SHINING LIGHT ON THE SLOGAN "CANDLE WITH CARE"

LEADING COMMUNITY RISK REDUCTION

BY: David A. Luers
Burlington Fire Department
Burlington, Iowa

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

April 2004

CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

ABSTRACT

Due to a renewed popularity in candles, fires caused by candles have risen, as have fire deaths. The problem was in the past 15 years there have been five fire deaths in the city of Burlington, Iowa caused by candles. Three of the fire victims were children and two were adults over 65 years of age. The purpose of this research was to identify ways to reduce the number of fire deaths caused by candles. The descriptive research method was used to answer the following questions.

- What are the reasons for the increase in the consumer use of candles?
- In what way are candles used that result in fires?
- What engineering controls are available to enhance the safe use of candles?
- What educational programs are available to promote the safe use of candles?

The approach included interviews and literature review to determine women between 18 and 24 years of age were the biggest users of candles. Candle fires were most likely to start in the bedroom, bedding and clothing most commonly spread the fire, and children under 4 and adults over 60 were the most likely to die in a residential fire.

The recommendations derived from this research included contacting and encouraging the NFPA, USFA, and the CPSC to include the phrase, ”make sure an operational smoke alarm is on each level of the home” on their respective safe candle use literature. Additionally, the formation of safe candle use literature directed to the identified consumers of candles, the initiation of a smoke alarm/battery give away and installation program. And, lastly, encourage the Fire Prevention Bureau to become a leader in our community and encourage the installation of residential sprinkler systems.

TABLE OF CONTENTS

INTRODUCTION

The City of Burlington, Iowa spends a considerable amount of resources responding to the emergency needs of its' citizens. After taking a National Fire Academy course, Leading Community Risk Reduction, this author accepted the challenge offered during the course to go back to our communities and make a difference. In reviewing related statistics a problem became apparent. In the past 15 years there have been five fire deaths in the City of Burlington, three children and two adults over 65 years old, and in each case candles caused the fires. The purpose of this research is to identify ways to reduce the number of fire deaths caused by candles. The study used the descriptive research method to answer the following research questions:

- What are the reasons for the increase in the consumer use of candles?
- In what way are candles used that result in fires?
- What engineering controls are available to enhance the safe use of candles?
- What educational programs are available to promote the safe use of candles?

Background and Significance

`While attending the National Fire Academy's Leading Community Risk Reduction course the class was challenged to evaluate risks in our communities and then find innovative ways to reduce those risks. Upon returning to Burlington I asked the City Fire Marshal, Mike Hartman, how many fatal house fires we experienced within the past 10 or 15 years and what was the cause of the fires. He responded, "In the past 15 years there have been five civilian deaths; three children and two adults over 65 years old. In each case the cause of the fire was listed as candle". (Hartman)

Research revealed that Burlington is not unique in the frequency of candle fire deaths or

the age groups of the victims. The Consumer Product Safety Commission (CPSC) reports ”Candle deaths increased 750 percent from 1980 (20 deaths) to 1998 (170 deaths)”. The CPSC mirrors the Burlington data by stating, “children under age 5 have a fire death rate more than twice the national average”. (June, 2001, ¶ 1) In an article written by Fleming D. Madrzykowski of the National Technical Information Service (NTIS) he stated in his review of residential sprinklers that children 4 years of age and under and adults 60 years of age and older are more likely to die in a fire than other segments of the population.

Burlington, like many other communities in the Midwest, has faced tight budgets and as a result reduced the numbers of firefighters. The Burlington Fire Department (BFD), with its paid staff of 46, attempts to fill the emergency response needs of the citizens by accepting the challenges of firefighting, emergency medical services, regional airport crash fire rescue, technician level hazardous materials response along with technical rescue. Reducing personnel due to budget constraints also impacts the emergency response capabilities of the department. The citizens still expect their fire department to be the leader in community risk reduction, whether it is prevention or suppression. As leaders of the fire service, we need to be proactive and find ways to reduce the frequency, and the severity, of fires which would reduce the burden of the Burlington emergency responders.

