Fire Sprinklers Should Be a Voluntary Choice

By Angela White, Government Affairs Director

Earlier this year the Washington Fire Sprinkler Coalition made another run for a state mandate for residential fire sprinklers. Your State Association, the Building Industry Association of Washington (BIAW), acted immediately and submitted a letter to the International Residential Code (IRC) Technical Advisory Group (TAG) of the State Building Code Council (SBCC) urging them to leave this issue as is: adoptable by local jurisdictions.

There was a hearing in front of the TAG at the end of May, for which BIAW gathered a group of members and Association staff from around the State to testify, including OMB member Don Koidahl of MDK Construction Inc. and myself. The TAG voted to recommend to the SBCC to leave mandatory fire sprinklers adoptable by local jurisdictions. The SBCC voted 8 to 1 to accept the recommendation of the TAG. A final hitch took place at the end of June when the SBCC agreed to hear and review the minority report after they had already voted on the issue. Once again BIAW was there and ready to testify. The good news; the SBCC affirmed their original decision.

As I watch the members of OMB do business in the community I have been struck by a very real point in this process. I haven't seen our Associate members developing a product they believe in, starting a business and then trying to force their product on the market through a mandate or regulation; greatly increasing the cost of housing! Our members joined OMB, advertise to and educate the public through available avenues, work hard to form relationships with the builders in the community and together, give potential homebuyers OPTIONS when building a home.

Fire Sprinklers should be a voluntary choice left to a consumer when they are building a home, period! If the Washington Fire Sprinkler Coalition had worked with BIAW and encouraged companies to educate builders about their product, who in turn, could provide information to the people building homes, this could be a much different playing field we are working on right now.

What we have instead is an "us against them" fight. The building industry has been forced to defend itself against the ever rising cost of building a home in an economic environment where the profit margins are extremely tight. The industry has been painted as being against life safety when this is FAR from true. Over the last 30 years residential construction technology has greatly improved and building code requirements for electrical and smoke alarm systems are leaps and bounds more stringent. Paired with a concerted effort from firefighters, home builders and other safety advocates to educate consumers there has been a dramatic drop in the number of home fire fatalities. This is an impressive trend given the significant population growth and increase in housing stock over the same time period.

Last year the Lewis County Chapter of OMB worked hard to educate the City of Chehalis, who in turn voted to keep fire sprinklers a voluntary choice by a homebuyer instead of making them mandatory. This year the City of Olympia will be starting discussions about whether to mandate fire sprinklers. Since this will, for now, remain a local option OMB will continue to discuss these points with the local jurisdictions you are doing business in. And because I can't say it enough, fire sprinklers should be a voluntary choice left to the homebuyer because it keeps housing affordable in our community.

Members, as you talk with elected officials keep in mind these points:

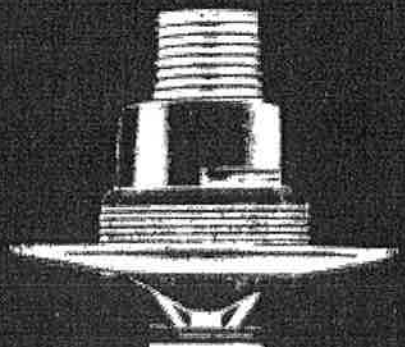
- Fire deaths have continued to decline without a fire sprinkler mandate in new homes.
- Smoke alarms work.
- New homes are safer than ever.
- Fire prevention education is a more practical and effective way of reducing home fire incidents.
- Fire sprinklers are costly equaling in fewer people will be able to afford new homes.

Background on SHB 2475

The state Legislature passed SHB 2575, titled "An act relating to fire sprinklers systems in private residences," in the 2007 session. Basically SHB 2575 requested the SBCC to form a technical advisory group to "examine issues, barriers, and incentives pertaining to....the voluntary installation of sprinkler systems in private residences." The SBCC was required to report back the findings of the TAG to the appropriate committees of the House of Representatives and the Senate by January 15, 2009. The TAG came out with a report in December of 2008 outlining 7 barriers to voluntary installation of sprinkler systems in private residences along with recommended solutions. This report is available at biaw.com.

