December 2006, a candle used for light burned down to and ignited the living room coffee table in a two-story Ohio single-family dwelling. Power had been shut off before the fire occurred. Five people died in this fire.¹³
- In March 2005, a family that had just moved into a townhouse was using candles for light because the electricity had not yet been turned on. One of the candles ignited bedding. Attempts to move the burning mattress were unsuccessful. Eleven people died in this fire.¹⁴

Health Canada focus groups found candles were used differently in power outages.

The focus groups in the study done for Health Canada were asked about their use of candles in power outages. Many had a stash of candle stubs, often from tapers, or ugly candles that they would use in blackouts. Most would light candles in several rooms to make movement easier and to reduce the danger of falls. If the candles were placed in "safe and stable" holders, they felt that the candles were safe. Most avoided walking around with lit candles but some had special candle holders that they considered safe to use for this purpose. People with large numbers of decorative candles reported that power outages were a good time to use candles they no longer wanted and would light candles all over the house without moving the candle.¹⁵ Because many decorative candles are placed as art objects, their location may be less than safe for actual use.

Advice for using candles safely and special additional advice for situations in which candles must be used as emergency light sources are found on page 20. However, people who cannot afford to pay their electric bills may also have difficulty affording flashlights and batteries. Prolonged power outages may exhaust battery supplies. Developing strategies to address this problem is a challenge for all life safety educators, and a particular challenge for fire safety groups such as NFPA.

¹² Harris Interactive, *Fire Prevention Week Survey*, conducted for National Fire Protection Association (Public Affairs Division), Fall 2004, Pp. 22-23, available at <http://www.nfpa.org/assets/images/Public%20Education/FPWsurvey.pdf>.

¹³ Badger, Stephen G. "U.S. Multiple-Death Fires for 2006," *NFPA Journal*, 101, no. 5 (2006), pp. 59-60.

¹⁴ Badger, Stephen G. "U.S. Multiple-Death Fires for 2005," *NFPA Journal*, 100, no. 5 (2006), p. 60.

¹⁵ Environics Research Group Limited. *Canadians' Behaviour Surrounding Candle Use and Fire Safety, A qualitative Exploration: Final Report*, Toronto Ontario, Canada. Study prepared for Health Canada, January 2006, pp. 25-27.

CPSC's Candle Fire Pilot Study, NEISS Candle Data, and Recalls

CPSC conducted pilot study of candle fires.

The U.S. Consumer Product Safety Commission (CPSC) conducted 79 in-depth investigations of candle fires between August 2000 and March 2001 (inclusive) as part of a pilot study on the topic. The study sought data on causes, types of candle, scent characteristics, reason for candle use, frequency of candle use, room in which candle was used, surface on which candle was placed, presence of the consumer in the room and home at the time of incident, object ignited and the amount of time the candle was burning before the ignition. The pilot was done to ascertain how much detail could be obtained about these fires. Some of the highlights are summarized here.¹⁶

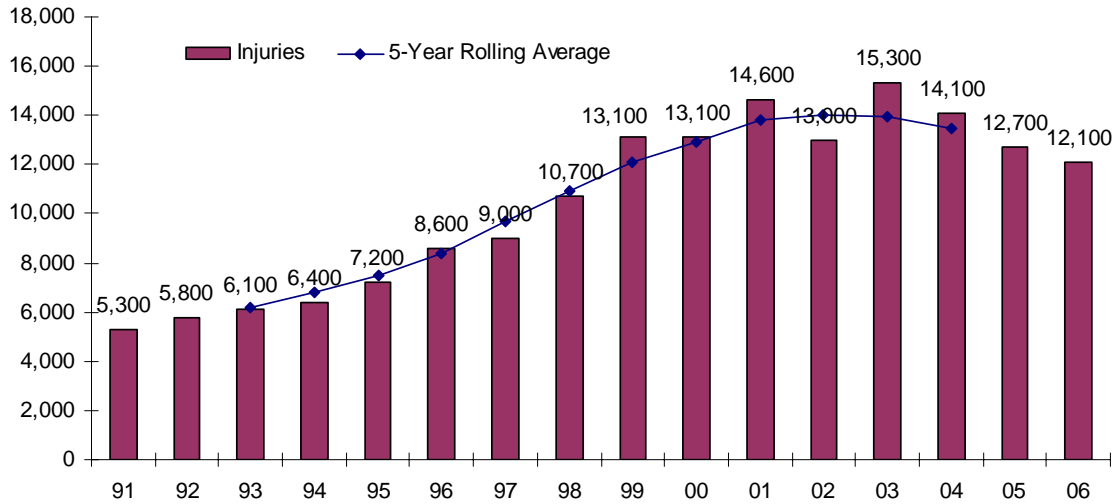
- Based on 55 incidents with known causes, 47% were caused by combustibles too close to the candle (without further elaboration), the candle fell over in 9% of the fires, was knocked over by a pet in 9%, and was just said to be knocked over in another 9%. Five percent were caused by a child playing with a candle and 4% started after the candle burned down.
- Filled candles (candles produced and used in the same vessel) accounted for 27% of the 48 known types of candles, 25% were pillar or column candles, dinner or taper candles accounted for 15%, 8% were freestanding, and votive candles accounted for another 8% of the incidents.
- In 37% of the 41 incidents in which the reason for candle use was known, candles were used for fragrance. In 20% of the cases, candles were used for religious purposes. They were used for light in 17% of the fires, for aromatherapy in 7%, for ambience in 5%, and for heat in 5% of the fires.
- In cases in which the surface was known (53 incidents), candles were placed on tables in 19% of the fires, on dressers in 15%, on nightstands in 15%, on bookcases, cabinets or shelves in 9%, on coffee tables or end tables in 9% and held by a child in 6% of the fires.
- In 70% of the fires, someone was home at the time of the fire (based on 63 cases with known data). Someone was in the room with the candle in only 15% of the fires (based on 82 fires with known data).

Many candle-related injuries are not caused by fire.

According to estimates from the CPSC's National Electronic Injury Surveillance System (NEISS), candles, candlesticks and other candleholders were involved in an estimated 12,700 injuries seen at emergency rooms in 2006, 21% less than the peak of 15,300 in 2003 but still more than twice the 5,300 in 1991. Figure 7 shows the injuries seen by year and five-year rolling averages. The 2006 estimates are projections made based on 329 cases seen.

¹⁶ Signe Hiser, *Candle Fires Pilot Study Summary*, Washington, DC., CPSC, September 2001, available online at <http://www.cpsc.gov/LIBRARY/FOIA/FOIA02/os/Candles3.pdf>.

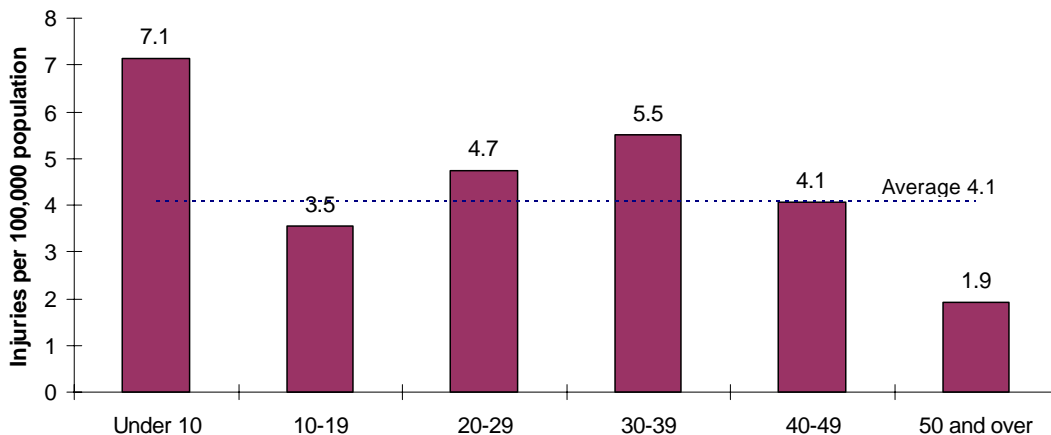
Figure 7. Candle-Related Injuries Seen at Hospital Emergency Rooms: 1991-2006



Source: NEISS estimates as reported in *Candle Fires Pilot Study Summary*, by Signe Hiser, CPSC, September 2001 for 1991-2000, NEISS estimates obtained for product code 463 (candles, candlesticks and other candleholders from <http://www.cpsc.gov/library/neiss.html> in August 2004 for 2001-2003, in July 2005 for 2004, in November 2006 for 2005, and September 2007 for 2006.

Males accounted for 36% of the candle-related injuries seen at emergency rooms in 2006; 64% were female. Forty-three percent (43%) of the candle-related injuries that year were lacerations, 22% were thermal burns, and 12% were scald burns. Some of the lacerations were caused by sharp or broken candleholders; some occurred while candles were being trimmed or wax was being removed from candleholders. Scald burns tended to be from the hot wax or the candle product itself.

Figure 8. Emergency Room Visit Rates for Candle-Related Injuries in 2006 by Age Group



Source: NEISS estimates obtained for product code 463 (candles, candlesticks and other candleholders from <http://www.cpsc.gov/library/neiss.html> in September 2007. Population estimates for 2005 were used. These were obtained from Table 12, "Resident Population Projections by Age and Sex: 1980 to 2005" from the U.S. Census Bureau's *Statistical Abstract of the United States: 2007*.

Twenty-four percent of the emergency room patients seen for candle-related injuries were under 10 years old. Overall, there were 4.1 candle-related emergency room visits per 100,000 population in 2006. Figure 8 shows that the injury rate for individuals under ten was almost twice that of the general population. Adults between 30 and 39 had the second highest rate of these injuries. The rate was lowest for those 50 and older.

CPSC has recalled more than 100 candles and candle-related products because of fire danger.

From 1993 through May 2006, fire safety issues caused the CPSC to recall 118 candles and accessories. The leading problems were secondary ignitions (often of items embedded in a candle), excessively high flames, and candleholders that overheated or ignited. Based on the 97 recalls in which the country of origin was known, 84% of the recalled candles or related products were imported. Two-thirds of the recalls of imported products involved items made in China.¹⁷

1999 Massachusetts Candle Study Sought More Detailed Information

The Massachusetts Office of the State Fire Marshal and the NFPA worked together on a special study of 1999 Massachusetts candle fires. Information was collected on the age of the individual who was using the candles, what type of candle was involved, and whether the candleholder was a factor. The Massachusetts fire service completed special forms on 220 fires, or more than 70% of the candle fires reported that year.¹⁸

Massachusetts teenagers had a disproportionate number of candle fires.

Two-thirds of the people using candles in these fires were between 20 and 64 years old. However, teenagers faced the greatest relative risk of a candle fire. Although they comprised only 9% of the Massachusetts population, they accounted for 21% of the fires, meaning they were more than twice as likely to have a candle fire as the population in general.

About two-thirds of the candle users in the Massachusetts fires were female. Although females were in the majority in all age groups, the distribution ranged from about three-fifths female for teenagers and young adults; four-fifths in the middle age group, and about nine-tenths female among candle users over 65. When Massachusetts teenagers were the candle users, three of every four candle fires started in the bedroom. This study asked first if the candle was unattended, and then asked for the cause separately. Three-quarters of the fires occurred when candles were unattended. Interestingly, there was relatively little difference between the causes seen for unattended and attended candle fires.

Forty percent (40%) of the Massachusetts candle fires were caused by combustibles too close to the candle. In 35% of the cases, the candle burned down too low. The candle

¹⁷ U.S. Consumer Product Safety Commission Candle Petition Product Team. *Petition CP 04-1 HP 04-1 Requesting Mandatory Fire Safety Standards for Candles and Candle Accessories* Briefing Package, July 2006, accessed online at <http://www.cpsc.gov/library/foia/foia06/brief/candleballot.pdf> on September 5, 2007.

¹⁸ Marty Ahrens and Jennifer Mieth, "A Special Study of Massachusetts Candle Fires During 1999," available from the National Fire Protection Association's One-Stop Data Shop. Email osds@nfpa.org.

tipped over (on its own) in 10% of the incidents, and was knocked over (by a person, pet or other object) in 7% of the fires. The holder broke in 3% of the cases.

In half of the Massachusetts fires in which information about the candleholder was provided, the holder was made of glass, china, crystal, or pottery. No holders were used in 16% of the fires. The holders were metal in 12% of the incidents, and plastic or polystyrene in another 12%. Candleholders were made of wood in 4% of these incidents.

ASTM's Candle-Related Standards

ASTM issued standards relating to candles

ASTM International (formerly the American Society for Testing and Materials) develops consensus standards for “materials, products, systems and services.” As candle fires (and candle sales) increased during the 1990s, it became clear that standards were needed for candles and associated products. As of 1997, no uniform standards existed for candle manufacturers to test or label their products. ASTM subcommittee F15.45 was created to address candle safety issues. Its first meeting was held in August 1997. Jim Becker described the committee’s history and provided background on candle-related standards in his March 2003 article in *Standardization News*.¹⁹ To date, ASTM standards on candles include:

F1972-05, Standard Guide for Terminology Relating to Candles and Associated Accessory Items establishes standard terms and definitions for common types of candles and associated products.

F2058-00, Standard Specification for Cautionary Labeling for Candles Burned in a Home describes labeling requirements, including minimum size, formatting specifications, and the minimum words of "Warning: To Prevent Fire Burn candle within sight. Out of the reach of children and pets. Never on anything that can catch fire."

F2179-02, Standard Specification for Annealed Soda-Lime Silicate Glass Containers That Are Produced for Use as Candle Containers provides for minimum requirements and testing options for containers of this type when they are expected to be used for candles. Containers should be able to withstand a change in temperature without cracking or breaking.

F2326-04, Standard Test Method for Collection and Analysis of Visible Emissions from Candles as They Burn addresses smoke and burn behavior of most types of indoor candles.

F2417-04-Standard Specification for Fire Safety for Candles addresses issues of candle stability, flame height, end of useful life and secondary ignition. (Some types of candles are excluded from this standard.) This standard replaces the earlier provisional standard.²⁰

¹⁹ Becker, Jim. Candles: Answering your Burning Questions,” *Standardization News*, March 2003, online at http://www.astm.org/SNEWS/MARCH_2003/becker_mar03.html.

²⁰ ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

ASTM is developing two new candle standards.

In 2005, ASTM F15.45 initiated work on WK9172, *New Standard Specification for Fire Safety for Candle Accessories*. In 2006, work began on WK 10385 *New Standard Specification for Candle Container Temperatures*. Existing standards are also reviewed and revised periodically.

In 2006, CPSC Voted to Defer Action on Mandatory Safety Standards

Like NFPA standards, the ASTM standards are not mandated by ASTM, but can be referenced or incorporated into contracts, regulation, laws, codes and procedures. In light of the increase in candle fires, the National Association of State Fire Marshals (NASFM) petitioned to have the CPSC set mandatory standards for candles and accessories.²¹

NASFM proposed that the standards be largely based on ASTM's then draft standard, *PS59-Provisional Specification for Fire Safety for Candles*, with additional requirements for candles not covered by that standard. NFPA supported this proposal. Bob Higgins, president of the National Candle Association, testified against the petition at the Senate Committee Hearing on Commerce, Science and Transportation on July 14, 2004. He noted that their members account for 90% of all candles manufactured in the United States and that his organization has worked closely with ASTM and CPSC to develop the ASTM standards. His organization advocated the continued use of ASTM standards as voluntary standards, maintaining that standards are better at incorporating latest technology than regulations. He also stressed the importance of consumer education and behavior in preventing candle fires.²² In July, 2006, the CPSC voted 3-0 to defer a decision on the petition. CPSC staff had recommended that that the decision be deferred so they could continue to work with ASTM on the two new standards and to assess the effectiveness of the voluntary standards.²³

Other Countries Are Also Concerned about Candle Safety

Three percent of Canada's candle users had a candle-related fire or injury in the year before a March 2006 survey.

