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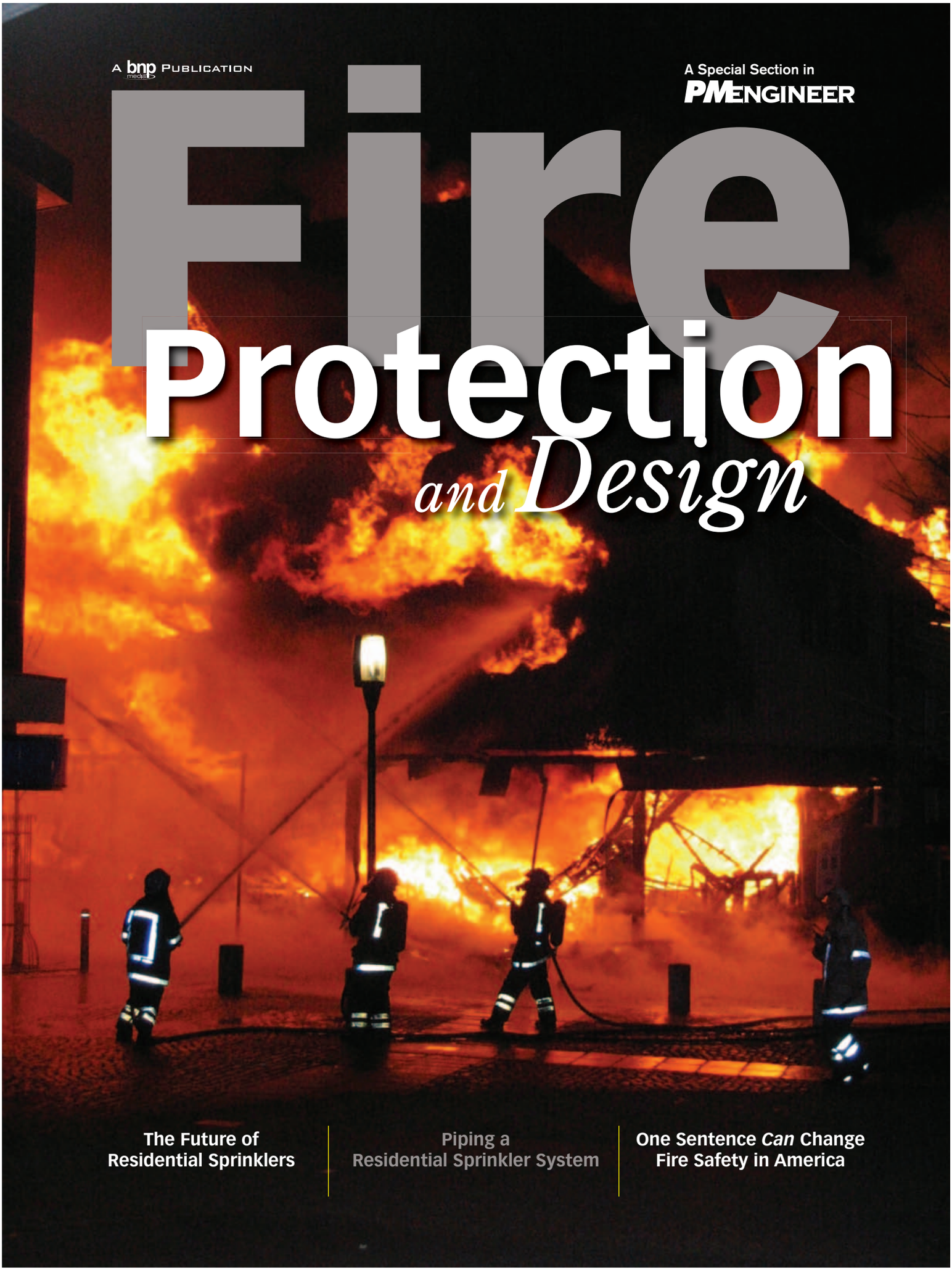
Fire Protection and Design



The Future of Residential Sprinklers

Piping a Residential Sprinkler System

One Sentence *Can* Change Fire Safety in America

A Paradigm Shift

The Future of Residential Sprinklers

by Azarang (Ozzie) Mirkhah, P.E., EFO, CBO

Residential sprinklers have proven their potential to reduce fire fatalities and decrease total property loss, yet they are still underutilized—to the detriment of the general public.

At the 1947 President's Conference on Fire Prevention, President Truman stated: "the serious losses in life and property resulting annually from fires cause me deep concern. I am sure that such unnecessary waste can be reduced. The substantial progress made in the science of fire prevention and fire protection in this country during the past 40 years convinces me that the means are available for limiting this unnecessary destruction."

The reason for direct involvement from the highest level of government almost six decades ago was a series of tragic fire losses that plagued the country: the 1942 fire at the Coconut Grove in Boston (492 dead); the 1943 Gulf Motel Fire in Houston (54 dead); the 1946 LaSalle Hotel fire in Chicago (61 dead); the 1944 Ringling Brothers and Barnum & Bailey circus fire in Hartford (167 dead); and the 1946 Winecoff Hotel fire in Atlanta (119 dead).

In the years that followed, building and fire codes were improved, and fire death rates in commercial occupancies declined. Nevertheless, fire continues to take a significant toll on society in the United States.

