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THE FIRE SERVICE IN TRANSITION: THE SCOTTSDALE REPORT

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Providing sprinkler protection in high rise buildings is now accepted engineering practice, however, that wasn't always the case. Prior to the early 1970's, the standard fire protection provided for high rise buildings consisted of only fire resistive building construction, a fire alarm system and a standpipe system. In the late 1960's and early 1970's, buildings such as the World Trade Center towers in New York and the John Hancock and the Standard Oil Buildings in Chicago were constructed without sprinkler protection. A revolution in high rise building fire protection occurred when the design of the Sears Tower included sprinkler protection throughout the building.

In the early 1970's, providing sprinkler protection in high rise buildings was opposed by both the real estate industry and architects. The opposition to providing sprinkler protection centered on two main issues-cost and aesthetics. The opposition based upon cost was addressed by both reductions in passive fire protection requirements (sprinkler "trade-offs") and through changes in the sprinkler design standard, NFPA 13. The opposition based upon aesthetics was addressed by changes to the appearance of sprinklers. The changes which addressed cost and aesthetics of sprinklers, along with the fires at the MGM Grand Hotel in Las Vegas in November 1981, the First Interstate Bank Building in Los Angeles in May 1988 and One Meridian Plaza Building in Philadelphia in February 1991, silenced the critics of sprinkler protection in high rise buildings.

Like the battle over sprinkler protection in high rise buildings which began some 35 to 40 years ago, there is now a battle over sprinkler protection in single-family dwellings. This time, the real estate industry and home builders associations have joined together to oppose the idea based primarily on cost (actually cost/benefit). Similar to the Sears Tower in the early 1970's, the adoption of an ordinance requiring the installation of sprinklers in all residential buildings in the City of Scottsdale, Arizona in 1985 provides a model for overcoming resistance to the installation of sprinkler protection in single-family dwellings.

The following are excerpts from a report titled "*Automatic Sprinklers-A 10 Year Study*" written by Assistant Chief Jim Ford of the Rural/Metro Fire Department in 1997:

"*In July of 1985, when Scottsdale passed Ordinance #1709, there were still numerous questions related to the effectiveness and wisdom of using built-in protection to replace some of the traditional resources commonly used by the fire service. It was well established that automatic sprinkler protection could have a positive impact on large risk facilities. Why couldn't this type of equipment be used in the structures that are the most dangerous to our citizens: their homes?*"

"*The impact and installation costs have been reduced dramatically, from $1.14 sq. ft to $0.59 sq. ft. The average fire loss per sprinklered incident was only $1,945, compared to a non-sprinklered loss of $17,067. Automatic protection had a direct role in saving eight lives. . . . .When the city finally reaches its full growth potential, it is estimated that it will be a community with over 300,000 residents and more than 65% of the residential homes and 85% of commercial property protected with automatic sprinkler systems.*"

"*History has shown us that traditionally, these tremendous annual losses* [in residential buildings] *are suffered at small isolated incidents across the country. As a result, the residential building industry has been successful in opposing changes to the built-in protection concept for homes.*"

"*It* [the report] *will illustrate the history, development, records, and results for the first 10 years of a comprehensive, community sprinkler ordinance. The ordinance was adopted for the community on June 4, 1985 and it was fully implemented on January 1, 1986.*"

"*In the beginning of 1985, the city had a population of 107,900 which grew to 166,490 by 1995. This is a 54% increase in 10 years.*"

"*It soon became apparent that this effort would not be very successful, unless the economic impact issues were aggressively addressed."*

"*As a result of the staff research and valuable input from the development community, several "design freedoms"* ["trade-offs"] *were identified. . . .In development services, a density increase of 4% for single family communities was initiated. A reduction in residential street width from 32 feet to 28 feet was approved. Cul-de-sac lengths were increased from 600 feet to 2,000 feet. . . .In the building code, the requirement for one hour construction was eliminated for single and multi-family dwellings. The standards for rated doors separating single family homes from garages was also eliminated. The most substantial impact was in the water resources department. Fire hydrant spacing was increased from 330 feet to 700 feet for sprinklered commercial and multi-family developments and from 600 feet to 1200 feet in fully sprinklered single family home developments. The required fire flow demand for structures was reduced by 50%, and resulted in a typical one step reduction in water main size. These changes also resulted in the ability to provide smaller water storage tanks.*"