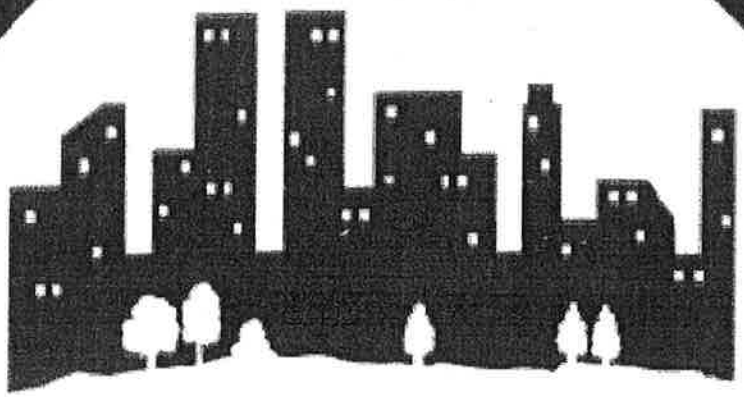
FA-90 / September 1989

RESIDENTIAL FIRE SPRINKLERS RETROFIT DEMONSTRATION PROJECT



Final Report

Phase I:
Multifamily
Structures
Case Studies



FEDERAL EMERGENCY MANAGEMENT AGENCY

UNITED STATES FIRE ADMINISTRATION

Residential fire safety is the primary concern of the United States Fire Administration (USFA), an operating division of the Federal Emergency Management Agency. Based on their mandate, USFA funded the design and installation of quick-response residential fire sprinklers in multifamily residences that were rehabilitated in low-income sections of Austin, Texas; Boston, Massachusetts; Harrisburg, Pennsylvania; Prince George's County, Maryland; and St. Louis, Missouri. The project included various types and sizes of residential buildings. In conjunction with USFA funding, the U.S. Department of Housing and Urban Development (HUD), as part of its effort to rehabilitate and improve urban housing, funded the NAHB National Research Center (National Research Center) to provide technical assistance relating to fire sprinkler system design and installation. Each of the jurisdictions participating in the project are recipients of funds from two HUD programs, the Community Development Block Grant Program (CDBG) and the Rental Rehabilitation Program (RRP).

Funding for this project came from USFA's fiscal year 1986 appropriation directing them to focus on fire safety among "high-risk" populations. The five jurisdictions were included in the first phase of a three-year project sponsored together by HUD and USFA. Most of the jurisdictions participating in the fire safety project were receiving HUD-funded technical assistance regarding residential energy efficiency in low-income neighborhoods provided by the National Research Center. It was recognized by USFA, HUD and the National Research Center that the goals of the fire sprinkler project would be served by continuing provision of technical assistance in the same neighborhoods.

The major goals of the project were to:

- investigate technical, regulatory, and administrative barriers to residential fire sprinkler installation in multifamily buildings undergoing rehabilitation
- evaluate residential fire sprinkler design standards as they relate to multifamily building rehabilitation
- demonstrate the latest residential fire sprinkler technology
- enhance the fire safety of buildings that house low-income high-risk urban populations

Statistics have shown low-income families to be at a disproportionately high risk of death or injury from fire, as are the elderly, the very young, and the physically immobile. Each recipient city or county has a sizeable low-income population.

This project began with selection of a building that met the criteria concerning occupants and that was imminently scheduled for substantial rehabilitation. Design of the sprinkler system began after the building was selected and the owner agreed to participate in the sprinkler project.

Standards for sprinkler design, installation, and maintenance have been developed by the National Fire Protection Association (NFPA) and are known as NFPA 13 (1987) for large buildings, NFPA 13D (1987) for one- and two-family residences and mobile homes, and NFPA 13R (1989) for residential structures up to four stories high, NFPA 13R was not available at the time the sprinkler systems were designed for this project. The variety in size, use, and configuration among the buildings allowed for design of fire sprinkler systems based on a modified NFPA 13D standard.

NFPA 13 was developed for property protection as well as for life safety and usually applies to large buildings. NFPA 13D was developed primarily for life safety and is used for one- and two-family residential buildings and mobile homes. The major difference lies in the fact that the sprinkler heads in a 13D system are quick-response, and are designed to ensure life safety over property protection, Quick-response heads are designed to suppress incipient fires and provide additional time for occupants to escape. One philosophy behind NFPA 13D is provision of 10 minutes of escape time. The more complex NFPA 13 systems require extra connections and control mechanisms, including flow alarms and external water connections and higher water pressure necessary to cover larger areas. In addition, NFPA 13 delineates many technical variations regarding numerous types of occupancies, building materials, and levels of hazard. The extensive technical requirements of a 13 system make it more expensive than a 13D system.