The Total Cost of Fire

According to "The Total Cost of Fire in the United States," a report published

by the National Fire Protection Association (NFPA) in October 2005, the total property loss due to fire in 2003 was approximately $14.5 billion, but this was only a small part of the overall cost of fire. The report estimates that the total cost of fire in 2003 was between $226 and $272 billion, which roughly equates to 2-1/2% of U.S. gross domestic product (GDP). A quarter of a trillion dollars in annual cost related to fire demands serious attention.

Let's put the magnitude of these statistics into perspective. That quarter of a trillion dollars fire cost in 2003 is on a par with the total GDP of the 20th largest economy in the world! Even more interesting is the fact that our total annual fire cost in 2003 was more than 30% higher than the total GDP of the largest oil-producing country in the world, Saudi Arabia. According to the World Bank's 2003 statistics, Saudi Arabia's total GDP for 2003 was about $189 billion.

From a purely statistical perspective, the total U.S. fire cost over the past three years even exceeds direct costs and losses associated with the Iraq war. Since the start of the war three years ago, America has spent $350 billion to fund the war effort, and we have lost more than 3,000 of our bravest in Iraq. In comparison, during that same time period, with a $250 billion average annual cost of fire and 4,000 annual fire fatalities, the total cost of fire was on the order of $750 billion and 12,000 fatalities.

Do Americans realize this? I believe that, as Americans, it is our national obligation to focus on ways to significantly reduce the unnecessary destruction associated with fire. In the competitive world of global economics, we must be concerned about such waste. We need the foresight to look ahead 30-40 years and recognize that, to be competitive in the global economy, we should focus on ways to decrease our total national fire cost. Looking that many years ahead, though, it is not far-fetched to predict that, by staying on our current course, America's fire problem will worsen with the passage of time and the pace of growth.

A single-family dwelling, 4,500 square feet in area, without sprinklers becomes engulfed in flames. Photos courtesy of Tualatin Valley Fire & Rescue, Aloha, OR.

Smoke Alarms and Sprinklers

In charting the future of fire safety, one area that clearly requires our attention is protecting Americans from fires at home. In the September 2006 *NFPA Journal* article entitled, "Fire Loss in the United States During 2005," it is stated that "with home fire deaths still accounting for 3,030 fire deaths or 82% of all civilian deaths, fire safety initiatives targeted at the home remain the key to any reductions in the overall fire death toll." The answer to this problem can be found on the Home Fire Sprinkler Coalition's (HFSC) Web site, www.homefiresprinkler.org: "installing

Sprinklers minimized the fire damage to this room.

Is New Home Construction Really Safer Than Older Home Construction?

With the advent of new materials and construction methods during the past few decades, one would think that new homes constructed under modern building codes would be inherently safer than older homes from a fire- and life-safety perspective. However, "improvements" in one aspect of construction—structural floor supports—actually increase the fire danger to occupants and firefighters.

Although I-shaped trusses and other engineered wood truss systems offer strength, versatility and economy in residential and light commercial applications, their performance in fire falls far short of traditional solid wood members. I-joist members are comprised of top and bottom dimensional lumber flanges of various widths, united with plywood or similar webs of various depths.

The flanges resist common bending stresses, and the web provides outstanding shear performance while maintaining required space between the top and bottom flanges. Unfortunately, exposed lightweight trusses burn and separate quickly in a residential fire environment, losing their ability to carry design loads and sometimes collapsing under the weight of a firefighter, perhaps in the process of rescuing an occupant.

As reported in at least two news articles in recent months (noted here), there is growing concern in the public sector that the use of exposed engineered wood floor trusses in unsprinklered homes presents a risk to firefighters and occupants that should not be ignored. The articles are: Firefighters Face New Hazard (11/20/06) (http://www.ksdk.com/news/news_article.aspx?storyid=107868) and Type of Wood Can Affect How Fast House Burns (2/16/07) (http://www.wbaltv.com/print/11028701/detail.html).

both smoke alarms and a fire sprinkler system reduces the risk of death in a fire home by 82% relative to having neither."

Eureka, we do indeed know where we should be focusing to reduce 80% of our fire fatalities and decrease our fire losses! Simple, affordable, life-saving technologies, such as smoke alarms and residential fire sprinkler systems, have been available for decades. However, while smoke alarms are now quite common in households, with a reported 96% of homes having smoke detectors, residential fire sprinkler systems are thought to be installed in only 2% of American homes.

The question is why? What are we waiting for? What is holding us back? Why don't we have residential fire sprinkler systems installed in all newly constructed homes? Why doesn't fire service put all its support behind installing such life-saving technology in all our new houses?

From a fire-service perspective, we know that residential fire sprinkler systems are primarily intended as life-safety systems, but they do much more than just save lives. Not only do these systems increase the survival window for occupants by stopping fire spread and impeding flashover, they also create a safer environment for responding firefighters, minimizing the possible need for interior search and rescue and required fire-suppression operations. Simply put, residential fire sprinkler systems save not only occupants' lives but firefighters' lives as well. Additionally, by suppressing fires in incipient stages, residential fire sprinkler systems also decrease the adverse economic impact of residential fires.