Decima Research's March 2006 survey of candle users found that no one was in the room when more than half of the candle users' fires occurred. The most common scenario involved a candle igniting something nearby. One-third of these incidents were reported to the fire department.²⁴

²¹ *Federal Register*, Vol. 69, No. 66, Tuesday, April 6, 2004, "Petition Requesting Mandatory Fire Safety Standards for Candles and Candle Accessories (Petition No. CP 04-1/HP 04-1)," online at <http://www.cpsc.gov/businfo/frnotices/fr04/candle.pdf>.

²² Testimony of Bob Higgins, president, National Candle Association, Full Committee Hearing: Home Products Fire Safety, Senate Committee on Commerce, Science and Transportation. July 14, 2004, online at http://commerce.senate.gov/hearings/testimony.cfm?id=1267&wit_id=3680.

²³ U.S. Consumer Product Safety Commission, *Record of Commission Action Petition CP 04-1?HP 04-1, Requesting Mandatory Fire Standards for Candles and Candle Accessories*, accessed online at <http://www.cpsc.gov/library/foia/ballot/ballot06/Candles.pdf> on November 9, 2006.

²⁴ Decima Research. *Canadians' Behaviour Surrounding Candle Use and Fire Safety: A Quantitative Exploration*, Study done for Health Canada, March 2006.

Health Canada may require candle warning labels.

Health Canada is exploring the possibility of requiring warning labels on candles. The survey and focus groups were commissioned to better understand the behaviors associated with candles, and how consumers react to and interpret different messages on warning labels.

Most felt knowledgeable about candle fire safety and believe they use candles safely, but they also acknowledged bending the rules, sometimes leaving candles unattended, falling asleep with candles burning, or leaving children and teens alone with candles. Most did not know that that candles should not be used in a drafty location, that they should be kept a minimum distance away from other candles, that candles should not be placed near a heat source or in the sun to prevent damage to the candle, or that wick trimming was important. Candles with labels were viewed as better quality. While participants said they are more likely to read labels on products that are new to them, even labels on familiar products provide useful reminders.²⁵ Different groups focus on different aspects of candle safety, although most agree on the top tier of issues – keeping candles away from anything that can burn and not leaving candles unattended.

Candle fires account for 3% of the U.K.'s home fires.

Table 15 shows that in the United Kingdom, reported home candle fires tripled from 700 in 1992 to 2,100 in 2000, going from 1% of reported home fires to 3% during that time. The percentage has remained at 3%, although the number of fires has fallen to 1,700 in 2005.²⁶ In a 2004-2005 survey of the British population, 7% of the people who had domestic fires (fires anywhere in or on the householder's property regardless of whether the fire department was notified) reported they were caused by candles.²⁷

A special U.K. Department of Trade and Industry and Home Office report on *The Safety and Use of Candles and Tea Lights* compiled a wide variety of information about candle fires and candle injuries.²⁸ In 1998, 43% of the U.K.'s unintentional home candle fires started in the bedroom and 31% started in living rooms, family rooms or dens.

The authors cite the 1997 report of the U.K.'s Home and Leisure Accident Surveillance System (HASS and LASS) of hospital accident data which estimated that 1,300 injuries were caused by candles and candle wax and 500 were caused by candlesticks. The number of injuries caused by candles and candle wax in particular increased steadily from 1992 to 1998, the last year of data shown. During 1989-1998, 39% of these injuries

²⁵ Environics Research Group Limited. *Canadians' Behaviour Surrounding Candle Use and Fire Safety, A qualitative Exploration: Final Report*, Toronto, Ontario, Canada. Study prepared for Health Canada, January 2006.

²⁴ Department for Communities and Local Government, *Fire Statistics, United Kingdom, 2005, 2007* Office of the Deputy Prime Minister, *Fire Statistics United Kingdom, 2004, 2006*. London, U.K. Available online at <http://www.communities.gov.uk/fire/fireandresiliencestatisticsandfirestatistics/firestatisticsuk/>. Candles were listed under accidental causes. "Dwelling" is used in the U.K. to refer to what is called "home" in the U.S. The percentage is based on candle fires as a share of reported dwelling fires of all causes, including malicious.

²⁷ Office of the Deputy Prime Minister. *Fires in the Home: Findings from the 2004/05 Survey of English Housing*, 2006, London, U.K. p. 12.. Available online at <http://www.communities.gov.uk/documents/fire/pdf/143501>.

²⁸ Department of Trade and Industry and Home Office. *The Safety and Use of Candles and Tea Lights*, 2000, pp. 36-48. Available online at <http://www.berr.gov.uk/files/file21807.pdf>.

were flame burns, 26% were burns from hot wax, 3% were other burns, and smoke inhalation caused 16% of the injuries. Lacerations obtained while trimming candles or removing wax accounted for 13% of the cases. Statistics from the Dutch Injury Surveillance System were also included. In 1997 to 1998, an estimated 360 people were treated at hospital Accident and Emergency departments for injuries caused by candles and tea warmers. Twenty-nine percent (29%) of these injuries were caused by fires or flames, 24% were caused by cutting or piercing objects, and 21% were caused by hot liquid or steam.

The authors also referenced statistics from the Swedish Rescue Service, noting that candles were listed as the preliminary cause of an estimated 263, or 4%, of all dwelling fires in Sweden during 1998.

Increasing Candle Safety

Specific information is needed to develop effective prevention strategies.

We need to know more about the circumstances of these fires and the people who are having these fires to develop and target our educational messages effectively. The focus groups done for Health Canada provide some valuable new information, including the importance of warning labels. Candles used for religious purposes are likely to be used differently and in different places than candles used for fragrance or ambience. Manufacturers and regulators also need to know if product issues are significant problems. The Massachusetts study provided some information on fires in one state, but more studies are needed, particularly for issues regarding specific types of candles or candleholders. The CPSC study was a pilot, with a relatively small number of incidents but greater detail more actively sought.

The ASTM documents provide standard definitions, tests and minimum warning wording, in effect, an agreed upon starting place from which to build. While responsible manufacturers follow ASTM's voluntary standards, mandatory standards would provide the consumer with greater protection and make enforcement easier. We are hopeful that such standards will be adopted at some point in the future. In the staff briefing on the subject, the authors noted the long burning time of candles can give consumers the impression it is safe to leave the candles for a period of time. This impression may even be stronger with jar candles or candles inside containers. They also note that information and education campaigns tend to be more effective when individuals feel they have less experience with a product. When people are already quite familiar with a product, it can be harder to get their attention or to convince them that their usual practices could be unsafe.²⁹

NFPA brochure – “Candle with Care” -- provides safety information.

In response to the growing problem of candle fires, NFPA developed “Candle with Care,” a brochure focusing on candle safety. This brochure may be ordered by calling NFPA's catalog at 1-800-344-3555 or on-line at <http://www.nfpacatalog.org/>. A sample

²⁹ U.S. Consumer Product Safety Commission Candle Petition Product Team. *Petition CP 04-1 HP 04-1 Requesting Mandatory Fire Safety Standards for Candles and Candle Accessories Briefing Package*, July 2006, accessed online at <http://www.cpsc.gov/library/foia/foia06/brief/candleballot.pdf> on September 26, 2007.

of the brochure may be obtained by calling NFPA's "Fax on Demand" at 1-877-252-8145 and selecting brochure # 139. A fact sheet on candle safety is available to all visitors to the Research and Reports section of NFPA's web site (<http://www.nfpa.org/>).

Educational Message Advisory Committee developed basic candle messages.

The Educational Messages Advisory Committee, a group of fire safety experts who help NFPA's public education division develop and review educational messages, endorsed the following basic messages for candle safety:

- Keep candles at least 12 inches from anything that can burn.
- Use sturdy, safe candleholders.
- Never leave a burning candle unattended. Blow out candles when you leave a room.
- NFPA discourages the use of candles in bedrooms and sleeping areas.
- Use a flashlight, not a candle for emergency lighting.
- Be careful not to splatter wax when extinguishing a candle.

These messages are short and simple. When additional information is required, some or all of the following expanded points may be useful.

Remember: A candle is an open flame. It can easily ignite any combustibles nearby. *Keep a careful eye on candles.*

- Extinguish all candles when leaving the room or when going to sleep.
- Keep candles away from items that can catch fire such as clothing, books, paper, curtains, Christmas trees, flammable decorations or anything else that may burn.
- Make sure candles are placed on a stable piece of furniture in sturdy holders that won't tip over. Candles should fit in the holders securely and holders should be made from material that can't burn.
- Make sure the candle holder is big enough to collect dripping wax.
- Don't place lit candles in windows, where blinds or curtains can close over or come in contact with them.
- Place candles away from spots where they could be knocked over by children or pets.
- Keep candles and all open flames away from flammable liquids.
- When purchasing or using candles, consider what would happen if the candle burned low. Could it burn the candle holder or decorative material nearby? Extinguish taper and pillar candles when they get within two inches of the holder or decorative material. Votives and filled candles should be extinguished before the last ½ inch of wax starts to melt.
- Fire experts discourage the use of candles in bedrooms, where almost half of all home candle fires start. If you must burn candles in the bedroom, keep them away from bedding, curtains and blinds, wallpaper, upholstered furniture, piles of clothing, and newspapers and magazines, and monitor them carefully.
- Avoid candles with combustible items embedded in them.

Where young children are present:

- Keep candles up high out of the reach of children.
- Never leave a child unattended in a room with a candle. A child should not sleep in a room with a lit candle.
- Keep all matches and lighters up high and out of the sight and reach of children.

Power outages are special situations.

Flashlights and other lights generated by batteries are much safer light sources than candles. Keep working flashlights on hand. If you do use candles during power outages,

- Avoid carrying a lit candle. When you carry a candle, you are carrying something that could start a fire. If you need to look for something in a closet or confined area, use a flashlight or wait.
- Never use a candle for light when checking pilot lights or fueling equipment such as a kerosene heater or lantern. The flame may ignite the fumes.
- Extinguish all candles when leaving the home or when going to sleep.
- Don't allow children to use candles for light without supervision.

Table 1.
Candle Fires in the Home by Year: 1980-2005

Year	All Fires	Non-Confined Fires	All Civilian Deaths	Non-Confined Deaths	All Civilian Injuries	Non-Confined Injuries	Direct Property Damage (in Millions)		
							Total Loss (As Reported)	Non-Confined Loss	Total Loss Adjusted to 2005 Dollars
1980	10,400		40		580		\$51		\$122
1981	9,600		140		510		\$53		\$115
1982	8,900		100		530		\$51		\$102
1983	8,100		130		580		\$57		\$112
1984	8,200		120		640		\$65		\$122
1985	8,500		90		670		\$73		\$132
1986	8,200		150		640		\$94		\$168
1987	8,000		130		640		\$59		\$101
1988	8,300		100		780		\$85		\$140
1989	7,700		120		740		\$81		\$127
1990	6,800		120		650		\$81		\$121
1991	7,300		90		750		\$106		\$152
1992	7,700		130		700		\$85		\$118
1993	7,800		100		720		\$108		\$146
1994	8,900		100		980		\$111		\$146
1995	10,700		90		1,080		\$153		\$196
1996	12,300		160		1,310		\$221		\$275
1997	14,400		210		1,410		\$217		\$264
1998	15,700		190		1,290		\$226		\$271
1999									
*	16,900	(16,500)	90	(90)	1,630	(1,630)	\$410	(\$409)	\$481
2000	16,000	(15,700)	240	(240)	1,650	(1,650)	\$338	(\$338)	\$384
2001	18,900	(18,000)	250	(250)	1,900	(1,860)	\$418	(\$418)	\$462
2002	18,200	(17,500)	160	(160)	1,680	(1,680)	\$482	(\$482)	\$523
2003	17,100	(15,800)	140	(140)	1,520	(1,520)	\$463	(\$462)	\$492
2004	17,000	(15,600)	200	(200)	1,510	(1,500)	\$465	(\$464)	\$482
2005	15,600	(14,900)	150	(150)	1,270	(1,270)	\$539	(\$539)	\$539

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. The 1999-2005 estimates shown without parentheses are sums of the non-confined (shown in parentheses) and the confined fire (not shown) projections. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported, as well as proportional shares of fires 1980-1998 in which the form of heat of ignition was an unclassified or unknown-type open flame or spark, and in 1999-2005, in which the heat source was an unclassified open flame or smoking material.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on the consumer price index found in the U.S. Census Bureau's *Statistical Abstract of the United States: 2007*, "Table 705, Purchasing Power of the Dollar: 1950 to 2005."

Table 2.
Candle Fires in the Home as a Share of All Home Structure Fires
(Including Confined Fires)
1980-2005

Year	Home Fires	Home Candle Fires	Percent of Home Fires Started by Candles
1980	734,000	10,400	1%
1981	711,000	9,600	1%
1982	654,500	8,900	1%
1983	625,500	8,100	1%
1984	605,500	8,200	1%
1985	606,000	8,500	1%
1986	565,500	8,200	1%
1987	536,500	8,000	1%
1988	538,500	8,300	2%
1989	498,500	7,700	2%
1990	454,500	6,800	1%
1991	464,500	7,300	2%
1992	459,000	7,700	2%
1993	458,000	7,800	2%
1994	438,000	8,900	2%
1995	414,000	10,700	3%
1996	417,000	12,300	3%
1997	395,500	14,400	4%
1998	369,500	15,700	4%
1999	371,000	16,900	5%
2000	368,000	16,000	4%
2001	383,500	18,900	5%
2002	389,000	18,200	5%
2003	388,500	17,100	5%
2004	395,500	17,000	4%
2005	381,000	15,600	4%

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Fires reflect a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported, as well as proportional shares of fires 1980-1998 in which the form of heat of ignition was an unclassified or unknown-type open flame or spark, and in 1999-2005, in which the heat source was an unclassified open flame or smoking material.

Source: Total home fires are based on the NFPA survey. Candle fire estimates are derived from NFIRS and the NFPA survey.

Table 3.
Home Candle Structure Fires, by Area of Origin
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Area of Origin	Fires		Civilian		Civilian		Direct	
			Deaths	Injuries	Property Damage	(in Millions)		
Bedroom	6,100	(38%)	70	(41%)	730	(49%)	\$213	(44%)
Living room, family room or den	2,400	(15%)	30	(21%)	260	(17%)	\$93	(19%)
Bathroom	2,300	(14%)	0	(0%)	110	(7%)	\$34	(7%)
Unclassified function area	1,400	(9%)	30	(18%)	140	(9%)	\$49	(10%)
Kitchen or cooking area	1,300	(8%)	10	(7%)	80	(5%)	\$22	(5%)
Unclassified structural area	300	(2%)	10	(3%)	40	(3%)	\$10	(2%)
Unclassified area of origin	200	(2%)	0	(2%)	20	(1%)	\$6	(1%)
Wall assembly or concealed space	200	(1%)	0	(0%)	10	(1%)	\$5	(1%)
Exterior balcony or unenclosed porch	200	(1%)	0	(1%)	10	(0%)	\$13	(3%)
Closet	200	(1%)	0	(0%)	10	(1%)	\$6	(1%)
Crawl space or substructure space	100	(1%)	0	(3%)	20	(1%)	\$6	(1%)
Garage or vehicle storage area*	100	(1%)	0	(0%)	10	(1%)	\$4	(1%)
Exterior wall surface	100	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Lobby or entrance way	100	(1%)	0	(2%)	0	(0%)	\$2	(0%)
Laundry room or area	100	(1%)	0	(0%)	10	(1%)	\$2	(0%)
Office	100	(1%)	0	(0%)	10	(1%)	\$3	(1%)
Other known area	600	(4%)	0	(1%)	40	(3%)	\$18	(4%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)

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

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the area of origin was unknown or not reported are allocated proportionally among fires with known area of origin. 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 and NFPA survey.

