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The Challenge of Implementing Residential Sprinkler Systems

Mario G. Garcia

Porterville Fire Department, Porterville, California

CERTIFICATION STATEMENT

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

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Abstract

In an effort to reduce annual loss of life, the development of NFPA 13D took place in May, 1973. Residential sprinkler systems are a life-safety system, designed to provide an environment that allows the occupants of a dwelling enough time to escape in the event of a fire.

At the 2008 International Code Council meeting in Minneapolis, the requirement for mandating residential sprinkler systems in all newly-constructed one and-two family homes and townhouses passed by an overwhelming vote. This mandate became effective January 1, 2011. Even with the passage of this mandate, there continues to be opposition from the National Association of Home Builders (NAHB) and the Building Industry Association (BIA) through political and legislative actions. The City of Porterville will be enforcing the new building code regulations that require residential sprinkler systems in all newly-constructed one and two-family dwellings and townhouses in the community. However, this new requirement is meeting opposition by the NAHB.

The purpose of this research project is to understand the concerns of the stakeholders and provide the necessary information to those who are in opposition to the new regulations. A descriptive-based research method will be used to conduct this research and to answer the following questions:

1. What are the concerns of the City of Porterville's water, building and fire departments?
2. What are the fears or objections of developers and architects?
3. What is the added cost of residential sprinkler systems to homeowners?

4. What are the opportunities to develop good relationships with stakeholders?
5. What are other fire departments doing to address this issue?

The fire service needs to embrace the mandate and bridge any gaps with the building industry by providing information so that misconceptions of residential sprinkler systems are dispelled, thus mitigating opposition by the NAHB.

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Introduction

Automatic sprinkler systems have been in place since the late 1870's. Since their inception, automatic sprinkler systems have been proven to save lives and property. A variation of the automatic sprinkler is the residential sprinkler system, which has been in place since the early 1950's. In the 60's, with the concern of overwhelming property loss as well as the loss of human lives in residential fires, new sprinkler technologies have been developed in an effort to minimize such losses. As residential sprinkler systems were improved, they began to gain favor as a life-safety fire protection system for common households.

However, throughout the years, efforts and initiatives to promote the requirement and installation of residential sprinkler systems by the proponents of residential sprinkler systems have always met with strong opposition and resistance from the National Association of Home Builders (NAHB) and the Building Industry Association (BIA). Their argument is that the economic impact of the cost of residential sprinklers outweighs the benefit of installing sprinklers in the common home.

At the 2008 International Code Council meeting in Minneapolis, the requirement to install residential sprinkler systems in all newly-constructed one-and-two family homes and townhouses passed by an overwhelming majority vote. This mandate became effective January 1, 2011. However, even with the mandate requiring residential sprinkler systems in all new one and two-family dwellings, there continues to be opposition from the NAHB and the BIA.

The City of Porterville is preparing to enforce the new requirement for sprinkler systems in newly-constructed one and-two family dwellings and has met resistance from the City's governing board (City Council) as well as local developers. The governing board is questioning whether the city is required to enforce the mandate. The governing board has asked the Fire Chief what legislation or regulations were in place to mandate this requirement and questions if the city must enforce the new code. The Fire Chief has also been asked to explore all avenues and options available to the city regarding enforcement of the new requirement and what the consequences would be for not enforcing the new regulations. The developers are fearful of the newly-mandated requirement and have expressed their concerns to certain City Council members.

The problem at hand is that the City of Porterville will be enforcing the new Building Code regulations that require residential sprinkler systems in all newly-constructed one and two-family dwellings and townhouses in the community and this requirement is meeting opposition by the NAHB.

The purpose of this research project is to understand the concerns of the stakeholders and provide the necessary information to those that are in opposition to the new regulations. A descriptive-based research method will be used to conduct this research and to answer the following questions:

1. What are the concerns of the water, building and fire departments?
2. What are the fears or objections of developers and architects?
3. What is the added cost of residential sprinkler systems to homeowners?
4. What are the opportunities to develop good relationships with stakeholders?
5. What are other fire departments doing to address this issue?

Background and Significance

The Porterville Fire Department (PFD) is an old fire department by West Coast standards; it was established in June 9, 1890. As is typical with an old town with numerous deep-rooted, established families, there is an apparent commitment to community needs with political influences sometimes working behind the scenes, creating havoc or resistance to progress that may not be in the interest of politically-connected groups or individuals.

The City of Porterville is located in the southeastern part of Tulare County at the foothills of Sequoia National Forest; the city has a population of 54, 465 and serves an area of 16 square miles within the city limits. It is not an affluent city, as it is an agriculture-based community with an average annual income of $30,000 to $40,000 per year. There are very few high-paying jobs available in the community. In the next few years, the City of Porterville will be annexing several county islands, and will increase its population base as well as its emergency response responsibility.

In 2010 the Porterville Fire Department (PFD) responded to over 4,000 calls. The City of Porterville is served by two fire stations: Station 1 was built in 1934 and Station 2 was built in 1992. Both stations are staffed 24 hours-a-day with a minimum staffing of seven per shift. The PFD is structured as such: 1 Fire Chief, 2 Battalion Chiefs (1 Suppression & 1 Fire Marshal), 3 Administrative Captains, 3 Suppression Captains, 3 Suppression Lieutenants, 9 Fire Apparatus Engineers, 15 Firefighters, 2 Code Enforcement Officers and a capacity of 20 Reserve Firefighters.

