NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Water Purveyor's Guide to Fire Sprinklers in Single Family Dwellings

Fire sprinklers have long been used in commercial buildings and large residential occupancies to provide economical life safety and property protection in those buildings. Starting in 1976, the National Fire Protection Association (NFPA) has made available a special, low cost, design and installation standard (NFPA 13D) to bring this important technology into one and two-family dwellings and manufactured homes. Every year, approximately 300,000 fires occur in homes in the United States resulting in thousands of deaths. These deaths can be prevented by the installation of a fire sprinkler system in each home.

In addition to their life safety abilities, fire sprinklers also offer the water purveyor a cost effective method of managing their water usage. During a fire in a home that does not have a fire sprinkler system, the fire department will use thousands of gallons of water to fight that fire. In a home with a fire sprinkler system, a few hundred gallons are all that the sprinkler system and the fire department will need. This efficient use of water translates into significant savings for the water purveyor.

This guide will provide a water purveyor with information on the topics that need to be addressed in preparing a jurisdiction for fire sprinklers in single-family dwellings. Although there is general information provided on all sprinkler systems this guide will concentrate on fire sprinkler system for one- and two-family dwellings, manufactured homes and townhouses. In order to save space, this guide will refer to "single family dwellings" or "homes" to make a distinction between this kind of building and a larger multi-family building like an apartment building or multi-unit condominium. In all cases, the rules that apply to single family dwellings or homes also apply to two-family dwellings, manufactured homes and townhouses that are built with sufficient separation to be considered individual homes or two-family buildings.

Model Codes

The following model codes contain requirements for fire sprinkler systems in new homes.

- The *International Building Code*, 2003 and 2006 editions, require sprinkler protection for all residential occupancies. This code is typically used for larger residential occupancies such as hotels, apartments, dormitories or condominiums, but it could also be used for single family dwellings units as well (R-3 occupancies), which would be required to be sprinklered due to this provision.

- The *International Fire Code*, 2003 and 2006 editions, also requires sprinkler protection for all residential occupancies.

- The *International Residential Code*, 2006 edition, has a residential sprinkler requirement in the appendix which allows a state or community to adopt language requiring sprinkler protection for single family dwelling units.

- NFPA 101, *Life Safety Code*, 2006 edition, now requires sprinkler protection for all new single family dwelling units.

- NFPA 5000, *Building Construction and Safety Code,* 2006 edition, now requires sprinkler protection for all new single family dwelling units.

- NFPA 1, *Uniform Fire Code,* 2006 edition, references NFPA 101 for the residential sprinkler requirement.

Sprinkler Standards

The following standards address the installation requirement for sprinklers in residential occupancies.

- NFPA 13, *Standard for the Installation of Sprinkler Systems,* can be used for sprinkler systems in any residential occupancy. It is typically used in large apartment and hotel buildings.
    - NFPA 13 uses a density/area method of determining the total flow and pressure for the sprinkler system. For example, in many residential occupancies a minimum water density of 0.1 gpm/sq ft is required over an area of 1500 sq ft. Other options exist including the use of residential sprinklers with a 4-sprinkler design.
    - Residential occupancies are typically considered Light Hazard.
    - The maximum system pressure is usually 175 psi, although some equipment is rated for higher pressure.
    - The minimum operating pressure for a sprinkler is 7 psi, or the pressure needed to obtain the minimum flow, or the pressure corresponding to the sprinkler manufacturer's listing, whichever is greater.

- NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height,* can be used in residential occupancies up to 4 stories in height. NFPA 13R has a high level of life safety with a lesser level of property protection than NFPA 13.
    - NFPA 13R uses up to 4 flowing sprinklers to determine the flow and pressure demand of the system. For example 4 sprinklers flowing 13 gpm each would produce a total system demand of approximately 52 gpm.
    - The minimum flow for each sprinkler is determined by the manufacturer's listing, which is dependent on the area that the sprinkler is listed to cover. At no time is the flow allowed to be less than 0.05 gpm per sq ft of coverage area.

    - The domestic water demand must be added to this flow if the system is part of a combined domestic/fire protection system. Tables are provided to estimate the domestic water demand.
    - The maximum system pressure is 175 psi, although some equipment is rated for higher pressure.
    - The minimum operating pressure for a sprinkler is 7 psi, or the pressure needed to obtain the minimum flow, or the pressure corresponding to the sprinkler manufacturer's listing, whichever is greater.

