

Hazard Report on Candle-Related Incidents



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U.S. Consumer Product Safety Commission
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CONSUMER PRODUCT SAFETY COMMISSION
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MEMORANDUM

DATE: MARCH 20, 1998

TO : James F. Hoebel, ES
Project Manager, Candles

Through: Mary Ann Danello, Ph.D., Associate Executive Director
Directorate for Epidemiology and Health Sciences

Susan Ahmed, Ph.D., Director
Hazard Analysis Division (EHHA)

FROM : Harpreet Singh, EHHA

Subject: Updated Hazard Report for Candle-Related Incidents

Attached is the updated report for candle-related incidents using the most recent available data.

Introduction

This memorandum presents the most recent available data on hazards associated with candles. Estimates of the number of residential structure fires and fire losses for 1985-1995 associated with candles were derived from the the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS). Estimates of the hospital emergency room treated injuries for 1985-1997 associated with candles were derived from the U.S. CPSC's National Electronic Injury Surveillance System (NEISS). Also, the In-Depth Investigation File (CPSC Investigated Incidents) was searched from 1985-1997 to obtain important details concerning injuries and deaths associated with candles.

Nationl Fire Estimates

Table 1 presents estimated residential structure fires and fire losses involving candles for 1985-1995. Candles were involved in an estimated annual average of 6,800 residential fires, which resulted in 680 injuries, 90 deaths, and estimated losses of \$74 million annually from 1985 through 1995, based on data obtained from the NFIRS applied to national fire loss estimates developed by the National Fire Protection Association (NFPA).

Table 1
Estimated Residential Structure Fires and Fire Losses
Involving Candles, 1985-1995

Year	Fires	Deaths	Injuries	Estimated Loss (Millions)
1995	8,700	80	990	\$123.4
1994	7,400	80	870	\$ 93.3
1993	6,600	80	670	\$ 84.4
1992	6,300	100	610	\$ 61.6
1991	6,200	60	670	\$ 83.7
1990	5,700	100	560	\$ 63.2
1989	6,600	100	690	\$ 63.7
1988	6,900	90	690	\$ 61.1
1987	6,700	100	600	\$ 50.6
1986	6,800	110	580	\$ 71.7
1985	7,200	70	600	\$ 57.2

Total	75,100	970	7,530	\$813.9
Annual				
Average	6,800	90	680	\$ 74.0

Source: The National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association (NFPA).

Note: - Estimates of aggregate fire losses for the nation are produced annually by the NFPA based on an annual sample survey of public fire departments. Candle fires reported in NFIRS are weighted so that they represent the same proportion of NFPA estimated U.S. residential structure fires as in the NFIRS database. The NFIRS is a nonprobability sample of fires attended by the fire service. It is believed to represent the overall national fire loss experience because of its large sample size.
- Fires were rounded to the nearest hundred, deaths and injuries were rounded to the nearest ten.

Table 2
Estimated Residential Structure Fires Involving Candles
by Ignition Factor, 1993-1995 Average

Ignition Factor	<u>Fires</u>		<u>Deaths</u>		<u>Injuries</u>	
	Number	Percent	Number	Percent	Number	Percent
Total	7,600		80		840	
Unknown	200		*		20	
Total Known Ignition Factor	7,400	100	80	100	820	100
Abandoned, Unattended	4,400	59	40	50	500	61
Combustibles Too Close	1,300	18	30	38	150	18
Child Play	700	9	10	13	70	9
Arson	300	4	*	*	20	2
Design Deficiency/Malfunction	100	1	-	-	10	1
Other	600	8	*	*	70	9

Note: Detail may not add due to rounding.

Fire estimates were rounded to nearest hundred, deaths and injuries were rounded to nearest ten.
Estimates less than ten are denoted by an (*).

Source: Estimates based on data obtained from the National Fire Incident Reporting System applied to national fire loss estimates developed by the National Fire Protection Association.

Table 2 presents the annual average of estimated residential fire data involving candles by ignition factor for 1993-1995 (3 most recent years). During this time, an estimated annual average of 7,600 fires were responsible for 80 deaths and 840 injuries annually. An estimated 4,400 fires were reported to have been caused by abandoned or unattended candles. These fires resulted in 40 (50%) deaths and 500 (61%) injuries. Combustibles too close accounted for 1,300 fires that resulted in 30 (38%) deaths and 150 (18%) injuries.