The PFD has a fire prevention division. The fire prevention division consists of a Battalion Chief/Fire Marshal and a Deputy Fire Marshal. The fire prevention division is tasked with the enforcement of all state mandates and local regulations pertaining to inspections and plans review for all occupancies within the city limits. In the past 5 years, the City of Porterville has annexed 15 county islands located within the city boundaries and is anticipating annexing a few more in the near future, thus, stretching the current available public safety services within our community.

The City of Porterville encourages business-friendly attitudes and will go out of its way to accommodate commercial and private business owners and developers. The City has one of the lowest impact fees in Tulare County and the City's Community Development and Redevelopment Division work hard to attract business to the city. Developing jobs and attracting business is paramount to the survival of any city and in particular Porterville.

With the interest of being business-friendly, the city has tried to build partnerships with local developers. In past years, city staff and the City Manager have had quarterly community-developer meetings with all local interested and vested developers and architects to try to establish lines of communication, address building concerns, address perceived issues with city inspectors, hold problem-solving sessions, streamline the permit process, including a two-week turn-around plan review process (this put a burden on all departments to ensure that all plans are completely reviewed within two weeks from the date of submittal) and assure them of the city's business-friendly attitude.

During the code adoption process, the governing board questioned whether the city is required to enforce the new mandate on residential sprinkler systems. The governing

board asked the Fire Chief what legislation or regulations were in place to mandate the new requirement or to force the city to comply with the new code. The Fire Chief was asked to explore all avenues and options available to the city in enforcing the new requirement and was asked to explain what the consequences would be for not enforcing the new regulations. Developers are fearful of the newly requirement and have expressed their concerns to certain City Council members. The current mindset of the governing board is to avoid acting like "Big Brother" towards private industry and business by imposing unnecessary rules and regulations. The governing board feels that California is overregulated and that this new requirement is unnecessary.

The research approach will include interviews with prominent building developers and architects, a survey of other fire departments that are similar in size in the surrounding area, and a review of the new regulations that require sprinkler installations. The results of this applied research project (ARP) will be useful in developing a vested interest with stakeholders in our community as well as in breaking down any misconceptions of the stakeholders as they pertain to the value of residential sprinkler systems.

This ARP is related to the networking and influencing style units in the National Fire Academy (NFA) Executive Leadership course (NFA, 2005, SM 10-7, SM 12-3). As well as meeting one of the United States Fire Administration's operational objectives, responding appropriately in a timely manner to emerging issues is of paramount importance (NFA, 2003, p. II-2). Educating and building stronger relationships with the HBA will enhance the ability to work together, eliminate misconceptions/opposition and provide an acceptable attitude to the implementation of the new code requirement for residential sprinkler systems.

Literature Review

The literature review for this applied research paper initially began while the author attended the Executive Leadership class and at the Learning Resource Center (LRC) at the National Fire Academy in Emmitsburg, Maryland, in September, 2010. Since the City of Porterville does not have a university nearby (the closest is California State Bakersfield, 50 miles away) the Porterville City Library, a survey of neighboring cities, interviews with local developers, meetings with city staff, journals, magazines, and the internet were used to conduct the research for material pertinent to this research topic.

In an effort to reduce the number of lives lost annually in residential homes, the appointment of a subcommittee was made in May 1973 by the Committee on Automatic Sprinklers. The subcommittee was tasked with developing the Standard on the Installation of Sprinkler Systems in One and Two-Family Dwellings and Mobile Homes (NFPA, 2009). This was the birth and the development of NFPA 13 D. As a result of tests conducted and administered by the National Fire Protection Association and the United States Fire Administration on residential fires, their findings warranted a complete rewrite on the existing standard on the installation of sprinkler systems in one and two-family dwellings and mobile homes in 1980. The main focus of residential sprinkler systems was to address limited water supplies; the primary goal is life-safety by providing adequate time for the occupants of a home to escape during a fire (Nicholson, 2005).

Residential sprinkler systems are a life-safety system by design. They are designed to hold a fire at bay and to provide an environment that allows the occupants of a dwelling

time to escape. One or two sprinkler heads that are activated will hold a fire at bay until the fire department arrives or the sprinkler heads extinguish the fire.

All efforts and initiatives to promote the requirement and installation of residential sprinkler systems by the proponents of residential sprinklers, including the fire service, have been met with strong opposition and resistance from the National Association of Home Builders (NAHB) and the Building Industry Association (BIA). Their argument is that the economic impact of the cost for residential sprinklers outweighs the benefit of what is gained by installing sprinklers in the common home.

In September, 2008, at the International Code Council meeting in Minneapolis, the requirement for mandating residential sprinkler systems in all newly-constructed one and-two family homes and townhouses was brought to the attention of the ICC and passed with an overwhelming 1,283 votes in favor to 470 votes against. There was a large turnout by fire service representatives. As Ronny Coleman stated, “our opposition … isn’t really home builders and developers. It’s our apathy” (Caulfield, 2008). This mandate became effective January 1, 2011.

Even with the passage by the ICC requiring residential sprinkler systems in new one and two-family dwellings, there continues to be opposition from the NAHB and the BIA. The NAHB has continued to appeal the new requirement of residential systems to the International Code Council Appeals Board and when the ICC Appeals Board rejected their appeal, the NAHB moved to introduce state legislation to block local adoption of the requirement for residential sprinkler systems in new one and two-family dwellings. The contention by the NAHB was that the vote at the final hearing was strongly supported by a

single interest group, namely the fire service which showed up in large numbers at the ICC meeting (Smith, 2008).