- NFPA 13D, *Standard for the installation in Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, is a reasonable life safety standard for providing fire sprinkler protection in homes.
    - Wet pipe systems only
    - NFPA 13D uses up to 2 sprinklers flowing to determine the pressure and flow of the sprinkler system. For example 2 sprinklers flowing 13 gpm each would produce a total system demand of approximately 26 gpm.
    - Figure A.6.2 (a) illustrates the preferred arrangement for piping arrangement and meter location. In this case the meter would only be used on the domestic water line and therefore should not be subject to the scope of our residential fire meter project.
    - Figure A.6.2. (b) Illustrates an acceptable arrangement with 2 water lines, one for the domestic and one for the sprinkler system. Only the domestic water line is metered.
    - Figure A.6.2 (c) illustrates an acceptable arrangement with a meter on the combined domestic/fire protection water line. This should be the only illustration that would require a meter that would restrict the water to the sprinkler system.
    - The minimum flow for each sprinkler is determined by the manufacturer's listing, which is dependent on the area that the sprinkler is listed to cover. At no time is the flow allowed to be less than 0.05 gpm per sq ft of coverage area.
    - If the house is a duplex and the water supply combines the domestic/fire protection then 5 gpm must be added to the total demand.
    - The maximum system pressure is 175; unless nonmetallic pipe is used in multipurpose domestic/fire protection systems then the working pressure can be 130 psi. (See 5.2.1.2 and 5.2.1.3)
    - The minimum operating pressure for a sprinkler is 7 psi, or the pressure needed to obtain the minimum flow, or the pressure corresponding to the sprinkler manufacturer's listing, whichever is greater.
    - Plans and calculations are not required by the standard, although many local jurisdictions do require them.
    - The sprinkler contractor is required to provide the home owner with inspection, testing and maintenance information

AWWA policies and research

The following residential fire sprinkler policy statement was adopted by the AWWA Board of Directors on February 4, 1996, and was reaffirmed on June 13, 2004.

> "The American Water Works Association (AWWA) recognizes the increasing use of residential fire sprinkler systems and encourages that they be designed by licensed or accredited professionals and installed by licensed fire sprinkler contractors or properly trained personnel. The design of a system requires communication with the utility so that available water pressures and flow to the residential fire system can be determined and the design can meet the utility's requirements."

AWWA Research Foundation has published the following report: *Impact of Fire Flow on Distribution System Water Quality, Design, and Operation.* This report concludes the following:

> "Water-efficient fire suppression technologies exist that use less water than conventional standards. In particular, the universal application of automatic sprinkler systems provides the most proven method for reducing loss of life and property due to fire, while at the same time providing faster response to the fire and requiring significantly less water than conventional fire-fighting techniques. It is recommended that the universal application of automatic fire sprinklers be adopted by local jurisdictions."

Residential Fire Meters

As a general rule a fire protection water line should not have any devices in line that could restrict the flow of water (for example a meter). If this were true in all cases we would not need to develop standards for fire meters. But recognizing that combined domestic/fire protection water lines may need metering then this should be the only time such meters should be used. The scope of these efforts should not be to mandate fire service meters on dedicated fire protection lines. Meters on fire lines should have a minimal friction loss. These meters should be able to fail safely in the full flow position and an increase in sediment in the water should not affect the meter. The meter should be able to continue to flow under various failed conditions. These meters do not necessarily need to be listed for fire service, as this will increase the cost. This concept is recognized by both NFPA 13D and NFPA 13R, which allows the sprinkler system to be connected to a reliable waterworks system.

There are residential fire meters being manufactured although there is no universal standard guiding their construction. Underwriters Laboratories is in the process of releasing a document on residential fire meters (SUBJECT 327A, OUTLINE OF INVESTIGATION FOR INFERENTIAL TYPE RESIDENTIAL FLOW METERS).

The manufactures of small meters have used construction criteria for residential fire meters which is similar to that for existing fire meters over 3 inches in diameter. Some of the concerns for the use of these meters included; using dirty water under high flow conditions, endurance versus accuracy, 3rd party certification, and any increase in cost.