"*An evaluation of the fire hydrant distribution plans indicated a reduction by approximately 1/3 in the total number of hydrants required. This resulted in a savings of $2,000 per hydrant and has contributed to reducing the future, ongoing maintenance costs which the city is required to provide.*"

"*The justification for narrower streets and longer cul-de-sacs was related to the risk and possibility of multiple alarm fires occurring in sprinklered structures. It was determined, with the vast majority of fires starting in the protected living areas of a residence (67.5% per NFPA statistics) that the required sprinkler protection would result in smaller, lower impact fire incidents.*"

"*A practical evaluation of the one hour construction and compartmentalization building requirements for residential structures was also completed. Several evaluations of one hour construction, indicate this laboratory rating is obtained under optimum testing conditions and often does not translate to actual material or construction practices and real time fire conditions. In real life experience, the theory of one hour compartmentalization is an optimistic assumption that might be effective if people did not move into the structure. Post fire investigations and reports regularly reveal, the required one hour construction components had easily been voided and provided questionable protection. It was recognized that each structure will still receive a measure of compartmentalization with the use of 1/2 inch non-rated gypsum materials. Actual live testing indicated, when non-rated materials were combined with the proactive protection of working fast response sprinklers, the structure has a better chance of being less impacted by the growth and destruction associated with typical structure fire events.*"

"*. . . . , the primary focus and impact identified not only the life saving factors, but, the economic benefits that could be expected for the approximately 100 square miles of the city still essentially undeveloped. Estimates for the infrastructure costs were based on the current city master plan and showed that substantial savings were possible. The major impact was projected at $7.5 million in infrastructure savings for the water distribution system.*"

"*Additionally, it was anticipated that the sprinkler ordinance would result in the reduction in size or elimination of at least three fire stations at a savings of $6 million in initial capital costs and annual savings of over $1 million.*"

"*The findings of this 1986 study indicated the total costs would be $1.14 per square foot to install a residential sprinkler system in a new 2,000 square foot Scottsdale home. The design freedoms* ["trade-offs"] *that were included in the ordinance equaled a per house savings of $158.52 for on-site construction tradeoffs and an additional $1,951.55 for off-site adjustments. When these ordinance design freedoms were included, the total costs of the residential system were estimated to be $157.24 per installation to the builder and approximately $212.27 per home to buyers.*"

"*It must be recognized that Scottsdale's location in the Southwest has a positive impact on the associated costs due to the climate and dramatic growth associated with the area. Additionally, these same advantages might not apply to all areas of the country. However, what is important is the ability of the industry to become more innovative, productive and cost effective when market conditions allow open competition for the installation of these required systems.*"

"*The NFPA reported that in 1994 nearly 74% of all structure fires occurred in residential properties, 57% of the total structure loss for the year occurred in residential properties (estimated $3.615 billion dollar loss in single family structures), and 80% of fire fatalities occurred in residential buildings (66% of total fire fatalities occurred in single family structures).*"

"*This review illustrated that smaller amounts of water, distributed earlier in the incident by built-in protection, had a positive effect on the impact and extent of fire and water damage experienced by the structure.*"

"The use of NFPA sprinkler standards 13D and 13R to protect residential properties does not translate to an increased community credit by ISO [Insurance Services Office] *standards. This occurs because the introduction of these standards indicate the primary goal of these documents is to better address life safety issues."*

"*However, using the new technology and objectively evaluating and understanding the positive impact these tools can have on a community, it is sometimes difficult to understand the massive amounts of opposition this type of program encounters.*"

"*On June 4, 1985, representatives of the National Association of Home Builders testified to the Scottsdale City Council that by passing this comprehensive type of sprinkler ordinance, they would be making the cost of new homes increase to the point that future residents would not be able to qualify for a home loan. In addition, the council was also advised that new development of residential homes would stop in this city and dramatically impact the ability of the city to continue its positive growth cycle. As illustrated earlier in this report, this has not happened.*"

"*All* [sales] *contracts examined indicated that upgrades to the lot, landscaping, carpeting, kitchens, tile, window coverings, fireplaces and patio coverings were common. When reviewing the costs of these upgrades, nearly all were more expensive than the additional cost of a typical residential sprinkler installation.*"

"*The cost to install sprinklers in Scottsdale has dropped dramatically since the ordinance was adopted, from $1.14 per square foot to $.60 per square foot.*"

