Exterior Fire Sprinkler System Fact Sheet

Home Ignition

Wildfires generally ignite buildings in two ways:

Wind thrown embers

A wildfire can throw embers up to one quarter of a mile, especially during high wind conditions. These embers fall on combustible material (decks, gutters, etc.) on or around the house and start a new fire. This is the most common method of home ignition.

Radiant heat

Nearby structures, trees or vegetation on fire can generate radiant heat onto the home. Even if the radiant exposure is not hot enough or long enough to ignite the home, the surfaces of the home can be pre-heated to a level that can make them more vulnerable to embers or direct flame contact.

Design Concept

The exterior fire sprinkler system is designed to:

- Wet combustible material on and around the house to prevent it from catching on fire
- Pre-wet the property prior to the advancement of a fire
- Create a dome of high humidity and lowered temperatures around the house

The fire sprinkler system is not designed to:

- Extinguish a fire that has already ignited on or inside the building, although it can help to suppress or slow the progress of an existing fire

Wetting of Combustible Material

New construction buildings in the Wildland Urban Interface (WUI) are required to install fire resistant roofs and wall materials. These materials generally have a Class A fire rating which is the most resistant to fire. It is highly unlikely for Class A rated materials to catch on fire from thrown embers. Therefore, the exterior fire sprinkler system is designed to wet the combustible materials on and around the house that are more susceptible to catching on fire. This includes:

- Nearby trees and vegetation
- Nearby structures that do not have Class A materials
- Wooden structures attached to the house (decks, arbors, etc.) that do not have Class A materials

Humidity Dome

In addition to reducing the chance of ember ignition, the exterior fire sprinkler system can create a dome of high humidity and lowered temperature around the house. When a fire storm is quickly moving through the area, this humidity island can counteract the radiant heat of the fire and reduce the chances of ignition through embers or direct flame contact.

Wetting Methods

The most common method to apply water is either through an above ground brass sprinkler or below ground rotor sprinkler.

Below Ground Rotor Sprinklers

Using below ground "pop-up" type sprinklers in the landscape is the preferred method. Because the sprinkler is below ground when not activated, there is no visual impact in the landscape and the sprinklers are less exposed to disturbance from animals/humans.

The downside of below ground sprinklers is that the "pop-up" height is limited to 12" above ground level when active, with a water stream trajectory of 25 degrees. This means that vegetation height within a 4' radius of the sprinkler must be kept below 2' tall and within an 8' radius must be kept below 4' tall. This can place a limit on the plant material around the sprinkler location.

Above Ground Brass Impact Sprinklers

When underground sprinklers cannot be used, above ground brass sprinklers are the preferred method. These can be installed on roofs, decks and in landscape areas where higher elevations are required. The brass construction is durable and long lasting. The downside is the high visibility of the sprinklers.

Sprinkler Zones

Ideally all sprinklers are on a single zone and run at the same time to provide complete coverage around the house and apply water as quickly as possible. In practice it may be very costly to have only 1-zone of sprinklers for a couple of reasons:

- A single zone of sprinklers may require a pumping system capable of delivery over 200 GPM through a 6" supply pipe for a single-family home. Properties with multiple buildings my require an even larger pumping system.
- The electrical draw for a large pumping system can be expensive if a battery or generator backup is installed for the pumping system.

In general, we propose multiple zone systems to provide a more affordable system. As an option we can provide costs for a single zone system, at your request.

For sprinkler systems with multiple zones, the control panel will run each zone for 5 minutes before continuing to the next zone, then start over when all zones have completed a 5-minute cycle.

System Activation

The fire sprinkler control panel is connected to the house Ethernet to allow the user to remotely activate the system using a mobile device or web browser. The system does not have an auto-detection/activation feature and instead requires a user for activation of the system for the following reasons:

- Flame detectors and other fire detection sensors are typically intended for indoor or enclosed spaces (warehouses, yards, etc.). As such its impossible to provide 100% coverage when sensors are oriented toward open spaces with many possible obstructions (trees, other structures, play equipment, etc.).
- With less than 100% coverage, auto-detection & activation systems provide a false sense of security to the owners
- Sensors generally require a fire to be 1'x1' size before detection. On highly combustible material the fire can grow rapidly in size before the wetting action of sprinklers takes effect.

The online app comes pre-programmed with three different activation settings or "Threat Levels". These threat levels are designed to use water in the most economical way possible to ensure that water does not run out during a multi-day fire threat.