This Applied Research Project (ARP) relates to Unit 2, Assessing Community Risk, taught in the Leading Community Risk Reduction course, specifically the Risk Assessment Analysis activity 2.1 (National Fire Academy [NFA], 2003, SM 2-17). This research project also relates to the United States Fire Administration’s 5 year Operational Objectives of reducing by 25% the loss of life of the age group 14 years old and below, as well as a second objective of reducing by the same percentage the loss of life of the age group 65 years old and above by

reducing the incidences of fires caused by candles.

Literature Review

This literature review is important to the Burlington Fire Department, its firefighters, and the citizens they serve. The problem that initiated this study is in the past 15 years there have been five fire deaths in the City of Burlington, three children and two over 65 years old, and in each case candles caused the fires. The fire service and the insurance partners have done a remarkable job educating the public about the dangers of fires, keeping lighters and matches away from children and engineering controls on lighters to make them more child proof. But there is one area where fires and, consequently, fire deaths has increased and that is the use of candles. According to the Burn Survivors Throughout The World, Inc. (BSTTWI), "The United States Consumer Products Safety Commission released a report stating that the deaths from residential fires fell from 4,500 in 1980 to 2,660 in 1998. The Safety Commission also stated that candle-related fire deaths increased from 20 to 170". (¶ 2)

With the realization that locally we are falling behind in this area, it is the intent of this study to lay the groundwork for a positive change through sound research. To do this four questions are addressed. The first, what are the reasons for the increase in the consumer use of candles? In the dark days, before electricity, candles were a necessary part of life. Religious and cultural rituals were big users of candles and still are in today's ceremonies.

"Candles are integral to cultural and religious rituals, showing up on Christian advent wreaths (representing penitence and joy), at the center of Kwanzaa (denoting desired qualities), and on the Hanukkah menorah (commemorating an ancient miracle). On Roman Catholic feast day called Candlemas, all the ceremonial candles are blessed". (Foster, 2004, ¶ 4) In modern times, according to a report by Symons, multiple drivers are swelling sales in the candle

category; "They include the continuing home décor trend and the fact that candles are an affordable way to add a touch to a room… Home décor is a trend that is fueling the increased use of candles today as well as aromatherapy". (1999, ¶ 3)

Aromatherapy is making its mark as a significant reason for burning candles as stated in a report from the National Fire Protection Association, "An increasing demand for candles has driven a once-modest market for the religious, the romantic and those ridden with power outages to a booming enterprise where aromatherapy and room fresheners now rule." (NFPA, 1998, ¶ 3)

In an effort to determine whom the main purchasers of candles are, demographics were reviewed. In an article entitled Wax Buildup, the authors listed Hispanics purchasing 43 candles compared to Blacks who purchased 25 candles, and Whites who bought 30. "But 18-24 year olds win the prize for excessive candle consumption, buying on average 59 candles a piece, double the number of every other age group" (Fetto and Gardyn, 2002, ¶ 1). The National Candle Association adds some additional light as to who is buying all these candles when the article listed candles are used in 7 out of 10 households. Continuing with a report from a consumer survey, 96% of all candles purchased are bought by women. "Women are more frequent users than men, and younger people tend to use candles more often than older adults." (NCA 10-14) The United States Consumer Product Safety Commission (CPSC) listed results of a pilot study and found that many consumers use candles because they enjoy the home fragrance properties of scented candles. Candles are often frequently used for religious purposes, for light, and for aromatherapy. Ambiance and heat were also mentioned as reasons for candle use. To sum up the question, what are the reasons for the increase in the consumer use of candles, Vanessa Facenda stated in an article entitled Waxy Profits, "Whether consumers are buying candles to accent their homes or to set a mood, the category is being driven by the fact that

consumers are simply burning more candles." (February, 2000, ¶ 1)

In what ways are candles used that result in fires is the next question researched. According to an article by the Pennsylvania Association of Mutual Insurance Companies (PAMIC), "Though fires can start in any room the bedroom is the most common area for a candle fire to start." (n.d., ¶ 4) This is substantiated by the National Candle Association (NCA), which listed the bedroom as the most common room for a candle fire to start at 44.5% followed by the living room, family room, or den.