Also, Smith noted that the appeal from the NAHB states that the "ICC's governmental consensus process was manipulated and subverted to advance the interests of a single stakeholder." The proponents of residential sprinkler systems were appalled by the accusations of the NAHB, since the NAHB has a reputation of championing the needs of special interest groups through collective strength to manipulate the code-development process (Smith, 2008).

According to an article on anti-sprinkler legislation/fire sprinkler initiative, there are 12 states (Alaska, Arizona, Connecticut, Kansas, Mississippi, Missouri, Montana, Nebraska, New Hampshire, Mew Mexico, North Dakota and Pennsylvania) that have filed anti-sprinkler legislation. These bills, if passed, will defeat all efforts made towards the implementation of residential sprinkler systems in all new one and two-family dwellings (NFPA, 2011).

The NAHB claims that at the present time, if residential sprinklers were installed in new home construction there would not be an immediate impact in the reduction of fire losses in residential occupancies. The main argument by the NAHB against mandatory sprinklers is because of the "safety track record of newer housing and the new building codes, more wide-spread consumer safety education and the inappropriate impact on housing affordability without any commensurate benefits..." Furthermore, the NAHB feels that smoke detectors are enough for the safety of the home owner (Mirkhah, 2011).

The building code requires the installation of smoke detectors in common areas, bedrooms and on every floor. More than 95% of all homes have one form or another of

smoke detectors installed, either hard-wired or single-stage smoke detectors. The NAHB prefers hard-wired, interconnected smoke detectors over a residential sprinkler system. As smoke detectors have become a common household fixture over the last three decades, fire deaths have drastically declined (Sichelman, 2008). Smoke detectors alone are not fail-proof. According to Dewar, (2001), in 14.8 percent of fires occurring in residential homes where death occurred, it was attributed to poor battery maintenance. Smoke detectors will alert the occupants; however, the elderly or the very young may be impaired and may not have ample time to escape. However, NFPA claims that smoke detectors and the addition of residential sprinkler systems together as fire protective systems will reduce fire deaths and property loss by 97%.

In a statement by NAHB President Sandy Dunn of West Virginia, “because the evidence is clear that (sprinklers) are not the right solution for every home,” the NAHB’s opposition is not about money but about what is gained by the cost, since smoke detectors are proven to be a reliable fire-protection device. Proponents and advocates of residential sprinkler systems countered that $1.50 per square foot to install sprinklers in a home is a small price to pay for fire and life-safety for its occupants (Sichelman, 2008).

The requirement of residential sprinkler systems is not a new concept. One of the first cities in the country to adopt a comprehensive residential ordinance was the City of San Clemente, California, over 30 years ago. Several other cities nationwide adopted city ordinances that require residential sprinkler systems in single family dwellings. It appears that over 300 municipalities nationwide have adopted a sprinkler ordinance in their prospective cities, with almost half of them in California (Caulfield, 2008).

The most remarkable impact made by residential sprinklers where sprinklers were required was the City of Scottsdale, Arizona, in 1985. In Scottsdale, it was noted that after 15 years of implementing the residential sprinkler ordinance, fire loss in homes had dropped drastically. In Scottsdale, the average fire loss noted in single-family homes equipped with sprinklers was $2,166 in comparison to the national average of $45,019 in homes without sprinklers (Athavaley, 2008).

It was noted through a study in 1997 in Scottsdale, Arizona, that when a fire occurred in a sprinkler home, 90% of the time the fire was extinguished with the activation of one or two sprinkler heads. The amount of water used in the activation of the sprinkler head was 300 gallons, whereas the typical amount of water utilized by the fire department to extinguish a fire is approximately 3,000 gallons. The average fire damage in homes with sprinklers was limited to less than $2,000 whereas in non-sprinkler homes it was $17,067 (Behre, 2009).

It appears that there are many misconceptions about residential sprinkler systems by those in opposition. Some of the misconceptions are that consumers feel safe without the installation of sprinklers in their home. That’s because of the human tendency for people to believe that “it won’t happen to me”. Also, many believe that newer homes are safer than older homes and that fire deaths are limited to older homes. However, lightweight construction, increased fuel loads and synthetic fabrics used in furnishings have increased fire dynamics, thus creating a shorter escape time. The other misconception is that if one sprinkler is activated all sprinkler heads will active and create an enormous amount of water damage, with resulting mold issues, or that the cost for the sprinkler

system will increase the price of the home and prevent potential buyers from qualifying for a home mortgage (Takahashi, 2010).

It was remarkable to learn through this research that the opposition by the NAHB has been a long-standing one which has continued even after the passage by the ICC of mandated residential sprinklers. The research revealed that the misconceptions of the NAHB and the BIA are mainly due to self-interest, money, faulty information, posturing through legislative actions and a lack of public education on the part of fire service to provide and promote the importance of sprinklers in one and two-family dwellings. In this regard the fire service is its own worst enemy. Residential sprinkler systems add another component of safety in the home. The purpose of the residential sprinkler system is to activate in a predetermined temperature and put water on the fire during the incipient phase of the incident, thus limiting the heat, smoke and spread of the fire. Sprinklers will either hold the fire at bay or extinguish it prior to the arrival of the fire department. By doing so, residential sprinkler systems provide a tangible environment that allows the occupants of the home to escape a deadly atmosphere and situation.

