

# UNDERSTANDING WATER SUPPLY FOR HOME FIRE SPRINKLER SYSTEMS



**Saving Lives, Saving Water**



**Home Fire Sprinkler**

**COALITION**

Protect What You Value Most

[HomeFireSprinkler.org](http://HomeFireSprinkler.org)

## COMMUNITY WATER SUPPLY

You turn on the tap and the water comes out. Pretty simple. On the surface, water supply seems like an uncomplicated subject. But fire and other local officials in communities across the country are discovering there are widespread myths and misinformation about how water is actually used for new houses protected by fire sprinkler systems.

Unfortunately, when there is uncertainty about home fire sprinkler water supply or usage, homeowners may end up with unnecessary add-ons that increase costs and discourage installations.

Every time a home is built without a fire sprinkler system, generations of families miss out on the ultimate protection from fire. This brochure was produced by the nonprofit Home Fire Sprinkler Coalition (HFSC) as a public service to clear confusion about water supply and help communities build safer homes. To learn more and to hear water purveyors and members of the fire service talk about this important topic, please visit our website at [HomeFireSprinkler.org](http://HomeFireSprinkler.org).

## HOME FIRE SPRINKLER SYSTEMS

Fire sprinkler technology has been saving lives and protecting property for more than 100 years. Home fire sprinkler systems are different from commercial and industrial sprinkler systems, but their technology is similar – all types of sprinklers respond quickly to a fire and control or extinguish it while it is still small. Yet the systems have significant differences, and water supply is chief among them.

Because home fire sprinkler systems are still an emerging trend across the country, local water utilities and other suppliers are often less familiar with systems for houses. And they may incorrectly assume that residential systems are basically the same as commercial or industrial.

SPRINKLERS ARE LINKED BY A NETWORK OF PIPING, TYPICALLY HIDDEN BEHIND WALLS AND CEILINGS AND USUALLY DRAWING UPON HOUSEHOLD WATER SOURCES.

EACH SPRINKLER PROTECTS AN AREA BELOW IT, AND WHEN HEATED BY FIRE, ACTIVATES.

ONLY THE SPRINKLER CLOSEST TO THE FIRE WILL ACTIVATE, SPRAYING WATER DIRECTLY ON THE FLAMES.



Design, installation and maintenance of home fire sprinkler systems are governed by NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*. Fire sprinkler systems for commercial, industrial and other structures are governed by different national standards. All systems installed in homes should comply with NFPA 13D.



## WHY FIRE SPRINKLERS? THEY PREVENT INJURIES AND SAVE LIVES

Although sprinklers also protect property from fire damage, the purpose of the NFPA 13D standard for home systems is life safety. That's because nine out of every 10 U.S. structure fire deaths happen in homes (NFPA). Many people are surprised to find out that the very place they feel the most safe is actually where they are at greatest risk from fire. Sprinklers provide residents with peace of mind and increase safety in communities.

## PREVENTING DEADLY FLASHOVER

When a home fire grows and spreads, it leads to flashover – the point at which everything combustible in the room ignites. No one can survive flashover. An uncontrolled home fire can reach flashover in fewer than three minutes.

Working smoke alarms are essential, but they only can provide early warning so residents can follow their escape plan.

Fire sprinklers go an important step beyond: they automatically react to the heat from a fire and put water on it, confining it and keeping it small. With that fast action, sprinklers control the spread of deadly flames, smoke and searing heat, preventing flashover.

Sprinklers uniquely give residents time to follow their escape plan and survive; even young children, older adults and those whose physical abilities may slow them down in an emergency can get out safely.

## TODAY'S HOMES BURN FASTER

There's never been a more important time to protect new homes with fire sprinkler systems. Today's new houses feature open spaces and are filled with synthetic furnishings and products. This results in houses burning faster and hotter (NIST). Modern construction materials also have increased fire dangers in homes because unprotected lightweight wood construction products (such as wood-truss roofing and I-joists) burn faster and fail sooner in a fire (UL).

**“The key thing with a fire sprinkler system is it slows the fire down and prevents flashover – when the entire room and its contents suddenly burst into flames.”**

– BILL KIRKPATRICK, EAST BAY MUNICIPAL UTILITY DISTRICT (CA)

When fire sprinkler systems are installed in homes, everyone is safer, including firefighters.

## TYPICAL HOME FIRE SPRINKLER PROTECTION

It's important to understand how a home fire sprinkler system works in order to understand its water supply needs.