Table 4.
Home Candle Structure Fires, by Item First Ignited
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unclassified furniture or utensil	1,900	(12%)	30	(16%)	180	(12%)	\$80	(16%)
Mattress or bedding	1,800	(11%)	40	(23%)	310	(20%)	\$75	(15%)
Curtain, blind, drapery or tapestry	1,500	(10%)	10	(5%)	130	(9%)	\$51	(10%)
Cabinetry	1,400	(9%)	10	(4%)	100	(6%)	\$38	(8%)
Upholstered furniture	900	(6%)	30	(15%)	120	(8%)	\$41	(8%)
Interior wall covering, excluding drapes	900	(6%)	0	(1%)	30	(2%)	\$17	(3%)
Decoration	900	(5%)	0	(1%)	50	(3%)	\$22	(5%)
Unclassified item first ignited	800	(5%)	0	(3%)	50	(3%)	\$16	(3%)
Magazine, newspaper or writing paper	700	(4%)	0	(3%)	70	(4%)	\$20	(4%)
Linen other than bedding	600	(4%)	0	(3%)	30	(2%)	\$10	(2%)
Clothing	600	(4%)	20	(10%)	60	(4%)	\$20	(4%)
Floor covering, rug, carpet, or mat	500	(3%)	0	(1%)	50	(3%)	\$11	(2%)
Appliance housing or casing	400	(3%)	0	(2%)	50	(4%)	\$5	(1%)
Unclassified soft goods or wearing apparel	400	(2%)	0	(3%)	40	(3%)	\$11	(2%)
Multiple items first ignited	300	(2%)	10	(4%)	40	(3%)	\$15	(3%)
Box, carton, bag, basket, or barrel	300	(2%)	0	(0%)	30	(2%)	\$5	(1%)
Flammable or combustible liquid or gas, filter or piping	200	(1%)	0	(3%)	50	(3%)	\$6	(1%)
Unclassified structural component or finish	200	(1%)	0	(0%)	10	(0%)	\$4	(1%)
Non-upholstered chair or bench	200	(1%)	0	(0%)	20	(1%)	\$6	(1%)
Rubbish, trash or waste	200	(1%)	0	(0%)	10	(1%)	\$2	(0%)
Unclassified adornment, recreational material or sign	200	(1%)	0	(0%)	10	(0%)	\$5	(1%)
Exterior wall covering or finish	200	(1%)	0	(0%)	10	(0%)	\$4	(1%)
Book	100	(1%)	0	(0%)	0	(0%)	\$3	(1%)
Unclassified organic materials	100	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Structural member or framing	100	(1%)	0	(0%)	0	(0%)	\$4	(1%)
Interior ceiling cover or finish	100	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Goods not made up, including fabrics and yard goods	100	(1%)	0	(0%)	20	(1%)	\$2	(0%)
Other known item	600	(4%)	0	(1%)	30	(2%)	\$12	(2%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the item first ignited was unknown or not reported are allocated proportionally among fires with known item first ignited. 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 and NFPA survey.

Table 5.
Home Candle Structure Fires, by Cause
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Cause	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	15,100	(95%)	160	(97%)	1,430	(96%)	\$462	(95%)
Intentional	400	(2%)	0	(1%)	30	(2%)	\$13	(3%)
Unclassified cause	300	(2%)	0	(0%)	10	(1%)	\$7	(1%)
Failure of equipment or heat source	200	(1%)	0	(1%)	10	(1%)	\$4	(1%)
Act of nature	0	(0%)	0	(0%)	0	(0%)	\$0	(0%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the cause was unknown or not reported are allocated proportionally among fires with known cause. 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 and NFPA survey.

Table 6.
Home Candle Structure Fires, by Factor Contributing to Ignition
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustible	8,800	(55%)	110	(69%)	910	(61%)	\$268	(55%)
Abandoned or discarded material or product	2,000	(13%)	0	(2%)	150	(10%)	\$60	(12%)
Unclassified misuse of material or product	1,900	(12%)	20	(10%)	170	(11%)	\$57	(12%)
Equipment unattended	1,100	(7%)	10	(7%)	80	(5%)	\$34	(7%)
Unclassified factor contributed to ignition	900	(6%)	10	(8%)	80	(6%)	\$27	(6%)
Playing with heat source	600	(4%)	10	(4%)	70	(4%)	\$27	(6%)
Collision, knock down, run over, or turn over	300	(2%)	10	(4%)	40	(2%)	\$11	(2%)
Improper container or storage	300	(2%)	0	(2%)	20	(1%)	\$5	(1%)
Unclassified fire spread or control	100	(1%)	0	(0%)	10	(0%)	\$5	(1%)
Animal	100	(1%)	0	(2%)	10	(1%)	\$8	(2%)
Unintentionally turned on or not turned off	100	(1%)	0	(0%)	10	(1%)	\$2	(0%)
Unclassified operational deficiency	100	(1%)	10	(3%)	10	(1%)	\$4	(1%)
Other known factor contributing	500	(3%)	10	(4%)	40	(3%)	\$14	(3%)
Total*	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)
Total entries*	16,900	(106%)	190	(114%)	1,590	(106%)	\$523	(108%)

* Multiple entries are allowed which can result in sums higher than totals.

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the factor contributing to ignition was unknown, not reported, or coded as "none" are allocated proportionally among fires with known item first ignited. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS and NFPA survey.

Table 7.
Home Candle Structure Fires, by Human Factor Contributing to Ignition
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Human Factor Contributing	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (In Millions)
Unattended or unsupervised person	3,400 (21%)	10 (6%)	210 (14%)	\$101 (21%)
Asleep	2,000 (12%)	40 (26%)	430 (29%)	\$78 (16%)
Age was a factor	700 (4%)	20 (12%)	60 (4%)	\$25 (5%)
Possibly impaired by alcohol or drugs	200 (1%)	0 (0%)	50 (3%)	\$9 (2%)
Multiple persons involved	100 (1%)	0 (0%)	20 (2%)	\$7 (1%)
Possibly mentally disabled	100 (1%)	0 (2%)	20 (1%)	\$8 (2%)
Physically disabled	100 (0%)	20 (10%)	20 (1%)	\$3 (1%)
None	9,800 (61%)	90 (55%)	770 (51%)	\$284 (58%)
Total*	16,000 (100%)	160 (100%)	1,490 (100%)	\$486 (100%)
Total entries*	16,400 (103%)	180 (111%)	1,580 (106%)	\$516 (106%)

* Multiple entries are allowed which can result in sums higher than totals.

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was 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 and NFPA survey.

Table 8.
Home Candle Structure Fires, by Extent of Flame Damage
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	4,200	(26%)	10	(8%)	240	(16%)	\$34	(7%)
Confined to room of origin	7,900	(50%)	40	(24%)	660	(44%)	\$110	(23%)
Confined to floor of origin	1,300	(8%)	30	(21%)	210	(14%)	\$85	(18%)
Confined to building of origin	2,300	(14%)	70	(40%)	340	(23%)	\$222	(46%)
Extended beyond building of origin	200	(1%)	10	(7%)	50	(3%)	\$35	(7%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the extent of flame damage was unknown or not reported are allocated proportionally among fires with known extent of flame damage. 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 and NFPA survey.

Table 9.
Home Candle Structure Fire Deaths and Injuries by Age
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Age Group	Deaths			Injuries			Population (in Millions)
	Civilian Deaths	per Million Population	Relative Death Risk	Civilian Injuries	per Million Population	Relative Injury Risk	
0-4	20 (12%)	0.95	1.7	70 (4%)	3.32	0.7	19.9 (7%)
5-9	10 (5%)	0.37	0.7	50 (3%)	2.33	0.5	19.7 (7%)
10-19	20 (12%)	0.46	0.8	230 (16%)	5.52	1.1	41.7 (14%)
20-34	20 (13%)	0.36	0.6	430 (29%)	7.10	1.4	60.7 (21%)
35-49	20 (14%)	0.35	0.6	380 (26%)	5.80	1.1	66.2 (23%)
50-64	30 (18%)	0.61	1.1	200 (14%)	4.23	0.8	47.8 (16%)
65-74	20 (14%)	1.28	2.3	50 (4%)	2.89	0.6	18.4 (6%)
75-84	10 (8%)	0.99	1.8	40 (3%)	3.39	0.7	12.9 (4%)
85 and older	10 (5%)	1.54	2.8	20 (1%)	3.90	0.8	4.8 (2%)
Total	160(100%)	0.56	1.0	1,480(100%)	5.05	1.0	292.2(100%)
65+	40 (27%)	1.21	2.2	120 (8%)	3.20	0.6	36.2 (12%)

Note: These are national estimates of fire deaths and injuries reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total civilian fire deaths and injuries from non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) casualties. Civilian deaths and injuries are rounded to the nearest ten. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Casualties in which the victim's age was unknown or not reported are allocated proportionally among casualties with known age. 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 and NFPA survey. Population estimates were obtained from Table 11, "Resident Population by Age and Sex: 1980 to 2005" from the U.S. Census Bureau's *Statistical Abstract of the United States: 2007*.

Table 10.
Home Candle Structure Fires, by Month
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

Month	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
January	1,600	(10%)	20	(12%)	180	(12%)	\$53	(11%)
February	1,300	(8%)	20	(9%)	150	(10%)	\$39	(8%)
March	1,400	(8%)	20	(9%)	140	(10%)	\$44	(9%)
April	1,200	(8%)	10	(9%)	120	(8%)	\$40	(8%)
May	1,200	(7%)	10	(7%)	120	(8%)	\$33	(7%)
June	1,100	(7%)	10	(5%)	90	(6%)	\$37	(8%)
July	1,000	(6%)	10	(5%)	80	(6%)	\$30	(6%)
August	1,100	(7%)	10	(9%)	80	(6%)	\$30	(6%)
September	1,200	(7%)	10	(7%)	80	(5%)	\$28	(6%)
October	1,400	(8%)	10	(8%)	130	(9%)	\$43	(9%)
November	1,400	(9%)	10	(4%)	120	(8%)	\$39	(8%)
December	2,100	(13%)	30	(16%)	190	(13%)	\$69	(14%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)
Monthly average	1,300	(8%)	10	(8%)	120	(8%)	\$41	(8%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. 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 and NFPA survey.

Table 11.
Home Candle Structure Fires, by Day of Week,
Excluding Fires Reported as Confined Fires,
2002-2005 Annual Averages

Day of Week	Fires		Civilian		Civilian		Direct	
			Deaths		Injuries		Property Damage (in Millions)	
Sunday	2,500	(16%)	20	(14%)	250	(17%)	\$73	(15%)
Monday	2,100	(13%)	20	(13%)	250	(17%)	\$62	(13%)
Tuesday	2,100	(13%)	20	(11%)	200	(14%)	\$64	(13%)
Wednesday	2,100	(13%)	10	(8%)	200	(13%)	\$68	(14%)
Thursday	2,200	(13%)	30	(20%)	180	(12%)	\$62	(13%)
Friday	2,300	(15%)	20	(13%)	200	(13%)	\$78	(16%)
Saturday	2,600	(16%)	30	(20%)	210	(14%)	\$79	(16%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)
Daily average	2,300	(14%)	20	(14%)	210	(14%)	\$69	(14%)

Table 12.
Home Candle Structure Fires, by Time Period
Excluding Fires Reported as Confined Fires,
2002-2005 Annual Averages

Time Period	Fires		Civilian		Civilian		Direct	
			Deaths		Injuries		Property Damage (in Millions)	
Midnight – 2:59 a.m.	1,900	(12%)	50	(28%)	260	(17%)	\$69	(14%)
3:00 – 5:59 a.m.	1,400	(8%)	40	(22%)	250	(17%)	\$53	(11%)
6:00 – 8:59 a.m.	1,200	(8%)	20	(13%)	150	(10%)	\$43	(9%)
9:00 – 11:59 a.m.	1,600	(10%)	0	(2%)	130	(9%)	\$44	(9%)
Noon – 2:59 p.m.	2,000	(13%)	10	(3%)	140	(10%)	\$64	(13%)
3:00 – 5:59 p.m.	2,400	(15%)	10	(9%)	150	(10%)	\$62	(13%)
6:00 – 8:59 p.m.	2,900	(18%)	10	(8%)	200	(13%)	\$76	(16%)
9:00 – 11:59 p.m.	2,600	(16%)	20	(14%)	210	(14%)	\$75	(15%)
Total	16,000	(100%)	160	(100%)	1,490	(100%)	\$486	(100%)
Average	2,000	(13%)	20	(13%)	190	(13%)	\$61	(13%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. 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 and NFPA survey.

Table 13.
Home Candle Structure Fires, by Item First Ignited:
January-November and December
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages

January-November	Fires		December	Fires	
Unclassified furniture or utensil	1,600	(12%)	Decoration	280	(13%)
Mattress or bedding	1,600	(11%)	Unclassified furniture or utensil	240	(11%)
Curtain, blinds, drapery or tapestry	1,400	(10%)	Mattress or bedding	210	(10%)
Cabinetry	1,200	(9%)	Cabinetry	170	(8%)
Upholstered furniture or vehicle seat	800	(6%)	Interior wall covering, excluding drapes	130	(6%)
Interior wall covering, excluding drapes	800	(5%)	Curtain, blinds, drapery or tapestry	120	(6%)
Unclassified item first ignited	700	(5%)	Unclassified item first ignited	120	(5%)
Magazine, newspaper or writing paper	600	(4%)	Upholstered furniture or vehicle seat	110	(5%)
Decoration	600	(4%)	Linen other than bedding	100	(5%)
Clothing	600	(4%)	Magazine, newspaper, writing paper	90	(4%)
Linen other than bedding	500	(4%)	Clothing	70	(4%)
Floor covering rug, carpet or mat	400	(3%)	Floor covering rug, carpet or mat	60	(3%)
Appliance housing or casing	400	(3%)	Appliance housing or casing	50	(2%)
Unclassified soft goods or wearing apparel	400	(3%)	Unclassified adornment, recreational material or sign	40	(2%)
Multiple items first ignited	300	(2%)	Unclassified soft goods or wearing apparel	40	(2%)
Box, carton, bag, basket or barrel	200	(2%)	Multiple items first ignited	40	(2%)
Unclassified structural component or finish	200	(1%)	Box, carton, bag, basket or barrel	30	(2%)
Flammable or combustible liquid or gas, piping or filter	200	(1%)	Rubbish, trash or waste	30	(1%)
Non-upholstered chair, bench	200	(1%)	Flammable or combustible liquid or gas, filter or piping	30	(1%)
Other known item	600	(4%)	Non-upholstered chair or bench	30	(1%)
Total	13,800	(100%)	Christmas tree	20	(1%)
			Unclassified structural component or finish	20	(1%)
			Other known item	100	(2%)
			Total	2,100	(100%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires in January-November are rounded to the nearest hundred and December fires are rounded to the nearest ten. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. Fires in which the item first ignited was unknown or not reported are allocated proportionally among fires with known item first ignited. 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 and NFPA survey.

