

Running Head: Residential Sprinklers: A Model Ordinance

A Model Fire Sprinkler Ordinance for Large Single Family Occupancies

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

Signed: _____

Abstract

This action research project provides the basis for the development and implementation of an ordinance that requires automatic residential fire sprinkler systems in large single-family occupancies.

The United States Census Bureau rates Wake County, North Carolina, as the ninth fastest growing county in the United States. The rapid growth has resulted in the construction of large residential occupancies. Real Estate and tax data shows that 36,490 single-family dwellings 3,000ft² or larger are located within Wake County. The problem is the larger occupancies create a greater risk for fire related deaths and injuries to occupants and firefighters from rapid fire growth and the inability of fire departments to expediently rescue trapped occupants during advanced fire conditions. The purpose of this applied research project was to collect and analyze data connected to fire related deaths and injuries in non-sprinklered and sprinklered residential occupancies. The results of the research provided the basis for developing a model ordinance that requires automatic fire sprinkler systems in residential occupancies that are 3,000ft² or larger.

Each state Fire Marshal's office in the United States received a questionnaire developed from the project research questions. The research questions requested statistical data and information on residential fire related deaths and injuries for the last six years, the adoption or development of residential sprinkler codes and ordinances, state and local requirements for residential sprinkler systems, and the examination of code or ordinance development obstacles, supporters and detractors.

The results of the research concluded that automatic residential fire sprinklers, in conjunction with smoke detectors, are critical to the reduction of residential fire related deaths and injuries. The resulting recommendation was the Wake County Board of Commissioners

adopt an ordinance that requires automatic fire sprinkler systems in all newly constructed single-family dwellings that are 3,000ft² or larger starting January 1, 2010.

Table of Contents

Certification	2
Abstract.....	3
Table of Contents.....	5
Introduction.....	6
Background and Significance	7
Literature Review.....	10
Procedure	28
Results.....	30
Discussion.....	45
Recommendations.....	55
References.....	58
Appendix A: Questionnaire Letter.....	60
Appendix B: Fire Marshal Database.....	63
Appendix C: Applied Research Paper Questionnaire.....	69
Appendix D: Applied Research Paper Questionnaire Results.....	77
Appendix E: A Model Fire Sprinkler Ordinance For Large Single Family Occupancies	93

A Model Fire Sprinkler Ordinance for Large Single Family Occupancies

Introduction

During the last twenty years, United States Census data indicates that Wake County, North Carolina's population has grown from 423,380 to 886,410. The 110% growth occurred in urban, suburban, and rural areas of the county. Census Bureau predictions show Wake County continuing to grow at an increased rate through the year 2020.

Wake County is located in the central part of North Carolina, is the home of multiple universities, hospitals, large corporations, research facilities, and is part of the Research Triangle Park. Affluence is associated with the aforementioned educational, research and work environment. The affluence has resulted in 36,490 single-family dwellings (SFD) that range from 3,000 to 28,880ft² in size. Most large dwellings are multiple storied. The dwellings are located in areas with and without access to pressurized fire hydrants.

The problem is the larger occupancies create a greater risk for fire related deaths and injuries to occupants from rapid fire growth and the inability of fire departments to rescue trapped occupants during advanced fire conditions. Research conducted by the United States Fire Administration (USFA) and the National Fire Protection Association (NFPA) indicates large residential occupancies require additional time for occupants to escape safely once they are aware of a fire emergency within the dwelling. The USFA research concludes that persons 14 years old and younger, 65 years old and older and firefighters are at a greater risk to fire related death and injury in larger SFDs.

The purpose of the research is to examine information connected to fire related deaths and injuries in non-fire sprinklered and sprinklered residential occupancies. The information will provide the basis for developing a county ordinance that requires fire suppression sprinkler

systems in SFDs that are 3,000ft² and larger. The ordinance will be presented to the Wake County Board of Commissioners (WCBOC) for adoption should the North Carolina Building Code Council (NCBCC) fail to adopt the latest revisions to the International Residential Code (IRC) that requires automatic residential sprinkler systems (ARSS) in one and two family dwellings and manufactured housing.

Four research questions supported this action research project (ARP). The questions are as follows: (a) what statistical information supports the reduction of fire related deaths and injuries through the installation of residential fire sprinkler systems; (b) how have counties, cities and communities successfully developed and adopted ordinances in states that do not have code requirements for ARSS; (c) what obstacles were encountered by local jurisdictions during the development and adoption phases of residential fire sprinkler ordinances; (d) what groups were the supporters and detractors of the ordinances.

The statistical data derived from this ARP resulted in a model ordinance requiring ARSS in SFDs 3,000ft² or larger. The action research method consisted of mailing a 29-question research questionnaire to the state Fire Marshal in each state within the United States. In addition, the research included analyzing the results of the research instrument, presenting the information in a usable format and developing the model ordinance based on information from similar ordinances from counties and cities across the United States.

Background and Significance

Founded in 1963, the Fairview Fire Department (FFD) is located in southern Wake County, North Carolina. The founding members protected a small rural fire protection district. Thirty-eight volunteer firefighters and 23 part-time paid personnel serve the fire protection district. The department employs a career Fire Chief and an Executive Secretary.

The department protects 19,000 permanent residents and 12,000 transient citizens in a 28 square mile fire district. The department responds to an average of 1,200 calls per year. The services provided include fire suppression, non-transport basic life support Emergency Medical Services, Type-I technical rescue, hazardous materials operations, and fire and burn prevention education. The once rural fire district has transitioned to a suburban fire district. Located within ten miles of the North Carolina State Capital, the FFD provides fire protection to the main campus of Wake Technical Community College, light and medium manufacturing facilities, and mercantile occupancies. The majority of the fire district is comprised of residential occupancies. Less than 15% of the fire protection district contains pressurized fire hydrants.

The department contracts with Wake County to provide emergency services. A nine-member Board of Directors governs the department. The Command Staff consists of a Fire Chief, Assistant Fire Chief, six Captains, six Lieutenants, a Safety Officer, and a Traffic Control Officer. The fire apparatus includes four Engines, two Water Tenders, one Heavy Rescue, two EMS Quick Response Vehicles, one Brush Truck, and two Chief vehicles.

During the last twenty years, the Fairview Fire Protection District (FFPD) has inwardly developed from rural farmland with small dwellings to a suburban bedroom community of the City of Raleigh, Town of Cary, and Wake County. During the rapid growth period, subdivisions filled with houses that followed the national trend that bigger was better. The FFPD is located within an environmental watershed area. The watershed protection laws permitted larger homes on large lots. The low density and large home development in non-pressurized fire hydranted areas negatively affect the ability of the FFD to provide fire and emergency services to the citizens that live in the large homes. Extensive automatic mutual-aid from surrounding fire departments is required to provide water tenders to supply water for fire extinguishment. The

mutual-aid water haul efforts expend critical personnel needed to conduct search, rescue, and fire suppression activities.

Data from the 2007 United States Census indicates that the population and density of the FFPD will double in eleven years. Current real estate data obtained from Wake County indicates that large homes within the FFPD range from 3,000 to 18,800ft². The current trend of building SFD 3,000ft² and larger places the citizens living in the large homes and the firefighters of the FFD at greater risk of death and injury during a fire emergency.

Larger, multiple storied homes place citizens at a greater risk of fire related death and injury because of the additional distance and travel time required to exit the dwelling during a fire emergency. The greater risks placed on the FFD firefighters include exposure to larger fires from increased fire loads, cavernous search areas, and advanced stage interior fire conditions. The larger homes require larger and less maneuverable hose lines for interior fire attacks. Moreover, the firefighters face greater risks of entrapment, losing orientation, running out of air, or caught in a flashover in the large dwelling fire. During several recent structure fires in large dwellings, the author witnessed the increased risks citizens and firefighters face once a fire occurs in a large dwelling. Advanced interior fire conditions prevented searching for trapped occupants and the advancement of hose lines for an interior fire attack.

The significance of this applied research project has a major impact on preventing and reducing deaths and injuries to citizens and firefighters during a large dwelling fire event. The effects of adopting an ordinance in Wake County that mandates the installation of ARSS in large SFDs will prevent and reduce residential fire related deaths and injuries for the citizens of Wake County and the firefighters of FFD. A secondary benefit of a residential fire sprinkler ordinance

is the reduction of fire damage and financial losses to the homeowner, insurance industry and the community.

This applied research paper directly supports the teachings of the National Fire Academy (NFA) Executive Fire Officer Program course entitled Leading Community Risk Reduction. In addition, the direct results of adopting the model residential sprinkler ordinance, contained herein, supports the operational objectives and continuous efforts of the USFA by reducing the loss of life from fire in the age groups of 14 years and younger and 65 years old and older. In addition, the residential fire sprinkler ordinance, once enacted, will reduce the loss of life of firefighters (USFA, 2008). The information and results of the research contained herein provides the supporting evidence for the adoption of a model residential fire sprinkler ordinance.

Literature Review

The 2007 edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes is the basis for the 2009 International Residential Code (IRC) revision. To provide the reader of this ARP with a basic understanding of the requirements of NFPA 13D, the author chose to include information contained in the text entitled Automatic Sprinkler Systems for Residential Occupancies Handbook, first edition. Christian Dubay, a Professional Engineer, and Vice-President of the NFPA Codes and Standards wrote the text. Moreover, Dubay is the Chief Engineer of the National Fire Protection Association. The text contained the entire NFPA 13D standard, commentary text, and illustrations for each chapter and section of the standard. The inclusion of the commentaries assisted the reader with understanding the specifics and intent of the standard.

Fire officials and those skilled in the art and science of fire protection have an understanding of the life safety benefits of sprinkler systems. Sprinkler systems in commercial

and industrial buildings have been in operation throughout the last century. The primary purpose of the commercial and industrial sprinkler system was the protection of the building and contents from fire. Based on information contained in the report entitled *America Burning*, the magnitude of the residential fire problem in the United States came to the forefront of fire officials and the NFPA in 1973 (Dubay, 2007). The *America Burning* report and work by NFPA subcommittees led to the adoption of NFPA 13 in 1975. In subsequent years, NFPA 13 became NFPA 13D and specifically addressed one and two family dwellings and manufactured homes (Dubay, 2007).

The NFPA 13D, 2007 edition development committee shared similar ideals and philosophies as those who served on the original NFPA 13 committee during the period from 1973 to 1975, and the committee's attributes continued in the 2007 standard. The philosophies include low cost, life safety is the top priority, the system should allow a ten minute escape time for the occupants, and the sprinkler system must be compatible with residential construction and plumbing methods (Dubay, 2007).

While the benefits of residential sprinkler systems are well known, residential builders and the public have been reluctant to accept and install such systems. To assist with public education on the benefits of residential sprinkler systems, and to provide an awareness of the potential to residential fires, the NFPA established the Home Fire Sprinkler Coalition (HFSC) in 1997 (Dubay, 2007). Acting as an independent non-profit agency, the HFSC's primary purpose is awareness and to "promote the option of residential fire sprinklers" (Dubay, page 5, 2007).

Residential fire sprinkler systems and smoke alarms have their intended purpose, and when combined in a systematic approach to fire protection, they provide the best means available for an occupant to detect and escape from a residential fire. The smoke detector provides early warning to the airborne products of combustion. The sprinkler system provides additional time

for the occupant to escape before the space becomes untenable. The design of residential sprinkler systems prevent total fire involvement in a room or compartmentalized space that is occupied with furnishings that are typically found in living rooms, kitchens, and bathrooms (Dubay, 2007). The sprinkler system design provides a minimum of a ten-minute water supply. The water supply time correlates with the designed ten-minute occupant escape time once the system activates and simultaneously sounds an audible alarm. Complete fire extinguishment is not the intent of a residential sprinkler system. Because of early activation of the sprinkler system, complete extinguishment is often achieved (Dubay, pages 2-6, 2007). Dubay defined an automatic sprinkler as:

A fire suppression or control device that operates automatically when the heat-actuated element is heated to its thermal rating or above, allowing water to discharge over a specific area. “Residential sprinklers that are specifically listed automatic devices are intended to achieve life safety as their primary objective” (Dubay, page 25, para 5, 2007).