A sprinkler is very simple: basically it's a heat-sensitive plug on a piping system. In homes, the plug is most commonly held in place by a glass tube that contains a liquid element. That liquid responds when the temperature at the sprinkler reaches 135°-165°F. A fire produces those high temperatures in its early stages. The liquid in the sprinkler nearest the fire expands until the glass tube bursts, releasing water. The deflector distributes the water.

When a fire starts in a room, smoke and heat rise. When the high heat reaches the sprinkler's operating temperature, that sprinkler's plug will release water on the fire. Sprinklers operate individually and only in response to the high heat from fire. They don't operate all together. In most sprinklered-home fires, only one sprinkler was needed to control the fire.

Neither interconnected smoke alarms nor smoke can cause sprinklers to operate.

IN MOST ROOMS, A SINGLE FIRE SPRINKLER WILL PROVIDE ENOUGH PROTECTION. SOME LARGER GREAT ROOMS OR KITCHENS MAY NEED MORE THAN ONE SPRINKLER OR A SPECIALLY LISTED EXTENDED-COVERAGE SPRINKLER.

## THREE TYPES OF RESIDENTIAL FIRE SPRINKLERS



SIDEWALL SPRINKLER



CONCEALED SPRINKLER



PENDENT SPRINKLER



The American Water Works Association 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.

— AWWA STATEMENT OF POLICY

## ENVIRONMENTAL IMPACT OF FIRE SPRINKLERS

Water demand and usage are issues of critical importance in every community. Conservation of this precious resource is one of the reasons why home fire sprinkler systems are increasing in popularity. Fire sprinklers are green.

In a fire in a sprinklered home, the system controls the fire with only a fraction of the water that would be used by fire department hoses in non-sprinklered homes.

How much less? According to research conducted by FM Global, fire sprinklers reduce water usage to fight a fire by upwards of 90% compared to responding fire departments. They also reduce water pollution. When sprinklers are present in a fire, the resulting wastewater has fewer persistent pollutants, such as heavy metals, and fewer solids.

**“The sprinkler will come on in the room where the fire is started, instead of spreading thousands of gallons on the entire structure. When the fire is contained to one room, obviously you’re going to use a lot less water.”** – DAVE PETTY, CITY OF SCOTTSDALE WATER DEPARTMENT (AZ)

FM Global’s study, which captured wastewater from test fires with and without sprinklers, showed that the pH value of the test wastewater from unsprinklered fires exceeded the allowable discharge range of 5.5 to 9.0 required by most environmental agencies, and was four orders of magnitude higher in alkalinity than the wastewater from the sprinklered test.

The study proved that sprinklers can reduce fire damage by up to 97%, which means less waste is sent to landfills. Sprinklers can also reduce greenhouse gas emissions by 98%.



Fire departments have to use far more water to fight an unsprinklered house fire. That’s because the fire will have grown and spread during the time between detection, fire department notification and when the fire department can arrive on scene and get set up. A fire department response time of nine to 12 minutes is considered good. Yet with flashover possible in as few as three minutes, the damage to the house will be considerable at that point. It’s easy to see why so much water under high pressure is required for fires in unsprinklered homes.

When sprinklers activate, the fire department response is more often than not a clean-up operation. When additional suppression is necessary, the water use is minimal.

## HOME FIRE SPRINKLER SYSTEM HYDRAULICS

Two types of residential fire sprinkler systems are permitted under the NFPA 13D standard: *stand-alone* systems, where the sprinkler system is independent of the plumbing system; and *multipurpose* systems, where the sprinkler system is combined with the cold water plumbing. Most home fire sprinkler systems are connected to the domestic water supply. When public water is not available or pressure is insufficient, a well or a tank and pump can be used for water supply.

Designing the domestic-fed system requires communication with the water utility so that available water pressures and flow to the system can be determined, and so that the design can meet the utility requirements. Proper hydraulic calculations are paramount to life safety, so the systems must be designed and installed by qualified professionals.

A sprinkler system should be designed so that water flow is at least 15 gallons per minute (gpm) and up to a maximum of 40 gpm.

Regardless of the type, the standard requires that the water supply for a home fire sprinkler system accommodate one or two operating sprinklers for a period of seven to 10 minutes. That's not a significant demand on a municipal water system, especially compared to the volume of water used by fire departments when sprinklers are not installed.