The CPSC agrees that the bedroom is the most likely place for a fire to start (41 out of 79 incidents). In addition, the CPSC listed tables, dressers, and nightstands where candles that start fires are most frequently placed. The items ignited most often were bedding followed by paper, cardboard, and clothing. The consumer was at home when the fire started in about half of the fire cases, but often they were not in the room of the fire origin. Just because a candle is used in a room doesn't explain why they cause fires. The American Society for Testing and Materials (ASTM) listed the following reasons candles cause fires; abandoned or unattended, combustibles too close, and child play. Collectively these three represented 85% of the ignition factors.

The NFPA reports that 37% of the candle fires occurred because candles were left unattended, abandoned, or inadequately controlled. Nineteen percent occurred because some form of combustible material was left too close to the candle and nine percent occurred because children were playing with candles or something flammable near the candles. In addition to these statistics, the PAMIC listed people falling asleep while a candle was burning as an additional cause. The National Candle Association reported that consumers would burn candles just less than 3 hours.

The next question, what engineering controls are available to enhance the safe use of

candles, was asked. Research looked at the success the CPSC had with childproofing cigarette lighters. The Consumer Product Safety Commission (CPSC) approached the candle industry through the National Candle Association (NCA) in 1997 with the following question: "Could anything be done to improve candle safety and minimize fatalities and injuries associated with candle fires?" (Becker, 2003, p. 3) The result was the formation of two task groups. The first was a Terminology Task group. "…Candles were new products to the ASTM standards process and, therefore, there was a need to define the terms that would be used in the standards." (p. 4) This task group published the terminology standard F 1972, Guide for Terminology Related to Candles and Associated Accessory Items. The second task group formed was the Fire Data Evaluation Task group. Their objective was to identify the causes of candle fires by looking at available data to those specific issues. They reported abandoned or unattended candles caused 60% of the candle fires, with combustibles too close and child play the next two most common causes. Collectively, these three represented 85% of the ignition factors. (Becker) As a result of this ignition factor data, a Label Task group was formed. This group was directed to develop a labeling standard with specific language requirements designed to inform and educate the consumer about the recommended use of candles. This resulted in a Standard Specification for Cautionary Labeling for Candles Burned in a Home reading, keep burning candle within sight, keep out of the reach of children and pets, never burn on or near anything that can catch fire. (Becker) The NFPA acknowledged this task group's work on candle fire safety. "ASTM International's Candle Fire Safety Task Group, part of F15.45 Candle Products Subcommittee, is working to develop a standard testing protocol for candle fire safety issues, although they are focusing first on wax candles." (NFPA, 2002, ¶ 5) The NFPA also addressed a weakness in the study. "At present, each candle producer is responsible for testing its own products according to

its own standards" (¶ 5).

Due to the fact the candle industry is not yet able to engineer a fire safe candle, this research began looking at prior engineering successes in fire prevention, smoke alarms, and residential sprinklers. The NFPA stated in an on-line fact sheet that smoke alarms are the residential fire safety success story of the past quarter century. Since the single battery powered smoke alarms have been available, home fire deaths have been reduced in half. NFPA continued with an estimate of 95% of homes have at least one smoke alarm today. But a disturbing report continues, "In one quarter of the reported fires in homes with smoke alarms, the devices did not work. Households with non-working smoke alarms now outnumber those with no smoke alarms" (January, 2004, ¶ 4). Some fire departments are already addressing the issue of old or outdated non-operational smoke alarms. The Ames, Iowa Fire Department is making a difference in the risks of its citizens with a Free Smoke Detector Program. This program targets homes within the high-risk group consisting of the elderly, the young, and the low-income households. Within this group the Ames firefighters will install the smoke detectors free of charge. (City of Ames) With all the successes of smoke alarms, the USFA is striving for an even higher goal.