Other items found in the text were technical specifications and sprinkler system design requirements. The specifications and requirements include the following elements:

- Stored water systems must be a minimum of 260 gallons for residences 2,000ft² and larger and taller than 1 story.
- Stored water systems must be a minimum of 182 gallons for residences under 2,000ft² and not taller than 1 story.
- Sprinkler heads must contain fast acting elements and be designed to actuate at temperatures above 150°F.
- Single sprinkler heads must flow a minimum of 18 gallons per minute.

- The system must be designed such that two activated sprinkler heads in the same compartment must be capable of flowing 13 gallons of water per minute simultaneously (Dubay, pages 45-63, 2007).

Residential sprinklers are not a new concept. “The first practical sprinkler was invented by Henry Parmelee in the late 1800s. One of the first buildings sprinklered in the US was Parmelee’s home in New Haven, Connecticut” (Dubay, page 205, para 1, 2007). San Clemente, California was the first community to pass an ordinance requiring ARSS in one and two family dwellings (Dubay, 2007). In 1986, Scottsdale, Arizona passed a sprinkler ordinance for all occupancies including residential properties.

In 2006, 20 years after the ordinance was passed, more than 75 percent of all commercial buildings in Scottsdale had automatic sprinkler protection. “The number of single-family houses with sprinklers had grown to 43,000, which was 54% of the total housing stock. Citywide, 56% of all the community’s dwellings were protected with automatic fire sprinklers. Some of the major benefits have been a reduction in loss of life, fire loss, water damage and infrastructure costs” (Dubay, page 215, para 3-4, 2007). Based on the information provided by Dubay, one can conclude that ARSS greatly reduce the potential for the loss of life from fire.

In 2001, while serving as Fire Chief for Prince Georges County, Maryland (PGCM), Ronald J. Siarnicki wrote an applied research paper for the National Fire Academy entitled Residential Sprinklers: One Community’s Experience Twelve Years after Mandatory Implementation. The document detailed the process of creating and implementing legislation in PGCM that required fire sprinkler systems in all residential occupancies. Moreover, the successes of the mandatory sprinkler program were included in the document. The research

document included statistical data and information from the mandatory sprinkler requirement date of February 1, 1988 through December 31, 1999.

The efforts to prevent the adoption of residential sprinkler requirements today are the same as those in the late 1980s when efforts by the Prince Georges County Fire Department (PGCFD) were met with great resistance. “The concept of engineered systems has developed into one of the most successful fire suppression methodologies known to man and yet these lifesaving devices continue to be met with great resistance when applied to a residential style development” (Siarnicki, Page 1, 2001). The homebuilder industry in PGCM led the fight to stop the sprinkler legislation. The reasons opposing the legislation are familiar to fire officials. The reasons include:

The cost would be too much for an average homeowner, the water damage would be too great due to their activation, and what if they discharged accidentally or a water pipe broke. The devastation from free flowing water would be astronomical (Siarnicki, page 3, 2001).

However, the resistance to the legislation was met with a sound strategic development and implementation plan.

Working with community leaders and government officials from various organizations and agencies, the strategic plan development process identified areas that needed to be addressed for the legislation to be passed. The plan included gathering “solid facts and obtainable predictions, identifying needed resources, developing consensus, and establishing the future needs of the community” (Siarnicki, page 3, 2001).

The legislative mandate for residential sprinkler systems included a phased approach over a 4-year period. The first phase required all one and two family homes be sprinklered. The

second phase required all multifamily homes be sprinklered. The third phase mandated town homes be sprinklered. The final phase required all residential structures to be fully protected by an approved NFPA 13D residential sprinkler system (Siarnicki, 2001).

During the period of January 1, 1992 through December 21, 1999, the PGCFD collected the following statistical information on fires that occurred in residential sprinklered occupancies:

- Residential Sprinkler System Reported Incidents 121
- Residential Sprinkler System Reported Fire Incidents 117
- Residential Sprinkler Activations 143
- Total Fire Loss \$ 401,220.00
- Potential Fire loss \$ 38,230,000.00
- Reported Lives Saved 154
- Injuries Reported (All minor in nature) 7

Siarnicki reported that of the 121 incidents only eleven fires had more the one sprinkler head activated. Seven of the twelve fires had two or more sprinkler heads activated. In the seven incidents in which multiple sprinkler heads activated, an accelerant or other human intervention started the fires (Siarnicki, 2001). During the same period, no fire fatalities occurred in sprinklered occupancies. Comparing the information for the same period in non-sprinklered residences, 22 fatalities, and 46 injuries occurred.

As with any new program, there were predictable and unforeseen problems with sprinkler systems during the early phases of the mandate. The problems included improperly designed systems, a lack of inspector experience, inexperienced installers, inferior products, and poor workmanship (Siarnicki, 2001). These issues were resolved during the initial phases of the mandate. Programs that included formal education, sharing of information, and improved

inspection services “allowed the mandated sprinkler program to achieve the desired results” (Siarnicki, page 21, 2001). Siarnicki concluded by stating that:

a definitive communications effort must be put forth to ensue that the facts, utilized in support of these laws, are representative of the future needs of the community through public education initiatives and marketing campaigns. Lastly, that adequate research is done so that the best possible composites of the legislation are adapted to the specific needs of the community and that the appropriate trade-offs and adjustments to the building and life safety code are made in a positive way to support enactment of the law (Siarnicki, page 40, 2001).

A December 12, 2008, Fire Chief Magazine article entitled Appeals Board Uphold Fire Sprinkler Requirements, detailed the decision to uphold the September 2008, IRC committee decision to include residential sprinkler systems in one and two family dwellings and manufactured housing. The appeal was filed by the National Association of Home Builders (Fire Chief, 2008). Fire and public safety officials united once more to support the live safety initiative. Ronny Coleman, President of the IRC Fire Sprinkler Coalition stated, “The success of this effort reflects the commitment of many individuals and organizations who share a common belief that injuries and deaths associated with home fires are preventable through the use of residential fire sprinkler systems” (Fire Chief, 2008).

In an article found in the periodical On Scene, published by the International Association of Fire Chiefs (IAFC), entitled Residential Fire Sprinklers Proposal Approved at the International Code Council Hearing, Chief Larry J. Grorud, President of the IAFC, extolled the hard work of fire and code officials in the passage of the IRC that required fire sprinklers in one and two family dwellings. During the September 21, 2008 meeting of the ICC hearing in

Minneapolis, MN, fire and code officials voted to pass the inclusion of the residential sprinkler requirement in the next version of the code. The vote to include the residential sprinkler requirement in the code was 1,282 in favor and 470 against (On Scene, 2008). Chief Grorud stated:

The fire service has won a major victory in the fight to make our citizen's home safer. Although there is still work to do, this precedent-setting vote will change the face of fire safety in America. Fire service personnel supported the unified effort that involved more than 100 public-safety organizations including the IAFC and IAFF. They came prepared with incontrovertible evidence that residential fire sprinklers save much more than property; they save the lives of the public and the lives of fire service personnel who protect them (On Scene, 2008, page 1).

In an article entitled South Carolina House Revives Sprinkler Bill, Kelly Fuller, of the Sun News in Myrtle Beach, S.C., describes how state legislators and the Governor are at odds regarding the passage of sprinkler laws in South Carolina (SC). SC Fire officials recognized the benefits of residential sprinkler systems and worked with the state legislature to pass a bill that offered tax incentives to property owners who installed sprinkler systems (www.Firehouse.com, [Firehouse], 2008).

Despite the efforts of the SC Fire Chiefs Association, SC Firefighters Association, SC Fire Marshals Association, and SC Legislators working together to pass the tax incentive bill, Governor Mark Sanford vetoed the bill. Governor Stanford stated that taxpayers should not subsidize improvements to private property. Fire officials were not deterred by the Governor's veto. Fire officials continued to work with their legislators. The SC House of Representatives overrode the Governor's veto (Firehouse, 2008).

Following a fatal October 2007 beach cottage fire that claimed the lives of seven college students in Ocean Isle, NC, fire officials in North and South Carolina were concerned the ICC ruling that requires residential sprinklers in one and two family dwellings will not be adopted in the Carolinas (www.SunNews.com [Sun News], 2008). Code officials, in both states, stated that public education promoting the life safety benefits of residential sprinkler systems would be a key component to the adoption of the new ICC code requirements. Eddie Watson, President of the S.C. Fire Marshals Association stated, "I feel this is something that has to be presented properly and correctly to the public which will probably take at least a year to get the word out properly" (Sun News, para 2, 2008).

The struggle to adopt single family residential sprinkler codes in North Carolina is evidenced by the title of a newspaper article, *Sprinklers An Uphill Battle*, and the failed efforts of the North Carolina Building Code Council (NCBCC) to form a committee to investigate the feasibility to require residential sprinkler systems in single family homes 3,600ft² or larger and those homes three stories or more in height (SunNews, 2008). This requirement would also apply to vacation homes that are typical to the size and type of residence in which the college students perished. Not all members of the NCBCC are opposed to residential sprinkler code changes. "Dave Smith, Chairman of the residential committee for the NCBCC said he is encouraging the public to ask the builders for sprinklers in their new homes and have builders ask their customers if they want sprinklers" (SunNews, Para 7, 2008).

During a news story that aired on WTVD-TV in Chapel Hill, NC, Mrs. Bonnie Woodruff spoke of the pain and anguish a parent goes through when they lose a child to the ravages of fire. Woodruff was interviewed by WTVD following the Ocean Isle, NC fire that killed 7 college students. Woodruff understands the pain and suffering first hand. She lost her son, Ben

Woodruff, in the Phi Gamma Delta fraternity house fire on Mothers Day of 1996 (www.abc.local.com, [ABC], 2007). Woodruff “transformed her tragedy into advocacy” (ABC, para 7, 2007). Woodruff joined Fire Chief Dan Jones of the Chapel Hill Fire Department and led a crusade for residential sprinklers in college dormitories and fraternity and sorority houses. Woodruff, a member of the Common Voices Coalition of Six, works to raise national awareness of the benefits of residential sprinkler systems. “Woodruff is convinced a sprinkler system could have saved her son and those in Ocean Isle” (ABC, para 9, 2007).

In an article entitled Sprinklers Become Mandatory on New Homes, Sonja Elmquist, of the News-Record located in Greensboro, NC, wrote on the recent changes to the 2009 IRC that requires ARSS in one and two family dwellings and the challenges fire officials have with the adoption of the code at state and local levels (www.Newsrecord.com, [Newsrecord], 2008). Elmquist wrote, “North Carolina uses the IRC as the basis for their state and local residential codes” (Newsrecord, para 8, 2008). Elmquist noted that the North Carolina Office of State Fire Marshal (OSFM) supported the “adoption of the requirement in the 2009 IRC (Newsrecord, para 6, 2008).

Information contained within the article states that not all organizations involved with construction of homes supports ARSS. Organizations such as the National Association of Home Builders (NAHB) opposed the change to the IRC. The NAHB is quoted in the article as having made negative statements towards the installation of residential sprinkler systems. Statements such as “the potential to discharge accidentally causing water damage and system maintenance issues to remain functional” were made by the NAHB (Newsrecord, para 9, 2008). Officials of the Greensboro Fire Department refuted the NAHB claims in the article. Greensboro fire

officials presented data that showed homes with sprinkler systems suffered one-fifth the amount of damage as those homes without sprinkler systems. Fire officials stated that accidental discharges from a sprinkler head are rare.

In a news release entitled Code Hearings Feature Major Issues, Dramatic Moments, by the ICC, Gretchen Hesbacher stated, “fire sprinklers are required in all new one and two family residences beginning January 1, 2011” (www.iccsafe.org [ICC], 2008). In addition, the new code provision requires fire sprinklers in all new town homes (ICC, 2008).

The North Carolina State Firemen’s Association (NCSFA) has staunchly supported ARSS for one and two family dwellings and town homes. In a September 22, 2008 press release, the NCSFA stated that fire service leaders from North Carolina and 45 other states gathered in Minneapolis to support the changes in the IRC. Ronny J. Coleman stated, “they know from experience that sprinklers are the answer to the nation’s fire problem. The vote was a historic moment in residential fire safety and is a significant step in a long journey before sprinklers are installed in every new home” (www.ncsfa.com, [NCSFA], para 3, 2008).