Today, there is an inventory of around 100 million existing dwellings in our country, so clearly, installing residential fire sprinkler systems in the roughly 1.5 million new homes that are constructed each year will not be an immediate solution to the country's fire problem. Nevertheless, putting sprinklers in today's new homes is the only

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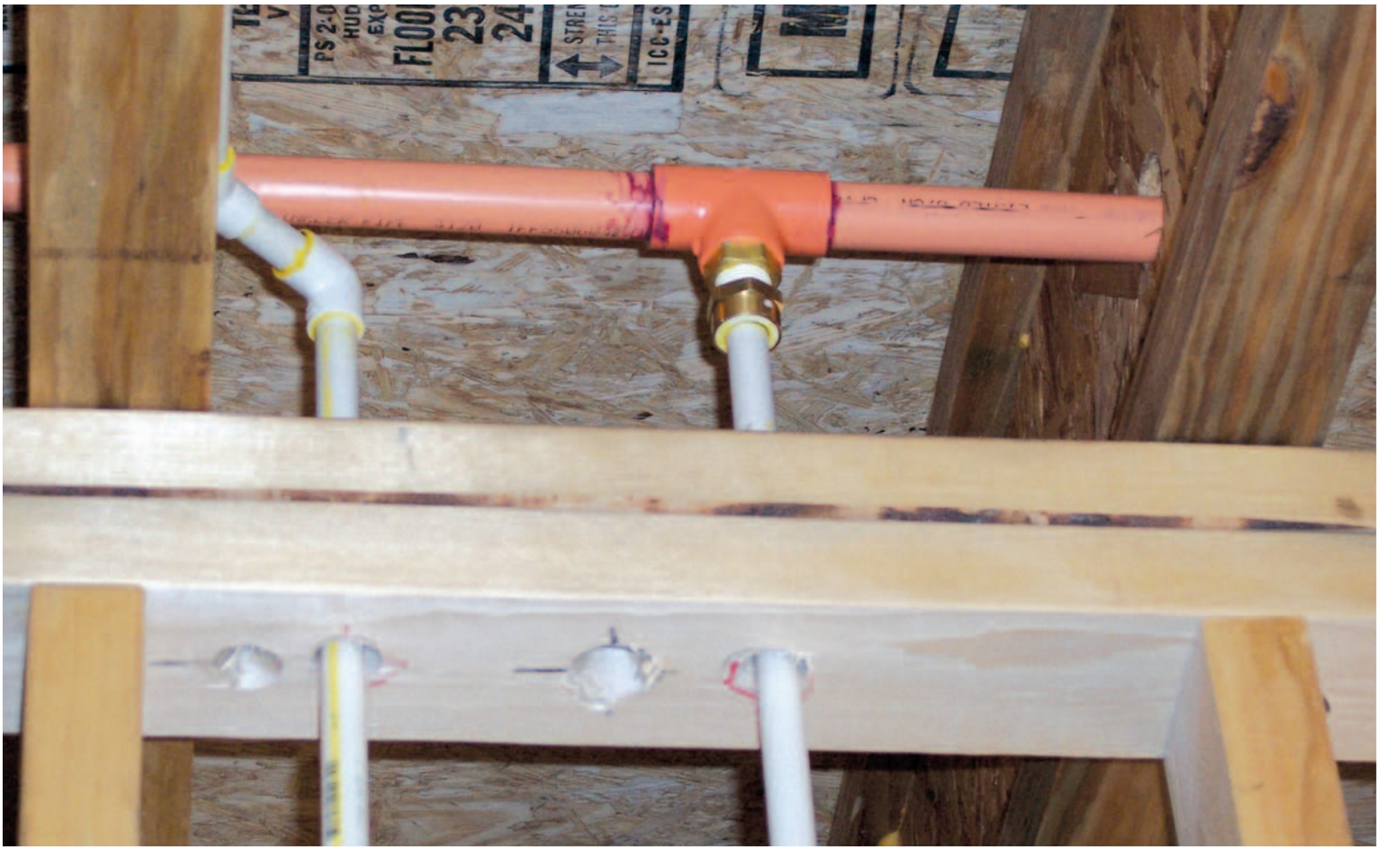

Piping a Residential Sprinkler System

by Julius Ballanco, P.E.

A residential sprinkler system is a system that provides protection of residential units. In addition to dwelling units, these systems extend to hotels, motels, residential care facilities and similar facilities that house people.

There are three standards that regulate residential sprinkler systems: NFPA 13, 13R and 13D. NFPA 13 covers all types of sprinkler systems. NFPA 13R covers residential sprinkler systems for residential buildings four stories or less in height. NFPA 13D covers residential sprinkler systems in one- and two-family dwellings, including townhouses.

Standards' Special Requirements

Each one of these standards has special requirements for residential systems. A residential system is a special system that allows the design to be based on the number of sprinklers in a room or compartment. Each standard is slightly different in establishing the flow rate in the piping system.

NFPA 13 requires the residential system to be sized based on the discharge of the four most remote sprinklers. NFPA 13R requires the system to be sized based on the maximum number of sprinklers in a room or compartment to a maximum of four. NFPA 13D requires the system to be sized for the maximum number of sprinklers in the room or compartment to a maximum of two.

With an NFPA 13R or 13D system, if the building is designed so that

Above: In a multipurpose piping system, the plumbing contractor uses a sprinkler tee to adapt to ½-inch Flowguard Gold CPVC.

Piping a
Residential
Sprinkler System

Factors to consider include regulating standards, piping materials, system types and cost.

■ The multipurpose piping system results in the sprinkler/cold-water pipe running perpendicular to the hot water distribution piping, as opposed to running parallel in a normal hot- and cold-water piping installation.

only one sprinkler is located in each room or compartment, the system is designed for the discharge of one sprinkler. This is rather unique, in that commercial sprinkler systems are always designed for multiple-sprinkler discharge.