NFPA 13D does not require sprinklers in all areas of a dwelling. Sprinklers may be omitted from small bathrooms and closets. Sprinklers are not required in garages, open attached porches or attics that are not used for living space. Some jurisdictions exceed the standard, however, and do require sprinklers in those areas.

## MAKING THE CONNECTION

The connection includes a single supply from the water main into the house. Once inside the house, for *stand-alone* systems, the water delivery is split so that the domestic system is isolated from the fire sprinkler system.

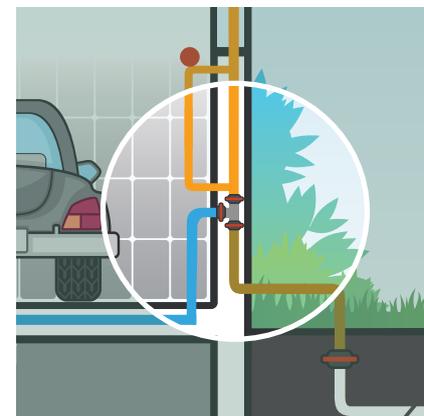
The riser is typically located in the basement where the water main enters the home. In regions where there are no basements, the riser is located in the garage.

With a *stand-alone* system, the NFPA 13D standard recommends that a water meter not be installed on the sprinkler line because the meter could produce friction or blockage or reduce water pressure. In jurisdictions that require meters on *stand-alone* systems, the meter is placed before the split between the domestic and sprinkler lines. In these cases, the meter must be included in the hydraulic calculations for the sprinkler system.

For combined, *multipurpose* systems, the lines are metered.

“In most cases, the flow is between 15 to 25 gallons per minute — nothing more than you would see in the fixture count of an average home. Because the water demand is so low, that allows us to tie it into the domestic system and really make it an extension of the existing plumbing system in the home.”

— CHRISTINA JAMISON, SAN RAMONE VALLEY FIRE PROTECTION DISTRICT (CA)



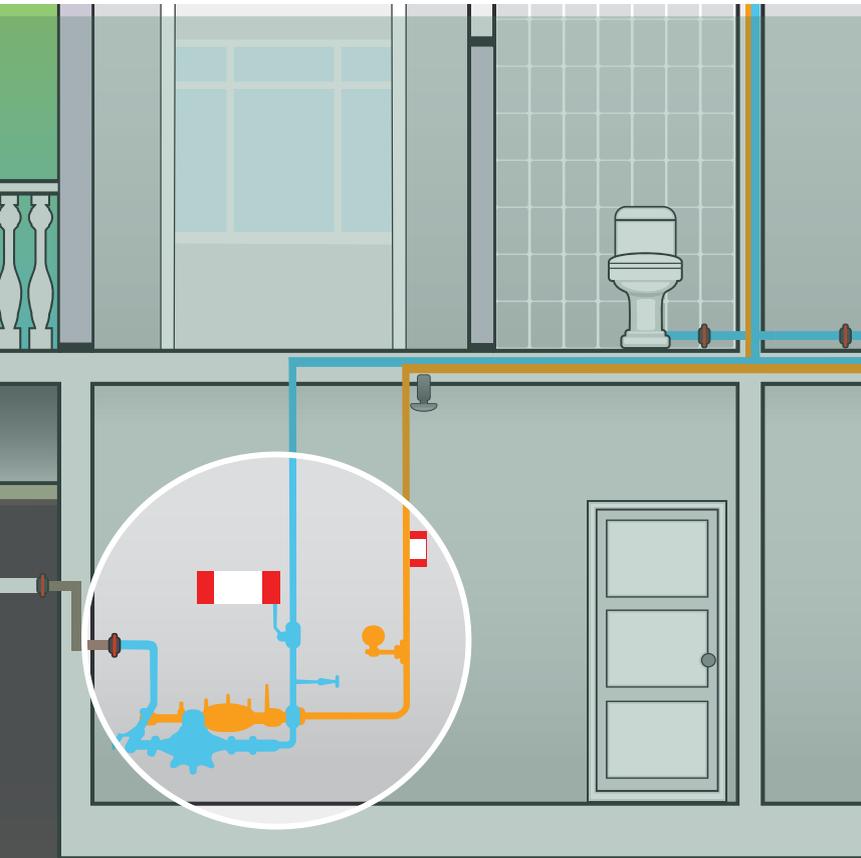
STAND-ALONE SYSTEM IN GARAGE

## MAINTAINING WATER QUALITY

Backflow preventers are not required by NFPA 13D. Where required by local code, backflow preventers must be considered in the hydraulic calculations.