Upon the adoption of the IRC revisions by the ICC, the North Carolina Association of Fire Chiefs (NSAFC) issued a press release with quotes from Allan Purdue, the IAFC Fire and Life Safety Section Director. Purdue stated, “collaborative efforts must continue to make certain that the code requirements are adopted into state and local codes” (www.NCAFC.com [NCAFC], 2008). As indicated from the information contained in the press release, a small victory has been achieved towards providing safer living environments in town homes and one and two family dwellings. However, much work is needed to achieve adoption of the code changes at the state and local level.

For many years, the USFA has supported and advocated the use of ARSS combined with smoke detectors as a means for saving lives from the perils of fire and reducing property losses. In a March 28, 2008, position paper, the USFA stated, “despite efforts to reduce the number of civilian and firefighter deaths from fire the life losses continue at unacceptable levels” (www.usfa.dhs.gov, [USFA], 2008). Contained within the document were statistics showing a decline in the reduction of the number of fire deaths in the last 10 years. The installation of smoke detectors in residential occupancies was cited as the major cause of fire death reductions during the period of 1977 through 1995 (USFA, 2008). Test data, by the Center for Fire Research at the National Institute of Standards and Technology, indicated that fire grows faster in homes that contain modern furnishings. Because of the faster growing fires, occupants often do not have time to escape a residential fire. The documents stated, “smoke alarms alone may not provide a warning in time for occupants to escape a home fire” (USFA, para 6, 2008).

To further the mission of the USFA and the agency’s continual advocacy for the reduction in life and property loss due to fire, the USFA released the following official statement in support of residential fire sprinklers:

It is the position of the U.S. Fire Administration that all citizens should be protected against death, injury, and property loss resulting from fire in their residence. All homes should be equipped with both smoke alarms and automatic fire sprinklers, and all families should have and practice an emergency escape plan. The USFA fully supports all efforts to reduce the tragic toll of fire losses in this nation, including the proposed changes to the International Residential Code that would require automatic sprinklers in all new residential construction (USFA, para 7, 2008).

The passage of the revision to the IRC that requires ARSS in one and two family dwellings and town homes gave cause for concern by the fire sprinkler industry. The concern was based on the sudden demand for residential sprinkler systems design, installation, and inspection (www.residentialfiresprinklers.com [RFS], 2008). In an article entitled Residential Fire Sprinklers Market Growth and Labor Demand Analysis, author Russ Leabitt describes the impact of the residential sprinkler code revisions on the sprinkler industry. Leabitt states that the sprinkler industry has a shortage of “qualified layout technicians, installers, and maintainers. In addition, there is a large need for qualified plans review and inspection professionals” (RFS, page 5, 2008). Leabitt estimates the code change has the potential to create 11,100 new personnel positions in the private and public sector (RFS, 2008).

Leabitt expanded his research to include residential sprinkler system cost per installed sprinkler head and cost per square foot for newly constructed single-family residences and town homes. When calculating the cost of each installed sprinkler, Leabitt included the following system costs:

Each unit carries a portion of the expenses not directly tied to the sprinkler itself such as the system valves, building water supply, flow indicators, and alarms, feed pipe, support systems, and bracing. The system design, job site supervision, and company overhead are also factored into the unit cost (RFS, page 9, 2008).

Leabitt estimated the national average cost per installed sprinkler head to be \$100.50. Additional costs including regional labor rates, permit fees, taxes, and local market conditions may influence the average cost per sprinkler head (RSF, 2008).

When calculating the cost per square foot to install residential fire sprinkler systems, Leabitt used data gleaned from Housing and Urban Development statistics based on the number

of new single family residential units constructed in 2007 (RFS, 2008). Leabitt reported that 1,218,400 single-family homes were constructed. Three percent or 36,550 homes had residential fire sprinkler systems installed (RFS, 2008). Based on the number of single family homes constructed and the number of residential sprinkler systems installed, Leabitt estimated the average cost to install residential sprinkler systems was \$1.00 per square foot. It should be noted that additional fire and residential code enforcement officials and plans review personnel may be needed to meet the workload demand created by the residential code revision (RSF, 2008). The increased labor demand will cause the cost per installed sprinkler head and square footage cost to vary from the national average based on the authority having jurisdiction.

In a report prepared by Newport Partners, that was commissioned by the Fire Protection Research Foundation, entitled Home Fire Sprinkler Cost Assessment Final Report, research shows that residential sprinkler systems provide “significant life safety benefits; however, the installed costs of the systems remains a point of uncertainty and a potential barrier to broader adoption (www.nfpa.org [NFPA], 2008). The basis of the report was to provide an estimated cost for the installation of residential fire sprinklers in new homes based on 10 communities distributed throughout the United States that require residential sprinkler systems in new homes (USFA, 2008). Moreover, homeowner and fire insurance costs savings for the same communities were detailed in the report. Thirty single family homes of the same basic layout and square footage were used in the study. The research showed that “sprinkler system costs to the home builder ranged from \$2,386 to \$16,061 per home. The cost per square foot ranged from \$.38 to \$3.66 with the average cost being \$1.61” (NFPA, page 3, 2008).

Several variables were listed in the report as causes for the differing costs associated with the 30 sprinkler system installations in ten communities. The variables included geographic

regions, plumbing materials used to install the system piping, stand-alone systems, water supply, and local ordinances. Geographic regions that experienced freezing weather versus warmer climates required isolation of the sprinkler system in the areas of a residence where the piping is subject to freezing. These systems require an antifreeze solution in the piping and materials that are compatible with the solution (NFPA, 2008). Higher material costs were associated with systems that used copper rather than CPVC or PEX piping. The labor cost associated with copper piping was listed as a cost variable. Separate sprinkler systems that do not use domestic water piping had higher installation costs. Sprinkler systems that were tied to a municipal water system were less expensive than systems that required an on-site pressurized stored water system (NFPA, 2008).

Local ordinances that governed the required sprinklered spaces within a residence played a role in the cost of a sprinkler system. Some jurisdictions required sprinkler systems in only the living spaces of a home. Other jurisdictions required sprinkler systems in attics, garages, and basements. The systems that were designed and installed beyond the living spaces had a higher installation and maintenance cost. The higher costs are associated with additional materials and systems that are protected from freezing in the non-heated areas of a home (NFPA, 2008).

Homeowner and fire insurance was examined in each of the ten communities. Insurance discounts for residences equipped with sprinkler systems ranged from 0-10 percent. The average discount was 7 percent. The report indicated there were no instances of insurance premium penalties because of concerns with system leakage (NFPA, 2008).

Fire officials face many challenges from private sector entities as states and local jurisdictions proceed with the adoption of the ARSS requirements that were included in the 2008 revision of the IRC. In an article entitled Builders Try to Pre-Empt Sprinkler Regs, published in

the February 2009 edition of Fire Chief Magazine, the editor detailed steps taken in two states to prevent the adoption of the IRC revisions. Within weeks of the passage of the IRC revisions, homebuilder associations began lobbying state legislators to pass bills that would block the code adoption. Lobbyists in Arizona were successful in passing a code-blocking bill. A similar bill was filed in North Dakota. Lobbyists stated the code change would add \$5,000 to the cost of every new home (Fire Chief, 2009).

In an article entitled Eyewitness to Tragedy: 50 Years Ago a Nation Mourned Its Children, published in the December, 2008 edition of Firehouse Magazine, Hal Bruno gave first hand accounts of the tragic deaths of 92 schoolchildren and three nuns at the Our Lady of Angels School fire on December 1, 1958. Bruno was a volunteer firefighter with Squad 2 of the Chicago Fire Department and a reporter for the Chicago American newspaper during the fire. Bruno responded to the fire with Squad 2 on the fifth alarm (Firehouse, 2008). Bruno wrote of the sights and sounds of the fire, the tragic loss of life, and the heroic efforts of firefighters and citizens in their efforts to rescue the occupants of the school. More importantly, Bruno wrote of the many fire codes that were written and adopted because of the fire. Bruno stated, “after months of investigations, school officials loudly proclaimed that, they would spend money to enclose stairwells and install sprinkler systems. Nevertheless, a year later, hardly any progress had been made in Chicago’s firetrap schools” (Firehouse, page 22, para 6, 2008).

Following previous attempts to enact sprinkler system legislation, school and city officials, under pressure by the public and school lobbyists doubted the validity of sprinkler systems and their ability to work in an actual fire (Firehouse, 2008). This was not the first time America suffered a large loss of life in a school fire. In 1908, in Collingwood, Ohio, 175 children died in a school fire. Even in 1908, the coroner’s investigation and report recommended

“sprinklers for all school buildings” (Firehouse, page 22, para 3, 2008). Bruno indicated that 100 years later, sprinkler legislation is still controversial.

Francine Sawyer, a reporter for the Sun Journal newspaper, published an article entitled Sprinkler Systems Saves Couple, Small Child, on the successful extinguishment of an occupied apartment fire in New Bern, NC. The fire started when unattended candles set bed linens on fire in the parents’ bedroom. Fire Marshal Henry Watson of the New Bern Fire Department stated, “when firefighters arrived at the apartment complex, they observed smoke coming from the apartment and the occupants sitting on the steps waiting for the firefighters to arrive. The sprinkler system saved the unit, the neighbor’s unit, and the building” (Sawyer, 2009). Damage to the apartment was minimal. The occupants had to repaint and replace a few personal items. It was noted in the article that the sprinkler system was the only fire protection devices active in the apartment. The batteries in the smoke detector had been removed (Sawyer, 2009).

Information found in a 2007 position paper published by the North Carolina Association of Fire Chiefs indicated that 48 North Carolina citizens died in residential fires during the period of 2005-2007. The paper advocated the use of ARSS in addition to smoke detectors and other means of escape from residential fires. The following excerpt was contained in the document:

Smoke detectors, fire alarms, family escape plans, fire resistive construction, and plenty of easily accessible ways out in an emergency are all helpful to save lives and reduce injuries in a fire. The single most effective way to protect the life of family and friends in a residential fire is to have a fire sprinkler system. Therefore, it is the position of the North Carolina Association of Fire Chiefs, Board of Directors, that all homes, regardless of size, construction, or type should be protected by a residential fire sprinkler system (NCAFC, 2007).

The material contained in the literature review was retrieved from textbooks, reports, newspaper articles, position papers, trade journals, an Executive Fire Officer ARP, and the World Wide Web. The selected items were based on information pertaining to residential fire sprinkler systems from fire and emergency service agencies, the NFPA, ICC, non-profit organizations, and associations that support life safety initiatives. Each literature work was reviewed based on the ARP subject matter. A synopsis of each literature work was provided in the foregoing paragraphs.

Common themes emerged from the literature works. The themes included the data and facts that sprinkler systems combined with smoke detectors in residential occupancies provide the highest level of available fire protection for occupants of a residence. Education for the public, building and construction industry, and government officials that is directed to the benefits of ARSS is a major component of passing residential sprinkler legislation. Fire officials must work with legislators to ensure adoption of the latest IRC revisions. Homebuilder associations are a formidable opponent to the adoption of the IRC revisions. The final theme that emerged from the literature review was the IAFC, IAFF, and state and local firefighter associations across the United States must remain united in their efforts to ensure adoption of residential sprinkler codes and legislation.

The literature review guided the development of the questionnaire that focused on the process and obstacles encountered during the development of a sprinkler ordinance at the county or municipal level of government. Homebuilders and the construction industry in North Carolina have successfully opposed prior sprinkler legislation. The information contained in the foregoing literature review and the results contained within this research document provided the basis for a

proposed ordinance that requires ARSS in SFDs that are 3,000ft² and larger in Wake County, North Carolina.

Procedure

While attending the Leading Community Risk Reduction (LCRR) course during the second year Executive Fire Officer program at the NFA in 2008, the author developed the research problem and purpose statement for this applied research project.