Immediate Threat (use all water as fast as possible)

The Immediate threat level should be activated when the house is under immediate threat from a wildfire. For example :

- The owners are on the property and
- the fire is immediately on the property or
- embers are overserved being thrown on or near the property.
- The owners are not on the property but have good evidence of immediate threat (video cameras, neighbor confirmation)

The system will cycle through the zones watering each zone for 5 minutes before continuing to the next zone. Once it has cycled through all the zones, it will restart with the first zone and continue watering until all the available water runs out, or the system is deactivated by the user.

2-Day Threat (apply water more slowly over 2 days)

The 2-day threat level should be activated when the house is not under immediate threat but may come under threat within 48 hours (2 days). For example:

- The owners are on the property and
- fire is miles away but advancing in the direction of the house.
- The owners are not on the property but have good evidence of a 2-day threat (video cameras, fire locator app, neighbor confirmation)

The system will start a Cycle and Soak program and cycle through the zones watering each zone for 5 minutes. Once each zone has been watered for a set time (typically 20 minutes), the sprinkling will stop and enter a Soak period. The system will continue to cycle and soak so that all the available water is applied over 2 days, before running out or the system is deactivated by the user.

4-Day Threat (apply water more slowly over 4 days)

The 4-day threat level should be activated when the house is not under immediate threat but may come under threat within 96 hours (4 days). For example:

- The owners are required to evacuate and
- the owners don't have a method of remote detection (no cameras, fire locator app, neighbors)
- The owners are not on the property but have good evidence of a 4-day threat (fire locator app, neighbor confirmation)
- There is a perceived threat of fire, but the owners are unsure what level of threat it is.

The system will initiate the same program as the 2-dayThreat Level, except all the available water is applied over 4 days, before running out or the system is deactivated by the user.

Independent Operation

If a loss of internet connection occurs while the system is activated, the local control panel will continue to operate and manage the application of water based upon the available supply. Once coming back online the system will automatically initiate any changes that were applied through the app or browser while the internet connection was lost.

System Options

There are several options available to expand the systems potential.

Utilize Multiple Water Sources

The system primary uses a water storage tank to draw the water from and supply to the fire sprinklers with a pump. A pool may be used as a secondary water source to ensure a large amount of water is applied for maximum benefit. Even if a pool is present, we generally want a tank as a primary water source, even if modestly sized, for the following reasons.

- We recommend running the test program at least once per year to ensure the system is operating correctly. If the pool is the primary source, then chlorinated water would be applied to the house and surrounding landscape which may adversely affect the plants and building materials.
- During the test program, the pool would be drawn down which will temporarily affect chlorine and PH levels within the pool as makeup water is added back.

Failsafe Pumping System

The standard system includes a pump to supply the water to the fire sprinklers. As an option we can include a second pump as a failsafe measure to ensure the system will continue to operate if the following conditions occur:

- If the primary pump fails, the secondary pump can take over and continue to operate the system
- The primary pump is sized to supply the fire sprinkler flow rate, plus a 10% safety factor. If a large pipe break occurs in excess of the 10% safety factor, the secondary pump can turn on to continue to supply the sprinklers.

1-zone System

As mentioned previously most systems are proposed as multiple zone systems to keep costs lower. Ideally the system would have only 1-zone where all the sprinklers are running at the same time, especially during an Immediate Threat Level where we would want the water to be applied as quickly as possible. As an option we can quote a 1-zone system.

Recommended Additions

In addition to the work proposed by WaterSprout, we recommend that other work be performed by others to make the system more resilient in the event of a wildfire. During a neighborhood wildfire event both power and internet may be shutoff to the site, preventing the sprinkler system from working correctly. We recommend:

Satellite Internet Provider

Connecting the sprinkler system to a satellite-based internet provider. Wildfires do not affect satellite internet service and remote activation of the sprinkler system will not be compromised during a wildfire.

Backup Power System

Installing a backup power system to the sprinkler system so that the sprinklers can continue to operate during a neighborhood power failure. The backup system can be either generator or battery based.

Additional Resources for Wildfire Detection

Cal Fire Ready For Fire App

This app from Calfire can provide you with a warning if a fire incident has been reported near your house. In addition, the app helps you to plan for wildfires.

Exterior Security Cameras

Many home monitoring systems offer security cameras that allow real-time viewing of the conditions around your home. These can be helpful for spotting approaching fire especially if the owner is not in the home or has been evacuated.