Although friction loss tables can be used to estimate pressure loss in average meters, actual friction loss from the manufacturer should be used because true values vary between manufacturers and sizes. The following table is taken from NFPA 13D and shows the average friction loss in psi through some common meter sizes. Note that at a flow of 26 gpm, common for many NFPA 13D systems, the friction loss in a 5/8 inch meter is prohibitive and in a ¾ inch meter may be too high to be acceptable. Also note that in some circumstances, the two sprinkler design requirements of NFPA 13D might make flows in excess of 31 gpm mandatory, leaving little choice except a 1 inch meter.

Pressure Loss (psi)

Meter Sizes (inch)	Flow (gpm) 18	23	26	31	39	52
5/8	9	14	18	26	†	†
3/4	4	8	9	13	†	†
1	2	3	3	4	6	10
1½	††	1	2	2	4	7
2	††	††	††	1	2	3

NOTE: For SI units, 1 gpm = 3.785 L/min; 1 in. = 25.4 mm; 1 psi = 0.0689 bar.
† Above maximum rated flow of commonly available meters.
†† Less than 1 psi (0.689 bar).

AWWA Reference Material on Meters:

M6, *Water Meters - Selection, Installation, Testing, and Maintenance*
M22, *Sizing Water Service Lines and Meters*
C703, *Fire Service Meters*, covers fire meters 3 inches and larger.

See the discussion on arrangements of systems later in this guide for a more detailed discussion of meter sizes and arrangements.

Recommended Backflow Protection

The water purveyor needs to provide safe and reliable drinking water to all customers, and therefore needs to address all types of cross-connections. In most cases the water purveyor also needs to provide water for fire fighting operations throughout the community while at the same time continuing to address future development of the community and expansion of the total system demand.

Backflow preventers should not be necessary on small residential systems with the same components as domestic systems or on small residential systems integrated with domestic systems. Research sponsored by the United States Fire Administration and conducted by Worcester Polytechnic Institute showed that water that sits for long periods of time in fire sprinkler systems is not hazardous as long as the pipe is an approved potable piping material. The following is a summary of documents that require a backflow protection device or provide guidance for their installation.

NFPA 1, *Uniform Fire Code*, requires the installation of backflow devices to protect the public water supply from contamination and they must comply with NFPA 13 or NFPA 24, *Private Fire Mains*, and the plumbing code. Backflow prevention devices must be inspected, tested, and maintained in accordance with NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.*

The *Uniform Plumbing Code* recommends the following protection for fire systems as appropriate (see Section 603.4.18); Double Check Valve Assembly, Double Check Detector Assembly, Reduced Pressure Backflow Preventer or Reduced Pressure Detector Assembly. A Reduced Pressure Backflow Preventer or Detector Assembly is only required when a system is within 1700 feet of a non potable water source and a fire department connection is provided or if there is an additive is in the system.

The *International Plumbing Code* (§P608.16.4) requires that the potable water supply connected to an automatic fire sprinkler or standpipe system be protected against backflow by using a double check-valve assembly or a reduced pressure principle backflow preventer as appropriate. Additives or a nonpotable water source (§P608.16.4.1) require a reduced pressure principle backflow preventer. Examples could include chemical additives, antifreeze, or connections to a nonpotable secondary water supply assuming there is a fire department connection. Backflow protection is not required when a fire protection system is part of the water distribution system and there is no fire department connection nor is backflow required on deluge, preaction or dry pipe systems.

AWWA Manual M-14, *Recommended Practice for Backflow Prevention and Cross-Connection Control,* 3rd Edition provides the following information on backflow prevention and fire protection systems. The recommended backflow protection is based on the degree of hazard presented by the system, either low hazard or high hazard. A low hazard (non-health hazard) is a potential cross-connection involving any substance that generally would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced in the potable water supply. A high hazard (health hazard) is a potential cross-connection involving any substance that could, if introduced into the potable water supply, cause death or illness, spread disease, or has a high probability of causing such effects.

The following AWWA M14 requirements are generally for new systems. Existing systems usually do not require additional backflow protection if they already have some form of acceptable directional flow-control protection in place (ex: single check valve or alarm check valve) until the system is substantially altered. Requiring additional backflow prevention on existing systems can have a detrimental effect on the hydraulic capability of the system as well as the cost.