One innovative approach to ensuring fresh water and eliminating the need for a backflow preventer is connecting the sprinkler system to the toilet tank that is farthest away from the water supply. With each flush, water is drawn through the fire line.

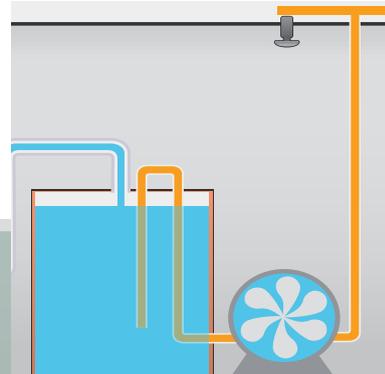
STAND-ALONE SYSTEM IN BASEMENT



## ALTERNATIVES TO PUBLIC WATER SUPPLY

Fire sprinklers can be installed in areas where homes are built without a municipal water supply or where there is insufficient water pressure from the main. The options

include utilizing the home's well system. If the well does not have adequate pressure, a pump may be required.



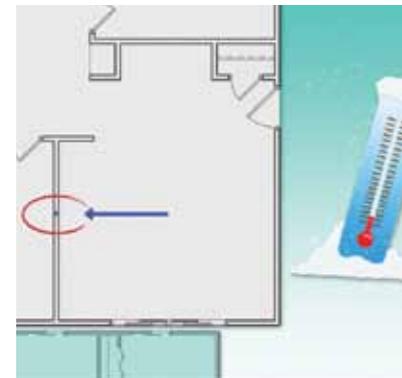
TANK AND PUMP SYSTEM

A tank and pump may be used on *stand-alone* systems. The pump is off until a fire causes a sprinkler to activate, when the pump will automatically turn on to provide the required water flow.

A pressurized tank system stores the sprinkler water supply under pressure, which is maintained by an external source, such as a nitrogen tank. These are used when the power supply is unreliable.

## FREEZE PROTECTION

Home fire sprinklers can be installed anywhere in the country, regardless of climate. When a home system is correctly installed to the requirements of NFPA 13D, freezing is not a problem. Methods include installing sprinkler piping in interior walls, avoiding placement of pipes in unheated attics, or if installing in attics, using proper insulation. An alternative is to install dry-pipe systems, which keep all water out of sprinkler pipes until a sprinkler activates.



SPRINKLER PIPE INSTALLED IN INTERIOR WALLS TO AVOID FREEZING

## MAINTENANCE

Home fire sprinkler systems are easily maintained with some simple safeguarding steps to make sure the system is ready to function when called upon. Additionally, a water flow test is recommended every six months. The resident or a contractor can do this. Systems with a tank should be checked to confirm the water level. Pumps should be operated to verify functionality.

## HOME FIRE SPRINKLERS BENEFIT COMMUNITIES

The bottom line is that home fire sprinkler systems are good for residents, good for the fire service and good for communities. In addition to their life-safety and property-protection benefits, fire sprinkler systems reduce local infrastructure costs and provide environmental benefits.

Communities across the country are offering incentives for homes protected with fire sprinklers.



THE STATE OF NEW JERSEY HAS A LAW THAT ELIMINATES THE STANDBY FEES FOR STAND-ALONE FIRE SERVICE WATER LINES OF TWO INCHES OR LESS.

ALTAMONTE SPRINGS, FLORIDA ALLOWS A 40% CREDIT AGAINST THE WATER CONNECTION CHARGE FOR RESIDENCES WITH SPRINKLERS.

SCOTTSDALE, ARIZONA AND OTHER COMMUNITIES ALLOW REDUCED FIRE HYDRANT SPACING REQUIREMENTS.

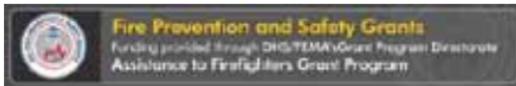


To learn more about all aspects of home fire sprinkler systems, installations and water use, please visit the Home Fire Sprinkler Coalition website at [HomeFireSprinkler.org](http://HomeFireSprinkler.org). All HFSC information is available free of charge.

This brochure was produced with generous funding through a Fire Prevention & Safety Grant award.



FEMA



Home Fire Sprinkler<sup>®</sup>

COALITION

Protect What You Value Most<sup>™</sup>

[HomeFireSprinkler.org](http://HomeFireSprinkler.org)

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