Principal considerations in the sprinkler system

design and installation process included:

- interpretation and application of NFPA sprinkler standards in rehabilitated multifamily dwellings as they pertain to hardware (e.g., pipe and fittings), external fire department connections, and placement of sprinkler heads including sprinklering non-living spaces
- plan review, inspection, and testing requirements and procedures
- water service connections, metering, fees, and backflow prevention; adequacy of existing water service in satisfying hydraulic requirements of residential fire sprinkler systems
- licensure requirements for sprinkler designers and installers

These questions were resolved by relevant authorities during design and installation of the system and are discussed throughout this report. Requirements and guidance were received from respective fire departments, water departments, community and economic development agencies, and building commissioners or building inspectors.

Evaluation of a fire safety system must also consider costs and benefits. Total cost for design and installation of the fire sprinkler systems are presented in the individual case studies. Although there are not enough data to perform a formal cost/benefit analysis, specific benefits are discussed including reduction in fire insurance premiums. and construction alternatives.

THE CASE STUDY APPROACH

This case study is intended to investigate whether or not it is feasible, as well as cost effective, to install residential fire sprinkler systems in multifamily buildings undergoing rehabilitation, The information is offered as a learning tool to help home builders, local officials, and others concerned about residential fire safety evaluate innovations in fire safety systems and, perhaps, take advantage of opportunities afforded during rehabilitation to retrofit residences with sprinklers. The case study outlines the experiences of those involved in design and installation of the fire sprinklers and discusses specific project characteristics and history. At the end of each chapter is a description of the population, income, housing, and residential production and rehabilitation programs in the subject community.

FIRE SPRINKLER SYSTEM DESIGN AND INSTALLATION

The major considerations for design of the residential sprinkler systems were:

- adequacy of existing water service
- coverage and location of sprinkler heads
- response time/activation of sprinkler heads
- sprinkler system plumbing

Each of these items is addressed by NFPA standards and/or by local codes or other building codes enforced in each community. A general discussion of the technical considerations is included in this section. The following chapters discuss the unique technical considerations of fire sprinkler systems in the five participating jurisdictions.

Water Service

The water service in each of the subject buildings was evaluated for sufficient pressure and flow to operate a sprinkler system. In making this determination, the project team evaluated the size of the existing water service connection to the public water supply. supply pressure at the connection, building height, anticipated pressure losses within the system, and maximum number of heads for which simultaneous flow is required.

According to NFPA 13D (Section 4- 1.1). the flow rate at a sprinkler head in a protected area requiring only one head must be no less than 18 gallons per minute (GPM). and in each compartment requiring two heads the heads must deliver no less than 13 GPM simultaneously. Engineering design protocol is that if these requirements are met at the sprinkler head(s) that calculations indicate will have the lowest flow rate (usually the farthest heads), it is generally assumed that they will be met or exceeded throughout the system. Therefore water delivery design must include pressure and flow-rate calculations at the sprinkler head most hydraulically remote from the water source and, in a "two-head" (or a "four-head") system, at the two (or four) heads located in the most hydraulically remote compartment (room) large enough to require two (or four) heads. Two-head designs are more common for residential systems because rooms large enough to require four

sprinkler heads are rarely encountered. Furthermore, in NFPA-13D the maximum number of heads for which simultaneous flow must be accomodated is two. Four-head systems are required by NFPA 13 but not by NFPA 13D.

Coverage and Location of Sprinkler Heads

One step in system design is to calculate the number and location of sprinkler heads. This calculation is primarily related to the square footage of the rooms and areas to be sprinklered, although the geometry or shape of each area is also a factor. NFPA 13D (Section 4-l 4.1) states the requirement for the maximum area covered by a single head to be 144 square feet. Spacing requirements found in NFPA 13D (Section 4-I 4.2). call for pendent heads to be one to four inches (4'6" for sidewalls) from the ceiling. 'The maximum distance between sprinklers shall not exceed 12 feet on or between pipelines and the maximum distance to a wall or partition shall not exceed 6 feet. The minimum distance between sprinklers within a compartment shall be 8 feet. NFPA 13D requires installation of sprinklers in all areas with the following exceptions noted in Section 4-6:

- bathrooms not exceeding 55 square feet with noncombustible fixtures
- closets where the least dimension does not exceed 3 feet (0.9 m.) and area does not exceed 24 square feet and the walls and ceiling are surfaced with noncombustible materials
- open attached porches, garages, carports and similar structures
- attics, crawl spaces not used or intended for living purposes or storage
- entrance foyers which are not the only means of egress

Many fire protection engineers would like to see sprinkler heads installed in the areas noted as exceptions, though simplification of sprinkler systems for affordability in residential settings encourages making the noted exceptions. Excepting the areas listed above is viewed as posing only a minimal life safety risk, and including sprinkler heads in those areas would likely add significantly to the cost of a residential fire sprinkler system.

Response Time/Activation of Sprinkler Heads

Occupant response time is a crucial factor in fire safety. Most deaths from residential fires result from inhalation of smoke or toxic gases such as carbon monoxide that can spread faster than flames. Sleeping or mobility-impaired persons in particular can be asphyxiated before they can escape. In order to protect occupants under conditions in which smoke detectors may be insufficient, sprinklers must activate early in a fire's sequence of events. One philosophy behind NFPA 13D is to provide 10 minutes of fire suppression in the room of fire origin to protect occupants during their escape.

Sprinkler head activation occurs when a soft metal link on the sprinkler head melts and releases a metal disk thus allowing water to flow. Melting the link requires exposure to a certain temperature for a certain duration. The links on commercial heads have a greater mass than on residential heads and require higher temperatures and take longer to melt, making them slower to discharge. For safety, heads are generally set to discharge at no less than a maximum ambient temperature plus 35°F. generally between 135°F and 170°F in a residential environment.

Sprinkler System Plumbing

During system design the project design team selected pipe and fitting material. Historically, sprinkler systems were fabricated of iron or steel piping materials. In recent years residential sprinkler designs have increasingly specified plastic pipe and fittings in fire sprinkler systems. Plastic has become the preferred material due to both lower material and installation costs made possible by its flexibility and ease of assembly. Two plastic materials are available for use in sprinkler systems. They are polybutylene and chlorinated polyvinyl chloride (CPVC). CPVC's listing allows it to be installed uncovered in protected compartments; its joints are solvent-welded together using an adhesive primer and a compound made, in part. of liquified CPVC that drys to help form a single piece of pipe. By contrast, polybutylene must be covered by material with a 30-minute fire suppression rating and its joints are formed by heat welding.

FIRE SPRINKLER SYSTEM COSTS

Specific costs for each sprinkler system installed during this project are presented in the chapters, Costs per square foot ranged from a high of $3.80 to a low of $1.51, with an average cost per

square foot of $2.40. There were several major factors driving either up or down the final costs of each system. In two cases sprinkler system materials were donated or greatly discounted; conversely, the costs of upsizing water service added significant cost to some of the systems. Sprinkler supply vendors, making little or no profit from this project, were interested in establishing reputations in the market for residential fire sprinklers. Staff engineers from the National Research Center estimated the cost for the sprinkler systems where materials costs were well below what they would have been for other building owners. Also, in two cases, National Research Center staff designed the sprinkler system at no cost to the grantees. In these two cases the cost of design was included in the cost table in order to present more accurate data on fire sprinkler systems.

Operation and Maintenance Costs

Fire sprinkler systems are subject to various costs whether or not a fire occurs in a building equipped with them. Costs may include water fees, inspection, testing and maintenance, a monitoring and response service, increased property taxes reflecting a higher tax assessment, damage from leakage or accidental discharge, and financing charges where a loan is involved. Further, in the event of a fire large enough to cause sprinkler activation (or false activation), there will be costs for replacement of heads, water service, and potentially other repair and maintenance costs. There may also be water damage to the building or its contents,

Economic Benefits to Owners of Building with Fire Sprinklers

The principal benefits from any residential fire protection strategy are potential reductions in losses from fires and reduction in the underlying probability of fire. The major categories of benefits are improved life safety and a positive effect on rental income, reduced insurance premiums, reduced property damage costs, reduced costs of indirect fire losses, and construction alternatives. This section discusses these benefits in general, while the chapters on each jurisdiction discuss specific benefits to the participating owners of the buildings. National Bureau of Standards Technical Note 1203 (Ruegg and Fuller, 1984) presents a more detailed analysis of the benefits of a hypothetical sprinkler system.