AWWA M-14 recommends two approaches for backflow protection on commercial fire sprinkler systems. The 1st approach recommends a double check valve assembly (DCV) on all systems, unless there is a risk of a high hazard cross-connection, in which case a reduced-pressure zone principal backflow prevention assembly (RPZ) is recommended. The 2nd approach is to assess each type of system individually. For this approach, M-14 provides guidance on the following types of fire-suppression systems:

Wet-Pipe Fire Sprinkler Systems usually have stagnated water that may not be acceptable to drinking water standards. For new systems a DCV is recommended on closed (nonflow-through) systems, unless there is a risk of a high hazard, in which case a PRZ or air gap is suggested. For existing systems with a low hazard of cross-connection an existing modern UL listed alarm check valve (containing no lead) can continue to be used to control the direction of flow. Existing systems that have an alarm check valve that contains lead should consider protection using a DCV. If the existing system is significantly modified then the backflow protection should also be reexamined. A fire department connection may also present a potential source of contamination based on the fire departments water supply and if additives are used.

Dry-Pipe Nonpressurized Fire-Suppression Systems (Deluge) are open to the atmosphere and generally do not require backflow protection unless chemicals will be added when water flows, in which case a RPZ is suggested.

Dry-Pipe Pressurized and Preaction Fire-Suppression Systems typically are pressurized with air or nitrogen. Preaction systems may or may not be pressurized. A DCV is recommended unless there is a risk of a high hazard (e.g. chemicals) in which case a RPZ or air gap is recommended.

Residential, Single-Family Fire Sprinkler Systems do not require backflow assemblies on systems that are constructed of approved potable material and are designed to flow water so it does not become stagnate. A DCV is suggested on other systems unless there is a risk of a high hazard cross connection in which case a RPZ or air gap is recommended

Other fire-suppression systems designs can vary and the level of backflow protection should be based on the type of cross-connection and the degree of hazard. The local plumbing code could regulate systems connected to private plumbing systems.

Antifreeze is permitted by NFPA 13, NFPA 13R and NFPA 13D for use in fire sprinkler systems. Only "Food Grade" (pure 95% grade Glycerin or Propylene Glycol) antifreeze is currently allowed to be used in fire sprinkler systems that are connected to any potable water source. When CPVC pipe is used in a fire sprinkler system, the only antifreeze that is allowed to be used is glycerin.

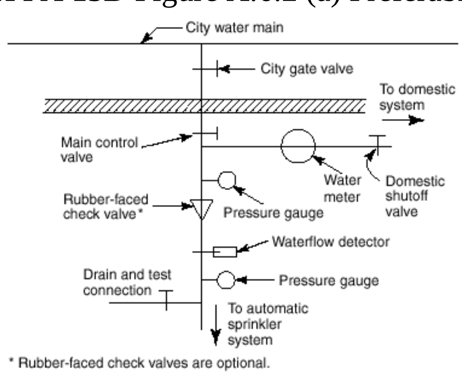
Backflow preventer approvals include the following organizations:

- The Foundation for Cross-Connection Control & Hydraulic Research at the University of Southern California
- Underwriters Laboratories - listed (classified) for friction loss and body strength
- Factory Mutual - Friction loss and body strength

NFPA13D Installation Arrangements

NFPA 13D expresses a preference for arranging the connection to a public water supply in Figure A.6.2 (shown below). The connection includes a single supply from the water main into the house. Once inside the house, the water delivery is split so that the domestic system is isolated from the fire sprinkler system. The water meter is only installed on the domestic portion, and therefore does not need to be included in the hydraulic calculations for the fire sprinkler system, and does not need to have any special requirements as far as the sprinkler system is concerned.

NFPA 13D Figure A.6.2 (a) Preferable Arrangement



The advantage to the configuration shown in Figure A.6.2(a) is that the only shut-off valve for the fire protected system also shuts off water to the domestic system. This encourages people to keep their sprinkler systems operational.