The author visited the Learning Resource Center to search for articles, textbooks, periodicals, trade journals and applied research papers written by previous Executive Fire Officers related to residential sprinkler systems. Upon returning home from the NFA, the author researched the subject of ARSS on the World Wide Web. Many websites offered information on fire sprinkler systems. The websites visited included the National Fire Protection Association, National Fire Academy, International Association of Fire Chiefs, International Association of Firefighters, the Sun News, American Broadcasting, The News-Record, International Code Council, United States Fire Administration, North Carolina Association of Fire Chiefs, North Carolina State Firemen's Association, Fire Smarts, LLC, Fire Chief, Fire Engineering, Firehouse, New Bern Sun Journal, and Home Fire Sprinklers.org. The author purchased textbooks and standards used in the research.

Four research questions were developed to address the problem and purpose statement. The research questions included: (a) what statistical information supports the reduction of fire related deaths and injuries through the installation of residential fire sprinkler systems; (b) how have counties, cities and communities successfully developed and adopted ordinances in states that do not have code requirements for residential fire sprinkler systems; (c) what obstacles were encountered by local jurisdictions during the development and adoptions phases of residential

fire sprinkler ordinances; and (d) what groups were the supporters and detractors of the ordinances. The author developed a questionnaire that contained 29 questions that were designed to answer the foregoing research questions. See Appendix C. The questionnaire required simple yes/no, fill in the blank, and narrative responses.

The state Fire Marshals for the 50 United States were selected to participate in this research project. The state's Fire Marshal offices were selected because his/her office is normally the state's repository for statistical data on fire related incidents based on the National Fire Incident Reporting System (NFIRS). The Fire Marshal's name, agency name, and address were obtained from the World Wide Web. This information was assembled in a database using Microsoft Excel[®]. See Appendix B. Attached to each questionnaire was a cover letter and a prepaid return envelope for the completed questionnaire. See Appendix A. The cover letter contained an introduction, description of the fire related life safety problem, purpose of the research, research questions that was addressed in the questionnaire, and an offer to receive a final copy of the ARP was given to each participating agency. Two agencies requested a copy of the ARP. Nine or 18% of the Fire Marshal offices participated in the research project. In addition to the research provided by the questionnaire, the author reviewed NFPA 13D Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes. Real estate data and information was obtained from Raymond Echevarria, Director of the Wake County Department of Fire and Emergency Management.

Several limitations affected this research project. The first limitation was the lack of participation from the various state Fire Marshal offices. The author planned to use data from a broader research base. Time and a lack of resources were the other limitations. Additional time and resources would have allowed the research to expand beyond the state level of government.

The additional research would have encompassed statistical information from counties and municipalities that have implemented mandatory fire sprinkler systems in one and two family dwellings.

Results

The states that participated in the research project included Idaho, Iowa, Mississippi, Montana, New York, Ohio, Texas, Washington, and one unidentified state. The number of questionnaires that were returned was much lower than the author expected considering the importance of this residential fire and life safety issue.

The data analysis indicated the total number of fire departments in the nine participating states was 8,783. Texas reported the highest number of departments. Idaho, the smallest reporting the state had 249 departments. 4,309 or 49% of the departments reported they collected statistical information using the NFIRS. The State of Mississippi indicated they do not report fire statistics based on NFIRS. Some departments in each state do not submit data to their respective state Fire Marshal's office. The use of the word agency, agencies or participants, from this point forward, unless otherwise specified in use, is indicative of the state Fire Marshal's office for each state. The following is a recapitulation of the agencies that submitted fire statistics using NFIRS:

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unknown
No. of Departments Per State	249	870	762	420	1857	1216	2000	501	908
NFIRS Reporting Departments	186	344	0	260	90	1210	1033	406	780
Non-NFIRS Reporting Departments	0	0	750	0	0	0	0	0	0

Three agencies include non-NFIRS data in their annual fire statistics report. All of the agencies collect data on the number of fire deaths and injuries within their state. All of the agencies collected data on the number of fires that occurs in one and two family dwellings. Four of the agencies noted the presence of fire sprinkler systems in residential occupancies when a fire occurs. The sample of data provided by the NFIRS and non-NFIRS reporting departments were sufficient to support this research project.

Each research question is listed below followed by the applicable research questionnaire question. The results of the data returned from the agencies are associated with each questionnaire question. Each research question has an analysis component that is based on the research results. The following information is the results of the research questionnaire:

What statistical information supports the reduction of fire related deaths and injuries through the installation of residential fire sprinkler systems?

The purpose of this research question was to collect data that supports the reduction of residential fire related deaths and injuries with ARSS. Moreover, questions 8 through 17 focused on fire statistics for the period 2002 through 2007. Unless otherwise specified, further reference to the term period will be understood to mean the data collection years of 2002 through 2007. The year 2008 was omitted from research because some states are approximately one year in arrears in data collection, compilation, and analysis. The information collected by the following questions was used as an educational component of the model mandatory ARSS ordinance. The research results compilation is located in Appendix D.

Statistical information on fire related deaths and injuries in residential and one and two family dwellings was collected separately. Most states have adopted residential sprinkler

requirements for occupancies other than one and two family dwellings. The purpose for including this information in the data collection was to show that ARSS are proven to reduce residential fire related deaths and injuries. Questions regarding the one and two family dwelling statistics were written to show a need for ARSS in this occupancy type. Questions regarding structure fires in one and two family dwellings 2,999ft² and smaller and 3,000ft² and larger were written to support the need for residential sprinkler systems in larger dwellings.

8. How many deaths occurred in your state in non-sprinklered residential structure fires during the following periods?

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

During the period, 2,080 residential structure fire deaths occurred in non-sprinklered occupancies in the reporting states. The highest number of fire related deaths was 691 as reported by Ohio and the lowest number of fire deaths was 79 as reported by Idaho. The annual average number of deaths per year for the reporting period was 347. Mississippi did not report data for 2007. Texas and the unidentified state did not report for the period.

9. How many deaths occurred in your state in non-sprinklered one and two family dwelling structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of fire deaths that occurred in non-sprinklered one and two family dwellings for the period was 1,283. The annual average number of fire deaths for the period was 214. Ohio reported 694 deaths and Iowa reported 3 deaths.

10. How many fire related injuries occurred in your state in non-sprinklered residential structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of residential fire related injuries in non-sprinklered residential structure fires was 9,038. Ohio was the highest reporting agency with 4,861 injuries. Montana was the lowest with 50 reported injuries. Iowa and Washington did not report statistical data for this question. The annual average number of injuries for the period was 1,506.

11. How many fire related injuries occurred in your state in non-sprinklered one and two family dwelling structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.
 _____ 2004
 _____ 2003
 _____ 2002

The total number of fire related injuries in non-sprinklered one and two family dwellings totaled 7,664. Ohio had the highest injury rate with 4,861 injuries. Montana had the lowest injury rate for the period with 47 injuries. Iowa and Washington did not report statistical data for this question.

Questions 8 through 11 examined fire related deaths and injuries in non-sprinklered residential and non-sprinklered one and two family dwellings. Residential fire related deaths for the period totaled 3,363. Residential fire related injuries in one and two family dwellings for the period totaled 10,315. The foregoing information on fire related deaths and injuries were retrieved from statistical data provided by six of the nine agencies that participated in the project. The participation rate of the reporting agencies represents 12% of the United States. Based on the agency participation rate and the annual death rate average of 581, one can conclude that the annual death rate in the United States is approximately 4, 665 deaths per year in all non-sprinklered residential agencies. Questions 10 and 11 had a four of the nine agency participation rate of data submission for fire related injuries in all non-sprinklered residential occupancies. The residential fire related injuries totaled 16,702. The annual average was 2,804 injuries. Based on the foregoing methodology for fire related deaths, one can conclude that approximately 35,050 people are injured from fires in residential occupancies annually.

Questions 12 through 15 gathered statistical data on fire related deaths, injuries in sprinklered residential, and one and two family dwellings.

12. How many deaths occurred in your state in fire sprinklered residential fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of fire related deaths that occurred during the period in sprinklered residential occupancies totaled 26. Six of the nine agencies reported statistical data. The highest number of deaths occurred in New York. Idaho and Iowa reported zero deaths. Mississippi, Ohio, Texas, and the unidentified state did not report any data for this question. The annual average number of fire deaths among the reporting agencies in sprinklered residential occupancies totaled four.

13. How many deaths occurred in your state in fire sprinklered one and two family dwelling fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of fire deaths that occurred during the period in sprinklered one and two family dwellings were 10. The 10 deaths occurred in the state of New York, Idaho, Iowa, and Montana. Washington reported no fire deaths in this class of residence. The annual average of fire deaths for the reporting agencies was two.

14. How many fire related injuries occurred in your state in sprinklered residential fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of fire related injuries that occurred during the period in sprinklered residential occupancies was 127. Four of the nine reporting agencies submitted data for this question. The state of Ohio reported 65 injuries and had the highest number of injuries. The state of Idaho did not report any injuries. The annual average number of fire related injuries for the period was 12.

15. How many fire related injuries occurred in your state in sprinklered one and two family dwelling fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

The total number of fire related injuries in sprinklered one and two family dwellings were 45. New York reported 26 injuries and was the highest reporting agency. Idaho reported no injuries. Ohio reported 19 injuries. The remaining agencies did not report statistical data for this area of research. The annual average of fire related injuries for the period was eight.

Questions 12 through 15 examined fire related deaths and injuries in sprinklered one and two family dwellings. Fire related deaths in sprinklered occupancies totaled 26. Fire related deaths in sprinklered one and two family dwellings totaled 10. The total number of fire related deaths for the period was 36. Comparing the number of fire related deaths in non-sprinklered and sprinklered residential occupancies one can observe a 3,329 or 98.92% fire death reduction in sprinklered occupancies. During the same reporting period similar reductions were observed for fire related injuries in all sprinklered residential occupancies. The total number of fire related injuries in non-sprinklered residential occupancies during the reporting period was 10,315. The total number of injuries in sprinklered residential occupancies was 45. The installation of residential sprinkler systems resulted in a 10,270 or 99.56% reduction in fire related injuries.

The focus of this ARP was to develop a model ordinance that mandates the installation of residential sprinkler systems in one and two family dwellings that are 3,000ft² and larger. The purpose of the next group of questions was to determine if a larger or smaller percentage of fires occurred in dwellings 3,000ft² or larger as compared to smaller dwellings.

16. How many structure fires occurred in one and two family dwellings that were 2,999ft² and smaller during the following periods?

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

Two of the nine agencies submitted data for this question. New York reported 11,403 fires and Ohio reported 35,515 fires. The total was 46,558 fires in one and two family dwellings that were 2,999ft² or smaller.

17. How many structure fires occurred in one and two family dwellings that were 3,000ft² or larger during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

Two of the nine agencies submitted data for this question. New York reported 828 fires and Ohio reported 1,759 fires. The total was 2,587 fires in one and two family dwellings that were 3,000ft² and larger. A larger number of fires occurred in the 2,999ft² or smaller dwellings compared to the 3,000ft² and larger dwellings. Based on a comparison of smaller versus larger dwelling fires during the period, 94.44% of the one and two dwellings fires occurred in smaller dwellings.

How have counties, cities, and communities successfully developed and adopted ordinances in states that do not have code requirements for residential fire sprinkler systems.

Questions 18 through 21 were developed to determine the number of states that have adopted or written fire codes, statutes, or ordinances requiring fire sprinkler systems in residential occupancies and one and two family dwellings 2,999ft² or smaller dwellings and dwellings 3,000ft² or larger.

18. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of fire sprinkler systems in residential occupancies?

- Yes
- No

Three of the agencies reported their state had adopted or written codes, statutes, or ordinances that required the use of sprinkler systems in residential occupancies. Six states did not have sprinkler requirements for residential occupancies.

19. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings?

- Yes
- No

If yes, please provide a copy of the code, statute, or ordinance.

None of the agencies reported having fire sprinkler system codes, statutes, or ordinance requirements for one and two family dwellings.

20. Has your state adopted or written building or fire codes, statutes or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings less than 2,999ft² ?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

None of the agencies reported having fire sprinkler system codes, statutes, or ordinance requirements for one and two family dwellings less than 2,999ft².

21. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings 3,000ft² or greater?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

None of the agencies reported having fire sprinkler system codes, statutes, or ordinance requirements for one and two family dwellings that were 3,000ft² or larger.

The research results for the above questions indicated that few states have ARSS requirements for residential occupancies and one and two family dwellings. The small number of agencies that submitted data relevant to this ARP indicates a need for future ARSS research.