Injuries Treated in Hospital Emergency Rooms (NEISS)

Table 3 shows estimated hospital emergency room treated injuries associated with candles for the period of 01/01/1985 through 12/31/1997. For the most part, these injuries did not occur in fires attended by the fire service. From 1991 to 1997 there is a significant increase in the number of estimated injuries.₁

Table 3
Estimated Hospital Emergency Room Treated
Injuries Associated with Candles
01/01/1985 through 12/31/1997

Year	Estimated Injuries*	Hospitalized**
1997	8900****	150
1996	8400	190
1995	7000	240
1994	6300	320
1993	6000	140
1992	5700	330
1991***	5300	230
1990	3300	100
1989	3200	90
1988	2900	110
1987	3300	70
1986	3200	---
1985	4000	130

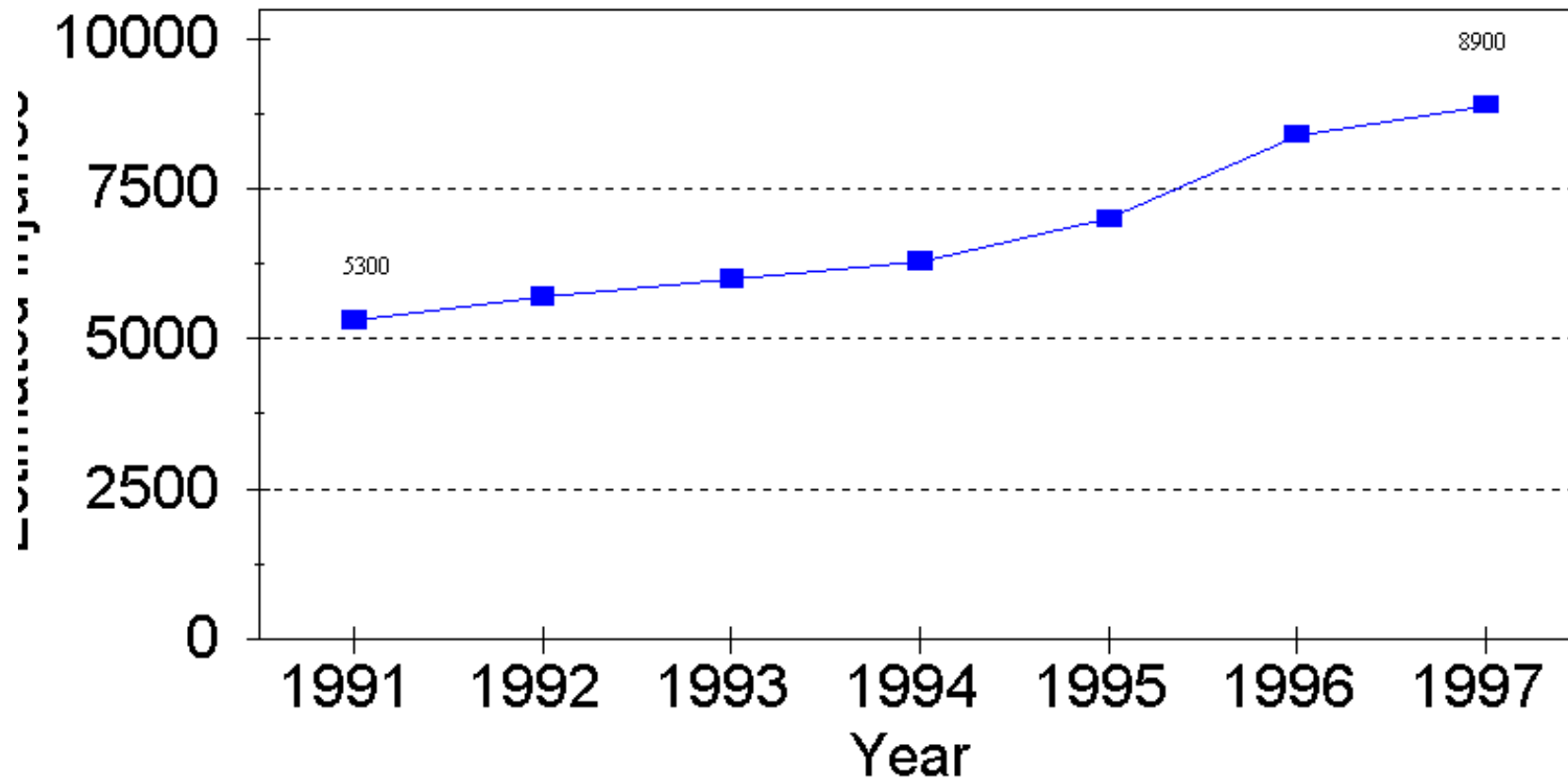
Source: National Electronic Injury Surveillance System (NEISS), U.S. Consumer Product

Safety Commission/EHHA

* Estimated Injuries are rounded to nearest 100.
** Hospitalized injuries are rounded to nearest 10.
*** Due to sample change in 1991, estimated injuries before 1991 should not be compared
with estimates after 1991.
**** Data is incomplete (Final estimates may be higher).
1 Paired t-test was done to determine a significant increase between years.

