

# Fire Sprinklers



FEMA

## Purpose

To provide guidance on the installation of interior and exterior fire sprinkler systems on buildings in wildfire zones. The guidance pertains to both new and existing buildings.

## Key Issues

- During a wildfire, firebrands and airborne debris can breach windows, and convective heat and embers can penetrate utility openings, gaps around doors, and other openings. The interior of a building can ignite even when the exterior does not. Fire sprinklers are not common in residential construction, but they can be effective in preventing damage from a wildfire.
- Exterior building components that are combustible such as overhangs and recessed alcoves can trap embers, firebrands, and hot gases, leading to ignition of the building. Exterior sprinklers can help extinguish flames before the building has been substantially damaged.
- A building that has ignited can endanger nearby buildings and contribute to the spread of a wildfire. Interior and exterior sprinklers can prevent substantial damage to the building, protect nearby buildings, and prevent the fire from igniting nearby combustible vegetation.

## Interior Fire Sprinklers

### *Common Misconception*

### *Fact*

All sprinklers in a system activate simultaneously.

Only sprinkler heads that are in an area of high heat are activated. Typically, only one or two heads activate during a fire. Sprinkler heads are activated only by heat, not by smoke.

Sprinklers can activate accidentally.

According to the U.S. Fire Administration, only 1 in 16 million sprinkler heads activates accidentally.

Water damage from sprinklers is more expensive to repair than damage from the fire.

Water damage from sprinklers is usually considerably less expensive to repair than damage caused by water from fire hoses, smoke, and fire. Quick-response sprinklers release 8 to 24 gallons of water per minute, while fire hoses release 50 to 125 gallons per minute.

Interior sprinkler systems are obtrusive and not aesthetically pleasing in residences.

Interior fire sprinklers for single-family residences are smaller than traditional commercial or industrial fire sprinklers and can be coordinated with any room décor. Sprinkler heads come in a variety of styles, models, and colors and can be mounted flush with the ceiling (see Figure 1) or concealed behind covers.

## Characteristics

- Interior fire sprinkler systems can detect a developing fire quickly and activate automatically. Systems do not require manual intervention.
- Interior sprinkler systems can include a warning system that notifies occupants and emergency response personnel of a developing fire.
- Interior sprinklers can be installed during new construction or in an existing home.

## Guidance

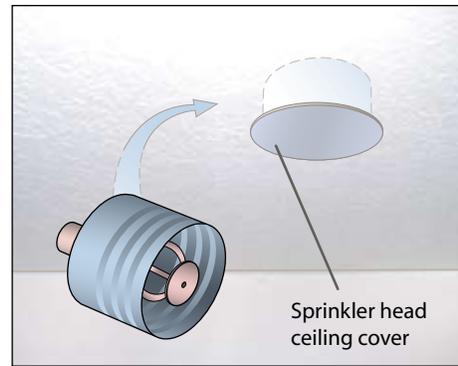
- Installing sprinklers in unoccupied, enclosed spaces such as attics should be considered because doing so can provide additional protection if fire penetrates the exterior of the space.
- Water pressure and supply must both be adequate for an interior sprinkler system to be effective. Water is typically supplied by the water main from the municipal water supply. During a wildfire, firefighting resources often exhaust the available water pressure. If existing water pressure is inadequate or the source of water is a well, a holding tank can be used as a water source. To ensure that water is available to the system during a wildfire, a pressurized holding tank should be considered, even if the structure is connected to the municipal water supply.

## Considerations

- The majority of the cost of an interior sprinkler system is associated with the piping material. Options for materials include steel alloys, copper, and fire-resistant plastics. Plastic piping is less expensive than steel alloys and copper, but its melting point is as much as five times lower than copper piping.
- Hazard insurance rates are typically discounted for homes with interior sprinkler systems.
- An interior sprinkler system is relatively easy to install during new construction. The system increases the total cost of construction by approximately 2 percent; complex and multi-story installations may increase the cost more. Installing an interior sprinkler system can be done when the roof is replaced or upgraded, and doing so may cost less than standard installation.
- The cost of installing an interior sprinkler system during new construction is about half the cost of installing a system in an existing building.