Questionnaire questions 22 through 24 were developed to answer the second research question regarding how many counties, cities, and communities have successfully developed and adopted ordinances in states that do not have code requirements for ARSS. These questions sought information on the processes used for developing codes, statutes, or ordinances that

require residential sprinkler systems in one and two family dwellings. Moreover, the author sought information on the names of local government entities that required ARSS in one and two family dwellings.

22. If your answers to questions 18, 19, 20 or 21 are yes, please describe the process or related information that led to the adoption or writing of a building or fire code, statute, or ordinance that requires the installation of ARSS in residential occupancies that include one and two family dwellings.

Two of the nine participating agencies responded to this question. Idaho adopted the provisions of the International Fire Code. Ohio requires sprinkler systems in hotels, motels, boarding houses, and apartments. Idaho and Ohio do not require sprinkler systems in one and two family dwellings.

23. If your answers to questions 18, 19, 20 or 21 are no, are there counties, cities, towns, or local jurisdictions within your state that have adopted or written building or fire codes, statutes, or ordinances that require the installation of ARSS in residential occupancies that include one and two family dwellings?

- Yes
- No

Seven of the nine participating agencies indicated there were local jurisdictions within their state that required sprinkler systems in residential occupancies and one and two family dwellings. Mississippi and Ohio indicated there were no local jurisdictions within their state that required sprinkler systems in one and two family dwellings.

24. If the answer to question 23 is yes, please provide a list of the counties, cities, towns, or local jurisdictions that have adopted or written building or fire codes, statutes, or

ordinances that require the installation of residential sprinkler system in residential occupancies that include one and two family dwellings?

Six of the nine participating agencies reported some of the counties, cities, towns, or local jurisdictions within their state had sprinkler system requirements for residential and one and two family dwellings. The cities and towns of West DeMoines, Clive, Urbandale, Johnston, and Grimes, Iowa require sprinkler systems in all residential occupancies. The counties of Missoula, Gallatin, Montana, Lake Jackson, Woodlands, and University Park, Texas require sprinkler systems in all residential occupancies.

The Fire Marshal for the State of New York reported the New York legislature must adopt the residential sprinkler code requirements as set forth in the revisions of the IRC. Noted in the Fire Marshal's response was the process of negotiations, additions, and deletions to the IRC prior to adoption. Moreover, the Fire Marshal noted that the following cities, towns, and villages mandate sprinkler systems in all residential occupancies:

Gates, Village of Ossining, Greene, Penfield, Guilderland, Village of Aye Brook, Town of Harrison, Village of Sleepy, Village of Irvington, Hollow, Town of Ithaca, Village of Tarrytown, Town of Newburgh, Town of New Castle, Village of North Syracuse, and the Town of Onondaga.

The cities and towns of Issaquah, Kirkland, Mercer Island, Squammamish, Shoreline, Woodinville, Steilacoom, and King County, Washington require sprinklers in single-family dwellings that are 5,000ft² or larger and dwellings that have zero lot lines.

What obstacles were encountered by local jurisdictions during the development and adoptions phases of residential fire sprinkler ordinances?

25. If your answers to questions 18, 19, 20 or 21 are yes, what were the obstacles that your state encountered during the adoption or development of codes, statutes, or ordinances relating to fire sprinkler systems in residential occupancies?

The State of Idaho reported legislative resistance from affected elected officials. Home builder groups have prevented the adoption of residential sprinkler requirements within the state of Idaho. The remaining agencies did not answer this question.

What groups were the supporters and detractors of the ordinances?

Questions 26 through 29 were developed to determine the various groups of supporters and detractors for adopting the IRC fire sprinkler requirements for residential occupancies. The questions were divided between residential occupancies and one and two family dwellings. The purpose of the division between the occupancy types was to determine if there were different supporters or detractors for the sprinkler requirements in the different occupancy types.

- 26 Who were the supporters for the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in residential occupancies in your state?

Six of the nine questionnaire participants stated the fire service and related Firefighter, Fire Chief and Fire Marshal associations were the supporters of the passage of codes and ordinances that required fire sprinkler systems in residential occupancies. Moreover, the fire sprinkler industry supports the fire sprinkler requirements. Included in the responses was the need for fire service leaders to be unified in the support of code revisions and adoption of codes that require ARSS. In addition, the Fire Marshal in Mississippi stated, “education is the key to code adoption and enforcement as well as fire safety in the homes.”

27. Who were the supporters for the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in one and two family dwellings in your state?

Seven of the nine participants responded to this question. The results of this question were similar to the results for question 26. The fire service and various associations support fire sprinkler systems in residential occupancies. The fire service was the largest supporter of the IRC revisions that incorporated sprinkler system requirements for one and two family dwellings. Texas reported that the insurance industry supported residential sprinkler requirements in their state. Education that focuses on the need for residential sprinklers was viewed as a contributing factor for residential sprinkler codes adoption.

28. Who were the detractors of the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in residential occupancies in your state?

Five of the nine participants responded to this question. The common theme among the participants was the building industry was opposed to code development and adoption that required fire sprinklers in residential occupancies. Other groups and factors that were detractors for sprinkler code development and adoption included individual legislators, homebuilder groups, property owner associations, cost, anti-government legislation, and water purveyors.

29. Who were the detractors of the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in one and two family dwellings?

Four of the nine participants responded to this question. Answers for this question were similar to responses to question 28. The NAHB and building code officials were opposed to national codes and the adoption of codes at the local level that require fire sprinklers in one and two family dwellings. Water purveyors in the State of Washington are opposed to residential sprinkler systems.

Discussion

The focus of the literature review was on the reduction of fire related deaths from the use of ARSS in one and two family dwellings. While the concept of residential sprinkler systems is not new, prior efforts to mandate codes, statutes, or ordinances that required ARSS were met with great opposition at the state and local levels of government. The literature review materials included NFPA standards, newspaper articles, textbooks, periodicals, trade journal publications, and applied research papers written by Executive Fire Officers. In addition, information was retrieved from the World Wide Web.

Research was conducted to determine how each agency collected civilian residential fire related death and injury data for each state. The purpose of this portion of the data collection and analysis was to determine how many fire departments were in each state and if they were reporting in a standard format consistent with the NFIRS. This information was needed to determine if the data was consistently reported the same from state to state. One can conclude from the low number of reporting agencies that a significant number of agencies did not have their states NFIRS data in a readily reportable format, some agencies do not compile NFIRS data, states do not have a central repository for NFIRS data, or a significant number of fire departments across the United States do not report statistical data to a central state agency. Moreover, one can conclude that some agencies do not have sufficient staff to compile data or report information.

The research questions were developed to determine if sufficient data and information existed that supports a reduction in residential fire related deaths and injuries from the installation of ARSS in one and two family dwellings. Moreover, the data and information support the author's educational component of the ARSS model ordinance. Additional research

questions focused on the processes for developing and adopting codes, statutes, or ordinances for mandatory residential sprinkler requirements. Further, the authors research questions focused on the obstacles, supporters, and detractors that have been encountered by fire officials during their efforts to develop and adopt one and two family dwelling residential sprinkler requirements.

Statistical data that supports the research question regarding the reduction of fire related deaths and injuries through the installation of ARSS was solicited from 50 state Fire Marshals. The data submitted by each agency was disparate. The disparity of data created limited opportunities for in depth statistical analysis. However, one can draw conclusions from the data that shows fewer fire related deaths and injuries occur in sprinklered versus non-sprinklered residential occupancies.

During the period of 2002 through 2007, referred to as the period, the agencies reported 2,080 residential fire deaths in non-sprinklered occupancies. Fire deaths in non-sprinklered one and two family dwellings totaled 1,283. The fire related injury rate for non-sprinklered residential occupancies was 9,083. The fire related injury rate in non-sprinklered one and two family dwellings was 7,664.

The fire related death and injury rate in sprinklered residential occupancies and one and two family dwellings dropped significantly for the same period. Twenty-six fire related deaths occurred in sprinklered residential occupancies compared to 2,080 fire related deaths in non-sprinklered residential occupancies. The same fire death reduction trend occurred in sprinklered one and two family dwellings. During the period, ten deaths occurred in sprinklered one and two family dwellings compared to 1,283 in non-sprinklered one and two family dwellings. Fire related injuries in sprinklered residential occupancies was 127 compared to 9,038 in non-

sprinklered residential occupancies. Forty-five injuries occurred in sprinklered one and two family dwellings compared to 7,664 injuries in non-sprinklered one and two family dwellings.

The research results compared to prior literature works written on the subject of non-sprinklered versus sprinklered residential occupancies produced similar findings. Numerous texts, articles, and publications have touted the safety benefits of ARSS for decades. In 2007, Christian Dubay wrote of the benefits of residential sprinkler systems in one and two family dwellings. Dubay's work included the history of the invention of fire sprinklers by Henry Parmelee in the late 1800's. In addition, Dubay cited Parmelee's foresight was when he installed a residential sprinkler system in his home (2007). History has shown the benefits of fire sprinkler systems in industrial and commercial buildings and the reduction in fire related property loss that benefited property owners and the insurance industry. Not until the congressional commissioned report entitled America Burning was published in 1973 was the magnitude of residential fire problems in the United States known (Dubay, 2007).

The NFPA 13 Standard on Residential Sprinkler Systems was published in 1975 because of the America Burning report, the researchers associated with the report and the NFPA. NFPA 13 became NFPA 13D in subsequent editions and addressed sprinklers systems in one and two family dwellings and manufactured homes (Dubay, 2007).

Many fire officials across the United States were exposed to the American Burning report and the resulting NFPA 13D standard. Progressive fire officials have advocated for the development of codes, statutes, or ordinances within their jurisdictions and have mandated the installation of residential sprinklers in newly constructed one and two family dwellings. Ronald J. Siarnicki was one of the progressive fire officials when he served as Fire Chief of Prince Georges County, Maryland. During his tenure as Fire Chief and recognizing the fire and life

safety benefits of residential sprinkler systems, Siarnicki led the effort to mandate that all newly constructed residential occupancies in PGCM were required to have NFPA 13D compliant sprinkler systems installed starting in February of 1988.

As part of his Executive Fire Officer Program research requirements, Siarnicki wrote an ARP entitled Residential Sprinklers: One Community's Experience Twelve Years After Mandatory Implementation. Siarnicki provided statistical data that proved sprinkler systems reduced the loss of life and injuries in residential structure fires. During the period of January 1, 1992 through December 21, 1999, there was no loss of life and seven minor injuries recorded in PGCM from fires in sprinklered residential occupancies (Siarnicki, 2001). During the same period, 22 fatalities and 46 injuries occurred from fires in non-sprinklered residential occupancies (Siarnicki, 2001).

In an article entitled Sprinkler System Saves Couple, Small Child, Francine Sawyer, a reporter for the Sun Journal, noted the successful outcome of a residential fire event that was extinguished by an ARSS. This newspaper article is one of many success stories touting the benefits of ARSS in saving lives and preventing injuries from fire.

The research results that support the reduction of deaths and injuries from residential fires shows disparity in data collection and reporting from state to state. The limitations of the data did not provide sufficient information to prove, nationally or regionally that residential sprinkler systems reduced deaths and injuries from residential fires. However, there was sufficient data on a state-by-state basis to conclude that residential sprinkler systems reduce residential fire related deaths and injuries. The data provided a comparison of information found in previous subject matter literature contained within this document. The author is in agreement

with the findings of Dubai, Siarnicki, and Sawyer and the findings of the research. Residential sprinkler systems significantly reduce residential fire related deaths and injuries.

Continuing the discussion of the research questions, additional research focused on dwelling size. Dwelling size has a direct affect on the time it takes an occupant to escape a SFD during a fire emergency. Dwelling size has a direct affect on a fire department's ability to conduct expedient search and rescue operations. Questions were developed to determine the number of fires that occurred in one and two family dwellings that were 2,999ft² and smaller and 3,000ft² and larger. The results of the research indicated that 94.44% of residential fires occurred in dwellings 2,999ft² or smaller.