In an article entitled Review of Residential Sprinkler Systems, Fleming D. Madrzykowski identifies sprinkler systems as a successful automatic suppression system that has worked well for industry for more than 100 years. However, he also said "Historically, the place which has offered the least amount of fire protection to occupants, was and still is their own home" (Abstract, ¶ 1). The target group that could benefit the most according to this article is the same group identified as the most at-risk of fire both in Burlington and across the nation. "…Children 4 years of age and under and adults 60 years of age and older are more likely to die

in a fire than other segments of the population." "Because these high-risk groups may depend on assistance to exit the dwelling, anything less than automatic suppression may not be enough to save them". (p. 3) As if the author was fueling the desire to meet all of the USFA's 5-year Operational Objectives, Madrzykowski concludes the article with "Another group that can benefit from the use of residential sprinklers are firefighters. The majority of firefighter deaths and injuries on the fire ground occur at residential fires". (p. 4) The USFA (2004) gives additional insight on the argument for residential sprinklers. "Millions of Americans have installed smoke detectors in their homes in the past few years, but a detector can only alert the occupants to a fire in the house [*sic*] cannot contain or extinguish a fire Residential [*sic*] sprinkler systems can!" (p. 1)

In a USFA press release dated July 15, 2003, the fire administrator echoed the sentiments of previous authors,

> "We know how important residential sprinklers systems are." said U.S. Fire Administrator, R. David Paulison. "Every year, more than 3,000 people lose their lives in home fires, and most of these deaths are among the elderly, the disabled, the low income and the very young. Sprinkler systems are one way to reduce that number and to save the lives of community residents served by the nation's fire service." (¶ 2)

Lastly, this research looked at what educational programs are available to promote the safe use of candles. As Becker (2003) identified earlier, the ASTM was given the question "Could anything be done to improve the candle safety and minimize fatalities and injuries associated with candle fires?" (p. 3) This resulted in a Standard Specification for Cautionary Labeling for Candles Burned in a Home; keep burning candle within sight; keep out of the reach of children and pets; never burn on or near anything that can catch fire.

The NFPA (1999) went a little further with their recommendations by suggesting the following safety tips when using candles, some of which they listed in their Candle With Care brochure.

- Extinguish all candles when leaving the room or when going to sleep.
- Keep candles away from items that catch fire such as clothing, books, paper, curtains, Christmas trees, flammable decorations, or anything else that burns.
- Make sure candles are placed on a stable piece of furniture in sturdy holders that won't tip over. Candles should fit the holders securely and holders should be made from materials that can't burn.
- Use flashlights for temporary lighting in power outages, not candles. Keep plenty of fresh batteries on hand during thunderstorm seasons.
- Don't allow children or teens to have candles in their bedrooms
- Don't place lit candles in windows, where blinds or curtains can close over them.
- Do not use candles in places 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 candleholder or decorative material nearby?
- Avoid candles with combustible items embedded in them.
- Extinguish taper and pillar candles when they get within two inches of the holder or decorative material. Votives and container candles should be extinguished before the last ½ inch of wax starts to melt. (¶ 6)

In a journal archive within the NFPA (2003) website, The Massachusetts Public Fire and Safety Education Task Force set up a candle committee. This committee developed a "Candle

Circle of Safety" logo that lists their top five messages aimed at preventing home candle fires.

- Burn candles inside a 1-foot circle of safety, free of anything that can burn.
- Extinguish candles after use. Never leave a burning candle unattended.
- Keep candles out of reach of children and pets.
- Use a sturdy metal, glass, or ceramic candleholder.
- Keep all matches and lighters out of children's reach. (¶ 11)

The Pennsylvania Association of Mutual Insurance Companies (PAMIC) includes the same message of using candles safely but adds one very important point that was missed by the others. "Make sure your smoke detectors are in working condition on all levels of your home." (p. 2)

In summary, 18 to 24 year olds buy the most candles and women purchase 96% of all candles. In most cases, candles are purchased for their fragrance and ambiance. Forty-two percent of consumers will burn candles in the living room with an additional 18% in the kitchen. Only 13% burn candles in the bedroom yet 44.5 % of the fires will start in the bedroom. It is also noteworthy in that it is not this age group most at risk of death due to fires caused by candles. It is the very young and the older adults who are at risk. Additional research is warranted to discover personality traits of this target audience of 18 to 24 year old women in order to directly appeal to them with a safe candle use message.

Procedures

The first step in the research process was to interview the Burlington Fire Marshal to gain insight to the scope of the problem. In addition, contact was made by phone with Bridgett Cottrell, Federal Investigator for the United States Government Consumer Product Safety Commission. She was asked if the City of Burlington's data on candle fires was unique.