Improved Life Safety

Occupants of units with sprinklers benefit from a reduction in probability of death or injury from fire. Statistics (in each chapter below) showing local fire death experience give an indication of potential for reduction in fire related fatalities. As noted above, one philosophy behind NFPA 13D is to provide 10 minutes of fire suppression to protect occupants during their escape: and when a residential fire sprinkler system is supplied by stored water, NFPA 13D section 2-1 states the supply should be sufficient to provide 10 minutes of flow.

Owners (non-occupants) of sprinklered multifamily buildings ordinarily would benefit from the effect of sprinklers on rental income. Two factors predominantly determine the extent of effect on rental income: economic conditions in the housing market such as vacancy rate and median income of area residents, and regulatory authority by federal, state, or local governments who control rent levels and/or subsidize rental payments.

Property Insurance Discount and Reduced Property Damage Costs

Rate decisions in the insurance industry are guided by an advisory organization, the Insurance Services Office (ISO). IS0 has recommended that companies offer discounts of up to 10 percent on fire insurance policies covering rental structures that have "partial" sprinkler coverage and up to 20 percent for buildings that have "full" coverage. Insurance companies are free to offer higher or lower discounts with regulatory approval. The discount on any particular policy is determined on a case-by-case basis, particularly for large policies, and is dependent on evaluation of an underwriter. An underwriter bases actual rates on the reliability, maintainability, and expected performance of a fire sprinkler system, in addition to standard risk factors such as the local community fire protection rating and distance to the nearest fire hydrant and fire station.

Many fire insurance policies provide only partial coverage. An owner may not be reimbursed for some of the costs of property destroyed by a fire, due to a deductible, a low policy limit, or type of coverage (e.g., replacement value or less). An owner in this situation will benefit from any system that reduces the likelihood of property damage from fire. Also, several types of damage and costs from a fire will not be covered by insurance. Examples include demolition of

remaining property in preparation of construction, security of remaining property, and special administrative procedures in response to loss of property. Further, tenants may have insurance policies protecting against losses in their units, and reduced probability of fire may benefit those with such policies.

Construction Alternatives

Many jurisdictions enforce local building codes as well as codes used throughout large regions or nationally. Many codes require a variety of fire safety measures and systems such as an emergency egress from upper floors of multifamily buildings or use of material with a prescribed fire suppression rating in walls separating individual units or stairwells that serve as emergency egress. However, in recognition of protection provided by fire sprinklers, local building officials often waive such requirements, thus reducing some costs of owning or rehabilitating a building.