Candles

Estimated Hospital Treated Injuries



Note: 1997 Data are incomplete (Final estimates may be higher)

Source: National Electronic Injury Surveillance System (NEISS), U.S. Consumer Product Safety Commission.

Table 4 shows estimated hospital emergency room treated injuries associated with candles by hazard scenario for the most recent three years (01/01/1995 through 12/31/1997). Lacerations accounted for 39% of the injuries, burns accounted for 45% of the injuries and other miscellaneous injuries accounted for 15%. Among causes of laceration injuries, glass candle holders accounted for 14% of the injuries. Other candle holder materials such as brass, plastic, crystal, ceramic accounted for 7% of the injuries. Lacerations such as finger cuts from carving candles with knives and razor blades accounted for 18% of the injuries.

Among burn injuries, hot wax burns were responsible for 24% of the total injuries, flames for 5%, hot candle holders for 1% of the injuries, ignited combustibles for 6% of the injuries and other unspecified burns for 9% of the injuries. Fifteen percent of the total injuries occurred from falls and other unspecified causes.

Table 4
Estimated Hospital Emergency Room Treated Injuries
Associated with Candles by Hazard Scenario
01/01/1995 Through 12/31/1997

Hazard Scenario	Number of Injuries*	Percentage (%)
Lacerations		
Glass Candle Holders	3300	14
Other Candle Holders	1800	07
Other Lacerations	4400	18
	9500	39
Burns		
Hot Wax	5800	24
Flames	1200	05
Candle Holders	200	01
Ignited Combustibles	1500	06
Other Burns	2200	09
	10900	45
Miscellaneous		
Falls	500	02
Other	3300	13
	3800	15

Total	24200	100
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Source: National Electronic Injury Surveillance System (NEISS), U.S. Consumer Product Safety Commission/EHHA

* Estimated Injuries are rounded to nearest 100.

- Percentage may not add to 100 due to rounding.

Table 5 presents estimated emergency room treated injuries associated with candles by age groups for the period of 01/01/1995 through 12/31/1997. Fifty percent of the injuries occurred to victims between the ages of 25 and 64, and 31% of the injuries were to persons under 15 years of age.

Table 5
Estimated Hospital Emergency Room Treated Injuries
Associated with Candles by Age
01/01/1995 Through 12/31/1997

Age	# of Injuries	Percentage (%)
0-4 Yrs	3100	13
5-14 Yrs	4300	18
15-24 Yrs	4300	18
25-64 Yrs	12200	50
65+ Yrs	500	2
Total	24,400	100

Source: National Electronic Injury Surveillance System (NEISS), U.S. Consumer Product Safety Commission/EHHA

* Injuries are rounded to nearest 100.

- Percentage may not add to 100 due to rounding.

Investigated Incidents

Table 6 presents a summary of 160 investigations conducted by CPSC for the period of 01/01/1985 through 12/31/1997. Of the 160 incidents, 112 (70%) were fire related and 48(30%) were nonfire-related. Nonfire incidents are those in which candle flames did not ignite other combustibles. Fire incidents included candle holder fires which were limited to candle holders; candle holders breaking, shattering, and exploding which resulted in fire; clothing being ignited; ignitions of other nearby combustibles; and candle tipovers which resulted in fire. Nonfire incidents included candle holders breaking, shattering, and exploding; high flames or heavy smoke; clothing melted; and other unspecified incidents. Candle-associated incidents were selected for investigation during this period to learn details of hazardous incidents and may not be representative of all

incidents occurring. Of the 160 investigations, 36 were reported for the furniture and mattress/bedding studies where candles were the cause of the ignition.

Table 6
Investigated Candle-Related Incidents
01/01/1985 Through 12/31/1997

Fire/Non-Fire	Number of Incidents
Fire	
Candle Holder Fire	07
Candle Holder Broke/Shattered/Exploded	14
Clothing Ignited	15
Ignition, Other Combustible	55
Tipover	21
	112
Nonfire	
Candle Holder Broke/Shattered/Exploded	12
High Flames or Heavy Smoke	32
Clothing Melted	01
Other	03
	48
Total	160

Source: CPSC Investigated Incidents, U.S. Consumer Product Safety Commission/EHHA

Table 7 shows the investigated candle-related incidents by hazard and type of candle for the period of 01/01/1985 through 12/31/1997. Type of candle was not identified in one third of the incidents. Among those where type was identified, tealite, taper, and votive candles were cited most frequently.