Dubay expanded the concept of increased escape times for larger dwellings and the need for a minimum supply of water for residential sprinklers (2007). The ten-minute minimum water supply correlates with a ten-minute occupant escape time once the system activates and simultaneously sounds an audible alarm (Dubay, 2007).

The second research question sought information on how counties, cities, and communities successfully developed and adopted ordinances in states that do not have code requirements for ARSS. The purpose of this question was to determine the various processes for developing and implementing mandatory sprinkler requirements in local jurisdictions. There are counties, cities, and communities across the United States who have successfully reduced residential fire related deaths and injuries through mandatory sprinkler requirements.

The questionnaire questions associated with the research questions identified the communities that have successful mandatory residential sprinkler programs. The research questions were divided between residential occupancies, one and two family dwellings, dwellings 2,999ft² and smaller, and 3,000ft² and larger. The purpose of the division was to

determine if state or local jurisdictions targeted all residential occupancies or those that meet certain size requirements.

The results of the research indicated that three of the five agencies reported their state had adopted or written codes for residential occupancies. None of the agencies reported codes, statutes, or ordinances that required fire sprinkler system in one and two family dwellings. None of the agencies reported having codes, statutes, or ordinances that addressed mandatory sprinkler requirements for specific sized one and two family dwellings. The majority of the agencies reported some of the counties, cities, or communities within their state had adopted or written codes, statutes, or ordinances that required residential fire sprinkler systems in all residential occupancies.

Siarnicki addressed the procedures for adopting mandatory fire sprinkler requirements for all residential occupancies, regardless of size or type, in his NFA applied research paper. Siarnicki used strategic planning to identify all of the procedures needed for developing and implementing a mandatory sprinkler requirement, identifying who were the key community leaders and government officials needed for the process to be successful, and the evaluation process used to measure the success or failure of the sprinkler program. The success of the PGCM sprinkler program is attributed to using “solid facts and obtainable predictions” during the planning phase of the project (Siarnicki, 2001). Moreover, Siarnicki emphasized education as being a vital component of the process plan.

Siarnicki’s reference to education included formal and informal education and training (2001). Formal education was provided for the county’s plan review personnel and inspectors. Informal education on the benefits of residential fire sprinkler systems was provided to other plan development and implementation members, government officials, and the public. Training

on the proper installation of residential sprinkler systems was provided for installers, plumbers, and trades persons.

The data provided by the participating agencies lacked sufficient information to generate a clear understanding of how to adopt existing codes or write codes, statutes, or ordinances that require ARSS in one and two family dwellings. It is the author's opinion, based on the small percentage of participating agencies in this ARP and the disparate information provided by those agencies that participated, that a large number of fire officials are not concerned with the high number of fire related deaths and injuries in the United States. A second opinion of the author is that there is great concern for the high number of fire related deaths and injuries in the United States and the opposition against ARSS is insurmountable. Because of the lack of submittals relating to ordinance adoption procedures for this research question, the author agrees with the writings of Siarnicki and is of the opinion that the mandatory residential sprinkler legislation led by Siarnicki can be used by fire officials as a model to follow for the development of similar residential fire sprinkler programs.

The third research question focused on obstacles that hindered or prohibited the development or adoption of codes, statutes, or ordinances that required residential sprinkler systems in local jurisdictions. The state of Idaho was the only agency that responded to this question. The Fire Marshal reported elected officials and homebuilder groups prevented the adoption of residential sprinkler requirements within their state. Similar opposition surfaced during the literature review. Numerous articles were published that indicated a large majority of elected officials and builder associations opposed legislation or adoption of codes that required residential sprinkler systems.

In PGCM, Siarnicki reported the home building industry led the fight to oppose sprinkler legislation. The home building industry stated high cost, accidental sprinkler discharges, and excessive water damage as reasons to fight the legislation (Siarnicki, 2001). Fuller reported that South Carolina Governor Mark Sanford vetoed a bill that would provide tax incentives for property owners that installed residential sprinkler systems (2008). An article in the Sun News, following a fatal North Carolina fire in which seven college students died, spoke of the obstacles North and South Carolina code officials faced after a failed attempt to form a committee to study the feasibility of requiring residential sprinklers in residential occupancies 3,600ft² or larger, vacation homes, or SFDs three stories in height (2007).

During the fall of 2008, the News-Record stated the NAHB opposed recent changes to the IRC that requires ARSS in all new one and two family dwellings (Elmquist, 2008). Opposition to the installation of sprinkler systems is not a new experience for fire officials. Following the tragic Our Lady of Angels School fire on December 1, 1958, fire officials led the effort to have sprinkler systems installed in all Chicago schools. After a year of investigations by Chicago fire officials and efforts to move forward with local codes that would require sprinkler systems in all schools, school and city officials buckled under pressure by the public and school lobbyist that were opposed to the sprinkler code changes (Firehouse, 2008).

The results for this research question were limited. The literature review and research shows that some special interest groups oppose all forms of fire sprinkler system legislation. The findings of the literature review and research support one another. Following The Station nightclub fire in West Warwick, Rhode Island where 100 persons died, the NCBCC rejected the adoption of the ICC code changes that required sprinkler systems in places of assembly where the occupancy load was 100 or more persons.

The final research question sought to identify the supporters and detractors of residential fire sprinkler ordinances. The responses from the participating agencies spoke of Firefighter, Fire Chief, and Fire Marshal associations that were unified in their efforts to support the recent changes in the IRC that requires fire sprinkler systems in one and two family dwellings and manufactured housing. The insurance industry was listed as a supporter of residential sprinkler systems. Several participants stated that education by fire service officials was a key component for the passage of mandatory sprinkler requirements.

Numerous articles were written in support of requiring ARSS in one and two family dwellings. In an article that appeared in Fire Chief Magazine, Coleman extolled the efforts of fire officials and others who supported changes to the IRC and the continuous efforts to support the code changes through the ICC appeals process (2008). An article published by the IAFC reported the fire service won a major victory in the passage of code changes that requires ARSS in one and two family dwellings. Over 100 public safety organizations supported and voted for the code changes (Grorud, 2008). After losing her son to a tragic fraternity house fire on Mothers Day of 1996, Bonnie Woodruff became a national advocate for fire sprinkler systems in college dorms and fraternity and sorority houses (ABC, 2007). Position papers published by the North Carolina Association of Fire Chiefs and the North Carolina State Firemen's Association strongly support residential fire sprinkler legislation (2008).

The USFA continues, as part of their primary mission, to support an effort that requires ARSS in all residential occupancies. In a position paper, the USFA stated they support changes to the IRC that require automatic sprinkler systems in all new residential construction (USFA, 2008).

The works included in the literature review and the results of the research compliment each other in support for the installation of ARSS. Many fire service organizations and fire officials support the adoption of code revisions or the development of statutes or ordinances that are designed to reduce residential fire related deaths and injuries. The author agrees with the research results and the literature works of others.

The results of the detractor portion of the final research question produced similar responses as questions on the obstacles that were encountered when efforts to mandate residential sprinklers in residential occupancies failed. The participants listed the detractors as the building industry, NAHB, individual legislators, property owner associations, cost, anti-government legislation, and water purveyors. Based on the similarity of the results from the participating agencies regarding the obstacles to residential sprinkler legislation, the author considered the literature review for the detractors to be the same as the obstacles that was previously discussed.

The author observed that the results and articles in the literature review regarding distracters efforts to stop mandatory sprinkler systems in residential occupancies are similar. The one item that was different for this question was the response that water purveyors objected to residential sprinkler systems. The author contacted AQUA, a North Carolina private system water purveyor, regarding the response from the State of Washington. The representative from AQUA stated the private water systems were not designed to meet the required water flow requirement for fire sprinkler systems, and they would incur higher infrastructure cost for such water supply systems. The water purveyor said the higher infrastructure cost would be passed to the consumer through higher tap on fees and monthly water fees. The water purveyor stated that

the higher monthly water fees of approximately \$600 per month would be cost prohibitive for the homeowner. The higher costs bear further research for a separate applied research paper topic.

The findings of the research and review of previous literature works produced similar results. The research participants were 82 percent less than expected. However, based on the data and information contained within this applied research paper one can conclude that residential fire sprinklers, in addition to smoke detection systems, provide the highest degree of protection for reducing residential fire related deaths and injuries.

The statistical data collection and research submissions varied by agency during the reporting period. The variations of data submissions limited the breadth of the research results. However, the author observed a significant reduction in fire deaths and injuries in all sprinklered occupancies during the reporting period. Based on the foregoing information, fire officials and those skilled in the art of fire protection can conclude from the reduction of fire related deaths and injuries in sprinklered residential occupancies that a greater emphasis must be placed on adopting the IRC or developing and adopting statutes or ordinances for the mandatory installation of residential sprinkler systems.

Recommendations

Because of the information and research results for this applied research project, a model ordinance was written for the mandatory installation of ARSS in newly constructed single family dwellings that are 3,000ft² and larger located in Wake County, North Carolina. The model ordinance is located in Appendix E. The adoption and implementation of this ordinance will result in the prevention and reduction of residential fire related deaths and injuries to citizens of Wake County. Secondly the adoption and implementation of the ordinance will prevent and

reduce the potential for residential fire related deaths and injuries for Fairview Fire Department and Wake County firefighters.

It is recommended that the following action items take place to adopt and implement the model residential sprinkler ordinance in Wake County.

- Review of the applied research project by the Board of Directors and firefighters of the Fairview Fire Department.
- Review of the applied research project by the Wake County Department of Fire and Emergency Management.
- Review of the applied research project and ordinance by the Wake County Manager, Attorney, and Board of Commissioners.
- Seek the support and approval of the Wake County Department of Fire and Emergency Management and the Board of Commissioners to form a task force to conduct a feasibility study for the model ordinance.
- Form a task force of fire and rescue personnel, citizens, a Board of Commissioners member, county legal council, county plans review and inspection, and representatives from the Wake County Association of Homebuilders that develops a strategic plan for the adoption and implementation of the model SFD fire sprinkler ordinance.
 - The strategic plan shall include, but not be limited to, program education, adoption, implementation, measurement, evaluation, and time-line components.
- Research and obtain public educational programs and materials that detail the benefits of residential fire sprinkler systems.
- Develop educational and training programs for building contractors, plumbers, and trades persons on how to properly install and test residential sprinkler systems.

- Develop educational and training programs for county plan review and inspection personnel.
- Provide periodic reports to the county Board of Commissioners.
- Adopt and implement the model ordinance.
- During the implementation phase of the program, conduct a monthly evaluation to determine the need for ordinance revisions as internal and external environmental factors influence necessary changes.
- Request NFIRS residential structure fire data from Wake County fire departments on a monthly basis to determine the success or failure of the program.
- Compile residential structure fire data on an annual basis to evaluate the success or failure of the program.
- Evaluate the program on an annual basis to determine the need for revision.
- Publish in the annual county budget document the results of implementing the residential sprinkler program.

The subject matter, literature review, research, results, recommendations, and the model ordinance developed for this applied research program may be used to develop similar residential sprinkler programs in other jurisdictions. The content contained herein is that of the author, except where cited, and is submitted for use in the public domain. However, the author assumes no liability or responsibility for the results of adoption or implementation of the residential sprinkler ordinance contained within the Appendices, where the author has no direct jurisdictional authority for the control or use of the ordinance or appurtenances.

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Appendix A

Questionnaire Cover Letter

FAIRVIEW FIRE DEPARTMENT
4501 Ten-Ten Road
Apex, NC 27539
Telephone (919)-362-8445 - Facsimile (919) 387-3437
Email: ebrinson@celito.net

December 5, 2008

Subject: Executive Fire Officer Program Applied Research Project

I am working on an applied research project for the National Fire Academy Executive Fire Officer Program (EFO). The EFO class that prompted this research project was Leading Community Risk Reduction. The title of my applied research project is A Model Fire Sprinkler Ordinance for Large Single Family Occupancies.

Wake County, North Carolina is experiencing rapid growth resulting in the construction of residential occupancies that are three thousand square feet and larger. Many of the homes exceed ten thousand square feet. The larger residential occupancies create a higher risk for fire related deaths and injuries to occupants and firefighters from rapid-fire growth, prolonged escape times and the inability of fire departments to rescue trapped occupants during advanced fire conditions. Fire loss dollars in large occupancies range in the millions. The purpose of my research is to examine information related to fire related deaths and injuries in non-fire sprinklered and sprinklered residential occupancies.