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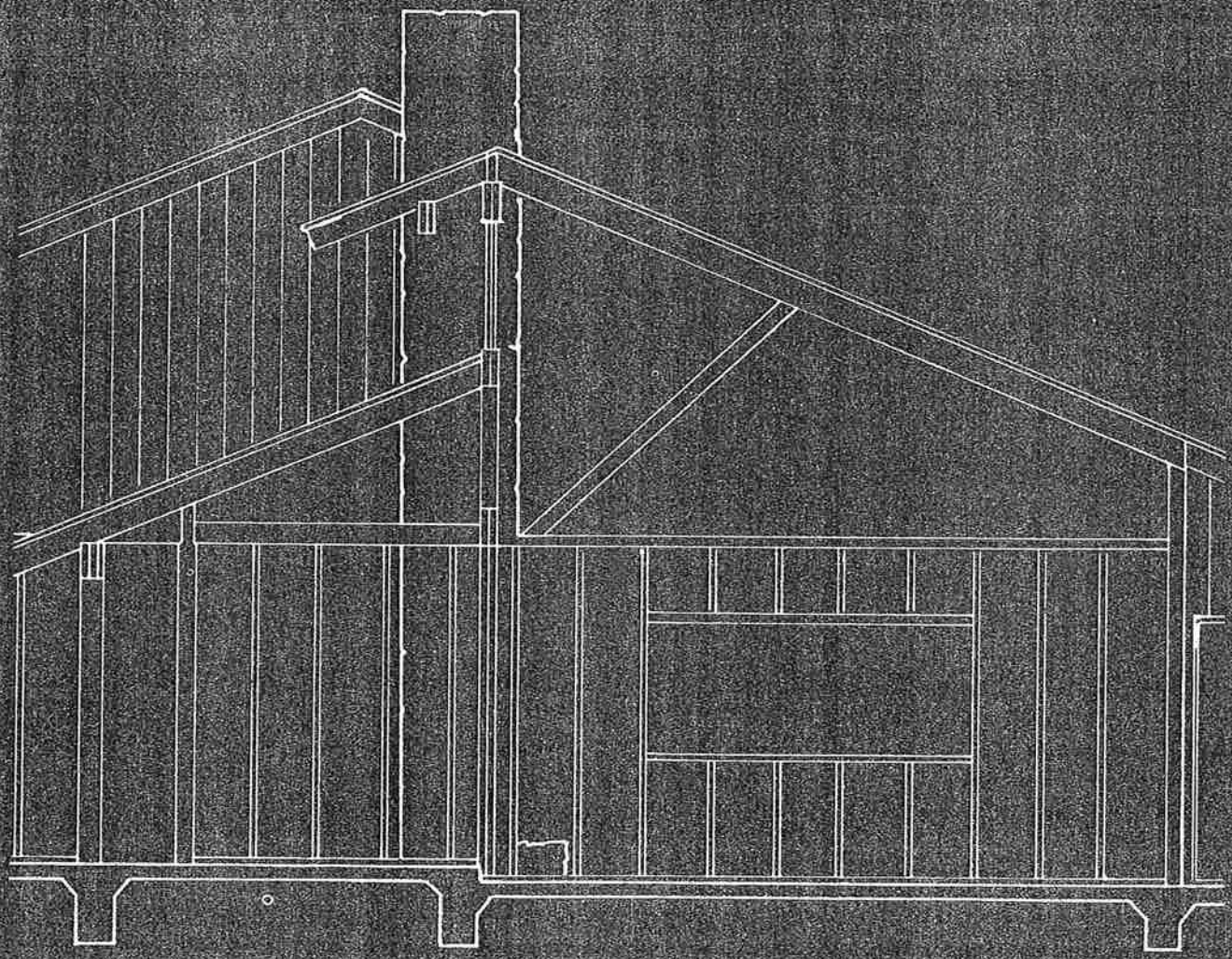
HOME FIRE PROTECTION

Fire Sprinkler Systems



Federal Emergency Management Agency

HOME FIRE PROTECTION
Fire Sprinkler Systems

SPRINKLER SYSTEMS IN INDUSTRY

Schools, office buildings, factories, and warehouses have benefited from fire protection sprinkler systems for a century. To protect investments in buildings and machinery, the textile mills in New England began using sprinkler systems over 100 years ago following a series of devastating fires which claimed many lives and destroyed entire businesses.

SPRINKLERS IN HOMES

But what about our homes? We protect our businesses from fire, but what actions do we take to protect our families, our homes, and our possessions from fire? Millions of Americans have installed smoke detectors in their homes in the past few years, but a detector can only alert the occupants to a fire in the house...it cannot contain or extinguish a fire. Home sprinkler systems can!

SPRINKLERS - THE SOLUTION

Fires in American homes in 1978 took a high toll of life and property.

Deaths—	6,700 Killed
Injuries—	22,000 Civilians Injured
Dollar Loss—	over $2 Billion in Property Destroyed

Studies by the Federal Emergency Management Agency's United States Fire Administration indicate that the installation of home fire sprinkler systems could have saved thousands of lives; prevented a large fraction of those injuries; and salvaged hundreds of millions of dollars in property losses.

WHAT ARE HOME FIRE SPRINKLER SYSTEMS?

Using newly designed prototype sprinklers and standard household piping, homes will be built or even remodeled to include low-cost automatic sprinkler systems connected to the household water supply.

Sprinkler systems offer advantages to the homebuilder:

- A low-cost reliable safety option that would attract many buyers.
- Trade-offs between sprinklers and code requirements that can result in lower construction costs, more units per area of land, etc.

For homeowners, the advantages include a safer environment for the family, protection of their investment and irreplaceable family possessions, and potentially lower insurance rates.