**Table 14.
Candle Fires in Non-Home Properties by Occupancy Class
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages**

Occupancy	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Non-home residential	900	(45%)	24	(100%)	47	(59%)	\$26	(49%)
Unclassified or unknown-type residential	530	(27%)	17	(72%)	27	(35%)	\$17	(32%)
Hotel or motel	150	(8%)	2	(7%)	9	(12%)	\$3	(6%)
Dormitory, fraternity, sorority or barracks	100	(5%)	2	(7%)	6	(7%)	\$4	(7%)
Rooming or lodging house	90	(4%)	3	(14%)	4	(5%)	\$2	(4%)
Residential board and care or assisted living	20	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Mercantile or office	390	(20%)	0	(0%)	8	(10%)	\$9	(16%)
Office, bank or mail facility	90	(5%)	0	(0%)	1	(1%)	\$3	(6%)
Specialty shop	80	(4%)	0	(0%)	2	(2%)	\$1	(2%)
Personal service, recreational or home repair	70	(4%)	0	(0%)	2	(3%)	\$1	(2%)
Unclassified or unknown-type mercantile or business	50	(2%)	0	(0%)	1	(1%)	\$1	(2%)
Grocery or convenience store	30	(1%)	0	(0%)	2	(2%)	\$0	(0%)
Household goods sales or repairs	20	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Department store or unclassified general retail	20	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Textile, or apparel sales	10	(1%)	0	(0%)	0	(0%)	\$1	(2%)
Service station or vehicle sales, service or repair	10	(1%)	0	(0%)	0	(0%)	\$1	(1%)
Laundry, dry cleaning, or professional supplies or services	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Storage	210	(11%)	0	(0%)	5	(6%)	\$3	(6%)
Unclassified storage	120	(6%)	0	(0%)	0	(0%)	\$1	(2%)
Vehicle storage, garage or fire station*	70	(4%)	0	(0%)	5	(7%)	\$2	(4%)
Warehouse, residential or self-storage	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Public assembly	180	(9%)	0	(0%)	2	(2%)	\$10	(19%)
Place of worship or funeral property	90	(4%)	0	(0%)	1	(1%)	\$9	(17%)
Eating or drinking places	50	(2%)	0	(0%)	0	(0%)	\$1	(1%)
Club	30	(1%)	0	(0%)	0	(0%)	\$0	(1%)
Library, museum, courthouse or other public property	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)

* Does not include fires in which an attached residential garage is coded as a dwelling with the garage as the area of origin.

Table 14.
Candle Fires in Non-Home Properties
by Occupancy Class
Excluding Fires Reported as Confined Fires
2002-2005 Annual Averages
(Continued)

Occupancy	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Outside or special property	90	(4%)	0	(0%)	4	(5%)	\$1	(2%)
Bridge, tunnel, or outbuilding	30	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Open land, beach, or campsite	20	(1%)	0	(0%)	1	(1%)	\$0	(0%)
Highway, street, or parking area	20	(1%)	0	(0%)	3	(4%)	\$1	(1%)
Educational	70	(4%)	0	(0%)	11	(13%)	\$1	(1%)
Preschool through grade 12	40	(2%)	0	(0%)	1	(1%)	\$0	(1%)
Adult education or college classroom	20	(1%)	0	(0%)	9	(12%)	\$0	(0%)
Health care, detention or correction	50	(2%)	0	(0%)	2	(2%)	\$1	(3%)
Nursing home	10	(1%)	0	(0%)	2	(3%)	\$0	(0%)
Mental retardation or substance abuse	10	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Industrial, utility, defense, agriculture, and mining	10	(0%)	0	(0%)	0	(0%)	\$0	(0%)
Manufacturing, processing	10	(0%)	0	(0%)	0	(0%)	\$0	(0%)
Unclassified or unknown property use	100	(5%)	0	(0%)	1	(1%)	\$2	(3%)
Total	2,000	(100%)	24	(100%)	80	(100%)	\$53	(100%)

Note: These 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. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Percentages of the total number of non-confined structure fires (incident type 110-129, excluding 113-118) and associated losses for each item first ignited were calculated using only data on non-confined structure fires originally collected in Version 5.0 of NFIRS. Total non-confined structure fires (all versions) are multiplied by these percentages to obtain national estimates of candle (heat source 66) fires. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the heat source was undetermined or not reported, as well as proportional shares in which the heat source was an unclassified open flame or smoking material. 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 and NFPA survey.

Table 15.
Home Candle Fires in the United Kingdom: 1992-2005

Year	Fires	Percent of Home Fires
1991	800	1%
1992	700	1%
1993	900	1%
1994	1,000	2%
1995	1,300	2%
1996	1,500	2%
1997	1,600	2%
1998	1,800	3%
1999	2,000	3%
2000	2,100	3%
2001	2,000	3%
2002	2,000	3%
2003	1,800	3%
2004	1,800	3%
2005	1,700	3%

Source: Department for Communities and Local Government, *Fire Statistics, United Kingdom, 2005, 2007* Office of the Deputy Prime Minister, *Fire Statistics United Kingdom, 2001, 2003*. London, U.K. Available online at <http://www.communities.gov.uk/fire/fireandresiliencestatisticsandre/firestatistics/firestatisticsuk/>. Candles were listed under accidental causes. “Dwelling” is used in the U.K. to refer to what is called “home” in the U.S. The percentage is based on candle fires as a share of reported dwelling fires of all causes, including malicious.

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.

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/download/nfirspaperforms2007.pdf>.

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; and (3) 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.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission have developed the specific 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.

Figure 1.

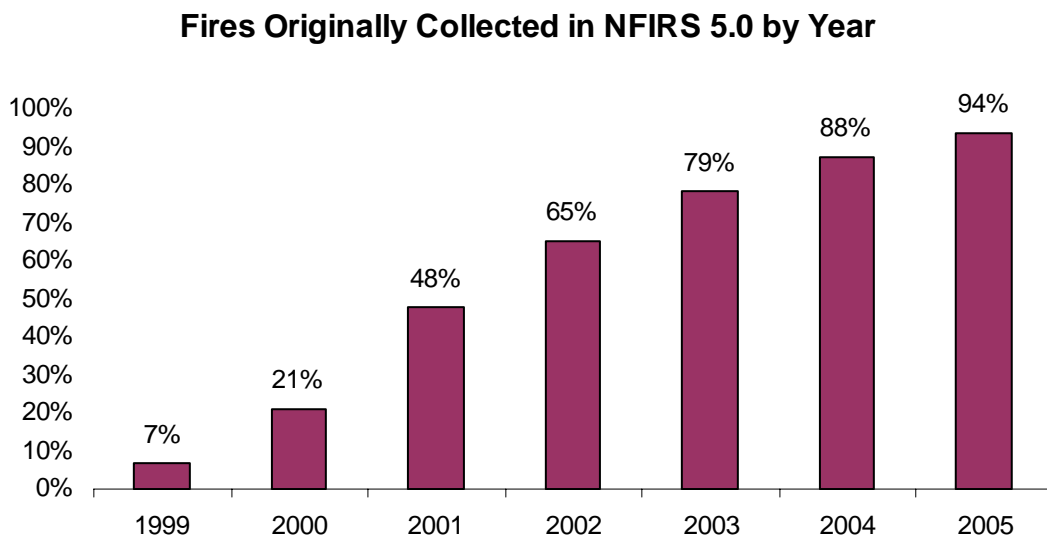


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

For 2002 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections
NFIRS totals (Version 5.0)

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

A second option is to omit year estimates for 1999-2001 from year tables.

NFIRS 5.0 has 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. In order for that limited detail to be used to characterize the confined fires, they must be analyzed separately from non-confined fires. Otherwise, the patterns in a factor for the more numerous non-confined fires with factor known will dominate the allocation of the unknown factor fires for both non-confined and confined fires. If the pattern is different for confined fires, which is often the case, that fact will be lost unless analysis is done separately.

For most fields other than Property Use, 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.

In the formulas that follow, the term “all fires” refers to all fires in NFIRS on the dimension studied.

For Factor Contributing to Ignition, 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%. Groupings for this field show all category headings and specific factors if they account for a rounded value of at least 1%.

Type of Material First Ignited (TMI). This field is required only if the Item First Ignited falls within the code range of 00-69. NFPA has created a new code “not required” for this field that is applied when Item First Ignited is in code 70-99 (organic materials, including cooking materials and vegetation, and general materials, such as electrical wire, cable insulation, transformers, tires, books, newspaper, dust, rubbish, etc..) and TMI is blank. The ratio for allocation of unknown data is:

$$\frac{\text{(All fires – TMI Not required)}}{\text{(All fires – TMI Not Required – Undetermined – Blank)}}$$

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, fusee
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11)
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

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

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

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

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, the 2006 data is not yet available and a large portion of the fires coded as no equipment involved (NNN) have heat sources in the operating equipment category. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

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

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

Additional allocations may be used in specific analyses. For example, NFPA’s report about home heating fires treats Equipment Involved in Ignition Code 120, fireplace, chimney, other” as a partial unknown (like Heat Source 60) and allocates it over its related decade of 121-127, which includes codes for fireplaces (121-122) and chimneys (126-127) but also includes codes for fireplace insert or stove, heating stove, and chimney or vent connector.

More general analyses of specific occupancies may not perform as many allocations of partial allocations. Notes at the end of each table describe what was allocated.

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.

Candle Fires Previously Published in *NFPA Journal's* "Fire Watch"

- Tremblay, Kenneth J. "Candle is Cause of Fatal Fire, Illinois," *NFPA Journal*, 101, no. 3 (2007), pp. 26.
- Tremblay, Kenneth J. "Apartments Housing Mostly Senior Adults Suffered Fatal Fire, Oklahoma," *NFPA Journal*, 101, no.1 (2007), pp. 19.
- Tremblay, Kenneth J. "Lack of Battery in Smoke Alarm Leads to Fire Death, Oregon," *NFPA Journal*, 100, no. 6 (2006), pp. 21-22.
- Tremblay, Kenneth J. "Candle Fire Leads to Four Deaths, Pennsylvania," *NFPA Journal*, 100, no. 3 (2006), pp. 36.
- Tremblay, Kenneth J. "Unattended Candle Ignites Fire Killing Three Children, Texas," *NFPA Journal*, 100, no. 2 (2006), pp. 28-30.
- Tremblay, Kenneth J. "Candle Ignites Fire in Basement Apartment, Nebraska," *NFPA Journal*, 100, no. 1 (2006), pp. 18.
- Tremblay, Kenneth J. "Four Die in Candle Fire, Illinois," *NFPA Journal*, 99, no. 5 (2005), pp. 27-28.
- Tremblay, Kenneth J. "Candle Fire Kills Three, Virginia," *NFPA Journal*, 99, no. 5 (2005), pp. 18-19.
- Tremblay, Kenneth J. "Candles Suspected in Deadly Blaze, Florida," *NFPA Journal*, 98, no. 6 (2004), p. 17.
- Tremblay, Kenneth J. "Alarm Alerts Occupant, Maine," *NFPA Journal*, 98, no. 5 (2004), p. 19.
- Tremblay, Kenneth J. "Candle Fire Damages Home: Pennsylvania," *NFPA Journal*, 98, no. 6 (2004), pp. 16-17.
- Tremblay, Kenneth J. "Alarm Alerts Occupant: Maine," *NFPA Journal*, 98, no. 5 (2004), p. 19.
- Tremblay, Kenneth J. "Smoke Alarm Alerts Napping Woman to Candle Fire," Wisconsin," *NFPA Journal*, November/December 2004 Online Exclusive at <http://www.nfpa.org/publicColumn.asp?categoryID=&itemID=21673&src=NFPAJournal> on August 3, 2005.
- Tremblay, Kenneth J. "Candle Ignites Fatal Fire: Georgia," *NFPA Journal*, 97, no. 6 (2003), pp. 14-15.
- Tremblay, Kenneth J. "Candle Ignites Decorative Linen over Bed: Florida" *NFPA Journal*, 97, no. 4 (2003), p. 14.
- Tremblay, Kenneth J. "Unattended Candle Fire Damages Apartment: Massachusetts," *NFPA Journal*, 97, no. 3 (2003), p. 16.
- Tremblay, Kenneth J. "Candle Ignites Fatal Fire: Michigan," *NFPA Journal*, 97, no. 2 (2003), p. 22.
- Tremblay, Kenneth J. "Three Boys Die in Unattended-Candle Fire: Minnesota," *NFPA Journal*, 96, no. 5 (2002), p. 18.
- Tremblay, Kenneth J. "Unattended Candle Sparks Fires, Killing Three: Indiana," *NFPA Journal*, 96, no. 1 (2002), p. 20.
- Tremblay, Kenneth J. "Four Die When Candle Ignites Curtains: Kentucky," *NFPA Journal*, 96, no. 1 (2002), p. 20.
- Tremblay, Kenneth J. "Candle Fire Kills Two: Washington," *NFPA Journal*, 95, no. 6 (2001), p. 21.
- Tremblay, Kenneth J. "Two Die after Candle Ignites Plastic Bathtub: Massachusetts," *NFPA Journal*, 95, no. 5 (2001), pp. 24-25.

Appendix B.
Candle Fires Previously Published in *NFPA Journal's* "Fire Watch" Series
(Continued)

- Tremblay, Kenneth J. "Children Playing with Candle Leads to Three Deaths: Indiana," *NFPA Journal*, 94, no. 5 (2000), p. 22.
- Tremblay, Kenneth J. "Candle Used during a Hurricane Ignite Fire, Killing Two: Maryland," *NFPA Journal*, 94, no. 5 (2000), p. 22.
- Tremblay, Kenneth J. "Unattended Candle Ignites Fire in Senior Housing: Kentucky," *NFPA Journal*, 93, no. 6 (1999), p. 19.
- Tremblay, Kenneth J. "Candle Fire Kills One: Washington," *NFPA Journal*, 93, no. 4 (1999), p. 19.
- Tremblay, Kenneth J. "Fire Spreads through Apartment Building: New Jersey," *NFPA Journal*, 93, no. 2 (1999), p. 24.
- Tremblay, Kenneth J. "Candle Fire Kills Four: Texas," *NFPA Journal*, 92, no. 5 (1998), p. 17.
- Tremblay, Kenneth J. "Candle Ignites Deadly Blaze: Connecticut," *NFPA Journal*, 91, no. 5 (1997), pp. 21-22.
- Tremblay, Kenneth J. "Candle Ignites Blaze that Kills Four Children: California," *NFPA Journal*, 90, no. 6 (1996), p. 22.
- Tremblay, Kenneth J. "Three Die in Apartment Fire: Arizona," *NFPA Journal*, 89, no. 6 (1995), p. 37.
- Tremblay, Kenneth J. "Four Children Die in Fire Started by Candle: North Carolina," *NFPA Journal*, 89, no. 1 (1995), p. 34.
- Courtney, Neil. "Two Die when Candle Ignites Gasoline during Power Outage" *Fire Journal*, 85, no. 4 (1991), p. 26.
- Courtney, Neil. "Dormitory Fire Controlled by Sprinkler: Arizona" *Fire Journal*, 85, no. 2 (1991), p. 29.
- Courtney, Neil. "Four Die when Candle Ignites Flammable Liquid: Massachusetts" *Fire Journal*, 84, no. 3 (1990), p. 26.