Bridgett answered that Burlington was not unique and directed me to the CPSC website to down load the CPSC report on candle fires. In addition to these interviews, the research process was to locate professional journals, periodicals, and Executive Fire Officer Program (EFOP) ARP's from the National Fire Academy's learning resource center. Most sources used were more recent than five years. Additional research was conducted via the Internet, primarily using websites and the State of Iowa EBSCOHost research companion located at the Burlington Public Library.

In researching the reasons for the increase in consumer use of candles, the following resources were discovered; Natural Health, Drug Store News, NFPA, American Demographics, CPSC, Discount Merchandiser. Each of these added some insight including religious, ceremonial, aromatherapy, décor, ambiance, and fragrance. How these candle uses caused fires included articles from PAMIC, NCA, CPSC and ASTM. Each article backed the other when stating the bedroom was the most common place where a candle fire started, and bedding was the most common material ignited by candles. The causes were also collaborated with abandoned or unattended, combustibles too close, and child play making up 85% of all ignition factors.

In researching what engineering controls are available to enhance the safe use of candles the CPSC, NCA, ASTM, NFPA, USFA and City of Ames web page were accessed. While a lot of effort went into studying the problem of candles causing fires, the only thing that came out of the study was a list of common terminology in the candle industry along with safe candle use messages. Becker (2002) sums up the candle industry progress in engineering a safer candle "…Each candle producer is responsible for testing its own products according to its own standards". (¶ 5) This researcher decided to go back to prior successes in risk reduction efforts and determine if the past can benefit the future. Smoke alarms and residential sprinkler systems

were researched in an effort to find a proven method of reducing the risk of fires caused by candles. The research was successful in finding several articles that identified the target population that can benefit from smoke alarms and residential sprinklers when using candles. The final question addressed was what educational programs are available to promote the safe use of candles. The ASTM, NFPA, MPFS and PAMIC websites were discovered and by far the NFPA had the most extensive listing of safety tips when using candles, but each touched on the same theme. The NFPA offers a brochure entitled Candle With Care while the Massachusetts Public Fire and Safety developed a Candle Circle of Safety logo which lists five messages of preventing home candle fires. Only the Pennsylvania Association of Mutual Insurance Companies added ”make sure your smoke detectors are in working condition on all levels of your home” to their safety message. (p. 2). While this research was intended to identify ways to reduce fire deaths caused by candles, it was limited in scope in the area of demographic research, and personality profiling, which would be needed to target those most likely to use candles, women and 18 to 24 year of age with a message that would have the most impact for that target group.

Definition of Terms

ARP	Applied Research Project.
ASTM	American Society for Testing and Materials.
Candle with Care	An NFPA safe candle use brochure.
CPSC	Consumer Product Safety Commission.
EBSCOHost	Elton B. Stephens Company, an electronic journal service sponsored by the State of Iowa and the Burlington Public Library.
EFOP	Executive Fire Officer Program.
MPFS	Massachusetts Public Fire and Safety.
NCA	National Candle Association.
NFPA	National Fire Protection Association.
PAMIC	Pennsylvania Association of Mutual Insurance Companies.
USFA	United States Fire Administration.

Results

The results of researching the reason for the increase in consumer use of candles were many, including religious and cultural rituals which were big users before and after electricity. (Foster) Aromatherapy and home décor are current trends fueling the increased use of candles. (Symons). The research also revealed that 7 out of 10 households burn candles and women were more likely to buy and burn candles than men. Hispanics use candles more than blacks or whites, but 18 to 24 year olds were by far the biggest purchasers of candles than any other group regardless of race (Fetto et al). Whether consumers are buying candles to accent their homes or to set a mood, the category is being driven by the fact that consumers are simply burning more candles. (Facenda) To discover in what way candles are used that result in fires, the American Society for Testing and Materials listed abandoned or unattended candles cause 60% of all candle fires.