ADVANTAGES OF NEWLY DESIGNED HOME SPRINKLER SYSTEMS

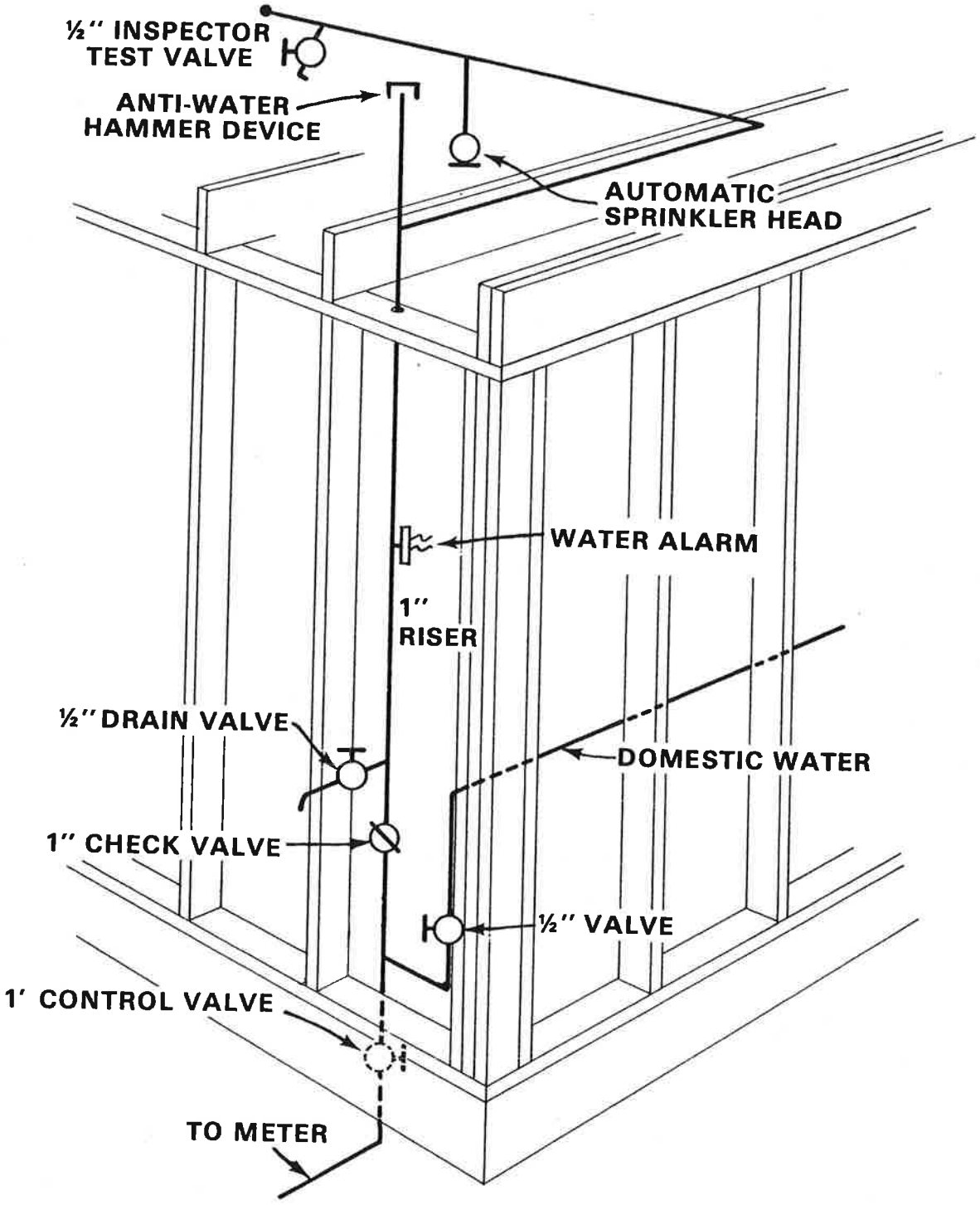
Fast Response

Prototype home sprinklers are in development. They are designed to respond to a fire at least five times faster than currently available standard commercial and industrial sprinkler systems. The new home sprinklers react automatically to fires of temperatures lower than those experienced by industry.

Low Cost

At the present time, cost of a home sprinkler system is targeted at 1% of the price of a home. Furthermore, it is hoped that the cost will decrease as the use of home fire protection grows.

SPRINKLER PIPE DIAGRAM



Small Size

For home systems, the sprinklers will be smaller than traditional, commercial, and industrial sprinklers, and can be aesthetically coordinated with any room decor.