Table 8 shows the investigated candle-related incidents by hazard and type of candle holder for the period of 1/1/1985 through 12/31/1997. Of the 160 incidents, 46 incidents (29%) involved glass candle holders and 21 (13%) involved ceramic holders.

Table 7
Investigated Candle-Related Incidents by
Hazard and Type of Candle
For the Period of 01/01/1985 Through 12/31/1997

Hazard	Type of Candle							Total
	Colonnade	Pillar	Taper	Tealite	Votive	Other*	Unknown	
Candleholder Fire	0	0	3	1	1	1	1	7
Candleholder Broke /Shattered/Exploded,Fire	0	1	0	3	4	5	1	14
Candleholder Broke /Shattered/Exploded,Non-Fire	0	0	0	0	5	4	3	12
High Flame or Heavy Smoke, Non-Fire	0	5	3	12	2	5	5	32
Clothing Ignited	1	0	0	1	1	1	11	15
Clothing Melted	0	0	0	0	0	0	1	1
Ignition, other Combustibles	1	1	5	6	0	16	26	55
Tipover, Fire	1	1	2	0	0	0	17	21
Other	0	0	1	1	0	1	0	3
Total	3	8	14	24	13	33	65	160

Source: CPSC Investigated Incidents
U.S. Consumer Product Safety Commission/EHHA

* Other includes citronella, homemade candles from kits and birthday candles.

Table 8
Investigated Candle-Related Incidents by
Hazard and Type of Holder
01/01/1985 Through 05/31/1997

Hazard	Type of Holder						Total
	Glass	Ceramic	Metal	Other*	Unknown	N/A**	
Candle Holder Fire	0	0	0	7	0	0	7
Candle Holder Broke /Shattered/Exploded,Fire	12	1	0	1	0	0	14
Candle Holder Broke /Shattered/Exploded, Non-Fire	12	0	0	0	0	0	12
High Flame or Heavy Smoke, Non-Fire	6	13	6	4	3	0	32
Clothing Ignited	3	0	0	2	9	1	15
Clothing Melted	1	0	0	0	0	0	1
Ignition, other Combustibles	10	5	4	3	26	7	55
Tipover, Fire	2	1	0	0	16	2	21
Other	0	1	1	0	0	1	3
Total	46	21	11	17	54	11	160

Source: CPSC Investigated Incidents
U.S. Consumer Product Safety Commission/EHHA

* Other includes plastic, wood, and terra cotta candle holders

** N/A include incidents where candle holder was not involved.

Table 9 shows investigated candle-related incidents by attended (when someone was in the room) and unattended; and burn time (how long the candle was burning) prior to the incident for the period of 01/01/1985 through 12/31/1997. Of the 160 incidents, burning candles were unattended in 109 (68%) of the incidents and were attended in 51 (32%) of the incidents. Candles were burning less than half an hour in 48 of the incidents, a half hour to one hour in 17 incidents, more than 1 hour in 44 of the incidents, and for an unknown time in 51 of the incidents.

Table 9
Investigated Candle-Related Incidents by Attended/Unattended
and Burn Time Before the Incident
01/01/1985 Through 12/31/1997

Attended/ Unattended	Burn Time Before the Incident				Total
	Less Than 1/2 Hour	1/2 - 1 Hour	More Than 1 hour	Unknown	
Attended	21	4	5	21	51
Unattended	27	13	39	30	109
Total	48	17	44	51	160

Source: CPSC Investigated Incidents, U.S. Consumer Product Safety Commission/EHHA

Summary

Candles were involved in an estimated 6,800 fires annually (1985-1995) that resulted in 90 deaths and 680 injuries. Based on the NFIRS data, the estimated number of fires, and injuries seem to indicate an increase in 1994 and 1995; however, deaths seem to be fairly constant. Estimated injuries treated in emergency rooms have increased significantly from 1991 to 1997. Most injuries were nonfire-related burns, or lacerations. Among the 160 CPSC investigated incidents for the period of 01/01/1985 through 12/31/1997, 112 were fire related and 48 were nonfire. The ignition of nearby combustibles and tipover of candles were the main factors in the investigated fire incidents. High flames or heavy smoke and candle holders breaking, shattering, and exploding were the major factors in the nonfire incidents. Among the 160 CPSC investigated incidents, there were 61 injuries and 26 deaths. Candles were unattended while burning in 109 of the 160 (68%) incidents. Candles were burning for less than half an hour in 48 of the 160 incidents and more than one hour in 44 of the 160 incidents.

Attachment