Combustibles too close and child play brought the total to 85%. The NFPA listed 37% of the fires occurred because candles were left unattended, abandoned, or inadequately controlled; 19% because some form of combustible material was left too close to the candle and 9% were children playing with candles or something flammable near the candles. In addition to these statistics, the PAMIC listed people falling asleep while a candle was burning as an additional cause. The NCA stated the place candle fires were most likely to occur was the bedroom at 44.5% followed by the living room, family room, or den. The most common material ignited by candles was bedding, followed by paper, cardboard, and clothing. (CPSC) The CPSC listed several statistic on the problems associated with candle use including the statement "candle deaths increased 750 % from 1980 (20 deaths) to 1998 (170 deaths)" (2001, ¶ 1) The CPSC is a leader in research of products that affect the safety of consumers. They approached the candle industry to look at finding ways to improve candle safety. As a result of the ASTM International's Candle Fire Safety Task Group, the Candle Products Subcommittee is working to develop a standard testing protocol for candle fire safety issues, but states in its report that each candle producer is responsible for testing its own products according to its own standards. This translates to there is no standard. The candle industry, the NFPA, the CPSC, and several insurance companies have answered the next research question of what educational programs are available to promote the safe use of candles. Each group identified safe candle use practices and has developed pamphlets, brochures, candle coasters, and web pages, which mirror each other's recommendations.

The Massachusetts Public Fire and Safety developed a Candle Circle of Safety logo, which lists five messages of preventing home candle fires. Only the Pennsylvania Association of Mutual Insurance Companies added "make sure your smoke detectors are in working condition

on all levels of your home" to their safety message. (p. 2) As a result of this added point more research was conducted on question #3, what engineering controls are available to enhance the safe use of candles. It was realized that consumers were burning candles more often in the living room but the majority of the fires were occurring in the bedroom, and that the occupants abandoned or left unattended candles near bedding. It was also discovered that the people most at risk for these candle fires were the very young or very old. The age of the consumer that was most likely to burn candles were 18 to 24 year olds in spite of the NFPA's (1999) safety message "don't allow children or teens to have candles in their bedrooms". (¶ 6)

Researching past successful engineering controls for fires regardless of what causes them seemed appropriate. The NFPA listed in an on-line fact sheet that smoke alarms are the residential fire safety success story of the past quarter century. Since the single battery powered smoke alarms have been available, home fire deaths have been reduced in half. The NFPA continues with an estimate of 94% of homes have at least one smoke alarm today, but "one quarter of the reported fires in homes with smoke alarms, the alarms did not work. Households with non-working smoke alarms now outnumber those with no smoke alarm". (January, 2004, ¶ 4) "Millions of Americans have installed smoke detectors in their homes in the past few years, but a detector can only alert the occupants to a fire in the house [*sic*] cannot contain or extinguish a fire Residential [*sic*] sprinkler systems can!" (USFA, 2004, p. 1) In an article entitled Review of Residential Sprinkler Systems, the author identifies sprinkler systems as a successful automatic suppression system that has worked well for industry for more than 100 years. But he says, "Historically, the place which has offered the least amount of fire protection to occupants, was and still is their own home." (Madrzykowski, 2002, Abstract ¶1) The author continues to give insight on the argument for residential sprinklers "…Children 4 years of age and under and

adults 60 years of age and older are more likely to die in a fire than other segments of the population." "Because these high-risk groups may depend on assistance to exit the dwelling, anything less than automatic suppression may not be enough to save them". (p. 3)

Discussion

The results of researching the reason for the increase in the consumer use of candles were many, including religious and cultural rituals which were big users before and after electricity was discovered. Natural health aromatherapy and home décor are current trends that are fueling the increased use of candles according to Symons. The research revealed that 7 out of 10 households burn candles, and women were more likely to buy and burn candles than men. Hispanics use candles more than blacks or whites, but 18 to 24 year olds were by far the biggest consumers of candles than any other group regardless of race according to Fetto. Whether consumers are buying candles to accent their homes or to set a mood, the category is being driven by the fact that consumers are simply burning more candles. (Facenda, 2000) To discover in what way candles are used that result in fires, Becker (2003) listed abandoned or unattended candles cause 60% of all candle fires. Combustibles too close and child play brought the total to 85%. The NFPA listed 37% of the fires occurred because candles were left unattended, abandoned, or inadequately controlled. Nineteen percent was from some form of combustible material left too close to the candle and 9% were children playing with candles or something flammable near the candles. In addition to these statistics, the PAMIC listed people falling asleep while a candle was burning as an additional cause. It is interesting to note that although almost half of the candle fires begin in the bedroom, a survey of consumers lists that they most frequently burn candles in the living room (42%) followed by the kitchen (18%) and the bedroom (13%). This means that 13% of the candles cause 44.5% of the fires. The most