The special piping design of a residential sprinkler system is based on the use of residential sprinklers. Unlike standard sprinklers, residential sprinklers are designed to activate much faster during a fire. The speed of the activation is intended to allow a person in the room of fire origin to survive the fire. This means that the sprinkler must not only control the fire, but it must also control the environment of the room to prevent a deadly accumulation of carbon monoxide.

There have been many advances in residential sprinkler technology over the past 10 years. One of the most noticeable changes has been in the flow rates for sprinklers. Depending on the style of sprinkler and the manufacturer, residential sprinklers will have flow rates ranging from 9 gpm to more than 20 gpm. That is quite a variety for designing a piping system. The flow rate also is related to the area of coverage of the sprinkler. Typically, the larger the area of coverage, the higher the flow rate.

Piping Materials

The common piping materials used in a residential sprinkler system include copper tubing, CPVC pipe and PEX tubing. Steel pipe, one of the dominant piping materials in commercial sprinkler systems, may also be used for these systems; however, it is less common.

Copper tubing and PEX tubing are the same piping materials that are found in plumbing water distribution systems. CPVC is somewhat unique, in that the piping material used for sprinkler systems is Blaze-

The plumbing contractor uses a sprinkler elbow to adapt to a shower connection in a multipurpose residential sprinkler piping system.

A multipurpose piping system piped in PEX tubing looks similar to a manifold installation.

master, which is produced in pipe size dimensions. CPVC for plumbing is produced in CTS sizes. The Blazemaster has a larger inside diameter to accommodate the higher flows in a sprinkler system.

CPVC and PEX both have requirements for the protection of the pipe from fire since the materials are combustible. The requirements are slightly different for the two materials. CPVC can be exposed under certain conditions, such as when it is tight to a flat ceiling or a solid wood joist ceiling.

Types of Systems

There are two styles of sprinkler systems—the *stand-alone* piping system or the *multipurpose* piping system. The stand-alone system is just as it sounds—the piping is separate from other piping systems, just serving the sprinklers. A multipurpose piping system is a system that supplies both the sprinkler system and the cold-water distribution system within the dwelling unit.

A multipurpose piping system is only permitted by NFPA 13D. Hence, it can only be installed in one- or two-family dwellings and townhouses. A multipurpose piping system is not permitted for apartments or condominiums.

When sizing a multipurpose piping system, the pipe is sized for the greatest demand of the two systems. For most installations, the sprinkler demand will dictate the size of the piping. However, in large dwelling units, the water distribution piping may have a greater demand for certain sections of the system.

The beauty of a multipurpose piping system is that it reduces the amount of piping required for a dwelling unit. As a result, the multipurpose piping system is one of the most economical piping installations for a residential sprinkler system.

Plumbing contractors often comment that a multipurpose piping system looks funny when installed. Rather than running the cold-water piping parallel with the hot water, the cold piping runs randomly through the dwelling unit to serve the sprinklers. A branch is taken off at convenient locations to serve the plumbing fixtures.

Since the piping system is a part of the potable water system, there are no requirements for backflow protection. The piping can be installed however it is convenient to the dwelling unit. Sprinklers can be run on dead-end lines. The piping also can be looped to reduce the size.

Unfortunately, some states and local jurisdictions have restrictive licensing laws that prevent the installation of a multipurpose piping system. Since the system is a part of the potable water piping system, it must be installed by a plumbing contractor that is familiar with residential sprinklers. Some restrictive licensing laws require the plumbing contractor to also be a licensed sprinkler contractor. This often requires the completion of a sprinkler apprenticeship program.

Other licensing laws, such as those of the State of Wisconsin, allow the plumbing contractor to install multipurpose piping when they have completed training on residential sprinklers. These same contractors are not permitted to install commercial sprinkler systems.

High or Low Cost?

One of the arguments against residential sprinkler systems is that there is a high cost of installation. Others state that residential sprinklers are a low cost. In reality, it all depends on how you consider the cost of the system.

With copper prices currently high, a lower-cost residential sprinkler system would be a multipurpose piping system in CPVC or PEX. The layout of the dwelling unit would dictate whether a CPVC or PEX system would be the lower cost.

Piping a Residential Sprinkler System

Protection is provided for sheet rocking and spackling around a flush-mounted sprinkler.

For a stand-alone sprinkler system, the entire system is piped in Blazemaster CPVC pipe.

The cost of residential sprinkler systems is typically identified in a price per square foot. The only reason for using such a cost factor is because commercial sprinkler systems have long been priced this way. The problem with a residential system is that the price per square foot can change significantly depending on the size of the dwelling unit and the size of the rooms.

The other problem with pricing a multipurpose piping residential sprinkler system is the original water distribution design. If a plumbing water distribution system was originally designed to be piped in copper tubing, and the sprinkler system switches to CPVC, there is an immediate savings in the cost of material.

A 6,000-square-foot dwelling unit in Virginia was designed without a sprinkler system. Copper tubing was specified for the water distribution piping system. When the owner decided to sprinkler the dwelling unit, the engineer switched the potable water piping material to CPVC. Both the hot- and cold-water piping were switched. The hot water could have remained copper tubing, but the engineer decided to use a single material for the dwelling.

The water service for the dwelling unit was already specified as a 1-1/4-inch polyethylene pipe. This size was adequate for both the sprinkler and water distribution demand. The main piping was increased to a 1-inch Blazemaster CPVC. Some of the copper tubing was scheduled to be 1-inch prior to the change in material.