Candle is Cause of Fatal Fire, Illinois

A 47-year old woman died when an unattended bedroom candle sparked a fire that spread to other areas of the home before being detected.

The fire occurred in a single-story ranch constructed of wood framing with an asphalt shingle roof. A battery-operated smoke alarm was installed in the hallway by the bedroom and operated during the fire. There were no sprinklers. A passerby called 911 at 12:33 a.m. to report the fire. Firefighters arrived a minute later and found the home well involved. Investigators determined that a candle left burning on a nightstand fell over and ignited bedding. A fan may have spread the fire from the bedroom to the hallway and living rooms where the victim was located.

The victim was medicated and sleeping in a sitting position just outside the room of origin. The victim died of smoke inhalation. The building valued at \$30,000 was a total loss and \$10,000 worth of contents suffered \$8,000 in loss. There were no other injuries.

Kenneth J. Tremblay, 2007, Firewatch, *NFPA Journal*, May/June, 26.

Apartments Housing Mostly Senior Adults Suffered Fatal Fire, Oklahoma

An unattended candle started a fire fatally injured one occupant and injured four others within a two building apartment complex housing 150 senior adults. Firefighters arrived to find heavy smoke and fire coming from the second floor of one of the buildings and needed additional resources to assist in the evacuation of the high-risk occupants. The fire occurred within a two-story apartment building covering approximately 1,600 square feet. Combination smoke and heat detectors in each unit failed to operate for reason undetermined. There were no sprinklers and building construction was not reported.

The fire was reported at 8:10 a.m. and arriving fire crews were divided into fire attack, and evacuation, search and rescue. A hose line was advanced to the second floor where the flames were quickly controlled. Smoke, heat and water damage was prevalent throughout the building.

During the fire five residents who evacuated suffered smoke inhalation. A 70-year old female developed pneumonia from the exposure to smoke and later died from her injuries. Four other females ages 18, 67, 73 and 82 years of age also suffered smoke inhalation injuries. The building valued at \$2,300,000 had losses estimated at \$300,000. Contents of \$755,000 had losses of \$115,000.

Kenneth J. Tremblay, 2007, Firewatch, *NFPA Journal*, January/February, 19.

Lack of Battery in Smoke Alarm Leads to Fire Death, Oregon

An occupant of an apartment suffered fatal smoke inhalation injuries when a candle left unattended ignited nearby combustibles and filled the unit with fire and smoke. A passerby observing fire coming from a window of the apartment drove to a fire station a block away to report the fire. Firefighters arrived and forced the door to the apartment, advanced a hose line, and performed a search quickly finding the victim who sadly already succumbed.

The single-story, wood framed apartment building was one of many located within a complex that contained from three to four units each. A battery operated smoke alarm was located within the hallway of the unit, but was found without batteries. There were no sprinklers.

Firefighters found a small amount of fire coming from the front window as smoke puffed from one side of the building. Upon entering the apartment fire was seen along the wall inside the living room along with a heavy smoke condition. Finding a closed bedroom door firefighters attempted to open it but found some resistance. Forcing the door open, they found the victim lying face down towards the bedroom door. A 46-year old male victim was taken outside and emergency medical treatment performed by other crews.

Investigators determined that the fire started against a wall in the living room, near a plant stand with a marble base was located. Speaking with an occupant of the apartment, who was traveling at the time of the fire, stated that both occupants from that location routinely burned candles. An unattended candle is believed to have ignited the fire that spread to other combustibles. The building valued at \$200,000 with \$30,000 in contents suffered structural losses of \$40,000 with contents suffering \$20,000.

Kenneth J. Tremblay, 2006, Firewatch, *NFPA Journal*, November/December, 21-22.

Candle Fire Leads to Four Deaths, Pennsylvania

Lack of smoke detectors failed to adequately alert the occupants to a fire started by an unattended candle left in a first floor bathroom. Four of the six occupants died as a result of the fire and two others were injured from smoke inhalation and while trying to escape. Firefighters arrived and attempted to search the interior of the home, just as flashover occurred igniting all first floor contents and rapidly spreading the fire to upper the upper floor and attic.

The two-story, single-family home was constructed of wood framing and measured 25-feet by 25-feet with a pitched roof covered by shingles. Conflicting reports from survivors stated smoke alarms were present, however investigators did not find any within the debris. There were no sprinklers.

A neighbor detected the fire at 1:56 a.m. and called 911 to report it to the fire department that responded and arrived within five minutes. On arrival the incident commander observed heavy, black and dark brown smoke pushing from two sides of the building and reports of at least multiple people still inside the building. One surviving occupant had taken refuge on the roof and needed immediate rescue, only to fall to the ground before firefighters could reach him.

Command initially ordered a water supply to be established and a hose line stretched to the dwelling for all hands to search for trapped occupants. The sudden ignition of the first floor contents from flashover forced firefighters from the home, as a deck gun was used in blitz attack to knockdown the heavy fire. In addition, heat from the fire was also affecting a nearby exposure as firefighters rushed to protect that home. Once the heavy fire was knockdown crews reentered the dwelling and found three of the victims and removed them from the upper floor. Partial collapse of the roof forced firefighters from the building a second time, as the fire was fought defensively. Later a team of firefighters found a fourth victim in the debris.

Investigators determined that an unattended candle ignited unknown combustibles in the first floor bathroom and spread undetected within the residence. The building lacked electricity and the candles were used for illumination purposes. Surviving the fire was a 57-year old male victim who fell from the roof and also a 14-year old female who suffered smoke inhalation. The dead included two 15-year old females, a 3-year old male, and a 49-year old female. The home and contents valued at \$35,000 were a total loss.

Kenneth J. Tremblay, 2006, Firewatch, *NFPA Journal*, May/June, 36.

Unattended Candle Ignites Fire Killing Three Children, Texas

Electrical power shut off to an apartment due to non-payment of the utility bill, led to the use of candles for illumination and to a fire that killed three. Contributing to the deaths and delay in detection was the removal of electrical power to the units hardwired smoke detectors. Although the units had a battery backup, the low battery alarm caused the tenants to remove the batteries rendering the alarms useless. Investigators suggested that the hardwired smoke detectors should have been connected to the uninterrupted building supply rather than the individual apartment circuit.

The two-story, townhouse-style apartment building was constructed of wood framing with an asphalt shingled roof and the unit measured 35-feet by 35-feet. The first floor included a living room, dining area, kitchen and master bedroom with bathroom. Unenclosed stairs led to a second bedroom, study, bathroom and a loft overlooking the first floor living space. Hardwired smoke detectors were installed and located on the first floor near the master bedroom and on the second floor loft area near the stairs. There were no sprinklers. The apartment was located in a building with eight other units and in a complex with 17 similar buildings totaling 250 units.

A candle placed on a paper food container for several hours burned down and ignited the container in the first floor master bedroom. Flames spread to the plastic housing of a fan and a nearby mattress and box spring stored upright against a wall. A neighbor passing by the apartment smelled smoke and discovered the fire at 9:58 p.m. Yelling for others to help, the neighbor broke an exterior window and tried to use an available 2-1/2 pound fire extinguisher on the flames without success. Fire was drawn to the open window and filled the apartment with smoke and heat. During the fire extinguishment three girls were found by firefighters in the second floor bedroom. Killed in the fire were a 6-year-old, 5-year-old, and a 2-year-old girl all succumbed to smoke inhalation. The report states that the children were abandoned, however it does not specify if it was before or during the fire event. Combined damages to the building and contents were estimated at \$60,000.

Kenneth J. Tremblay, 2006, Firewatch, *NFPA Journal*, March/April, 28-30.

Candle Ignites Fire in Basement Apartment, Nebraska

A fire that burned a sofa, coffee table and some other combustibles eventually burned itself out, but not before fatally injuring the occupant of a basement bedroom. The fire occurred in a duplex, where basement bedrooms were rented out to single occupants. Lack of egress windows and smoke alarms contributed to the victim's death.

The single-story, wood framed constructed home-contained two living units on the first floor and each had a bedroom located in the basement occupied by other renters. The 50-foot by 20-foot dwelling had only a smoke alarm located on the first floor hallway near sleeping areas. There were no sprinklers and all units of the building were occupied.

One of the basement renters smelled smoke and alerted other occupants and the fire department at 6:08 a.m. The occupant did not know if the other basement renter was home at the time, but relayed information to emergency responders that he may be home. Fire crews arriving six minutes later found light smoke coming from the building with similar smoke conditions inside the structure but no fire. Searching the lower level they forced a door to one of the bedrooms and found the interior was involved in fire but it had nearly extinguished itself. Searching further the victim, a 28-year old male, was found leaning against a dryer unit in the rented space.

Investigators determined that a candle left burning on the floor ignited the upholstered sofa and spread to a wooden table and other combustibles. Producing heavy smoke, the victim suffered severe smoke inhalation and was not able to be revived. A coroner's report stated he 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 other occupants, who were sleeping at the time, escaped unharmed. Damage to the structure having a combined value of \$200,000 had approximately \$6,000 in loss.

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

Four Die in Candle Fire, Illinois

A candle left burning on top of a stereo speaker by a sleeping occupant ignited an adjacent couch, starting a fire that killed a couple and their two children.

The two-story, brick apartment building in which the fire occurred had concrete floors and a wooden mansard roof covered in asphalt shingles and slate tile.

Fire detection equipment in the 12-unit structure, which was 150 feet (46 meters) long and 50 feet (15 meters) wide, was limited to single-station, battery-operated smoke alarms. There were no sprinklers.

The 911 call reporting the fire came from a neighbor across the street at 5 a.m. and was followed by many more reports from cell phones. Firefighters arriving within five minutes of the alarm found fire coming from a balcony door.

Using a 2 1/2-inch hose line with a straight stream nozzle, the first-in fire crew knocked down the heavy fire coming from the second-floor unit. Several crews found and removed three victims—a woman, a toddler, and an infant—and took them outside for transport to the hospital. One fire crew completed extinguishment using a 1-3/4-inch line advanced up a ladder. Other firefighters and police officers removed more residents from balconies without incident.

Upon arrival, fire companies were also directed to a fourth victim found outside the building, a 25-year-old man. He lived long enough to tell investigators he was awakened by the sound of a baby crying. Finding the apartment filling with smoke, he picked up the baby but had to set her back down to call 911. The descending smoke layer caused him to abandon the call, and he lost sight of the infant. He left the building alone.

Firefighters later found the infant in the kitchen and the man's 24-year-old partner and 2-year-old son on a bedroom floor. They had all died of smoke inhalation.

The injured man told hospital staff before he died that his family had lit candles in the living room earlier in the evening. Investigators found the remains of several small, tea-type candles near the point of fire origin.

They also found the smoke alarm had no battery.

The value of the building and its contents was not reported, but damage to the building was estimated at \$150,000, and damage to the contents was estimated at \$2,500.

Kenneth J. Tremblay, 2005, *NFPA Journal*, September/October, 27-28.

Candle Fire Kills Three, Virginia

Three people died of smoke inhalation and a fourth was hospitalized when an early-morning fire started by an unattended candle on a first-floor balcony spread through a 24-unit condominium complex.

The unsprinklered complex consisted of four semi-attached, wood-framed buildings 100 feet (30 meters) wide and 200 feet (61 meters) long. The exterior walls were covered with vinyl siding, and the roof decks were covered with asphalt shingles.

The structures, each containing six units, had smoke alarms in the occupied spaces, but activation was delayed because the fire started outside and spread indoors through concealed spaces.

A passing police officer reported the fire at 5:20 a.m. Arriving firefighters noted heavy fire in a portion of the building and worked together with civilians to evacuate several occupants still inside the burning structure. A second and a third alarm were ordered as fire spread on all floors to the attic and roof.

Investigators determined that a candle left burning unattended on a balcony ignited a table, and the fire spread to the exterior siding and other combustibles. It then spread to the upper floors and the attic through concealed spaces, including a fireplace flue, and an exterior stairwell.

Firefighters found a 69-year-old woman, a 36-year-old woman, and a 16 year-old boy dead of carbon monoxide inhalation. Another resident was hospitalized with smoke inhalation, and two others were treated at the scene.

The value of the building was estimated at \$6 million. Structural damage was estimated at \$3 million, and damage to the building's contents was estimated at \$875,000. Eighteen of the 24 units were so badly damaged that residents could not return to them.

A fire department spokesman told reporters that "[We] will be stepping up [our] efforts to educate the community about the hazards associated with leaving candles unattended... [Fires involving candles are] no longer a seasonal fire safety issue". The department also reported that 20 fires have been attributed to unattended candles in the community in 2003.

Kenneth J. Tremblay, 2005, *NFPA Journal*, July/August, 18-19.

Candles Suspected in Deadly Blaze, Florida

A fire that may have been started by candles burning unattended in the living room claimed the lives of two people in a manufactured home. The single-family, one-story home measured 22 feet (6 meters) by 54 feet (16 meters) and was constructed of wood framing over a steel frame covered with metal siding and a metal roof. There were no smoke alarms or sprinklers.

The only surviving family member, a 9-year-old boy, told firefighters that his mother woke him up and told him the house was on fire. The 41-year-old woman rescued her son, then reentered the burning home in search of her 3-year-old son. Before she could do so, however, they both succumbed to the smoke and heat.

The fire department received a 911 call from a neighbor at 2:37 a.m., and firefighters arrived to find heavy fire and smoke filling the home. Neighbors told firefighters that two people were still trapped in the house, but unstable flooring and the partial collapse of the roof prevented rescue. As conditions improved, firefighters found the mother and son in a bedroom. Investigators determined that the fire started in the living room near an area where the woman had left approximately 20 candles burning unattended. The candles ignited nearby combustibles, and the fire spread undetected through the rest of the house.

The home, valued at \$60,000, and its contents, valued at \$20,000, were a total loss.

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

Alarm Alerts Occupant, Maine

An unattended candle ignited window curtains of a second floor bedroom. Smoke and heat triggered a smoke alarm allowing one occupant to investigate the cause and shut the door to the room of origin.

The occupant had left a candle burning in his bedroom unattended, as he slept on a couch in another part of the home. The candle's flame came into contact with the curtains causing a fire that spread to other combustibles in the room. When firefighters arrived, fire was coming from a rear window. The room of origin suffered heavy fire damage with significant smoke and heat damage to the rest of the second floor. The home valued at \$200,000 with contents of \$40,000 suffered structural losses of \$50,000 and contents losses of \$10,000. There were no injuries.

Kenneth J. Tremblay, 2004, *NFPA Journal*, September/October, 19.

Candle Fire Damages Home, Pennsylvania

A candle used to light a single-family house that had no electricity or gas fell onto a living room couch and started a fire that spread to the upper floors and along the home's exterior siding, threatening several exposures. The two-and-a-half-story, wood-framed house, which was built on a grade, had no fire detection equipment.

The fire department received a 911 call from one of the house's occupants at 4:18 a.m. and arrived minutes later to find heavy fire venting to the exterior from two floors. Although the incident commander could only account for three of the four people thought to be in the house, he couldn't commit interior crews because the flames were too intense. Fortunately, the missing occupant showed up shortly after firefighters began battling the blaze, which they eventually extinguished with the help of mutual-aid companies summoned by a second alarm.

Investigators determined that the fire began in the first-floor living room after the missing man and his girlfriend went out, apparently leaving a candle burning on a tray on the couch. Burn patterns indicated that the fire burned horizontally and vertically throughout the house and vented through the windows to the exterior siding. Despite a lack of smoke alarms, the three other occupants, who were asleep on upper floors, woke up during the fire and escaped. They were treated for burns at a hospital. A firefighter who suffered minor burns was treated at the scene.