The data gathered from the attached questionnaire will provide the basis for developing a model ordinance that requires fire suppression sprinkler systems in residential occupancies that are three thousand square feet and larger. Some states have adopted or are in the process of adopting codes that require residential sprinkler systems in single-family residential occupancies. States that do not have residential sprinklers as a code requirement may have local jurisdictions within their state that have adopted ordinances that require residential sprinklers. The questions contained herein are designed to answer four research areas within your state or a county or local jurisdiction within your state. The research questions are:

1. What statistical information supports the reduction of fire related deaths and injuries through the installation of residential fire sprinkler systems?
2. How have counties, cities and communities successfully developed and adopted ordinances in states that do not have code requirements for residential fire sprinkler systems?
3. What obstacles were encountered by state and local jurisdictions during the development and adoption phases of residential fire sprinkler ordinances?
4. What groups were the supporters and detractors of the ordinances?

I would greatly appreciate your participation in this applied research project. Please complete the enclosed questionnaire and return it to me in the enclosed prepaid envelope by

January 5, 2009. Moreover, I would appreciate it if you would share any related data that your agency has compiled that would apply to this applied research project.

The information you supply will assist in the development of a model single-family residential fire sprinkler ordinance. I will be happy to share the findings of my research and supply you a copy of the final research document. Please add a quick note in your return envelope if you desire a copy of the document. Thank you for participating in this research project.

Respectfully,

Edward P. Brinson
Fire Chief

Enclosures

Appendix B

Fire Marshal Database

Residential Sprinklers-64

First Name	Initial	Last Name	Title	Address	City	State	Zip Code
Edward	S.	Paulk	Fire Marshal	P.O. Box 303351	Montgomery	AL	36130-3351
David		Tyler	Fire Marshal	5700 E. Tudor Road	Anchorage	AK	99507-1225
Dewayne	D.	Pell	State Fire Marshal	1540 W. Van Buren St.	Phoenix	AZ	85007
Lindsey		Williams	Fire Marshal	1 State Police Plaza Drive	Little Rock	AR	72209
Kate		Dargan	Fire Marshal	P.O. Box 944246	Sacramento	CA	94244-2460
Kevin		Klein	Director	9195 East Mineral Avenue, Suite 234	Centennial	CO	80112
John		Blaschik, Jr.	Deputy Fire Marshal	1111 Country Club Road	Middletown	CT	06457
Grover	P.	Ingle	Fire Marshal	1537 Chestnut Grove Road	Dover	DE	19904-9610
Alex		Sink	Fire Marshal	200 East Gaines Street	Tallahassee	FL	32399-0340
John	W.	Oxendine	Fire Commissioner	Two Martin Luther King, Jr. Drive, West Tower, Suite 716	Atlanta	GA	30334

Residential Sprinklers-65

Attilo		Leonardi	Chair of State Fire Council	3375 Koapaka Street, Suite H425	Honolulu	HI	96819-1898
Mark		Larson	State Fire Marshal	700 W. State Street	Boise	ID	83720
Ernest		Russell	State Fire Marshal	1035 Stevenson Dr.	Springfield	IL	62703-4259
M.	Tracy	Boatwright	State Fire Marshal	402 W. Washington St., Room C246	Indianapolis	IN	46204
James		Kenkel	State Fire Marshal	E. 9th & Grand Ave.	Des Moines	IA	50319
Joe		Odle	Fire Marshal	700 SW Jackson, Ste. 600	Topeka	KS	66603-3714
Dave		Manley	Fire Marshal	1047 US 127 S.	Frankfort	KY	40601
Vincent	J.	Bella	State Fire Marshal	8181 Independence Blvd.	Baton Rouge	LA	70806
Lt. Ladd		Alcott	State Fire Marshal	52 State House Station	Augusta	ME	04345
William		Barnard	Fire Marshal	300 East Joppa Road, Suite 1002	Towson	MD	21286-3020
Stephen		Coan	Fire Marshal	1010 Commonwealth Ave.	Boston	MA	02215

Residential Sprinklers-66

Mark		Dougovito	Commanding Officer	7150 Harris Dr.	Lansing	MI	48913
Thomas	R.	Brace	State Fire Marshal	444 Cedar Street, Suite 100M	St. Paul	MN	55101-2149
Ricky		Davis	Chief Deputy Fire Marshal	P.O. Box 79	Jackson	MS	39205
Bill		Farr	State Fire Marshal	175 Industrial Drive, P.O. Box 844	Jefferson City	MO	65102
Allen		Lorenz	State Fire Marshal	P.O. Box 201415	Helena	MT	59620-1415
Michael	R.	Durst	Fire Marshal	246 S. 14th St.	Lincoln	NE	68508
Doyle	G.	Sutton	Fire Marshal	107 Jacobson Way	Carson City	NV	89711
William		Degnan	Fire Marshal	10 Hazen Dr.	Concord	NH	03305
George	A.	Miller	Director/ Fire Marshal	101 S. Broad St., CN 809	Trenton	NJ	08625
George		Chavez	State Fire Marshal	PO Box 1269	Santa Fe	NM	87504
Floyd	A.	Madison	State Fire Administrator	98 Washington Avenue, Suite 500	Albany	NY	12231-0001

Residential Sprinklers-67

Jim		Long	State Fire Marshal	430 N. Salisbury Street	Raleigh	NC	27603-1212
Raymond		Lambert	Fire Marshal	P.O. Box 1054	Bismarck	ND	58502
Patrick		Wambo	Bureau Chief	8895 East Main Street	Reynoldsburg	OH	43068
Tom		Wilson	Fire Marshal	2401 N.W. 23rd Street, Suite 4	Oklahoma City	OK	73107
Robert		Garrison	State Fire Marshal	4760 Portland Road, NE	Salem	OR	97305-1760
Nick		Saites	State Fire Marshal	1800 Elmerton Avenue	Harrisburg	PA	17110
Irving		Owens	State Fire Marshal	24 Conway Ave, Quonset/ Davis,	North Kingstown	RI	02852
Robert		Polk	State Fire Marshal	141 Monticello Trail	Columbia	SC	29203
Dan		Carlson	Fire Marshal	500 E. Capitol Avenue	Pierre	SD	57501
Doc		Garner	Fire Marshal	500 James Robertson Pky., 3rd Fl.	Nashville	TN	37243
G.	Mike	Davis	State Fire Marshal	P.O. Box 149221	Austin	TX	78714-9221
Gary	A.	Wise	State Fire Marshal	5272 South College Dr., Ste. 302	Murray	UT	84123

Residential Sprinklers-68

Robert	M.	Howe	Assistant Fire Marshal	National Life, North Building Drawer 20	Montpelier	VT	05620-3401
Charles		Altizer	Fire Marshal	205 N. Fourth St.	Richmond	VA	23219
Aiyla		Pinentel	Assistant State Fire Marshal	P.O. Box 42600	Olympia	WA	98504-2600
Walter		Smittle, III	Fire Marshal	2000 Quarrier St.	Charleston	WV	25305
Carolyn	S.	Kelly	State Fire Marshal	123 W. Washington, 7th Fl., P.O. Box 7857	Madison	WI	53703
Jim		Narva	Fire Marshal	Herschler 1 West	Cheyenne	WY	82002

Appendix C

Applied Research Paper Questionnaire

Executive Fire Officer

Leading Community Risk Reduction

Applied Research Project Questionnaire

1. How many fire departments are located within you state?
_____ Total Number of Fire Departments
2. How many fire departments in your state submit fire reports or data to your agency based on the National Fire Incident Reporting System (NFIRS)?
_____ Total Number of Fire Departments Reporting
3. How many fire departments in your state submit fire reports or data to your agency that is not based on the National Fire Incident Reporting System?
_____ Total Number of Non-NFIRS Reporting Departments
4. Do you include the non-NFIRS data in your annual report?
 Yes
 No
5. Does your state collect data on the number of fire death and injuries in residential occupancies each year?
 Yes
 No
6. Does your state collect data on the number of fires that occurs in one and two family dwellings?
 Yes
 No

7. Does your state collect data regarding the presence of sprinkler systems in residential occupancies in which a fire occurs?

Yes

No

8. How many deaths occurred in your state in non-sprinklered residential structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

9. How many deaths occurred in your state in non-sprinklered one and two family dwelling structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

10. How many fire related injuries occurred in your state in non-sprinklered residential structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

11. How many fire related injuries occurred in your state in non-sprinklered one and two family dwelling structure fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

12. How many deaths occurred in your state in fire sprinklered residential fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

13. How many deaths occurred in your state in fire sprinklered one and two family dwelling fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

14. How many fire related injuries occurred in your state in sprinklered residential fires during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

15. How many fire related injuries occurred in your state in sprinklered one and two family dwelling during the following periods:

_____ 2007

_____ 2006

_____ 2005

Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

16. How many structure fires occurred in one and two family dwellings that were 2,999ft² and smaller during the following periods?

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

17. How many structure fires occurred in one and two family dwellings that were 3,000ft² or larger during the following periods:

_____ 2007

_____ 2006

_____ 2005 Please place an N/A in years that data is not available.

_____ 2004

_____ 2003

_____ 2002

18. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of fire sprinkler systems in residential occupancies?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

19. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

20. Has your state adopted or written building or fire codes, statutes, or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings less than 2,999ft²?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

21. Has your state adopted or written building or fire codes, statutes or ordinances that require the installation of residential fire sprinkler systems in one or two family dwellings 3,000 ft² or greater?

Yes

No

If yes, please provide a copy of the code, statute, or ordinance.

22. If your answers to questions 18, 19, 20 or 21 are yes, please describe the process or related information that led to the adoption or writing of a building or fire code, statute, or ordinance that requires the installation of residential fire sprinkler systems in residential occupancies that include one and two family dwellings.

23. If your answers to questions 18, 19, 20, or 21 are no, are there counties, cities, towns, or local jurisdictions within your state that have adopted or written building or fire codes, statutes, or ordinances that require the installation of residential sprinkler systems in residential occupancies that include one and two family dwellings?
- Yes
 - No
24. If the answer to question 23 is yes, please provide a list of the counties, cities, towns, or local jurisdictions that have adopted or written building or fire codes, statutes, or ordinances that require the installation of residential sprinkler system in residential occupancies that include one and two family dwellings?
25. If your answers to questions 18, 19, 21 or 22 are yes, what were the obstacles that your state encountered during the adoption or development of codes, statutes, or ordinances relating to fire sprinkler systems in residential occupancies?
26. Who were the supporters for the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in residential occupancies in your state?
27. Who were the supporters for the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in one and two family dwellings in your state?
28. Who were the detractors of the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in residential occupancies in your state?
29. Who were the detractors of the adoption or development of codes, statutes, or ordinances requiring fire sprinkler systems in one and two family dwellings?