Minimal Installation Work

When future homes are under construction or being remodeled, a home sprinkler system will require minimal extra piping and labor.

Low Water Requirement

These systems will require less water than the systems installed in industrial or commercial establishments and can be connected to the house water supply.

CALIFORNIA COMMUNITIES PROMOTE HOME FIRE SPRINKLERS

> *The fire loss in this country in residential occupancies is catastrophic. Manual firefighting methods are not the answer. The only way to attack the problem is to limit the fire growth where it occurs in dwellings. We have the technology to do that.*
>
> *Residential Automatic Sprinkler Systems. Ordinance No. 745; Adopted May 28, 1979; by the San Clemente, California, City Council.*

Proposition 13 was a major factor in promoting the ordinance, explained Ron Coleman, Director of Fire Protection in San Clemente. There is also a shift within the fire service toward more fire prevention and less suppression activities.

The San Clemente ordinance states:

> *This standard for low-cost residential sprinkler systems is designed to meet the following performance criteria:*
>
> 1. *To prevent flash-overs.*
> 2. *To protect lives and property immediately adjacent to fire room.*
> 3. *To contain the fire to room of origin.*
> 4. *To limit the number of fire personnel required to combat structural fires.*

San Clemente and Corte Madera were some of the first communities in the United States to enact a home sprinkler ordinance. Other localities which are encouraging these systems include Santa Barbara, Palm Springs, Redwood City, Orange County, Colorado Springs, Colorado, and Dallas, Texas.

TEST YOUR HOME SPRINKLER SYSTEM'S I.Q.

Here are five statements about home sprinkler systems. Are they true or false?

1. When one sprinkler goes off, all the sprinklers activate.

   False! Only the sprinkler over the fire will activate. The sprinkler heads react to temperatures in each room individually. Thus, fire in a bedroom will activate only the sprinkler in that room.

2. A sprinkler could accidentally go off, causing severe water damage to a home.

   False! Records, which have been compiled for well over 50 years, prove the

likelihood of this occurring is very remote. Furthermore, home sprinklers will be specifically designed and will be rigorously tested to minimize such accidents.

3. Water damage from a sprinkler system will be more extensive than fire damage.

   False! The sprinkler system will severely limit a fire's growth. Therefore, damage from a home sprinkler system will be much less severe than the smoke and fire damage if the fire had gone on unabated or even the water damage caused by water from firefighting hoses.

4. Home sprinkler systems are expensive.

   False! Current estimates suggest that, when a home is under construction, a home sprinkler system could cost about 1% of the total building price. Residential sprinkler systems could use standard piping and hardware with domestic plumbing.

5. Residential sprinklers are ugly.

   False! The traditional, industrial-type sprinklers as well as sprinklers for home use are now being designed to fit in with most any decor.

SPRINKLERS ARE A GOOD INVESTMENT FOR HOMEBUILDERS

New homes can be safely built further away from a fire station if they have sprinkler systems.

Home sprinkler systems offer both safety and financial advantages to home buyers, a rare combination.

SPRINKLERS ARE A GOOD INVESTMENT FOR THE HOMEBUYER

- Fire breaks out in one of every 10 American homes each year, according to the U.S. Fire Administration.

  To the homebuilder, this fact means that a large share of potential customers now have firsthand knowledge of the terror and destruction caused by fire.

- Families with children, senior citizens, and handicapped members will have special fire protection needs. Home sprinkler systems provide added protection for these people.

- A homeowner, with a sprinkler system, may find his insurance rates decrease.

- In case of a home fire, the firefighter will have less risk of injury or life loss since he will be fighting a "safer fire."

- Fewer fire stations may be needed since the fire will be limited and contained for a longer period of time in the room of origin while the engines are en route.

- Communities will be able to make better utilization of available land and thereby increase their tax base.

THE MOVE TOWARD HOME SPRINKLER SYSTEMS

The U.S. Fire Administration has worked toward the development of home sprinkler systems. A major consideration of the program was that home sprinklers should be low-cost, fast-acting, and reliable.

In November 1980, the National Fire Protection Association adopted a new NFPA 13D Residential Sprinkler *installation* standard. The new standard is based on technical data from the comprehensive full-scale fire tests which were sponsored by the U.S. Fire Administration.

Installation of the systems using the newly designed residential sprinklers, currently under development, will require no special piping and utilize standard off-the-shelf hardware.