Damage to the house, valued at \$50,000, is estimated at \$30,000, and damage to its contents, valued at \$6,000, is estimated at \$5,000.

Tremblay, Kenneth J., *NFPA Journal*, 98, no.5 (2004), pp. 16-17.

Smoke Alarm Alerts Napping Woman to Candle Fire, Wisconsin

A smoke alarm alerted a sleeping occupant to a fire started by a candle in an unoccupied bedroom. The occupant of the house, a 56-year-old woman, suffered singed hair and minor facial burns while exiting the fire. The fire occurred in a single-family, single-story manufactured home constructed of wood framing with asphalt roof shingles. The dwelling, which was 70 feet (23.3 meters) long and 14 feet (4.2 meters) wide, had a single, battery-operated smoke alarm near the bedrooms. There were no sprinklers.

The fire department received a 911 call at 5 p.m. and arrived to find smoke and flames coming from one end of the home. Crews advanced a hose line to the rear bedroom and extinguished the flames. The woman told police at the scene that she was napping in another part

of the house when the smoke alarm sounded and she went to investigate. Finding smoke and heat coming from the bedroom door, she gathered her pets and evacuated the home.

The woman told investigators that she had left a candle burning in the bedroom and one of her cats might have knocked it over. The heaviest damage occurred at the corner of the bedroom near the remains of a shelving unit, where firefighters also found was a plate that had been used as a candleholder and a large piece of candle wax. The property, valued at \$10,000, suffered losses of \$5,000. Damage to the contents, valued at \$2,000, was estimated at \$700.

Tremblay, Kenneth J., *NFPA Journal*, Online Exclusive, November/December 2004.
<http://www.nfpa.org/publicColumn.asp?categoryID=&itemID=21673&src=NFPAJournal>

Candle Ignites Fatal Fire, Georgia

Four members of a household of 10 died in a house fire started by a candle they'd been using for light because the utility company shut off their electricity for non-payment.

The single-family, wood frame house was 45 feet (14 meters) long and 20 feet (6 meters) wide. The first floor of the unsprinklered, two-story structure consisted of a living room, kitchen, dining room, bedroom and bathroom; there were five bedrooms and a bathroom on the second floor. After the fire, investigators found a smoke alarm on the floor under debris, but they don't know whether it operated.

The fire was reported at 12:35 a.m. Firefighters arrived to find fire and heavy smoke coming from the house and discovered neighbors using a ladder to help six of the occupants escape from the second floor. All six suffered smoke inhalation injuries and were taken to area hospitals. The injured included a 9-day-old boy, a 4-year-old boy, a 6-year-old girl, a 9-year-old boy, and two adults ages 25 and 21.

Firefighters found one of the victims, an adult, in the second-floor hallway, another adult and a child in a second-floor bedroom, and a second child in another bedroom. The 7-year-old girl, 4-year-old boy, 50-year-old woman, and 72-year-old woman had died of smoke inhalation.

Investigators determined that the 50-year-old woman, who was mentally impaired, occupied the bedroom in which the fire began after a candle she was using ignited combustibles.

Fire damage was limited to part of the second-floor hallway and the woman's bedroom, although the rest of the house incurred heavy smoke and water damage. The home, valued at \$39,000, suffered \$10,000 in damages. Its contents, valued at \$20,000, suffered \$5,000 in damage. There were no firefighter injuries.

Tremblay, Kenneth, J., *NFPA Journal*, 97, no.6 (2003), pp. 14-15.

Candle Ignites Decorative Linen Over Bed, Florida

When a candle ignited bedding in a condominium on the top floor of an 11-story building, the occupants had the presence of mind to close the front door when they left the unit, thus limited smoke damage to the condominium.

The unsprinklered, 85-unit concrete structure measured 195 feet (59 meters) by 50 feet (15 meters). Standpipe system and portable fire extinguishers were located throughout the building, and there were smoke alarms and manual pull stations in the common areas. Because the fire was confined to the unit of origin, however, smoke didn't reach the common areas so the internal fire alarm system didn't sound.

The fire began when a lit candle on a bedside table tipped over and ignited the bed's decorative linen canopy. The burning linen fell onto the bed, igniting the bedding and the

mattress, then spread to other combustibles in the room. The residents tried to extinguish the fire themselves, but the flames spread so quickly they called 911 at 12:44 a.m. and left the unit.

When they encountered arriving firefighters in the lobby, the unit's residents told the crews where the fire was and what was burning. An engine and rescue company attached hose lines to the standpipe on the fire floor and entered the condo to extinguish the fire, conduct a primary search and ventilate the unit. Firefighters also evacuated the building's top four floors.

Although the condo's occupants closed the unit's front door, they left the bedroom door open, allowing heat and smoke to damage the rest of the unit. Structural damage was estimated at \$10,000 and damage to the unit's contents was estimated at \$50,000. No one was injured.

Tremblay, Kenneth J., *NFPA Journal*, 97, no.4 (2003), p. 14.

Unattended Candle Fire Damages Apartment, Massachusetts

An unattended candle left in an entertainment center in the living room of a fourth-floor apartment ignited the room's furniture. Fortunately, a sprinkler extinguished the fire as it began to spread up the wall.

The five-story building, originally a mill, had a hard-wired fire detection system and wet-pipe sprinkler system, both connected to the municipal fire alarm system.

Firefighters received the alarm at 3:50 p.m. and arrived three minutes later to find that the sprinkler system had activated. Fire companies responding to the fourth floor reported smoke in the hallway and the sound of water running in the locked apartment. By the time they entered the unit, the sprinkler had extinguished the blaze.

The apartment's resident told investigators that she'd come home from work during a break to do some cooking and lit the candle to mask the odor. When she left to go back to work, she forgot to extinguish the candle, the heat from which eventually broke the glass candleholder. Molten wax dripping down the front and back of the entertainment center ignited the cardboard covering its back, and the fire spread up the wall until the sprinkler extinguished it.

Smoke damage in the unit of origin and common areas of the fourth floor, and fire damage to the entertainment center, its contents, and the wall behind it were estimated at \$10,000. There were no injuries.

Tremblay, Kenneth J., *NFPA Journal*, 97, no.3 (2003), p. 16.

Candle Ignites Fatal Fire, Michigan

A 24-year-old man died in a fire that apparently began when a candle he left burning on a wooden shelf in his basement bedroom ignited wooden wall paneling after he fell asleep. The early morning fire burned undetected until another member of the family on the first floor smelled smoke. The single-family home's two smoke alarms failed to activate because their batteries were dead.

The exterior of the two-story, wood-frame building was partially faced with brick, and the roof was covered with asphalt shingles. In addition to the bedrooms in the basement and on the first floor, there was a master bedroom on the second floor.

Firefighters responding to a 3:27 a.m. telephone call reporting the fire noted smoke coming from a side door and saw the blaze burning in the basement through a window. They mounted an interior attack and began searching the basement for the victim whom they discovered on a mattress on his bedroom floor. He was taken to the hospital, where he later died.

Discovering the remains of a candleholder, a candle and the shelf, which had been attached to the wall enclosing the stairs to the first floor, the fire investigator determined that the

candle ignited the wall paneling, and the resulting fire burned through the wall to the stairwell. He concluded that the location of the unapproved basement bedroom, with its single path of egress, and the non-functioning smoke alarms which failed to provide early warning of the fire directly contributed to the victim's death.

Three occupants escaped unharmed. Property damage to the dwelling, valued at \$175,000, came to \$45,000, while damage to its contents, valued at \$100,000, was estimated at \$25,000.

Tremblay, Kenneth J., *NFPA Journal*, 97, no.2 (2003), p. 22.

Three Boys Die in Unattended-Candle Fire, Minnesota

A candle left burning in the living room of a wood-frame house ignited combustibles, and heat and smoke spread to the second floor, where it fatally injured three sleeping boys. Smoke alarms on the second floor and in the basement were useless because their batteries were missing.

The two-story unsprinklered house, which was 52 feet (16 meters) long and 24 feet (7 meters) wide, had a 24-foot (7-meter) by 24-foot (7-meter) detached garage at one end. The house contained two apartments, a one-bedroom unit in the basement and a three-bedroom unit on the first and second floors. There were no smoke alarms installed on the first floor.

At 1:47 a.m., the police notified the fire department of a house fire with people trapped. A 40-year-old woman was standing outside when firefighters arrived, screaming that her babies were still inside and that there were people in the basement.

Fire crews advanced a 1 3/4-inch hose line through the front door to attack the blaze and search for trapped occupants. A second crew searching the basement apartment discovered that the occupants had already evacuated and that the fire hadn't spread to the basement. On the second floor, however, firefighters found two boys in one bedroom and a third boy in another bedroom. The boys, two 10-year-olds and an 11-year-old were taken to the hospital, where they were pronounced dead.

Investigators determined that the fire began in the living room near the front door when an unattended candle ignited nearby combustibles. The remains of a chair, a cabinet, and magazines were found near a steel candle holder. The fire spread up and out through the doors, living room wall spaces, and stairs. The house, valued at \$75,000, and its contents, valued at \$50,000, were total losses.

Tremblay, Kenneth J., *NFPA Journal*, 96, no.5 (2002), p. 18.

Unattended Candle Sparks Fire, Killing Three: Indiana

A 23-year-old woman and her two daughters, aged 11 months and 2 years, died when wind from an open window blew curtains across an unattended candle, spreading flames to nearby combustibles. The interior walls which were composed of 1 1/8-inch plywood paneling on wood studs contributed to flame spread.

The house had two smoke alarms, one battery-operated, and the other hardwired. Both were inoperable. There were no sprinklers.

The single-story, two-family, wood-frame house had a pitched roof covered with asphalt shingles. Each unit was 24 feet (7 meters) wide and 29 feet (8 meters) long and contained two bedrooms, a living room, an eat in kitchen, and a bathroom.

A passerby discovered the fire and called 911 at 9:45 a.m. Firefighters found the 11-month-old girl in a crib in the living room, which was involved in flames, dead from smoke inhalation and burns. Her mother and sister were found next to a bed, dead of smoke inhalation.

All three had been napping when the fire broke out. The mother was a heavy sleeper which may have kept her from waking up and detecting the fire.

The dwelling, valued at \$130,000, sustained \$75,000 in damage. Contents, valued at \$35,000, sustained \$25,000 in losses.

Tremblay, Kenneth J., *NFPA Journal*, 96, no.1 (2002), p. 20.

Four Die When Candle Ignites Curtains, Kentucky

A man and his three children died during an early-morning fire in their manufactured home when hot wax from an unattended candle dripped on curtains and the floor, igniting them. Candles were being used for illumination because the power was off.

The single-story, wood-and-steel-frame home, paneled in wood, was 12 feet (4 meters) wide and 65 feet (20 meters) long. It had no sprinklers and no smoke alarms.

A neighbor discovered the fire and called 911 at 12:09 a.m. Fire crews arrived 12 minutes later.

Initially informed that the house was vacant, firefighters began a defensive attack. About five minutes after their arrival, a neighbor reported that he thought people were inside. By this time additional resources arrived, allowing them to begin an interior attack. When they entered the house they found the body of a 6-year-old girl in one bedroom and those of her 27-year-old father, 3-year-old sister and 7-year-old brother in the second bedroom.

The blaze started in the living room at one end of the house and spread up the wall and into the hallway to the bedrooms. It appeared that the victims had been trying to escape when they succumbed to smoke inhalation. Dollar losses weren't reported.

Tremblay, Kenneth J., *NFPA Journal*, 96, no.1 (2002), p. 20.

Candle Fire Kills Two, Washington

An unattended candle sparked a blaze that killed two teenaged girls trapped in a bathroom that had only one exit.

The single-story, wood frame house, which had three bedrooms, 1½ baths, a kitchen and a living room covered nearly 1,200 square feet (111 square meters). A single-station smoke alarm was present but wasn't operational. There were no sprinklers.

Firefighters were dispatched to the scene at 2:07 a.m. and arrived four minutes later to find the house fully involved in flames and two girls trapped. Resources were divided into fire attack, ventilation, and search and rescue as entry teams began to attack the fire from exterior positions. Crews advanced two hose lines into the front of the house to control the blaze and search for the girls. A third hose line was positioned at the rear of the house to fight a porch fire fueled by stored tires.

The girls, aged 15 and 16, weren't found during a primary search. Crews found them during a secondary search in a bathroom off a bedroom at the center of house, which had previously been used as a beauty parlor. The bathroom had been added later, but neither the bedroom nor the bathroom provided a secondary exit from the house. The only exit was blocked by fire, heat, and smoke.

A 13-year-old girl who survived said she left an unattended candle burning in a plastic container. Heat from the flame melted the container and ignited a wooden headboard, as drop-

down flames spread to the bedding and other combustibles. The girl discovered the fire only after the house had filled with smoke and heat, and she and the only adult present escaped.

Contributing to the delay in alarm was a lack of an operating smoke alarm. The alarm wasn't working when it had been tested two weeks before the fire, and the situation hadn't been corrected.

The house, valued at \$100,000, and its contents valued at \$20,000, were a total loss.

Tremblay, Kenneth J., *NFPA Journal*, 95, no.6 (2001), p. 21.

Two Die After Candle Ignites Plastic Bathtub, Massachusetts

An unattended candle started an apartment fire that killed two children and injured three occupants. The fire burned rapidly, producing heavy black smoke, after the candle ignited a plastic bathtub enclosure.

The second-floor apartment was in a three-story building containing one 1,275-squarefoot (118-square-meter) unit on each floor. The wood-frame building had asbestos on the exterior walls and an asphalt roof. Each apartment had three bedrooms, a bathroom, a kitchen, and front and rear porches. Smoke alarms were present, but the type and their locations in the apartments weren't reported and it isn't known if they operated. There were no sprinklers.

A passerby saw smoke on the second floor and called 911 at 11:10 p.m. Firefighters arrived within four minutes to find that the blaze had spread from the second-floor bathroom into the hallway and kitchen. Firefighters from three engines, two ladder companies, and a rescue company brought the fire under control and made several rescue attempts. However, two girls, ages 9 and 5, died, and two other children, ages 7 and 11, were injured, as was a 35-year-old woman.

Investigators determined that a candle in a glass container had been lit and placed on the shelf of the tub enclosure. Heat from the candle ignited the tub enclosure, which burned vigorously, involving the entire bathroom. A closed door initially contained the heat and smoke, but flames broke through the door and into the hall and kitchen.

The fire department conducted flame testing on a similar tub enclosure from another apartment in the building. The sample began to melt within 20 seconds of exposure to an open flame, burning quickly and producing a significant amount of black smoke until it was nearly consumed by the flames.

The building, valued at \$91,000, sustained estimated losses of \$50,000. Content losses weren't reported. Two firefighters received minor injuries.

Tremblay, Kenneth J., *NFPA Journal*, 95, no.5 (2001), pp. 24-25.

Children Playing With Candle Leads To Three Deaths, Indiana

Despite a mother's effort to rescue her 2-year-old twins, all three died in a fire in their home after the twin's lit a candle in their plastic playhouse in the first-floor living room. When the playhouse ignited, the boy and girl ran upstairs to hide in a bedroom.

The mother, who was in the kitchen, noticed the fire was burned trying to extinguish it, and went upstairs to get the twins. The fire spread up to the second floor, when the mother opened a window to call for help.