When the plumbing contractor calculated the price of the installation of the CPVC multipurpose piping system, he realized that the installation was less than the copper system for the water distribution piping only. For this particular dwelling unit, one could say that the sprinkler system was $0 per square foot. Better yet, the sprinkler system was -$1 per square foot.

It sounds ridiculous to say that the sprinkler system was free, or that it made money for the homeowner. In reality, the water distribution system could have been piped in CPVC from the start. Therefore, the pricing would have to be based on the additional cost of piping the sprinklers. For this particular dwelling unit, the price of the installation was less than $0.40 per square foot. The reason for the low cost was the number of bathrooms and plumbing fixtures in the dwelling unit. There already was an extensive amount of piping. The additional piping for the sprinkler system was minimal.

If the system was piped in copper tubing, the sprinkler system would have been higher. Again, that is based on the current higher price for copper tubing. If copper tubing drops in price in the next few months, the cost per foot of the sprinkler system also will drop.

As more states and local jurisdictions consider requiring all dwelling units to be protected with a residential sprinkler system, the plumbing/sprinkler contractor will be challenged with finding ways to install low-cost systems. Sprinkler manufacturers expect to seek unique concepts from the installing contractor to lower the cost of installation. The impact will be a much safer home for minimal additional cost. PME

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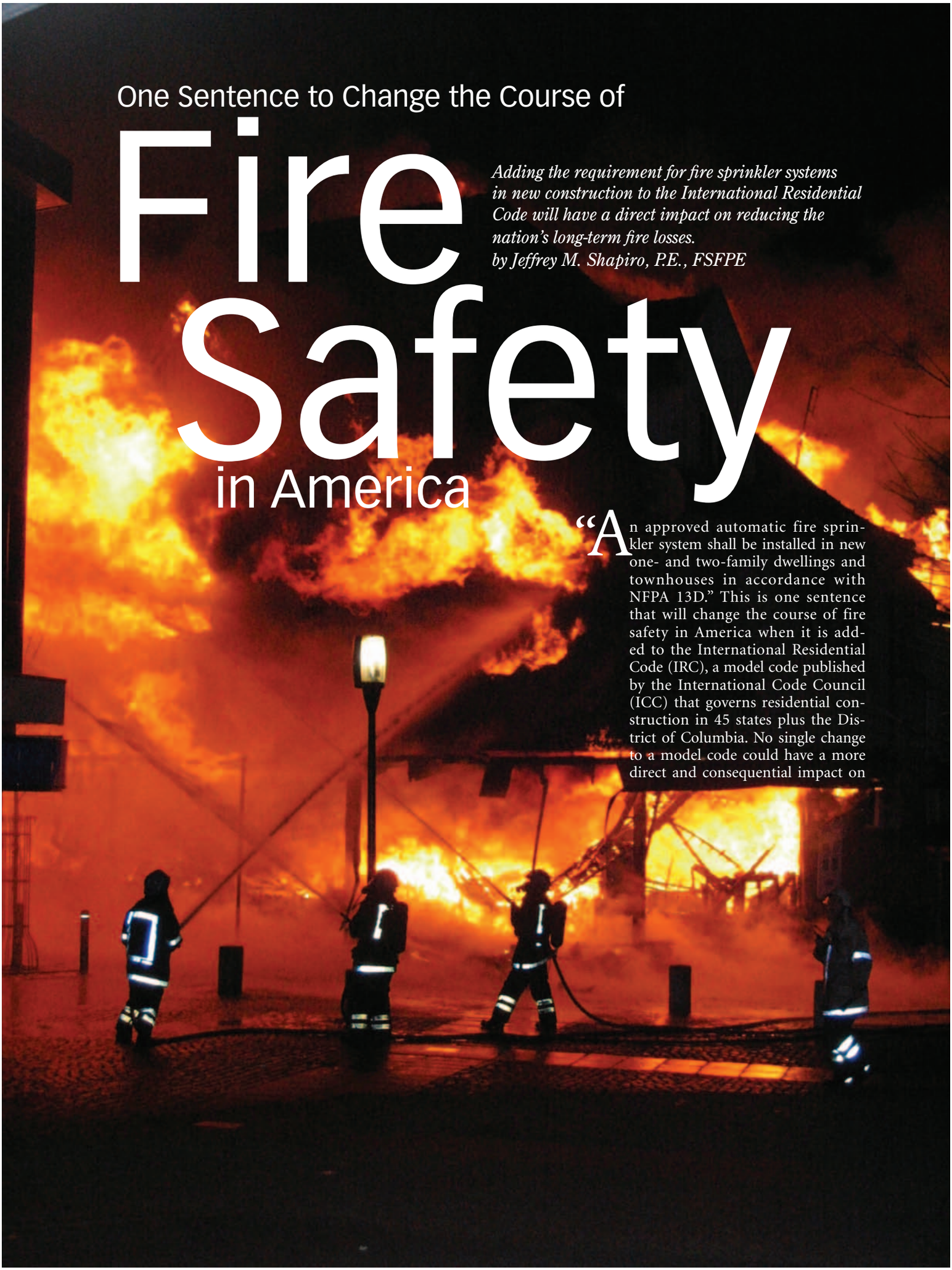

One Sentence to Change the Course of

Fire Safety in America

Adding the requirement for fire sprinkler systems in new construction to the International Residential Code will have a direct impact on reducing the nation's long-term fire losses.

by Jeffrey M. Shapiro, P.E., FSFPE

"An approved automatic fire sprinkler system shall be installed in new one- and two-family dwellings and townhouses in accordance with NFPA 13D." This is one sentence that will change the course of fire safety in America when it is added to the International Residential Code (IRC), a model code published by the International Code Council (ICC) that governs residential construction in 45 states plus the District of Columbia. No single change to a model code could have a more direct and consequential impact on

Residential sprinkler systems often use CPVC piping materials. PEX and copper also are common. (Photo courtesy of Jeff Shapiro.)

reducing the nation's long-term fire losses than revising the IRC to require residential sprinklers in new homes.