There has been significant discussion about the use of water meters on sprinklered lines. Some water purveyors want the fire sprinkler portion of the system to have a water meter, however, this practice should be discouraged on systems with waterflow alarms. Fire sprinkler systems are closed systems that do not have outlets where the homeowner can readily take water. A fire sprinkler system with a waterflow alarm will warn purveyors if an occupant of a home inappropriately attempts to take water. Given all of the problems that water meters bring to fire protection (excess friction loss, flow restriction, increased cost) it would be better to do without them. In the long run, the fire sprinkler systems will save water purveyors money by reducing the amount of water used in fighting fires in homes. The elimination of the meter on the fire sprinkler portion of the system is a small price to pay for the life safety and water savings that the sprinkler's provide.

Figure A.6.2(b) of NFPA 13D shows another acceptable arrangement. This arrangement uses two separate supply lines from the water main into the building, one for the domestic usage and one for the fire sprinkler system. The domestic line contains a water meter while the fire sprinkler line does not. See the discussion above for justification on not putting a meter on the fire sprinkler line. This arrangement is not preferred because of the additional cost of the second supply line into the house. The homeowner should not have to pay for two separate lines.

NFPA 13D Figure A.6.2 (b) Acceptable Arrangement with Valve Supervision – Option 1

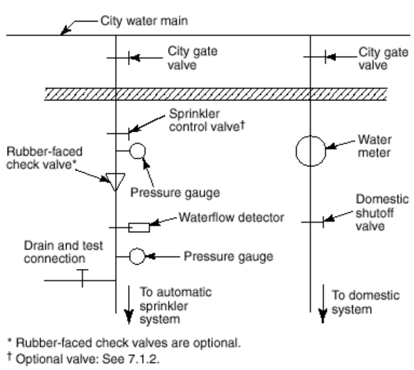
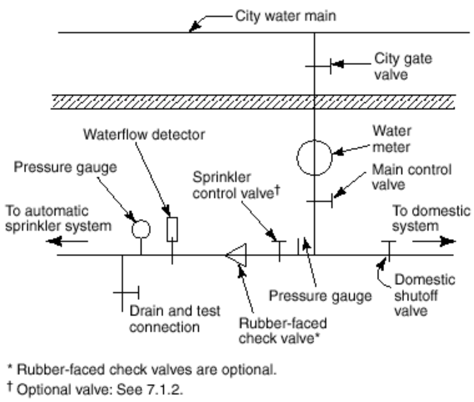
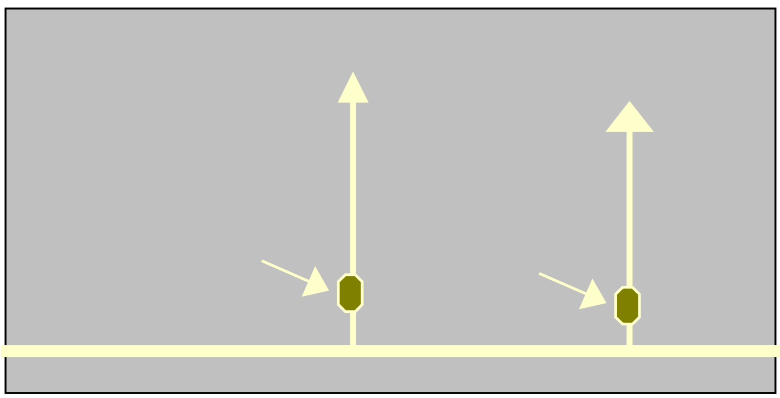


Figure A.6.2(c) of NFPA 13D shows another acceptable arrangement. This is actually similar to the preferred arrangement shown in Figure A.6.2(a), but includes a water meter on the main supply for both the fire sprinkler and the domestic water systems. While this is acceptable, the cost of the larger meter is considerable and the meter will need to be of a type that will not cause problems for the fire sprinkler system. The friction loss of the meter will need to be included in the hydraulic calculations of the fire sprinkler system.

NFPA13D Figure A.6.2(c) Acceptable Arrangement with Valve Supervision – Option 2



The following figure, showing a separate domestic service and fire protection service, each with its own meter is not referenced in NFPA 13D and is not considered acceptable for fire protection.