Appendix D

Applied Research Paper Questionnaire Results

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average
Question No. 1	249	870	762	420	1,857	1,216	2,000	501	908	8,783	
Question No. 2	186	344		260	90	1,210	1,033	406	780	4,309	
Question No. 3			750							750	
Question No. 4											
Yes	1		1						1	3	
No		1		1	1	1		1		5	
Question No. 5											
Yes	1	1	1	1	1	1	1	1	1	9	
No											
Question No. 6											
Yes	1	1	1	1	1	1	1	1	1	9	
No											
Question No. 7											
Yes					1	1	1	1		4	
No	1	1	1	1					1	5	

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average
Question No. 8											
2007	11	18	N/A	13	57	94	N/A	39	N/A	232	38.67
2006	18	18	78	17	76	124	N/A	51	N/A	382	54.57
2005	15	35	70	12	79	112	N/A	47	N/A	370	52.86
2004	9	28	86	16	93	113	N/A	39	N/A	384	54.86
2003	6	27	79	13	65	136	N/A	27	N/A	353	50.43
2002	20	16	110	13	39	112	N/A	49	N/A	359	51.29
Total	79	142	423	84	409	691		252		2,080	
Average	13.17	23.67	70.50	14.00	68.17	115.17	0.00	42.00	0.00	346.67	
Question No. 9											
2007	7	2	N/A	7	49	97	N/A	27	N/A	189	31.50
2006	15	0	N/A	7	59	124	N/A	34	N/A	239	39.83
2005	12	0	N/A	6	52	112	N/A	34	N/A	216	36.00
2004	6	1	N/A	12	68	113	N/A	33	N/A	233	38.83
2003	6	0	N/A	9	30	136	N/A	24	N/A	205	34.17
2002	16	0	N/A	6	28	112	N/A	39	N/A	201	33.50
Total	62	3		47	286	694		191		1283	
Average	10.33	0.50	0.00	7.83	47.67	115.67	0.00	31.83	0.00	213.83	

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average
Question No. 10											
2007	17	N/A	N/A	10	629	771	N/A	N/A	N/A	1427	356.75
2006	27	N/A	N/A	7	700	731	N/A	N/A	N/A	1465	366.25
2005	13	N/A	N/A	6	875	760	N/A	N/A	N/A	1654	413.50
2004	28	N/A	N/A	12	820	847	N/A	N/A	N/A	1707	426.75
2003	25	N/A	N/A	9	601	875	N/A	N/A	N/A	1510	377.50
2002	22	N/A	N/A	6	370	877	N/A	N/A	N/A	1275	318.75
Total	132			50	3,995	4,861				9,038	
Average	22.00	0.00	0.00	8.33	665.83	810.17	0.00	0.00	0.00	1,506.33	
Question No. 11											
2007	16	N/A	N/A	7	474	771	N/A	N/A	N/A	1,268	317.00
2006	11	N/A	N/A	7	476	731	N/A	N/A	N/A	1,225	306.25
2005	24	N/A	N/A	6	561	760	N/A	N/A	N/A	1,351	337.75
2004	11	N/A	N/A	12	526	847	N/A	N/A	N/A	1,396	349.00
2003	11	N/A	N/A	9	383	875	N/A	N/A	N/A	1,278	319.50
2002	25	N/A	N/A	6	238	877	N/A	N/A	N/A	1,146	286.50
Total	98			47	2,658	4,861				7,664	
Average	16.33	0.00	0.00	7.83	443.00	810.17	0.00	0.00	0.00	1,277.3	

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average
Question No. 12											
2007	0	0	N/A	1	2	N/A	N/A	0	N/A	3	0.50
2006	0	0	N/A	0	3	N/A	N/A	0	N/A	3	0.50
2005	0	0	N/A	0	1	N/A	N/A	2	N/A	3	0.50
2004	0	0	N/A	0	5	N/A	N/A	3	N/A	8	1.33
2003	0	0	N/A	0	6	N/A	N/A	1	N/A	7	1.17
2002	0	0	N/A	0	1	N/A	N/A	1	N/A	2	0.33
Total	0	0		1	18			7		26	
Average	0.00	0.00	0.00	0.17	3.00	0.00	0.00	1.17	0.00	4.33	
Question No. 13											
2007	0	0	N/A	0	0	N/A	N/A	0	N/A	0	0.00
2006	0	0	N/A	0	0	N/A	N/A	0	N/A	0	0.00
2005	0	0	N/A	0	0	N/A	N/A	0	N/A	0	0.00
2004	0	0	N/A	0	4	N/A	N/A	0	N/A	4	0.80
2003	0	0	N/A	0	5	N/A	N/A	0	N/A	5	1.00
2002	0	0	N/A	0	1	N/A	N/A	0	N/A	1	0.20
Total	0	0		0	10			0		10	
Average	0.00	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	1.67	

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average
Question No. 14											
2007	0	N/A	N/A	N/A	4	11	N/A	0	N/A	15	3.75
2006	0	N/A	N/A	N/A	11	8	N/A	0	N/A	19	4.75
2005	0	N/A	N/A	N/A	4	24	N/A	2	N/A	30	7.50
2004	0	N/A	N/A	N/A	13	5	N/A	3	N/A	21	5.25
2003	0	N/A	N/A	N/A	5	9	N/A	1	N/A	15	3.75
2002	0	N/A	N/A	N/A	18	8	N/A	1	N/A	27	6.75
Total	0				55	65		7		127	
Average	0.00	0.00	0.00	0.00	9.17	10.83	0.00	1.17	0.00	21.17	
Question No. 15											
2007	0	N/A	N/A	N/A	2	2	N/A	N/A	N/A	4	1.33
2006	0	N/A	N/A	N/A	6	1	N/A	N/A	N/A	7	2.33
2005	0	N/A	N/A	N/A	0	8	N/A	N/A	N/A	8	2.67
2004	0	N/A	N/A	N/A	2	1	N/A	N/A	N/A	3	1.00
2003	0	N/A	N/A	N/A	4	4	N/A	N/A	N/A	8	2.67
2002	0	N/A	N/A	N/A	12	3	N/A	N/A	N/A	15	5.00
Total	0				26	19				45	
Average	0.00	0.00	0.00	0.00	4.33	3.17	0.00	0.00	0.00	7.50	

	Idaho	Iowa	Mississippi	Montana	New York	Ohio	Texas	Washington	Unidentified	Totals	Average	
Question No. 18												
Yes	1		0		1	1				3		
No	0	1	1	1			1	1	1	6		
Question No. 19												
Yes	0		0							0		
No	1	1	1	1	1	1	1	1	1	9		
Question No. 20												
Yes	0	0	0	0	0	0	0	0	0	0		
No	1	1	1	1	1	1	1	1	1	9		
Question No. 21												
Yes	0	0	0	0	0	0	0	0	0	0		
No	1	1	1	1	1	1	1	1	1	9		
Question No. 22	See Written Answer Sheet											
Question No. 23												
Yes	1	1	0	1	1	0	1	1	1	7		
No	0	0	1	0	0	1	0	0	0	2		

Questionnaire Written Responses

Note: The written responses are transcribed verbatim from the agency responses. No grammatical corrections were made to the responses.

Question No 22

Idaho

Idaho Fire Code 41-253 Adopts the IFC Administrative Rule. 18.01.50 Modifies the IFC. Idaho Fire Code is available online. R. Occupancies under the IBC/IFC do not include 1-2 family dwellings. The IRC governs the construction of 1-2 FDs. Some local jurisdictions have required sprinklers in ½ FD's to offset water supply or access issues. (Note this may be good for model ordinance.)

Iowa

No Answer

Mississippi

No Answer

Montana

No Answer

New York

No Answer

Ohio

In Ohio, residential occupancies cover also hotels, motels, boarding houses, apartment houses, etc. Some of these residential occupancies are required to be sprinklered.

Texas

No Answer

Washington

No Answer

Unidentified

No Answer

Question No. 24

Idaho

Blaine County requires any building over 4000sf to provide an approved water supply or sprinkler the building.

Iowa

West DeMoines, Clive, Urbandale, Johnston, and Grimes

Mississippi

No Answer

Montana

Missoula County

Gallatin County

New York

Gates, Village of Ossining, Greene, Penfield, Guilderland, Village of Aye Brook, Town of Harrison, Village of Sleepy, Village of Irvington, Hollow, Town of Ithaca, Village of Tarrytown, Town of Newburgh, Town of New Castle, Village of North Syracuse, Town of Onondaga
New York state uses the ICC model code, which just adopted the Residential Sprinkler in new construction for 1 and 2 family dwellings,. However, the ICC version must subsequently adopted in NY, a process that always includes negotiation, additions, and deletions.

Ohio

Not Applicable

Texas

Lake Jackson, Woodlands, and University Park

Washington

The following require sprinklers in single-family dwellings that meet 5,000 square feet or larger or have zero lot lines. Issaquah, Kirkland, Mercer Island, Squammamish, Shoreline, Woodinville, Steilacoom, King County

Unidentified

The state does not track those jurisdictions enacting codes, however, the following have adopted a residential sprinkler code of some verities. The person did not list the code.

Question No. 25

Idaho

Legislative resistance from affected elected officials and home building groups

Iowa

Not Applicable

Mississippi

No Answer

Montana

No Answer

New York

No Answer

Ohio

Ohio merely adopted model code language found in the ICC Model Codes.

Texas

Home Builders

Washington

Not Applicable

Unidentified

No Answer

Question No. 26

Idaho

Office of the state fire marshal and state fire chiefs.

Iowa

Not Applicable

Mississippi

For the most part the fire service influenced the adoption of the code. 90% of the population does not understand the purpose of codes. Only a handful of the counties and the big cities that have codes enforce them, as they should. Residential sprinklers were passed in the codes because the fire service showed up and out voted the contractors and insurance companies. Education is the key to code adoption and enforcement as well as fire safety in the homes. You can talk all day long and collect millions of surveys but that is the bottom line.

Montana

Fire Officials

New York

No Answer

Ohio

At the ICC level codes are changed through the consensus process.

Texas

No Answer

Washington

Fire service and sprinkler industry.

Unidentified

Fire Marshals and local and state associations.

Question No. 27

Idaho

We have not ridden that horse yet.

Iowa

Not Applicable

Mississippi

1. We are inconsistent in educating adults and children.
2. We should adopt a program and request it to be taught in schools at every level. There are too many different programs being used and none of them are consistently taught. If this approach were taken, then a child who may be changing schools due to a family move would never miss out. They would understand the importance of codes and safe home construction. The whole thing is that folks buying homes have no common sense and know absolutely nothing about construction or even how to properly use the appliances in a home.

Montana

Fire Officials

New York

No Answer

Ohio

At the ICC level the fire service was the big supporter of the requirement to install residential sprinkler systems.

Texas

Insurance Industry

Washington

Fire service and sprinkler industry

Unidentified

Fire Marshals and local and state associations.

Question No. 28

Idaho

Individual legislators.

Homebuilder groups.

Property owner associations.

Iowa

Not Applicable

Mississippi

No Answer

Montana

Cost and Anti-Government Legislation

New York

No Answer

Ohio

Not Applicable

Texas

Fire Service

Washington

Concern was raised from the building industry and water purveyors.

Unidentified

Home Builders

Question No. 29

Idaho

We have not ridden that horse yet

Iowa

Not Applicable

Mississippi

No Answer

Montana

No Answer

New York

No Answer

Ohio

At the ICC levels the national homebuilders association and local building officials are the detractors to the adoption of residential sprinkler system requirements.

Texas

Home Builders

Washington

Concern was raised from the building industry and water purveyors.

Unidentified

Home Builders

Appendix E

A Model Fire Sprinkler Ordinance for Large Single Family Occupancies.

RESIDENTIAL FIRE SPRINKLER ORDINANCE FOR
LARGE SINGLE FAMILY OCCUPANCIES
OF WAKE COUNTY, NORTH CAROLINA

BE IT ORDAINED BY THE BOARD OF COMMISSIONERS OF WAKE COUNTY:

ARTICLE I

TITLE. This ordinance shall be know and may be cited as the Residential Fire Sprinkler Ordinance For Large Single Family Occupancies of Wake County, North Carolina.

ARTICLE II

PURPOSE. The purpose of this ordinance is to ensure additional fire safety measures for the citizens of Wake County through the reduction and prevention of residential fire related death and injury through the installation of automatic residential fire sprinkler systems in newly constructed single-family dwellings.

ARTICLE III

ADOPTION. The NFPA 13D, Standard for the Installation Of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, 2007 Edition, shall be adopted in its entirety as it applies to newly constructed single-family dwellings that are 3,000ft² or larger.

ARTICLE IV

JURISDICTION. This ordinance shall govern the installation of NFPA 13D compliant residential sprinklers systems in newly constructed single-family dwellings that are 3,000ft² or larger within Wake County.

ARTICLE V

APPLICATION OF ORDINANCE. This ordinance is applicable to in cases involving the installation of NFPA 13D compliant residential sprinklers systems in newly constructed single-family dwellings that are 3,000ft² or larger within Wake County.

ARTICLE VI

EXCEPTIONS. Exceptions to this ordinance shall be by the Wake County Board of Appeals to those persons or entities that show just cause for exception to this ordinance.

ARTICLE VII

ENFORCEMENT. The Director of the Wake County Department of Fire and Emergency Management or his/her authorized representative shall be responsible for the enforcement of this ordinance.

ARTICLE VIII

This ordinance shall become effective January 1, 2010 at 12:00 AM.