Procedures

The procedure for this descriptive-based research project is to attempt to understand and address any concerns and misconceptions of the stakeholders of the private sector such as developers, builders and architects who are dealing with the new requirement of residential sprinkler systems. The interview will target three prominent residential builders/developers and an architect. The selected builders/developers and architect are key and influential builders and designers in town that construct and design the lion's share

of all building that occurs in Porterville. They have the most to contribute to this research because of the volume of tract homes that they have built in past years and their contribution to the growth of Porterville. In obtaining the information, the researcher conducted a one-on-one 10-question interview with selected local builders, developers and an architect (see appendix A).

The Home Builders Association (HBA) in the southern part of the San Joaquin Valley is very active and politically involved with any issues that concern the building industry, e.g. changes, impact fees and code adoption and amendments. The HBA has a tendency to be upfront and direct when requesting variances, omissions, or demanding actions of the governing board, by applying political pressure or threatening litigation. In California, since the mandate to install residential sprinkler systems in all cities became effective January 1, 2011, it would be of a great benefit for this research to identify what other surrounding cities and counties are doing or how they are addressing this new code requirement.

A survey was developed to assist the researcher in determining what other cities and counties in our surrounding area are doing concerning the implementation and enforcement of the new residential sprinkler requirement. The survey was mailed to the fire chiefs of the surrounding cities to obtain the necessary information. The survey consists of 5 questions: Question #1: With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two-family dwellings and townhouses, did your city adopt the new code without any modifications? Question #2: If not, what modifications did your city incorporate into the new code requirement? Question #3: What opposition did you experience from the Home Builders Association?

Question #4: What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two-family dwellings and townhouses? Question #5: What problems do you foresee in enforcing the requirement for residential sprinkler systems?

The purpose of the survey is to see if any local amendments were made to the model code or whether they adopted the model code as presented, and to identify any opposition they may have encountered from the HBA during the adoption process (see appendix B). With the information obtained from the survey, the researcher could determine what code amendments and changes the surrounding cities made and address any concerns from the HBA relating to code implementation and enforcement and how information can best be disseminated to them. The survey was sent to Tulare County, City of Visalia, City of Tulare, City of Lindsay, City of Hanford and Kings County. All agencies are mandated to enforce the new requirements for residential sprinklers in one and two-family dwellings and townhouses.

In conjunction with interviews pertaining to this survey, several meetings with city department heads and staff were conducted to address issues and concerns regarding the new residential sprinkler requirements. These meetings resulted in the development of city standards for water meters, a point of connection to the city underground water supply, a requirement for double-check detector valves, a permit process, and who will be conducting field inspections – the building inspector or the fire department and what concessions are viable for the city and developers. Lastly, how can city staff provide the necessary and vital information to stakeholders that are in opposition to the new regulations and make the transition as smooth and painless as possible?

Limitations

Since the requirement for residential sprinkler systems is mandatory on January 1, 2011, the impact in California is not yet known and limited information is accessible. Several cities have adopted residential sprinkler ordinances prior to this mandate; however, the information that is relatively available is subjective and there are many misconceptions by the opponents of residential sprinkler systems. Developers and architects are fearful of the new requirements because they have limited knowledge or have not been educated in the new code; they have no knowledge at all of the impacts or have not had the proper training in developing plans and working with the new code. The author recognizes that since residential sprinkler systems are now mandatory this creates the necessity for critical meetings and educational programs for the building industry in order to alleviate some of these misconceptions. The author also recognizes that there is limited information on opposition by the California Home Builders Association since they were proponents of the new code requirement.

Definitions

NFPA 13D: The National Fire Protection Association Standard on the Installation of Sprinkler Systems in One and Two-Family Dwellings and Manufactured Homes. This standard governs the requirements for the installation of residential sprinkler systems.

Results

Research Question #1

What are the concerns of the water department, building department and the fire department? Several meetings have taken place with different city staff in water, building, public works, and fire departments to address standards and identify potential issues with the new code requirements concerning residential sprinkler systems. With the new code requirement for residential sprinkler systems in all newly-constructed one and two-family dwellings and townhouses, the biggest concern brought up by staff in field services is that there is a possibility of cross-contamination between the suppression service line and the domestic water line. After lengthy discussions on issues such as separate metering, service lines, and a double-detector requirement, it was decided by the Director of Public Works and those in attendance that no double-detector check valve is necessary, that a rubber face check-valve at the sprinkler system will be required and a single line from the city connection to the house to supply the water in the garage will "T". At the "T" there will be one line for the sprinkler and another for domestic use. The development of standards will be in accordance with the California Residential Code.

Another concern was what liability the City of Porterville will incur with a disconnection of service due to non-payment. After some discussion it was decided that this has been addressed in NFPA 13D. Modifications may have to be done as situations arise with disconnection of service for non-payment.

Minimum fire flow requirements and water demands were also discussed. Major concern has been expressed that minimum fire flows might not be met with the current meter service. During these meetings it was discovered that the engineering department

was already specifying a one-inch meter service in new development and that any further required flows would be the responsibility of the builder. It appears that the one-inch water meter would accommodate the average home's need and supply the residential sprinkler system demand.

Plan submittal, plans review and fees were also addressed. It was discussed and decided that there would be no additional fees proposed for the process at this time. Fire sprinkler plans must be submitted and must meet the current requirement of the "no deferred items" policy previously approved by interested parties a few years ago in efforts to expedite and streamline the plans review process. The fire department will conduct plans review and the building department will conduct field inspections after joint training with fire service representatives. This will streamline the field inspection process and eliminate undue hardship on the builder. These were the main concerns addressed. Additional concerns might come to light after plan submittals are processed.

Research Question #2

What are the fears or objections by developers and architects?