It has been more than 30 years since the concept of residential sprinklers was born, and in that time, roughly 100,000 Americans have lost their lives in residential fires. Putting this death toll into perspective, it is essentially equivalent to wiping out the entire population of the city of Albany, NY, in just 30 years. Those who argue that the residential fire problem is "not that bad" only get away with making such statements because residential fires tend to kill by ones and twos, ducking national attention. The solution to this problem is at hand: Fire sprinklers in one- and two-family dwellings.

Last Piece of the Plan

This is the last significant piece still missing from America's fire safety plan.

In the past few years, much progress has been made toward a long-term reduction in fire losses. Smoke alarms are now required in all new and existing dwellings, fire sprinklers are required in all multifamily dwellings other than townhouses not exceeding three stories in height, and codes published by the National Fire Protection Association now mandate fire sprinklers in all residential construction, including one- and two-family dwellings. Nevertheless, most one- and two-family dwellings built in the United States, more than 1.5 million per year, are still constructed without fire sprinklers, and thousands of lives are lost each year to residential fires.

If we are committed to protecting current and future generations from the destruction of residential fires, then the time has come to establish residential sprinklers as part of the minimum safety package for new home construction. To many, this is obvious, but one group, the National Association of Home Builders (NAHB), has publicly established itself as the adversary of the residential sprinkler movement, describing a 2006 defeat of an IRC proposal to require residential sprinklers as "a major victory" for NAHB.

Why do home builders oppose residential sprinklers? Here are some points and counterpoints to their claims:

1. Cost of sprinklers and impact on affordable housing. Before specifically addressing the direct cost of sprinklers, there is a basic question that has to be asked when it comes to the price of housing in America: "What drives the price of a new home?" In many, if not most, markets, the answer to this question is not construction costs, but instead, what the market will bear, with sales prices rising and falling based on what buyers are willing to pay. In such markets, costs associated with sprinklers are absorbed into the price by adjusting other costs or builder markup.

One source of cost data associated with the widespread installation of residential sprinklers is Scottsdale, AZ. Scottsdale, which became one of the first major U.S. jurisdictions to require residential sprinklers roughly 20 years ago, provides an excellent demonstration case to show the effects of a community's decision to require residential sprinklers on system cost, life safety, property protection and the local fire-protection infrastructure.

With respect to cost, residential sprinkler systems in Scottsdale were recently quoted as costing builders $0.55 to $0.75 per square foot, and there are now well over 40,000 sprinklered homes in the city. Scottsdale's experience clearly demonstrates that a competitive marketplace greatly reduces sprinkler costs.

Design approaches, such as using combined plumbing-sprinkler systems that serve both domestic and fire protection needs (multipurpose systems) are being pursued in some jurisdictions as one way to minimize the cost and impact of sprinklers on new home construction. Multipurpose systems, which are permitted by NFPA 13D, have been shown to be particularly well suited to entry-level homes because they add minimal cost to the plumbing installation.

Recent audits of sprinkler costs for affordable homes in the 1,000- to 1,200-sq.-ft. range showed that the added cost of materials related to sprinkler protection was in the $0.25 to $0.30 per sq.-ft. range, and the sprinkler installation required less than 8 hours of additional labor. While no cost increase is inconsequential when dealing with affordable housing, the significant fire-safety benefits gained by installing sprinklers for such a small cost (in the $4/month range on a 30-year mortgage, not including any insurance credit) certainly appears to be money well invested.

With respect to the cost of sprinklers in larger homes, the actual impact on the owner's monthly payment isn't much different. Figuring the cost of a hypothetical $3,000 sprinkler system in a $300,000

home with a 6.5% mortgage, a 5% credit on a $2,000/year insurance bill and a combined federal/state income tax rate of 33%, the net cost of fire sprinklers, after mortgage-related tax deductions, would be $4.37 per month. This represents a 0.23% increase in the monthly payment and roughly equates to the cost of a premium beverage at your local coffee shop. Just how cheap do sprinklers have to become before they're considered cost-effective?

2. Does the public want residential sprinklers? Opponents of residential sprinklers suggest that the general public opposes residential sprinklers, but a recent national poll conducted by Harris Interactive indicates that this claim misrepresents public opinion. The survey of more than 1,000 adults revealed that:

• 45% of homeowners said that a sprinklered home is more desirable than an unsprinklered home;

• 69% of homeowners said that having a fire sprinkler system increases the value of a home; and

• 38% of homeowners said that they would be more likely to purchase a home with fire sprinklers than without. (The reason that this number isn't higher appears largely tied to an unfounded fear of water damage, with 48% of homeowners citing water damage as the reason they would not want a sprinkler system.)

The results of this survey support the assertion that the general public has become aware of and has warmed up to the concept of residential sprinklers. With the International Building Code now requiring all new multi-family dwellings to be sprinklered, it seems fair to say public support for residential sprinklers will continue to grow as future home buyers move from sprinklered apartments into new homes.