The wood-frame, two-family duplex covered approximately 600 square feet (56 square meters). It had no sprinklers. A single smoke alarm in the attic was useless during the incident.

A neighbor saw the woman hanging out of the second-floor window calling for help and dialed 911 at 12:03 p.m. Responding firefighters could see white smoke coming from the home turn black as they approached.

After extinguishing the fire, fire crews found the bodies of the mother and one of the twins in a closet with the door partially ajar. The other twin was found outside the closet. All three had succumbed to smoke inhalation and burns. Firefighters rescued a third child, age 3 months, who survived with smoke inhalation and burn injuries. The baby was found on a bed, wrapped in a blanket.

The home, valued at \$65,000, and its contents, valued at \$10,000 sustained losses estimated at \$30,000 and \$10,000, respectively. No firefighters were injured.

Tremblay, Kenneth J., *NFPA Journal*, 94, no.5 (2000), p. 22.

Candles Used During a Hurricane Ignite Fire, Killing Two, Maryland

After their electricity was cut off, a family stockpiled candles in anticipation of Hurricane Floyd. An 8-year-old boy, who often woke during the night to read, lit four candles and dropped one on his bed, igniting the bedding and a box of matches. His delay in telling his mother allowed the fire to spread.

The unsprinklered unit was one of two in a two-story, wood-frame duplex that measured 25 by 25 feet (8 by 8 meters). The three bedrooms were on the second floor, along with two bathrooms and an office. Smoke alarms in the second floor hallway didn't operate, although the reason wasn't reported.

The power company had intentionally cut power to the area due to the advancing storm, and the family had prepared for the outage by stocking up on candles. The father wasn't home during the incident, as he had to work, but the mother and her four sons, ages 10, 8, 7, and 5 had all fallen asleep in the master bedroom.

At some point during the night, the 8-year-old awoke and took four candles from his parents' room so he could read. As he moved one of the candles, it fell onto his bed, igniting it. Unfortunately, the boy tried to extinguish the fire before alerting the others, and by the time he woke his mother, the blaze was well advanced. The 8-year-old, his mother, and his 7-year-old brother managed to escape, but the other two boys were still in the house when firefighters arrived.

A call was made to 911 at 3:51 a. m. from a neighbor's home, possibly by one of the family members who escaped. Even though the call came at the height of the storm, firefighters responded within eight minutes, only to find the 5- and 10-year-old dead of smoke inhalation in their parent's bedroom. The three surviving family members also suffered smoke inhalation injuries.

The dwelling, valued at \$125,000, suffered a loss of \$60,000. Its contents, valued at \$50,000, sustained \$25,000 in damage.

Tremblay, Kenneth J., *NFPA Journal*, 94, no.5 (2000), p. 22.

Unattended Candle Ignites Fire in Senior Housing, Kentucky

Smoke filled this complex for older adults when an unattended candle ignited combustibles in a bedroom. The fire killed a 74-year-old occupant of the room of origin and filled the apartment with black smoke, causing extensive smoke damage. A smoke detection system detected the fire, which was too small to activate sprinklers.

The six-story building was constructed of protected steel and concrete. It had a monitored smoke detection system and a wet-pipe sprinkler system, as well as portable extinguishers in the hallways.

An automatic alarm activation at 2:48 p.m. prompted a private alarm company to dispatch the fire department. En route, dispatch updated the crews, confirming a fire in an occupied apartment. Arriving four minutes after the alarm, firefighters found the alarms operating and noted light smoke. Directed by bystanders to a first-floor apartment, firefighters saw heavy smoke when they opened the door and quickly closed it again.

Firefighters set up two attack lines using two standpipe connections and advanced into the apartment to begin search and rescue operations. They discovered a small fire in a bedroom and removed the occupant, who was on the bedroom floor. Firefighters gave the victim to a medic unit for treatment. Meanwhile, the interior crews broke windows to ventilate and extinguish the remaining fire. Additional units, which were called as smoke filled the first floor hallway and spread to the second floor, began to evacuate residents.

The fire was started by a candle left burning on a nightstand. The 74-year-old woman in the apartment of origin was handicapped and infirm, and the candle was often used to mask odors caused by a medical condition. She died of burns and smoke inhalation after being transported to the hospital.

According to firefighters, the smoke alarms in the apartment weren't sounding when they entered, and it appears that the slow-burning fire didn't produce enough heat to activate the sprinklers.

Damage to the building was estimated at \$15,000. Many of the occupants were treated for smoke inhalation but refused transport to the hospital.

Tremblay, Kenneth J., *NFPA Journal*, 93, no.6 (1999), p. 19.

Candle Fire Kills One, Washington

A 48-year-old man died in a fire that started when a candle ignited combustibles in his bedroom in a single-family house that had no smoke alarms.

Residents of the one-story, wood-frame dwelling had been using candles the evening before the fire during a power failure. The power was restored during the night, and most of the candles had been extinguished, but apparently one was left burning in the victim's bedroom.

The victim and other residents of the house had been up and talking early in the morning, but by 7 a.m., the victim was in his room alone, with the door shut and barricaded for privacy. At 7:44 a.m., a next door neighbor detected the blaze and called the fire department. Firefighters arrived within four minutes to find smoke coming through a broken sliding glass door, and a man spraying water through the door with a garden hose.

Firefighters quickly extinguished the blaze. Firefighters found the victim in his bedroom, partially on the bed. His burns indicated that he had tried to stand but the intense heat in the room had caused him to fall back onto the bed.

Investigators determined that the blaze began on the dresser, where a candle ignited combustibles that then fell to the floor and ignited clothing behind and beside the dresser. Flames then spread up the wall. Other occupants of the house became aware of the fire when they noticed smoke seeping from around the bedroom door. They tried to alert the victim, but the heat and the blocked bedroom door prevented them from reaching him.

Fire damage was confined to the room of origin, but smoke spread throughout the house. Property damage was estimated at \$16,000.

Tremblay, Kenneth J., *NFPA Journal*, 93, no.4 (1999), p. 19.

Fire Spreads through Apartment Building, New Jersey

Three occupants and several firefighters were injured in an apartment building fire that spread through fire doors that had been propped open.

The five-story, 50-unit building, which was part of a larger complex, was of unprotected ordinary construction and measured approximately 150 by 150 feet. It contained hardwired smoke alarms and manual pull stations, as well as self-closing doors that opened into protected stairwells. It had no sprinklers.

Wind blowing through an open, second-floor bedroom window caused curtains to billow and knock a lighted candle from a dresser onto a bed, igniting the bedding and several stuffed animals. The apartment's occupant tried unsuccessfully to extinguish the blaze with a pot of water while her son called 911 at 4:14 p.m. When the two finally fled the apartment, they left the door open for firefighters.

As the fire grew, it spread into the hallway, where the stairwell doors had been wedged open with a chock, enabling smoke and flames to spread to the upper floors. Firefighters also found flames traveling in voids accessed through holes in the walls that had been covered for appearance, not for fire protection. This complicated extinguishment. Eventually, fire spread to all five floors, damaging the entire building.

Loss estimates weren't reported. Six firefighters and three occupants were injured.

Tremblay, Kenneth J., *NFPA Journal*, 93, no.2 (1999), p. 24.

Candle Fire Kills Four, Texas

An adult and three children died when a candle tipped over onto a love seat and ignited a fire in a single-family home. The occupants were using the candles for light because the utilities had been shut off.

The single-story structure of unprotected, wood-frame construction measured 50 by 30 feet (15.2 by 9.1 meters). Two unmounted smoke alarms were found, but neither had batteries. There were no sprinklers.

A 44-year-old man was sleeping on a sofa in the living room, and three children, ages 5, 4, and 3, were asleep in another room when a neighbor noticed the fire and called 911 at 11:00 p.m.

Investigators determined that a candle had fallen onto a love seat in the living room and ignited the upholstery. The fire smoldered for about an hour.

The adult's body was found in the living room. He had died of burns and smoke inhalation. Firefighters were able to rescue the three children, but all three died later of smoke inhalation.

Damage to the property, valued at \$15,000, and its contents, valued at \$5,000 was estimated at \$7,000 and \$3,000 respectively.

Tremblay, Kenneth J., *NFPA Journal*, 92, no.5 (1998), p. 17.

Candle Ignites Deadly Blaze, Connecticut

Three people died when a candle ignited a blaze in a two-story, four-unit apartment building.

The unit of origin, which measured 60 by 25 feet, was constructed of concrete block walls and wood joist floors and a wood roof covered with asphalt shingles. The first floor contained a kitchen, a utility/laundry room, and a living room. Two bedrooms and a bathroom were located on the second floor. A single-station, battery-operated smoke alarm located at the top of the stairs was missing its battery. There were no sprinklers.

At the time of the fire, the building was experiencing a power failure. Two girls, ages 6 and 7, were playing on the first floor, and four adults and two other children were on the second floor. The 7-year-old was using a candle to light a first-floor closet to look for toys when she accidentally ignited clothing. The girl told her mother, who tried to extinguish the fire.

Firefighters responded to a 7:54 a.m. call to 911 found fire visible in all windows on both floors. Staging an aggressive interior attack, they extinguished the blaze in 12 minutes using multiple hose lines. During their search, firefighters found two adults, ages 65 and 75, on a bedroom floor and the 7-year-old girl who started the fire hiding behind a closed second-floor bathroom door. All three had died of smoke inhalation.

Investigators determined that the mother had tried unsuccessfully for several minutes to extinguish the fire and had escaped with the 6-year-old girl, leaving a rear door open. Fire and smoke spread upstairs, as the father gathered two other children and tried to wake the other two adults. Breaking a second-floor bedroom window, he dropped the children to the ground, then jumped. Open windows and doors allowed the flames to spread rapidly, exposing the remaining occupants to heat and smoke.

Damage to the apartment, valued at \$210,000, was estimated at \$125,000. Its contents, valued at \$35,000, were a total loss. The father was injured while jumping from the window, and a firefighter was hurt when a ceiling collapsed on him.

Tremblay, Kenneth J., *NFPA Journal*, 91, no.5 (1997), pp. 21-22.

Candle Ignites Blaze That Kills Four Children, California

A candle that was being used for light in a single-family home ignited a fire that killed four children under age 7. Earlier in the day, the utility company had shut off the family's electricity due to extended nonpayment of bills.

The single-story dwelling of unprotected, wood-frame construction had a wood truss roof covered by asphalt shingles. The home, which measured 46 by 22 feet, contained three bedrooms, one bathroom, a combination living and dining room, a kitchen, and an attached garage. The only smoke alarm, which was hardwired with a backup power source, was located in the central hallway. However, it failed to operate because the electricity had been shut off and the battery was missing. The dwelling had no sprinklers.

The family was sleeping when, shortly after 10:00 p.m., the mother awoke and smelled smoke. Upon investigating, she found a fire in the living room and ran to the neighbors for help. She returned five minutes later and re-entered the dwelling, where she rescued two children from one bedroom. However, she was unable to reach four others in two other bedrooms.

A neighbor called 911 at 10:37 p.m., and firefighters arrived within four minutes to find flames coming from the house. Advancing a hose line to the front door, they knocked down the heavy fire in the living room and kitchen in two or three minutes. Using a second hose line, firefighters were able to control the blaze in 20 to 30 minutes, but not before it damaged adjacent exposures.

Two teams of firefighters conducted a primary search and quickly found the four children. Resuscitation efforts began immediately, and all seven occupants were transported to the hospital. The four children who'd been trapped, ages 1, 4, 5, and 7 died, and the mother and her two other children, ages 2 and 8, suffered smoke inhalation injuries.

Fire investigators determined that a candle left unattended in the first-floor living room started the blaze when it ignited a macramé hanger. The burning hanger dropped onto an upholstered couch, and flames spread to other combustibles in the living room and eventually to the kitchen. Investigators believe the fire burned for approximately 10 minutes before it was detected. This delay, added to the five-minute delay in alarm as the mother sought help from a neighbor, allowed flames to spread to ceiling/roof voids, causing the wood roof trusses to collapse into the burning room before firefighters arrived.

Damage to the structure valued at \$115,000, and its contents, valued at \$45,000 was estimated at \$65,000.

Tremblay, Kenneth J., *NFPA Journal*, 90, no.6 (1996), p. 22.

Three Die In Apartment Fire, Arizona

A 46-year-old mother and her two children, ages 6 and 2 died in a blaze that started when one of the children accidentally knocked over a candle.

The fire spread as the adult tried to extinguish it before calling 911. The two-bedroom, 800-square-foot apartment was located on the second floor of a 20-unit complex of unprotected, ordinary construction with masonry walls and wood-framed floors and roof. The apartment had a hardwired smoke alarm in the hallway near the bedrooms. There were no sprinklers.

The mother called 911 at 7:09 on Christmas night, but didn't make it clear that there was a fire. Therefore, police arrived first and called the fire department. Police found the woman inside the apartment and pulled her outside to the balcony. She had third degree burns on her face and chest, and was pronounced dead at the scene.

Two of the arriving firefighters stretched a hose line to the apartment and knocked down the heavy fire in the living room. They then searched the two bedrooms, bathroom, and living room, where one of them saw a child's head behind a couch. They moved the couch and found the two children, who had no pulses and second-degree burns over their entire bodies. The children were given CPR and medical treatment at the scene before being flown to a medical center, where they died of their injuries.

Investigators determined that one of the children was riding his bicycle in the living room and knocked over a lighted candle. The flame ignited combustibles, and the blaze spread as the occupant tried to extinguish it with water from a kitchen sink. Investigators couldn't determine why the smoke alarm which was found melted below its installed location hadn't operated.

Damage to the building and its contents, which were valued at \$256,000, was estimated at \$29,000.

Tremblay, Kenneth J., *NFPA Journal*, 89, no.6 (1995), p. 37.

Four Children Die in Fire Started By Candle, North Carolina

A candle that was being used to provide light in a house that had no electricity on the second floor started a blaze that killed four children. Lack of smoke alarms delayed detection.

The two-story, single-family home was of unprotected wood-frame construction. The 1,800-square-foot dwelling did not contain any smoke alarms or automatic sprinklers. The second floor, where five children slept, did not have electricity.

When the children were put to bed at night, candles were routinely left burning until they fell asleep. Around 10:00 p.m., a 2-year-old took a candle from the room in which the children were sleeping and placed it on stored clothing and bedding in an unoccupied bedroom. The combustibles eventually ignited, and the fire spread from the bedroom to the attic and through a doorway into the children's bedroom.

An 8-year-old girl detected the blaze, yelled to the others that there was a fire, and ran downstairs. Despite attempts by family members to rescue the other children, ages 9 months to 9 years, all four died.

The fire vented through windows and destroyed the entire second floor, causing approximately \$30,000 in damages to the structure, which was valued at \$70,000.

Tremblay, Kenneth J., *NFPA Journal*, 89, no.1 (1995), p. 34.

Two Die When Candle Ignites Gasoline During Power Outage, Florida

A 29-year-old woman and her 12-year-old stepdaughter were killed by a fire that was ignited accidentally in the family's manufactured home.

The two victims, along with the 35-year-old father, were in the bathroom filling a portable, liquid-fuel-fired lantern with gasoline after thunderstorms had interrupted electrical power in the area. The 12-year-old was holding a lighted candle for illumination, and one of the adults was pouring fuel from a 1-gallon container into the lantern. The gasoline accidentally spilled onto the clothing of the woman and the girl and was ignited by the candle's open flame.