Questions for Interviews with Developers and Architects

ENNIS HOMES

1. How long have you been a developer? *20 years.*

2. How many homes do you construct a month? *Economic times have slowed down the building market. Last year, Ennis Development constructed over 400 homes.*

3. What is your major concern about residential sprinkler systems? *Two concerns: the added cost to the homebuyer for the installation of the sprinklers and the availability of qualified sub-contractors to install residential sprinkler systems in this area. With the State not allowing licensed plumbers to install residential sprinkler systems this puts a burden on the developer to find qualified installers.*

4. What knowledge do you have concerning residential sprinkler systems? *Limited in residential homes. Experienced in commercial sprinkler installations.*

5. What impact do you feel that mandatory residential sprinkler systems will have on building and selling homes? *Puts the new homes in a disadvantaged position in comparison to existing homes. There will be added cost for sprinklers in new homes, whereas existing homes are not required to have sprinkler systems.*

6. Do you feel that residential sprinkler systems are a deterrent for home buyers or home safety? *Everyone would like to have sprinklers in their home. The question is can they afford them? The added cost of sprinklers could prevent them from qualifying for a home loan. It's not economical in some cases.*

7. What can the fire service do to educate and develop a better partnership with the Home Builders Association in order to promote residential sprinkler systems? *Porterville Fire Department has done a great job in providing information to the*

building industry. It would be nice if the State developed a list of qualified contractors so that developers can access them.

8. What can city staff do to accommodate the HBA as it pertains to the installation of residential sprinkler systems? *On-going training and education. This will help the building industry to better understand the new code requirements. Dissemination of information and constant communication would be helpful.*

9. What other concerns do you as a builder have concerning residential sprinkler systems*? Information on lead-free sprinklers and if any have been approved and listed. Again, dissemination of new information.*

10. Anything that you would like to add? *The City of Porterville organized recently an informational meeting that was helpful to the building industry and that was well received. Great job.*

Woodard Homes

1. How long have you been a developer? *20 years plus.*

2. How many homes do you construct a month? *Things are slow due to the current economical climate.*

3. What is your major concern about residential sprinkler systems? *That the sprinklers are unnecessary because newer homes are built safer and with better construction materials. Older homes are those that usually burn. Also, the added cost of sprinklers makes it cost-prohibitive for people to qualify to buy a home in placing an additional cost on the buyer.*

4. What knowledge do you have concerning residential sprinkler systems? *Limited*.

5. What impact do you feel that mandatory residential sprinkler systems will have on building and selling homes? *Profit margins are small. You can only sell what the market bears and the increase for sprinklers will eliminate some clients that are seeking to buy a home. It would be hard to recover cost and overhead for building a home with the added cost of the installation of sprinkler systems.*

6. Do you feel that residential sprinkler systems are a deterrent for home buyers or home safety? *Insurance rates would increase because of water damage caused by the activation of the sprinkler head versus minimum smoke damage if something burned on the stove.*

7. What can the fire service do to educate and develop a better partnership with the Home Builders Association to promote residential sprinkler systems? *The City of Porterville has developed a good working relationship with the building industry.*

Help keep the cost down by not over-regulating and putting a burden on the developer.

8. What things can city staff do to accommodate the HBA as it pertains to the installation of residential sprinkler systems? *Work with the HBA. Keep the president of the HBA informed of any changes or mandates so that he is able to disseminate information to all the builders in this area. Have meetings with HBA to identify areas that would make the transition as smooth as possible.*

9. What other concerns do you as a builder have concerning residential sprinkler systems? *Addressed his concern already.*

10. Anything that you would like to add? *Nothing else to add.*

SMEE BUILDERS

1. How long have you been a developer? *30 years*

2. How many homes do you construct a month? *220 homes last year*.

3. What is your major concern about residential sprinkler systems? *The increased cost to the home buyer and the increase in liability such as broken pipes or accidental discharge of sprinkler heads.*

4. What knowledge do you have concerning residential sprinkler systems? *Limited knowledge.*

5. What impact do you feel that mandatory residential sprinkler systems will have on building and selling homes? *The increased cost will eliminate several potential homebuyers by putting the cost out of the affordability range. An additional $1,000 to $3,000 could be the breaking point for some to qualify for a loan. The required sprinkler system does not add any value to off-set the cost of the sprinklers.*

6. Do you feel that residential sprinkler systems are a deterrent for home buyers or home safety? S*prinkler systems do not provide any life-safety value; they are for structural protection and entail an unnecessary additional cost.*

7. What can the fire service do to educate and develop a better partnership with the Home Builders Association in order to promote residential sprinkler systems? *The fire service in general needs to have clear guidelines and expectations of what is required along with unrestrictive code interpretations. With clear guidelines the information can be passed on to the designer and it would help them streamline the project. Not all cities and fire departments have been helpful with information and most are also in the dark about what is expected by the new code requirement.*

8. What things can city staff do to accommodate the HBA as it pertains to the installation of residential sprinkler systems? *Include the HBA in interpretations and*

guidelines that are being generated by the Authority Having Jurisdiction. Include the HBA in the development process.

9. What other concerns do you as a builder have concerning residential sprinkler systems? *Cost, incurred liabilities, and sprinklers entail an additional cost to the developer and homeowner. Economic times are hard and any added cost can disqualify a potential homebuyer from getting the loan to purchase a new home.*

10. Anything that you would like to add? *Help the HBA by providing pertinent information and help streamline the process of development*

Dennis Townsend and Associates.