3. Correlation between a home's age and fire risk…aren't new homes safe? Opponents of residential sprinklers assert that residential fire deaths are a function of a home's age and that new homes are safe without sprinklers. Many people buy these arguments because, on the surface, they seem to make sense. However, further analysis paints a different picture. Most residential fire deaths result from fires caused directly or indirectly by people and are not related to the age of the home.

■ Residential fires tend to burn much faster and hotter today than they did in past decades due to increased flammability of contents. (Photo courtesy of Orange County, CA, Fire Authority.)

Fire-safety experts know that socioeconomic status, occupant density and the age and mobility of occupants are far more likely to be contributory in fire deaths than the age of a structure. In addition, the speed by which a fire spreads in a home is generally a function of contents and room geometry, not age.

4. Aren't smoke alarms enough? Opponents of residential sprinklers suggest that smoke alarms are good enough to protect the public and that residential sprinklers aren't justified. Everyone can agree that smoke alarms save lives and that they are largely responsible for the dramatic reduction in fire death rates that has occurred in the U.S. over the past 30 years. Nevertheless, smoke alarms are only alerting devices. On their own, they do nothing to stop the spread of fire, protect property or protect firefighters.

Two issues related to sole reliance on smoke alarms are of concern. First, as smoke alarms age, their reliability declines. This concern prompted smoke alarm manufacturers to begin stamping an expiration date on each unit indicating a 10-year replacement cycle. The questions before us are: How many alarms will actually be replaced at 10-year intervals, and what will happen to the reliability of alarms that are not replaced?

Although an estimated 96% of U.S. homes with telephones now have at least one smoke alarm, in roughly 25% of reported fires in smoke alarm-equipped homes, the devices didn't work. In contrast, residential sprinkler systems can have a life expectancy of 50 years, and they require essentially no maintenance, particularly for multipurpose systems. With these systems, if the domestic water is turned on, sprinklers are on as well. With the combination of sprinklers and smoke alarms, homeowners get the best of both technologies.

There also is an issue related to the waking effectiveness of smoke alarms. In a study that was just completed in 2006, only 58% of a test group of children ages 6-12 awakened when a standard smoke alarm sounded, and only 38% of the test group evacuated successfully. Another recent study revealed that a surprising 24% of fire deaths in one- and two-family dwellings occur in homes with a working smoke detector.

Furthermore, fire death rates indicate that the young and the elderly, those who are least likely to be capable of self-preservation even if they are awakened by a

Dedication of the 25th Habitat for Humanity Home equipped with fire sprinklers in Austin, TX. Systems installed in these homes have utilized combined domestic and fire sprinkler piping, and they can be installed at prices starting as low as $0.50 per square foot. (Photo courtesy of Jeff Shapiro.)

smoke detector, are roughly twice as likely to die in a fire as compared to individuals in the remaining age group. To protect individuals in these high-risk age groups, we need residential sprinklers.

5. What about homes without a public water supply? Design options are available that make wells a viable water supply for both sprinklers and domestic service. Wells essentially fall into two categories, deep and shallow. With a shallow well, the well will likely be designed to provide a direct feed to the home, with no intervening tank. With these types of systems, pumps can be selected at reasonable costs that are capable of supplying both the domestic and sprinkler demands. Constant-pressure, variable-speed pumps are an excellent choice for this type of application.

One question that is frequently raised with respect to direct-feed well systems involves the "refresh" rate, or the rate at which water can keep up with the required flow. Most wells aren't capable of keeping up with the demand associated with a sprinkler system, which will typically be 20 gallons per minute or more. Many people automatically assume that a tank and a secondary pump are necessary in these cases, greatly increasing the cost of the sprinkler system, but a lesser known yet simple approach called "developing the well" is a much better solution.

Developing a well essentially involves creating an underground cistern that replaces the need for a tank. The approach involves digging the well substantially below the water table and allowing the hole to fill with water, retaining the needed capacity underground. By using an appropriate pump, an interior tank and pump arrangement can be avoided.

For deeper wells, there are two options. First, there are constant-pressure, variable-speed pumps suited for these applications. For installations utilizing this approach, a "developed well" as described above can also be used to accommodate needed water retention for sprinkler demand. The second alternative involves a tank and pump, which can be installed between the well pump and the plumbing system. This approach is the common arrangement utilized for deep wells supplying domestic service. To supply sprinklers simply requires that the size of the domestic supply tank be increased to something in the range of 200-300 gallons, and the secondary pump needs to have an increased flow rating. Both of these enhancements can be made at modest cost.

6. System freeze-ups in cold climates. Opponents of residential sprinklers assert that system freeze-ups will cause problems in cold climates. However, a sprinkler system poses no greater risk of freezing than domestic plumbing if the system is properly designed and installed. Freeze-ups result from design or installation errors that can occur with any plumbing system, and it is incorrect to suggest that sprinkler systems in cold climates are predisposed to freezing.

Many jurisdictions with severely freezing climates in mountainous and northern states from New York to Alaska have adopted residential sprinkler ordinances, and these would surely have been repealed if freezing problems were widespread. Dismissing the occasional anecdotal story about freeze-ups caused by faulty installations, common sense dictates that widespread freezing problems with sprinklers would generate an enormous political backlash in jurisdictions where sprinklers have been mandated. This simply hasn't happened.