common material ignited by candles was bedding, followed by paper, cardboard, and clothing. (CPSC, 2000) The engineering controls for the safe use of candles were a little disappointing. The CPSC listed several statistics on the problems associated with candle use including the statement “candle deaths increased 750% from 1980 (20 deaths) to 1998 (170 deaths)”. (¶ 1) The CPSC is a leader in research of products that affect the safety of consumers. They approached the candle industry to look at finding ways to improve candle safety. As a result, the ASTM International’s Candle Fire Safety Task Group Subcommittee is working to develop a standard testing protocol for candle fire safety issues. However, the committee states in its report each candle producer is responsible for testing its own products according to its own standards. The candle industry, the NFPA, the CPSC, and several insurance companies answered the next research question of what educational programs are available to promote the safe use of candles. Each group identified safe candle use practices, printed pamphlets; brochures, candle coasters, and web pages which mirror each other’s recommendations. The Massachusetts Public Fire and Safety developed a Candle Circle of Safety logo, which lists five messages of preventing home candle fires. Only the Pennsylvania Association of Mutual Insurance Companies added ”make sure your smoke detectors are in working condition on all levels of your home” to their safety message.

As a result of that statement more research was conducted on question #3, what engineering controls are available to enhance the safe use of candles. It was realized that the consumers were burning candles more often in the living room but the majority of the fires were occurring in the bedroom where the occupants abandoned or left unattended candles near bedding. It was also discovered that the people most at risk for these candle fires were the very young or very old. The age and gender of the consumers most likely to burn candles were 18 to

24 year olds and women more likely than men. Researching past successful engineering controls for fires regardless of what causes them seemed appropriate. The NFPA stated in an on-line fact sheet that smoke alarms are the residential fire safety success story of the past quarter century. Since the single battery powered smoke alarms have been available, home fire deaths have been reduced in half. The NFPA also stated that an estimate of 94% of homes have at least one smoke alarm today. The report continues, "one quarter of the reported fires in homes with smoke alarms, the alarms did not work. Households with non-working smoke alarms now outnumber those with no smoke alarm" (NFPA, 2004, ¶ 4). Smoke detectors have been installed in millions of homes in the past few years, but a detector can only alert the occupants to a fire in the house. Detectors cannot contain or extinguish a fire, but a residential sprinkler system can. In an article entitled Review of Residential Sprinkler Systems, Fleming D. Madrzykowski identifies sprinkler systems as a successful automatic suppression system that has worked well for industry for more than 100 years but says "Historically, the place which has offered the least amount of fire protection to occupants, was and still is their own home". The author continues to give insight on the argument for residential sprinklers "…Children 4 years of age and under and adults 60 years of age and older are more likely to die in a fire than other segments of the population." "Because these high-risk groups may depend on assistance to exit the dwelling, anything less than automatic suppression may not be enough to save them." (p. 3)

Recommendations

The problem is in the past 15 years there have been five fire deaths in the City of Burlington; three children and two adults over 65 yrs of age, and in each case candles caused the fires. The purpose of this research is to identify ways to reduce the number of fire deaths caused by candles. The first part of this research identified reasons for the increased use of candles and

how candles are used that start fires. Religious and ceremonial along with aromatherapy and ambiance are the leading reasons. Candles unattended or abandoned are the top reasons for candle fires. Bedding and clothes in the bedroom are the most common items that catch fire. Women are more likely then men to purchase candles, but 18 to 24 year olds burn the most candles. There are no engineering controls specific to candles to reduce the number of fires, but smoke detectors and residential sprinkler systems have been identified as engineering controls that could reduce the number of deaths caused by candle fires. Educational material on candle use and safety is abundant, but the industry missed an opportunity to promote smoke detectors and residential sprinklers as items to consider when burning candles.