## Effectiveness

Internal sprinklers extinguish the fire at an early stage and prevent substantial damage from heat and smoke or total loss of the structure. They are effective in all Fire Severity Zones.



**Figure 1.** A concealed, aesthetically pleasing fire sprinkler.

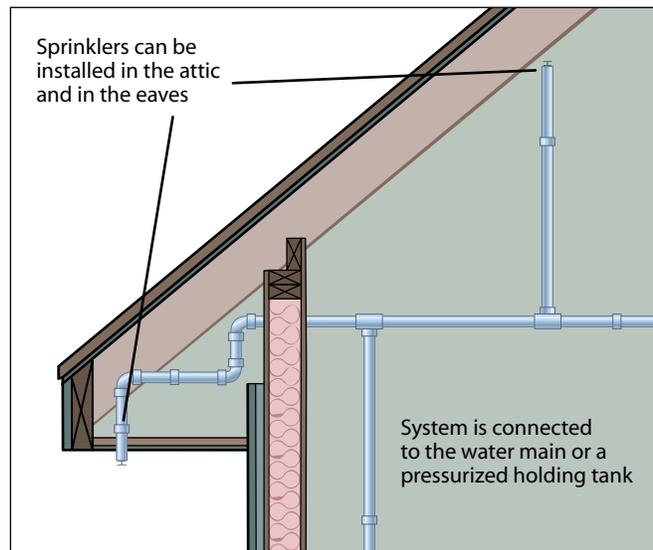
## Exterior Fire Sprinklers

### Characteristics

- The purpose of an exterior fire sprinkler system is to saturate the exterior of the building.
- Exterior sprinkler systems can be installed during new construction or on existing buildings. They are commonly installed on the roof along the ridge line or underneath the eaves and along soffits.
- Exterior sprinklers can be activated automatically by low-voltage heat detectors or manually by occupants before they evacuate the home.
- Exterior sprinklers can include a warning system that notifies occupants and emergency response personnel of a developing fire.
- Some landscape sprinklers are designed and installed to provide protection from a wildfire to landscape areas immediately surrounding a building.
- An exterior sprinkler system can be installed so that it is substantially hidden from view.

### Guidance

Exterior sprinklers mounted on the building can be configured to use water piping through the attic or roof or to use piping on the exterior of the structure. If interior pipes are used, exterior sprinklers can be installed in conjunction with interior sprinklers (see Figure 2). A stand-alone system that includes a pressurized holding tank can be considered to ensure an adequate water supply. See the information about water supply under interior fire sprinklers above.



**Figure 2.** Interior and exterior fire sprinklers can be installed in conjunction with each other, such as this system with a sprinkler in the attic and along the eave.

### Considerations

- If exterior sprinklers are installed in areas where freezing temperatures occur, special provisions such as dry sprinklers are required to prevent water in the piping from freezing and rupturing it. In a dry sprinkler system, the portion of piping that is vulnerable to freezing is not charged with water until a fire opens a valve and releases water into the piping.
- Exterior sprinklers can provide added protection when used in conjunction with fire-resistant construction materials (see Fact Sheets #5–14) and defensible space (see Fact Sheet #4, Defensible Space).
- Polymer gels, Class A foam products, and other long-term fire retardants can be applied to structures prior to fire impingement and provide greater thermal protection than water alone.

Many of these products are available to homeowners in self-contained application units and can be applied with an attachment to a garden hose or integrated into the home's exterior sprinkler systems.

### *Effectiveness*

- If exterior fire sprinklers require manual activation, occupants must activate the system expeditiously for the system to be effective.
- High winds that are frequently a byproduct of major fire activity can significantly degrade the effectiveness of an exterior sprinkler system.
- Manually applied fire-protection materials such as Class A foam products can be effective if time is available to treat the home. To be effective, the fire-protection material must be applied within the time frame identified by the product manufacturer.

### **Resources**

FireSafety.gov. *Residential Fire Sprinklers*. <http://www.firesafety.gov/citizens/sprinklers/index.shtm>.

National Fire Protection Association. 2007. *NFPA 13D: Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*. <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=13D>.

National Fire Sprinkler Association. Information about residential sprinkler systems. <http://www.nfsa.org>.