1. How long have you been an architect? *We've been licensed since 1993.*

2. How many homes do you design a month? *During the peak of 2007, 500 homes were designed and built.*

3. What is your major concern about residential sprinkler systems? *The design hurdle, i.e. whether a C-16 can design and install or if a Fire Protection Engineer is necessary.*

4. What knowledge do you have concerning residential sprinkler systems? *Prior to the new requirement, no knowledge. Now, on a scale of 1-10, about a 4.*

5. What impact do you feel that mandatory residential sprinkler systems will have on building and selling homes? *Unknown impact at this time. In the past, during the economic boom, it would be easy to absorb the cost. Now it makes it harder for someone to purchase a home with the added cost. Probably an initial negative impact but as time goes by it may turn into something positive.*

6. Do you feel that residential sprinkler systems are a deterrent for home buyers or home safety? *No.*

7. What can the fire service do to educate and develop a better partnership with the Home Builders Association to promote residential sprinkler systems? *Provide meetings and seminars to educate the building industry and bridge the gap. Disseminate new information to those that are mandated to install residential sprinkler systems.*

8. What things can city staff do to accommodate the HBA as it pertains to the installation of residential sprinkler systems? *Again, provide any new information to the HBA. Make available a checklist of items that can be incorporated into the plans. Make things as simple as possible.*

9. What other concerns do you as a builder have concerning residential sprinkler systems? *Two things that are feared by the builder or home owner is that if one*

sprinkler head is activated, all sprinkler heads would activate and create unnecessary water damage, resulting in increased insurance premiums. What about stagnant water in the sprinkler system?

10. Anything that you would like to add? *If possible, we would like the fire service to host a design and hydraulics class on residential sprinkler systems.*

Research Question #3

What is the additional cost to the homeowner to install a residential sprinkler system? The actual cost of installing residential sprinkler systems varies widely, depending on the area where you live. According to a report by Newport Partners (2008), the report prepared for the Fire Protection Research Foundation indicates that prices range from $0.38 to $3.66 per sq. foot, and that the national average cost for residential sprinkler systems is $1.61 per sq. foot. Mainly the price is based on the type of pipe being used, as this determines the cost of the system. In Fort Collins, Colorado, where copper pipe is exclusively used, the cost is $3.19 per square foot.

This study also indicates that in communities that use multipurpose systems that combine plumbing and sprinklers into one system, the average price for sprinklers is $1.04 per square foot in comparison to $1.61 where stand-alone sprinkler systems were installed. In an article by Xu (2007), the Home Fire Sprinkler Coalition uses a rule of thumb that could be used to calculate the cost of sprinklers in a home; the cost would be 1 to 1 ½ percent increase of the actual of the home. For example, a residential sprinkler system for a $246,500 median price would cost $2465-$3,698.

During this research, the question arose of what the cost for retrofits to existing homes would be if homeowners wanted to install a residential sprinkler system. In an article by Smith, (2008) the cost for retrofitting a 2,694 square-foot house was $4,000 or $1.48 per sq. foot. This may be a rare case, and again the cost is determined by what type of pipe is being used.

Research Question #4

What kinds of opportunities exist to develop a good relationship with the stakeholders? Opportunities to develop a good working relationship with stakeholders are golden right now. With the new code requirement in place it is in the best interest of the fire service to promote, educate and assist the developers in meeting code requirements that they are not familiar with. Even if there is some opposition, they would welcome any information that was presented to them.

A year prior to the requirement of residential sprinkler systems in California, the California State Fire Marshal was providing seminars and training classes on the requirements of the new code and its implications. These classes were offered throughout the State at different times and different locations, providing the building industry, fire service and anyone interested with an opportunity to become familiar with the upcoming requirements. Unfortunately, not many builders, developers, architects or fire service personnel took advantage of this training.

In November, 2010, the South San Joaquin Valley Home Builders Association had its monthly meeting in Visalia. The President of the HBA invited local fire service personnel, and the guest speaker was the State Fire Marshal. The majority in attendance

were building officials, fire department representatives (including the author of this research paper), sprinkler contractors, a few builders and one architect. By the questions asked by the audience it was evident that the majority, including some fire service personnel, had limited knowledge of the new code requirements and the demands placed on the building industry. According to developers and builders, it is important to have an open dialog with the HBA and attend any HBA meetings in order to learn new information and answer questions from developers and builders. It would be helpful in bridging the gap between the fire service which is entrusted to enforce the new requirements and the builders who are mandated to install residential sprinkler systems.

Research Question #5

What are other fire departments doing to address this issue? To assist the researcher in obtaining pertinent information a survey was developed and was sent to the surrounding cities and counties (see appendix B). It was surprising to note that most cities adopted the code with no modifications and that some received opposition from the HBA. The following are the results of the survey:

City of Visalia Fire Department

1. With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two family dwellings and townhouses, did your city adopt the new code without any modifications? *Visalia is the largest city in Tulare and Kings County. Visalia adopted the code with no modifications. Prior to adoption of the code, Fire Department staff attempted to include local code*

amendments to add sprinklers to the following: 1) detached garages within 30 feet of a residence, 2) remodels greater than 50% of the original square footage of the home.

2. If not, what modifications did your city incorporate into the new code requirement?

3. What opposition did you encounter from the Home Builders Association?
   The City of Visalia, in particular the Fire Department, received tremendous opposition from the HBA. The HBA showed up in number to state their opposition at city council meetings; local politics became very ugly. Staff decided not to proceed with local amendments and adopted the code without any changes.