As a result of this research and to meet the purpose of finding ways to reduce the number of fire deaths caused by candles, the Burlington Fire Department should follow the Ames Fire Department's lead and develop a smoke alarm give away program. In addition, provide batteries at no charge and offer to install both the batteries and detector. Another avenue would be to work with discount stores and bedding specialty stores to allow displays of safe candle use in the home brochures in the areas where bedding and candles are sold. In an effort to make a difference on a national level, contact the NFPA, USFA, and CPSC encouraging them to add "make sure a working smoke alarm is on each level of your home" to their respective safe candle use brochures. Finally, work on codes or find incentives to promote the use of residential sprinkler systems in new residential construction. "Every year, more than 3,000 people lose their lives in home fires, and most of these deaths are among the elderly, the disabled, the low income and the very young. Sprinkler systems are one way to reduce that number and to save the lives of community residents served by the nation's fire service." (USFA, 2003, ¶ 2)

References

Ames City Government (n.d.). Free Smoke Detector Program. Message retrieved March 4, 2004, from www.city.ames.ia.us/fireweb

Becker, J. (2003, March). Candles Answering Your Burning Questions. Message posted to American Society for Testing and Materials Standardization. News. Retrieved March 3, 2004, from www.astm.org.

Burn Survivors Throughout The World, (n.d.) Rising Candle Related Fire Deaths. Retrieved February 27, 2004, from www.burnsurvivorsttw.org.

Cottrell, B. [Federal Investigator for the United States Government Consumer Product Safety Commission] Unpublished raw data.

Hartman, M. [Fire Marshal, City of Burlington]. Unpublished raw data.

Standardization Burn Survivors. (n.d.). Rising Candle Related Fire Deaths. Message posted to www.burnsurvivorsttw.org.

Facenda, V. L. (1999, February). Candles Are Burning Brightly. Home Styles, 39(2). Retrieved March 4, 2004, from EBSCO database.

Facenda, V. L. (2000, February). Waxy Profits. Discount Merchandiser, 40(2), 00123579. Retrieved March 4, 2004, from Burlington Public Library EBSCO database.

Fetto, J., & Gardyn, R. (2002, March). Wax Buildup. American Demographics, 24(3), 01634089. Retrieved March, 2004, from Burlington Public Library EBSCO database.

Foster, D. R. (2004). Capturing the Light. Natural Health, 34(3). Retrieved March 4, 2004, from Burlington Public Library EBSCO database.

Madrzykowski, F. D. (2002). Review of Residential Sprinkler Systems: Research and Standards. *National Technical Information Service, NISTIR 6941,* 3,5. Retrieved March 4, 2004, from www.fire.nist.gov/bfrlpub/fire03.

National Candle Association. (n.d.). Candle Fire Safety. National Candle Association. Abstract retrieved February 27, 2004, from www.candles.org/useandsafety.

National Candle Association. (n.d.). Candle Industry Facts. Retrieved March, 2004, from www.candles.org.

National Fire Protection Association. (2002). Candle Fire Safety. National Fire Protection Association On Line. Abstract retrieved March, 2004, from www.nfpa.org.

National Fire Protection Association. (January, 2004).Smoke Alarms. National Fire Protection Association On Line. Abstract retrieved March, 2004, from www.nfpa.org.

National Fire Protection Association On Line. (1999, Winter). Fires Caused by Candles Peak in '98 Double Over Decade. National Fire Protection Association. Retrieved March 4, 2004, from www.nfpa.org/pressroom/newsrelease.

Pennsylvania Association of Mutual Insurance Companies. Candle Fires. Retrieved March, 2004, from www.pamic.org/candle_fires.

Symons, A. (1999). Aromatherapy, Home Decor Brighten Candle Sales. Drug Store News, 21(8).

United States Consumer Product Safety Commission. (2001, June 21). CPSC Releases New Report on Residential Fires [01-176]. Message posted to www.cpsc.gov.

United States Consumer Product Safety Commission. (2001, September 19). *Candle Fires Pilot Study summary* [Memo]. Retrieved February 4, 2004, from www.cpsc.gov.

U.S. Fire Administration. (2004, March 2). Home Fire Safety Residential Sprinklers. U.S. Fire Administration. Retrieved February 8, 2004, from www.usfa.fema.gov/public/hfs/sprinklers.

U.S. Fire Administration. (2003, July 15). Report on National Residential fire Sprinkler Initiative Available. U.S. Fire Administration. Retrieved February 4, 2004, from www.usfa.fema.gov/inside-usfa/media/2003.