Hydraulic Requirements

NFPA 13D: (1-2 sprinkler design area)

- The design must include the flow and pressure for the most demanding pair of sprinklers in the same room. If all of the rooms in the home can be protected by a single sprinkler, then the design is just for a single sprinkler.
- Sprinklers are listed with a minimum flow discharge to cover a specific area. The flow is not permitted to be less then 0.05 gpm/sq ft. The flow is up to the manufacturer to declare and is different for each models of sprinkler. The manufacturer must prove that the flow from the sprinkler will control a severe fire in tests performed by independent laboratories. Examples of listed residential sprinklers are the Reliable model R3516 recessed pendent sprinkler listed to cover a 12 ft by 12 ft area at a minimum flow of 13 gpm at 7 psi and a Tyco model TY2596 concealed pendent sprinkler is listed to cover a 20 ft x 20 ft area at a minimum flow of 24 gpm and a minimum pressure of 32.7 psi.

NFPA 13R: (1-4 sprinkler design area)

- The design covers all of the sprinklers in the most demanding room up to a maximum of four sprinklers. If all of the rooms are protected with less than four sprinklers, the design will be for all of the sprinklers in the most demanding single room.
- Sprinklers are listed with a minimum flow discharge to cover a specific area. The flow is not permitted to be less then 0.05 gpm/sq ft. The flow is up to the manufacturer to declare and is different for each models of sprinkler. The manufacturer must prove that the flow from the sprinkler will control a severe fire in tests performed by independent laboratories. Examples of listed residential sprinklers are the Reliable model R3516 recessed pendent sprinkler listed to cover a 12 ft by 12 ft area at a minimum flow of 13 gpm at 7 psi and a Tyco model TY2596 concealed pendent sprinkler is listed to cover a 20 ft x 20 ft area at a minimum flow of 24 gpm and a minimum pressure of 32.7 psi.

NFPA 13: (4 sprinkler design area)

- When using residential sprinklers, the design area includes the four hydraulically most demanding sprinklers regardless of how many sprinklers are in the most demanding room. If the most demanding room does not have four sprinklers, additional sprinklers are added from adjacent rooms.
- The minimum required discharge from each sprinkler must be per the listing requirements of the sprinkler (see examples above) which are not permitted to be below 0.1 gpm/sq ft over the design area.

Rural water supply options

The majority of fire sprinkler systems use a public water main as the source of water supply. In rural and suburban areas without public mains, fire sprinklers are the most affordable and economic form of fire protection. In rural communities, where fire departments are farther away, and response times are often affected by the number of volunteers that can be assembled, a fire can destroy most of a building before the fire department ever arrives. Once the fire department arrives, water must be obtained from somewhere to fight the fire. Whenever a building is constructed, consideration needs to be given to how much water will be needed to fight a fire in that building. The water must be either available at the sight, or the fire department must be capable of delivering the water in a timely fashion. Calculating how much water will be needed is a function of the building's construction, size, use, contents and the fire protection systems installed.

In sprinklered buildings, the Required Fire Flow is generally the demand for the fire sprinkler system, which is much less than the demand of an unsprinklered building. This can save a community hundreds of thousands of dollars in construction costs and fire department operating budgets.

Rural water supply options include the following for supplying water to a fire sprinkler system when a public main is not available:

- Elevated tank
- Storage tank with a pump
- Pressure tank
- Underground well

Each of the options has advantages in certain situations. For all of these options, the two critical things to consider are:

1) Is the capacity of the water supply large enough to provide the demand of the sprinkler system over the required duration?
2) Is the method of obtaining water pressure adequate to provide the minimum necessary pressure at the highest, most remote sprinkler in the system?

There are a number of formulas and methods for determining the needed fire flow for a subdivision of homes. The Uniform Fire Code and NFPA 1142 each contain tables that provide the needed fire flow calculated by considering the most demanding building in a subdivision. Each of these fire flow calculation methods contains significant reductions for fully sprinklered buildings and communities, which will help save the water purveyor in the development and maintenance costs of their own mains and distribution systems.

Water Department Fees

Many water purveyors require people that make connections to their water mains to pay "standby fees" in order to maintain their connections, even if they use little or no water. The justification for these fees is that the water purveyor makes the water available, and incurs some cost in doing so, making it logical that the person with the connection pay for the fact that the water was available for use. While this practice makes sense with many types of voluntary connections, it does not make sense with fire sprinkler systems.