The ensuing fire also caused the remaining fuel in the gas can to explode; the force of the blast blew the man out of the room. He was able to escape from the home with two other children – a boy, 14, and a girl, 8. Once outside, the father, who sustained burns to one arm, ran to a neighbor's house and called the volunteer fire department at 8:20 p.m.

The fire department first asked for help from several other county fire departments. This proved valuable because the remote location of the fire forced the use of booster-tank water exclusively, and the first department's water was exhausted before the fire was controlled.

One department reportedly refused to respond, claiming that it could not arrive in time to save anyone in a "trailer." As a result of this incident, a contract was signed mandating response to all structure fires.

The manufactured home and its contents, valued at \$5,800, were a complete loss. It had no automatic detection or suppression equipment.

Courtney, Neil, *Fire Journal*, 85, no. 4 (1991), p. 26.

Four Die When Candle Ignites Flammable Liquid, Massachusetts

Four people died in a fast-moving fire that began in the cellar and swept through the upper floors of this 2 ½-story wood-frame duplex.

One of the two units was occupied by a 57-year-old woman who operated a state-sanctioned foster-care home, her son-in-law, his wife, and five foster children. The building had smoke alarms on each floor, but it had no sprinkler protection.

Three of the five foster children, ages 4, 10, and 11, were preparing to run away when the fire broke out. They were descending a cellar stairway around 12:10 a.m., illuminating their way with a candle when one of them knocked one or more glass vessels containing illegally stored flammable liquids from their perch on the stairs. The containers fell to the floor and broke open. The child who was holding the candle also fell, dropping the candle which ignited the spilled liquid. The three children escaped unscathed, but the fire quickly spread up the cellar stairway and into the main section of the house.

The smoke alarms performed satisfactorily, but the fast-moving fire trapped four of the occupants before they could escape. Firefighters removed the bodies of the owner and the two foster children who had not been running away from a second-floor bedroom and found the woman's 31-year-old son-in-law, who was handicapped with a back injury, in a stairwell leading to an attic bedroom. The victims were taken to various hospitals where they died of severe smoke inhalation and burns shortly after arrival.

The deceased man's 27-year-old wife was also taken to a medical facility, where she was treated for injuries she sustained when she jumped from an attic window.

The two-alarm fire did an estimated \$125,000 in damage to the house.

Courtney, Neil, *Fire Journal*, 84, no. 3 (1990), p. 26.

Appendix C.
**Candle Fire Summaries Previously Published in NFPA’s Catastrophic Fire Studies
and Large-Loss Fire Studies**

- Badger, Stephen G. “U.S. Multiple-Death Fires for 2006,” *NFPA Journal*, 101, no. 5 (2007) pp.60.
- Badger, Stephen G. “Large-Loss Fires in the United States-2005,” *NFPA Journal*, 100, no. 6 (2006), pp. 71.
- Badger, Stephen G. “Catastrophic Multi-Death Fires of 2003,” *NFPA Journal*, 98, no. 5 (2004), pp. 69.
- McCarthy, Robert S. *Catastrophic Multiple Death Fires in the United States – 2001*, Quincy, MA: National Fire Protection Association, 2002, p. 11.
- McCarthy, Robert S. “Catastrophic Fires of 2000,” *NFPA Journal*, 95, no. 5 (2001), p.76.
- McCarthy, Robert S. “1999 Catastrophic Fires,” *NFPA Journal*, 94, no. 5 (2000), pp. 58-59.
- Tremblay, Kenneth J. and Rita F. Fahy. “Catastrophic Fires,” *NFPA Journal*, 92, no. 5 (1998), pp .49-50.
- Tremblay, Kenneth J. “1996 Catastrophic Fires,” *NFPA Journal*, 91, no. 5 (1997), p. 49.
- Tremblay, Kenneth J. “Catastrophic Fires of 1994,” *NFPA Journal*, 89, no. 5 (1995), pp. 53, 59.
- Tremblay, Kenneth J. “Catastrophic Fire Deaths: The Numbers Are Back Up,” *NFPA Journal*, 88, no. 5 (1994), p. 97.
- Tremblay, Kenneth J. “Catastrophic Fires and Deaths Drop in 1992,” *NFPA Journal*, 87, no. 5 (1993), pp. 64, 67.

State, Date, Time and Number of Deaths:

Ohio, December 2006, 6:12 a.m., 5 deaths

The Building:

This two-story single-family home was of unprotected wood-frame construction.

Detection and Suppression Systems:

Unknown. The fire department had found smoke alarms in the home on a previous inspection, but firefighters found no evidence of any at the time of the fire.

The Fire:

This fire broke out in the first-story living room. Power to the house had been shut off prior to the fire and the occupants were using candles throughout the house for light. A candle on a coffee table burned down to the table and ignited it. The smoke and fire spread, blocking egress from the stairs.

Contributing Factors and Other Details:

A guest fell asleep in the living room, and the candle burned unattended. The guest and four occupants upstairs were killed.

Stephen G. Badger, 2007, "U.S. Multiple-Death Fires for 2006", *NFPA Journal*, September/October, 60.

State, Date, Time and Dollar Loss

Florida, October 2005, 6:47 a.m., \$8,500,000

The Building:

This one-story single-family house was of unprotected ordinary construction and covered 11,000square feet (1,021 square meters). The house was occupied by one adult and six juveniles sleeping.

Detection and Suppression Systems:

There was a complete coverage of smoke alarms. However due to a power loss caused by a recent hurricane the back up batteries were removed and used elsewhere. There was no fire suppression equipment present.

The Fire:

Winds of 30 to 45 miles per hour (48 to 72 kilometers per hour) blew a window covering into an unattended candle left burning in a first-story room. Other combustibles were soon involved and by the time, the occupants detected the fire the room was well involved and spreading to the attic and hallway area. Firefighters initially mad an interior attack until they noticed the roof was sagging. Fire fighters evacuated the building just as the roof collapsed.

Contributing Factors and Other Details:

Water supply was a problem for firefighters. There were no fire hydrants on the street. Drafting operations were begun to supplement water flow. One civilian was injured. The loss was &7,000,000 to the house and &1,500,000 to the contents.

Stephen G. Badger, 2006, 'Large-Loss Fires in the United States-2005,' *NFPA Journal*, November/December, 71.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
Louisiana March 2005 5:05 a.m. 11 deaths (three under age 6)	Two-story single- family townhouse of unprotected wood- frame construction.	Unknown due to extent of destruction.	A candle ignited bedding in a second-story bedroom. Two occupants attempted to remove the mattress from the house. Having difficulties with the front door, they placed the mattress on some cardboard boxes while they worked on the lock, until the mattress began flaming. At this point, these two family members escaped out the rear door. Two others jumped out a second- story window. Some then went to the front door and kicked it open but by then the front room was fully engulfed with fire, and fire was spreading up the stairs to the second story.	The family was using candles for light, since they just moved into the house and the electricity had not yet been turned on. Instead of evacuating, occupants attempted to move the mattress out of the dwelling. The occupants were not familiar with the dead bolt lock on the front door. Escaping occupants left the rear door open, allowing the wind to spread the fire. The victims were found in second-story bedrooms and a bathroom.

Stephen G. Badger, "U.S. Multiple-Death Fires for 2005," *NFPA Journal*, 100, no.5 (2006), p. 60.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
North Carolina July 2003 1:14 a.m. 6 deaths (two under age six)	One-story single-family single-wide manufactured home of unprotected wood-frame construction.	Partial coverage smoke alarms operated and alerted the occupants.	An unattended lit candle ignited combustibles.	Two victims were trapped under a partially collapsed ceiling. The other four were attempting to escape. Six people survived this fire in a bedroom with a closed door.
Stephen G. Badger, "Catastrophic Multi-Death Fires of 2003," <i>NFPA Journal</i> , 98, no.5 (2004), p. 69.				
Georgia June 2001 4:26 a.m. Six (one under age six)	One-story, single-family dwelling of unprotected ordinary construction.	None	The fire began in the den when candles left unattended on a coffee table ignited curtains, wall coverings and other furnishings. The fire blocked the front door, the only exit from the structure.	The occupants were using candles for lighting after the utilities were shut off. Time of day meant everyone was at home and asleep. There were no smoke alarms present to alert the occupants of fire. Three victims were found in the southeast bedroom; one in the southwest bedroom; one in the kitchen; and the other was found outside.
McCarthy, Robert, S., <i>Catastrophic Multiple Death Fires in the United States-2001</i> , NFPA, Quincy MA (2002), p. 11.				
Maryland June 2000 4:18 a.m. Five (two under age 6)	Three-story, single-family dwelling of unprotected ordinary construction.	None	A candle left sitting on a stereo speaker ignited the speaker, stereo, and CDs. The fire quickly spread to the walls and combustibles, traveling down the hall and up the stairwell to the third floor.	Everyone was asleep at the time of the fire and there were no smoke alarms present to warn the victims. The fire blocked the exits and there were bars on the second-floor windows. The dwelling's gas and electric service had been disconnected and the occupants were using candles for light. All five victims were found in a second-floor bedroom.

McCarthy, Robert, S., "Catastrophic Fires of 2000," *NFPA Journal*, 95, no.5 (2001), p. 76.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
Texas December 12, 1999 4:40 a.m. Five (two under age 6)	Single-family manufactured home; unprotected wood-frame construction; one story.	None	A candle ignited a tapestry in the living room, and the resulting fire spread throughout the home.	Firefighters found the victims in the bedrooms at each end of the manufactured home.

McCarthy, Robert, S., "1999 Catastrophic Fires," *NFPA Journal*, 94, no.5 (2000), p. 58.

Massachusetts December 3, 1999 6:13 p.m. Six firefighters	Vacant cold storage warehouse; heavy timber construction; five stories.	Unknown	The fire started when a homeless couple knocked over a candle. Two firefighters became lost searching for the two occupants, and four others died searching for their colleagues.	This vacant building was a known hangout for homeless people. The interior of the building was maze-like, and fire conditions changed rapidly.
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McCarthy, Robert, S., "1999 Catastrophic Fires," *NFPA Journal*, 94, no.5 (2000), p. 59.

California June 1, 1997 1:16 a.m. 5 deaths (one under age 6)	Single-family dwelling; unprotected, wood-frame construction; one story.	None	Decorative candles left burning in a first-floor living room ignited a wood bar, and flames spread to wood wall paneling. An open sliding door provided unlimited ventilation as the fire spread throughout the house.	A 27-year-old woman and four children, ages 9, 7, 6, and 2, were found in escaping positions.
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Tremblay, Kenneth, J. and Rita F. Fahy, "Catastrophic Fires," *NFPA Journal*, 92, no.5 (1998), pp. 49-50.

Mississippi February 3, 1996 7 deaths (1 under age 6)	Single-family dwelling; unprotected, wood-frame construction; one story.	None	Due to a power outage caused by an ice storm, a candle was being used for light. The candle was left burning over night in the living room and ignited a couch. Fire spread through the entire dwelling before neighbors detected it.	Four adults, ages 60, 44, 23, and 20, died, along with two teenager's ages 15 and 13. A 1-year-old girl also died. All of the victims were found in their bedrooms.
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Tremblay, Kenneth, J., "1996 Catastrophic Fires," *NFPA Journal*, 91, no.5 (1997), p. 49.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
Maryland February 26, 1994 11:41 a.m. 9 deaths (3 under age 6)	Single-family dwelling; unprotected ordinary construction; two stories.	None	A candle placed too close to a sofa bed ignited bedding. The fire spread to combustibles stored in the front room on the first floor and traveled up the stairway to the second floor.	<p>Residents were using candles because the electricity was shut off for nonpayment. Although it had been unrelated to the fire, lack of an operating central heating system led occupants to use a natural gas stove in the kitchen for heat.</p> <p>Paths of egress were limited because furniture and boxes of clothing were stored in the front and middle first-floor rooms.</p> <p>Fourteen people from three families lived in the dwelling. All but two were home at the time of the fire.</p> <p>A 14-year-old boy sleeping on the sofa bed detected the fire and escaped out a rear door. The other survivors were a 2-year-old boy, whose mother dropped him from a second-floor window, and the mother, who jumped from the same window. All the fatalities were located on the second floor.</p>

Tremblay, Kenneth, J., "Catastrophic Fires of 1994," *NFPA Journal*, 89, no.5 (1995), p. 53.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
Mississippi April 3, 1994 5:25 a.m. 5 deaths	Single-family dwelling; unprotected ordinary construction; one story.	None	A candle left burning on a table ignited combustibles in a living room. Flames were intensified by ventilation from a door left open by an escaping occupant and from a window fractured by the heat.	<p>The electrical power to the area was shut off for the scheduled repair of transmission lines damaged during an ice storm. The occupants arrived home at night during the outage and used candles for light, leaving one lit as a night light.</p> <p>A 16-year-old boy woke to the fire and tried to extinguish it. He yelled for other family members to get out and escaped through the front door, leaving it open. There were no other survivors.</p> <p>Two adults, ages 45 and 42, and three children, two age 12 and one age 18, died in the blaze.</p>

Tremblay, Kenneth, J., "Catastrophic Fires of 1994," *NFPA Journal*, 89, no.5 (1995), p. 59.

Arizona November 5, 1993 5:25 a.m. 6 deaths (2 under age 6)	Single-family dwelling; unprotected ordinary construction; one story.	A single smoke alarm was located in the kitchen. The improperly placed alarm did not have a battery.	Candles being used for lighting were left unattended when the family retired for the night and eventually burned away, igniting combustibles, such as clothing and papers. The fire spread into the kitchen, and smoke traveled undetected throughout the house.	News accounts of the fire stated that the electricity had been shut off due to nonpayment.
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Tremblay, Kenneth, J., "Catastrophic Fire Deaths: The Numbers Are Back Up," *NFPA Journal*, 88, no.5 (1994), p. 97.

Location, Date, Time of Alarm, Number of Deaths	Occupancy Type, Construction Type, Number of Stories	Smoke Alarms and Other Fire Protection Devices	Fire Origin and Path	Contributing Factors and Victim Locations
Pennsylvania October 2, 1992 5:04 a.m. 5 deaths (5 under age 6)	Single-family dwelling; unprotected ordinary construction; two stories	None	A candle placed in a wall-mounted medicine cabinet in a second-floor bathroom was being used for light because the electrical power had been shut off due to lack of payment. Two children, ages 5 and 6, either were playing with or accidentally knocked over the candle, which ignited combustibles in the room. The fire spread into the hallway, blocking the occupants' exit from the second floor.	The children returned to their bedrooms without waking the adults. Five children under age 6 were trapped in one bedroom and died. Three adults and two children in two other bedrooms climbed onto porch roofs and escaped.

Tremblay, Kenneth, J., "Catastrophic Fire and Deaths Drop in 1992," *NFPA Journal*, 87, no.5 (1993), p. 64.

Pennsylvania August 1, 1992 4:00 a.m. 4 deaths (1 under age 6)	Single-family dwelling, unprotected ordinary construction, three stories, vacant	None	A candle being used by squatters ignited adjacent combustibles in a second-floor bedroom. The fire spread to an interior stairway and vertically to the third floor, where the victims were found.	The property was abandoned. It did not have electricity, heat, or water utilities and was in very poor condition. The 38-year-old mother, who had evidence of PCP, a controlled substance, in her blood; a 13-year-old; a 10-year-old; and a 3-year-old died. A 17 year-old escaped by jumping from a third-floor window.
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Tremblay, Kenneth, J., "Catastrophic Fire and Deaths Drop in 1992," *NFPA Journal*, 87, no.5 (1993), p. 67.