"*Over the past 10 years, automatic sprinkler systems have been effective in controlling numerous fires in the City of Scottsdale that involved grease, liquid flammable thinners, natural gas, and several arson fires that used gasoline as an accelerant. Five people were in the room of origin or in the direct vicinity of these incidents and would have been fire fatalities, if not for the installation of automatic sprinkler systems. Quick response residential sprinklers have proven very effective with flammable liquid fires, even in structures that were under construction. In addition, residential sprinklers are specifically designed to protect people located in the room of origin.*"

"*Of the 10 fire fatalities, seven had smoke detectors, four were working properly, investigators were unable to determine if the other three had worked, and three fire fatalities had no smoke detectors. The mere presence of smoke detection did not assist two children, one teenager, one elderly and three middle aged adults. Smoke detectors are an important and valuable tool to assist the fire service; however, the experience over the past 10 years in Scottsdale illustrates that even with a working smoke detector, the occupant must have the skills, knowledge and ability to escape the structure on their own. Smoke detection cannot address the growth, impact or control of the fire incident, because it is only a local, primary notification process.*"

"*Homeowners have very little to say about the majority of zoning, code and building requirements that apply to the construction of homes. It is very common for local stipulations to establish non-safety issues related to color of paints, roof type and color, additions to the structure, amounts and types of windows and even the direction and location of the building on the lot. Why should an issue that can positively impact citizen and community safety be pulled from the discussion?*"

"*The Scottsdale real estate market has not experienced any reduction in activity and knowledgeable local relators advise homes protected with automatic sprinklers are easier to sell.*"

"*Most of the internal fire service opposition to sprinkler protection is related to addressing change, protecting the status quo, and the belief that by adopting comprehensive sprinkler ordinances the local fire departments will no longer be needed. This is simply not true. However, what is true, is throughout the country the fire service is being asked to re-evaluate the service that is provided to its customers and to do more with less.*"

"*Does a fire department best serve its community by suppressing fires quickly and efficiently -- or by keeping the fire from occurring and having a major impact on the community through effective prevention efforts? Clearly it is more economical and effective for the community to use the available technology and reduce the impact of fire, than to continue to increase the efforts to provide traditional reactive protection. There is no question that once a fire does occur, it is a major emergency and critical event. However, can the fire service afford to concentrate the available resources on activities that continually make up a smaller percentage of the requests for emergency service?*"

"*Over the duration of this 10 year study, the City of Scottsdale experienced 598 fire incidents in residential structures. Of these fire incidents, 7.35% or 44 events resulted in sprinkler activation. The review of the 44 residential type activations indicate, 41 were controlled or contained with one or two sprinkler heads activating. Two of the three that needed additional heads were flammable liquid arson fires. The largest multiple head activation resulted from a flammable liquid pour which activated 13 sprinklers.*"

Fifteen years after Scottsdale's ordinance was passed, the following data on fire protection in Scottsdale was reported:

"*41,408 homes, more than 50 percent of the homes in Scottsdale, are protected with fire sprinkler systems.*"

"*In the 15 years there were 598 home fires. Of the 598 home fires, 49 were in single-family homes with fire sprinkler systems:*

- *There were no deaths in sprinklered homes.*
- *13 people died in homes without sprinklers.*"

"*Average fire loss per sprinklered incident: $2,166. Average fire loss per unsprinklered incident: $45,019.*"

"*In Scottsdale, the average cost* [of sprinkler installations in residential occupancies] *is less than $.80 per square foot.*"

Given the information above, it's difficult to understand the opposition to sprinkler protection in single-family dwellings. But, what the above doesn't address are the benefits to firefighters-a reduction in the number of firefighter injuries and fatalities which occur due to fighting fires in dwellings. When the costs, as well as the all of the benefits are considered, providing sprinkler protection in single-family dwellings makes even more sense than providing sprinkler protection in high rise buildings. Imagine if we had decided to mandate sprinkler protection in all new dwellings in the United States when the Scottsdale ordinance went into effect, rather than waiting another 20 or 25 years-what a different world it would be in the fire service.

Editor's Note: The "Scottsdale Report" and a report on the experience with sprinkler protection in residential occupancies in Prince George's County, Maryland can be found on the internet at the following addresses:

http://www.homefiresprinkler.org/images/sprinklers.PDF

http://www.homefiresprinkler.org/images/PrinceGeorgeStudy.pdf

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