Consider two identical homes right next door to each other; one with a fire sprinkler system, the other without. If a fire occurs in the home with a fire sprinkler system, the amount of water used to fight that fire will be tremendously less than the amount of water used to fight the fire that would occur in the unsprinklered home. Yet, if standby fees were being charged for the sprinklered home, the person spending their own money to save the water department money would be expected to pay an extra standby fee, while the person wasting the water purveyor's money (without the fire sprinkler system) is encouraged to continue the waste by not having to pay a standby fee.

Rather than charge standby fees, water purveyors are encouraged to build a fee structure based on the Required Fire Flow necessary to fight a fire in the building. A fee structure based on the fire flow would get everyone who relies on water for fire protection to pay for it, rather than allow people without sprinkler systems to skate by without paying their fair share. At the same time, such a fee structure would recognize the fact that less water is used in sprinklered buildings by charging people with sprinklered buildings less. This would be a fair way to share the cost of fire protection in a community without penalizing building owners who install fire sprinkler systems. This fee structure could actually increase the revenue for the water purveyor.

Scottsdale, Arizona, has been a sprinklered community for more than 15 years and has more than 50 percent of the homes protected with fire sprinkler systems. According to the Scottsdale Report, there was less water used in fires in the homes with sprinklers. Sprinkler systems discharged an average of 341 gallons of water/fire as compared to 2,935 gallons of water/fire released by firefighter hoses. Many water departments and communities have recognized this savings by developing incentives for the installation of fire sprinkler systems. The following are some examples of incentives:

- California AB 2943 – Water Charges: Residential Fire Sprinkler Systems. Under existing law, local water suppliers impose charges for water service in accordance with various requirements. This bill would prohibit a local water supplier that supplies water to retail customers from imposing or increasing water charges solely due to the installation of a residential fire sprinkler system. The bill was referred to the State Assembly Committee on Local Government on March 30, 2006.

- The City of Altamonte Springs, FL allows a 40% credit against the water connection charge for residential occupancies which have a sprinkler system installed.

- The Kentucky Public Service Commission ordered all utilities that currently access a minimum monthly bill for fire protection services to file a new rate structure and to eliminate standby fees.

- The City of Erie, PA has made a decision to provide a rate relief which would provide a 67% decrease for sprinkler standby fees and a 35% for sprinkler connections of 2 inches or less.

- M31, *Distribution System Requirements for Fire Protection,* mentions that water utilities can levy a one-time capital recovery fees or annual standby charges for fire protection systems. These charges should be based on the actual cost to provide the service.

- M1, *Principals of Water Rates, Fees, and Charges,* recognizes that sprinklers can reduce fire demands by faster, more efficient extinguishing of fires. In additi0n, private sprinkler connections use significantly less water than hydrants for fire fighting; as a result, they may reduce actual fire demands, because water is typically supplied only in the area if the fire. Accordingly, it is argued, there should be no additional charges for private fire service.

Maintenance

NFPA 13D, section A.4.2.1 provides information on residential sprinkler maintenance. It is the responsibility of the building owner for properly maintaining a sprinkler system. They should understand how the sprinkler system operates. A minimum monthly maintenance program should include the following:

(1) Visual inspection of all sprinklers to ensure against obstruction of spray.
(2) Inspection of all valves to ensure that they are open.
(3) Testing of all waterflow devices.
(4) Testing of the alarm system, where installed. (Note that where it appears likely that the test will result in a fire department response, notification to the fire department should be made prior to the test.)
(5) Operation of pumps, where employed. (See NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*.)
(6) Checking of the pressure of air used with dry systems.
(7) Checking of water level in tanks.
(8) Special attention to ensure that sprinklers are not painted either at the time of installation or during subsequent redecoration. When sprinkler piping or areas next to sprinklers are being painted, the sprinklers should be protected by covering them with a bag, which should be removed immediately after painting is finished.

The most important thing that a homeowner needs to remember is what NOT to do to a sprinkler system. Do not hang objects from the sprinklers or the pipe. Do not paint, coat or obstruct the sprinklers. And do not turn off the control valve. These simple rules will ensure that the sprinkler system is functional for years to come.