4. What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two-family dwellings and townhouses? *Once the code was adopted without amendment, the governing board was very supportive of the new fire code.*

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems? *The Fire Department does not foresee any problems enforcing the new code requirement.*

The City of Tulare Fire Department

1. With the adoption of the new code requiring residential sprinkler systems in one and two-family dwellings and townhouses, did your city adopt the new code without any modifications? *Adopted the code with no modifications.*

2. If not, what modifications did your city incorporate into the new code requirement?

3. What opposition did you experience from the Home Builders Association? *We have not encountered any opposition from the HBA.*

4. What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two-family dwellings and townhouses? *The governing board has taken neither a pro nor a con position pertaining to the new code requirements.*

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems? *The biggest problem is the lack of manpower to enforce the new code requirements.*

Tulare County Fire Department

1. With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two family dwellings and townhouses, did your city adopt the new code without any modifications?

We adopted the California Residential Code in the same manner that the SFM did without any further modifications.

2. If not, what modifications did your city incorporate into the new code requirement? *We did not modify the code in our adoption.*

3. What opposition did you experience from the Home Builders Association? *While we expected opposition, pleasantly enough we did not encounter any type of opposition from the HBA, nor any other agency or the public. That's too bad because I had prepared myself and had my guns loaded for bear.*

4. What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two-family dwellings and townhouses? *The board of supervisors is fully in favor of residential sprinkler systems.*

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems? *We do not anticipate any problems. We have met with the building official and have come to an agreement that the fire department will be the enforcing authority and will conduct the plans review as well as construction inspections.*

City of Lindsay Fire Department: Did not respond to the survey.

Kings County Fire Department:

1. With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two-family dwellings and townhouses, did your city adopt the new code without any modifications? *Still looking to adopt the model code and may amend later.*

2. If not, what modifications did your city incorporate into the new code requirement?

3. What opposition did you experience from the Home Builders Association? *Kings County Fire Department has met opposition and will meet with the HBA in the near future.*

4. What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two family dwellings and townhouses? *The governing board has not taken a pro or con position towards the new code requirement.*

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems? *At present, unable to identify problems in enforcing the new code requirement.*

City of Hanford Fire Department:

1. With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two family dwellings and townhouses, did your city adopt the new code without any modifications? *We adopted the model code with 3 modifications: 1) requirement of 1½ - 2 inch water meters, 2) all detached garages within 10 feet to be provided with residential sprinklers, 3) the exterior alarm be heard throughout the interior of the dwelling.*

2. If not, what modifications did your city incorporate into the new code requirement?

3. What opposition did you experience from the Home Builders Association? *The City of Hanford has not experienced any opposition by the HBA. However, in the near future they expect to have a meeting with the HBA and address any concerns.*

4. What is the governing board's (City Council's) position regarding the new requirement for residential sprinkler systems in one and two family dwellings and townhouses? *The governing board has not taken a pro or con position towards the new code requirement.*

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems? *We do not foresee any problems enforcing the new code requirement. It should be a smooth transition.*

Discussion

There seems to be a significant amount of opposition to the implementation of residential sprinkler systems by the NAHB. Even after the passage of the new code by the ICC, the NAHB continues to attempt to influence lawmakers to appeal the mandate of residential sprinkler systems. Besides opposition there are many misconceptions that are troublesome and that can influence the perception of the general public. One misconception is that the consumers feel safe without the installation of sprinklers in their home. That's because of the human tendency for people to believe that "it won't happen to me". Or, that newer homes are built safer than older homes, i.e. that fire deaths are limited to older homes. This is not true. Fire knows no such limits and death is not selective.

Newer homes still pose a danger to the occupants and to firefighters. Construction methods and designs create this false sense of security. Such things as lightweight construction, increased fuel loads and synthetic fabrics used in furnishings increase fire dynamics and shorten the escape time for the occupant. Lightweight construction presents a risk to firefighters during structure fires because of the potential of roof collapse and time elements due to direct heat impeachment.

Automatic sprinkler systems are not new; they have been around for over 120 years. Residential sprinkler systems are designed as life-safety systems to afford the occupant added time to escape. Another misconception is that if one sprinkler is activated all sprinkler heads will active and create an enormous amount of water damage and resulting mold issues, and that the cost for the sprinkler system will markedly increase

home prices and eliminate potential buyers from qualifying for a home loan (Takahashi, 2010). These misconceptions are still held by local developers; the issue of water damage and all sprinkler heads being activated all at once was a concern to some developers. Again, it would be in the best interest of the fire service to educate and provide the needed information to dispel all misconceptions.

Home owner insurance will cover any water damage from the discharge of a sprinkler, if it is accidental. However, a leak over a long period of time resulting in rot is not covered (Xu, 2007) A residential sprinkler system is a wet system; only those sprinklers heads affected by heat will fuse and activate, not all. Residential sprinkler systems are not a deluge system that totally floods an area when activated.

A study in 1997 in Scottsdale, Arizona, shows that when a fire occurred in a sprinkler home, 90% of the time the fire was extinguished with the activation of one or two sprinkler heads. The amount of water used in the activation of the sprinkler head was 300 gallons, whereas the typical amount of water utilized by the fire department to extinguish a fire was approximately 3,000 gallons. The average fire damage in homes with sprinklers was limited to less than $2,000, whereas in non-sprinkler homes the average fire damage was $17,067 (Behre, 2009). The water damage was considerably less in comparison to the water damage from a direct attack from one or two 1 ¾ hot lines used by fire crews.