In addition to antifreeze, there are many options that are available to combat the risks of frozen sprinkler piping. These include, among others:

• Using sidewall sprinklers supplied by pipes running in walls, soffits, closets and crawl spaces to keep sprinkler piping out of unheated areas;

• Properly installing piping beneath insulation in attics to protect the piping from unheated attic spaces (used in climates that are not subject to extremely cold temperatures);

• Installing dry-pipe systems in unheated attics (a new technology that is just entering the marketplace).

The bottom line is that residential sprinkler systems have been successfully installed in homes located in freezing climates for many years.

7. Required maintenance. Opponents of residential sprinklers state that residential sprinkler systems need regular maintenance and question who would perform this service.

The fact is that residential sprinkler systems are essentially maintenance-free. Multipurpose systems have no maintenance requirements at all, and stand-alone systems only require an occasional test of the water flow alarm, if provided (not required by NFPA 13D), and the backflow preventer, if provided (again, not required by NFPA 13D or the IRC when the sprinkler pipe is copper, CPVC or PEX).

8. Leakage and mold damage. Opponents of residential sprinklers say that sprinklers will leak and cause mold damage, which could make a home uninsurable. In response, it should be pointed out that residential sprinklers systems are no different than residential plumbing. If quality products are used and the system is properly installed, it won't leak. If substandard products are used or workmanship is faulty, leaks can occur.

Sprinklers, sprinkler piping and fittings are held to a far higher level of quality than are domestic water components, and sprinklers must be rigorously tested. Listing tests for sprinklers include, among others, 700 psi hydrostatic strength, 500 psi leakage resistance, 100,000 cycles water hammer resistance, 35°F -125°F temperature cycling and freeze performance to -20°F for 24 hours. Also, sprinkler piping and components are rated for a pressure of 175 psi, while plumbing water supply systems are rated for only 80 psi.

In conclusion, unlike many requirements in codes today, a residential sprinkler requirement would strike directly at the heart of America's fire problem. Opponents of residential sprinklers are the same groups that initially fought against smoke detectors, ground fault interrupters and mandatory sprinklers in multi-family residential occupancies.

In each of these cases, code officials heard dire predictions of gloom and doom, but once the codes moved forward to require these features, home building proceeded without so much as a detectible bump. As years passed, prices for all of these features declined, and technology advanced to create better and less expensive products. The same will happen with residential sprinklers once they become a standard feature in new home construction.

We're only one sentence away from that point, and ICC members will have their say on the matter in May 2007. For more information, go to www.IRCFireSprinkler.org. PME

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A Reply From NAHB About Residential Sprinklers and the International Residential Code

The IRC Building and Energy Committee's action to disapprove all proposals to mandate sprinklers in the body of the IRC is absolutely correct and should not be overturned. Each of the concerns raised by the committee as the basis for their disapproval is completely valid and none have been adequately addressed. The Committee's disapproval also appropriately reflects the fact that the need, practicality and impact of mandating sprinklers in one- and two-family structures is still a subject of much legitimate debate and new home buyers should not be forced to pay for expensive sprinkler systems that they do not need.

For these reasons, the decision of whether or not to impose these requirements on new home buyers should be left up to state and local jurisdictions via an action separate from the adoption of the IRC. Jurisdictions adopting the IRC should not be forced to amend sprinkler requirements out of the code. Furthermore, state and local statutes in many jurisdictions that adopt the IRC prohibit amendments that are deemed to result in a less restrictive code, and therefore, prevent the amending out of sprinkler requirements.

Finally, inclusion of Appendix P was overwhelmingly deemed as the most appropriate action to take by a large group of sprinkler proponents who testified so at the previous Final Action Hearings, stating that the appendix provides for jurisdictions that wish to require sprinklers as well as those that do not.

—National Association of Home Builders

Continued from "A Paradigm Shift"

The Cost of Sprinkler Installation–It's All Relative

On page 129 of *America Burning* (written in 1973 by the National Commission on Fire Prevention and Control), it states: "Reliable estimates place the cost of automatic sprinkler systems between $0.65 and $1.25 per square foot, depending on the difficulty of installation." It is quite interesting that this cost estimate for installation of fire sprinkler systems from the early 1970s is quite similar to the cost estimates commonly cited for sprinkler installations today, even though inflation has dramatically reduced the dollar's value over the past 30-plus years.

Consider that back in 1973, a gallon of gas was only $0.38. But in 2006, the same gallon of gasoline costs $2.50 or more. Thus, while we now pay about seven times more for a gallon of gas, the average installation cost of fire sprinkler systems has risen only modestly. According to the Home Fire Sprinkler Coalition (HFSC), today's average home fire sprinkler system adds only 1-1.5% to the total cost of building a new home. In jurisdictions that have long mandated residential fire sprinkler systems, such as Scottsdale, AZ, installation costs have fallen to less than a dollar per square foot, while the national average tends to be in the $1.00 to $1.50 per square-foot range.

systematic, long-range approach capable of reducing tomorrow's fire fatalities, while also reducing our total national fire cost. Today's new homes are tomorrow's older homes, where we will be compiling our future fire loss statistics. Closing our eyes on this reality will only prolong unnecessary destruction.

Why then do our building codes allow the construction of new homes without the protection of the residential fire sprinkler systems? This simply makes no sense.

With all our heart and soul, those of us in the business of public safety…engineers, architects, code officials, firefighters, home builders and others, must sincerely believe in the importance of reducing fire losses in our communities. This is both a professional and patriotic duty. By taking advantage of all available technologies, including smoke alarms and residential fire sprinkler systems, we can accomplish our mission. Accordingly, it is time for a shift in national policy to mandate residential sprinklers in all new dwellings. PME

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