During recent years many cities and counties throughout the country have adopted residential sprinkler ordinances. The first was San Clemente, California, and in 1985, Scottsdale, Arizona. A drastic decrease in fire loss and deaths in homes equipped with residential sprinklers has been noted. In Scottsdale, the average fire loss noted in single-family homes equipped with sprinklers was $2,166 in comparison to the national average

of $45,019 in homes without sprinklers (Athavaley, 2008). Scottsdale, Arizona, became the poster city for residential sprinkler systems and the highlight of cost savings in fire damage attributed to residential sprinkler systems.

According to the article by Xu (2007), the cost of a sprinkler system includes the cost for permits, taps, and inspection fees, as well as the cost of redesigning the home to accommodate sprinklers. The cost is basically determined by the type of pipe that would be used in the installation of the residential sprinkler system. Communities with specific requirements may increase the cost. A study conducted by the NFPA indicates that the average cost for residential sprinkler systems is $1.61 per square foot (Newport Partners, 2008).

The author recognizes that in order to implement the new code requirements of residential sprinkler systems in one and two-family dwellings and townhouses the HBA needs to be an intricate part of the process. It is important to the City of Porterville and the Porterville Fire Department to bridge the gap between the HBA and the fire service. The city is entrusted to enforce the new code requirements and the HBA is mandated to install the residential sprinkler systems. Opposition and resistance will only create political havoc and slow down the necessary process as well as create an adversary relationship between the City of Porterville and the HBA.

Recommendations

It is paramount for the success of implementing the new code requirement to bridge the gap between the HBA and the fire service. There are many misconceptions about residential sprinkler systems and clarification and information are important to both the HBA and the fire service. The fire service is entrusted to enforce the mandate requirements set by the ICC and the State of California and builders/developers are mandated to install the required residential sprinkler systems in all one and two-family dwellings through the code adoption.

There are ways to bridge the gap; one of them, as noted through the interview process, is to have an open communication and dialog with the HBA and provide any new information so that the HBA can disseminate it to their members, thus developing trust and a good working relationship. The dissemination of information can be accomplished by attending HBA monthly meetings, making presentations on residential sprinkler systems and answering any questions that arise. The City of Porterville needs to initiate and hold quarterly meetings with local builders and developers and provide any information necessary to streamline the code requirements or the permit process. This will insure continuity and conformance when dealing with issues that are important to all interested and vested parties, i.e. builders/developers and the fire service.

Also in these quarterly meetings, problems or issues encountered by the building industry need to be addressed, and if possible, resolutions or concessions would be helpful to all parties concerned as they pertain to the new code requirements that are causing delays in timelines in the building industry.

Another means of bridging the gap is to educate the fire service. The survey showed that not all fire service personnel have obtained the necessary knowledge through training to assist the building industry or to properly enforce the new code requirement. There is an opportunity to develop partnerships and assist the building industry by not drawing lines in the sand but instead being the conduit of information and education to the building industry. The Fire Chiefs and/or Fire Marshals for the surrounding area need to discuss amongst themselves what each jurisdiction is going to enforce or amend the model code and decide what effects this will that have on the building industry and the fire service. For example, one fire department has amended the code to include *1) requiring 1½ - 2 inch water meters, 2) requiring all detached garages within 10 feet to be provided with residential sprinklers, and 3) the exterior alarm be heard throughout the interior of the dwelling*. No other city in the surrounding area is requiring this amendment, as all other fire departments adopted the code without any modifications. These amendments will have a major impact on the building community in Kings County. The HBA is planning in the near future to hold meetings with Kings County to voice their opposition on the code amendments. These meetings could result in political turmoil and with less-than-desirable results.

It would be in the best interest of the fire service and the HBA to improve communication and promote a good working relationship in order to ensure a positive outcome for growth development in the community and to implement the new code requirements with minimum opposition and positive results. Regardless of opposition and misconceptions by the HBA, the fire service needs to be the expert on the new code requirements and to be customer-friendly in conveying the necessary information in order

to develop a good working relationship and enforce the new code requirement. By so doing, it will build mutual respect, gain approval from the HBA and possibly mitigate opposition on future issues that may impact the building industry.

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Appendix A

Copy of the Interview Questions for Developers and Architects

Questions for Interview with Developers and Architects

1. How long have you been a developer?

2. How many homes do you construct a month?

3. What is your major concern about residential sprinkler systems?

4. What knowledge do you have concerning residential sprinkler systems?

5. What impact do you feel that mandatory residential sprinkler systems will have on building and selling homes?

6. Do you feel that residential sprinkler systems are a deterrent for home buyers or home safety?

7. What can the fire service do to educate and develop a better partnership with the Home Builders Association to promote residential sprinkler systems?

8. What things can city staff do to accommodate the HBA regarding the installation of residential sprinkler systems?

9. What other concerns do you as a builder have concerning residential sprinkler systems?

10. Anything that you would like to add?

Appendix B

Copy of the Survey for Fire Departments in Surrounding Area

Survey for surrounding cities:

1. With the adoption of the new code in regards to the requirement of residential sprinkler systems in one and two family dwellings and townhouses, did your city adopt the new code without any modifications?

2. If not, what modifications did your city incorporate into the new code requirement?

3. What opposition did you experience from the Home Builders Association?

4. What is the governing board's (City Council) position regarding the new requirement for residential sprinkler systems in one and two family dwellings and townhouses?

5. What problems do you foresee in enforcing the requirement for residential sprinkler systems?