Fire Sprinkler Systems for New One- and Two-Family Homes
About the Home Fire Sprinkler Coalition (HFSC)

- HFSC is a national nonprofit 501(c)(3) organization focused solely on education about the life-safety value of installing fire sprinkler systems in new houses. HFSC does not lobby for code adoptions, or promote any sprinkler industry product, service or installation.

- HFSC earned a competitive Fire Prevention & Safety Grant to develop and distribute this course. This generous grant is awarded as part of the national Assistance to Firefighters Grants, managed under the Grant Programs Directorate in the Federal Emergency Management Agency.
Learning Objectives

1. Recognize the documented life-safety ramifications of unwanted fire in homes and describe the superior fire protection that fire sprinkler systems bring to residents, firefighters and at-risk populations.

2. Describe the basics of home fire sprinkler operation and care/maintenance, and be conversant in the installation process and interaction with the fire sprinkler contractor, building official and water purveyor, and have a basic understanding of relevant national standards and codes.

3. Describe how water is supplied to a home fire sprinkler system in differing circumstances, recognize the varied water supply options, and become familiar with water supply components.

4. Recognize common myths and know the facts about home fire sprinklers.
Home Fire Dangers

- Fire does not discriminate; it kills more people in the U.S. annually than all natural disasters combined.
  - According to the National Fire Protection Association (NFPA), fire is more common and often more deadly than hurricanes, tornados and other disasters.

- More than 3,000 people perish in fires each year
  - Most fire deaths occur in the very place where people feel safest – their homes.
  - Fire sprinklers are mandatory in most public buildings, and people are now demanding the same level of protection for their homes.
Each Sprinkler is Individually Activated by Heat

- Not the entire system activates
- Smoke will not activate a sprinkler
Home Fire Sprinklers Save Lives

• Research conducted by the National Institute of Standards and Technology (NIST) has shown that home fires become deadly in as few as three minutes.

“Fires today seem to burn faster and kill quicker, because the contents of modern homes (such as furnishings) can burn faster and more intensely…”

- NIST senior engineer Richard Bukowski, P.E.
Home Fire Sprinkler Basics

With a home fire sprinkler system
• Smoke alarm sounded at 30 seconds.
• Fire sprinkler activated at 90 seconds.

Without a home fire sprinkler system
• Flashover (simultaneous ignition of combustible material in the area) occurred in only 3-5 minutes.
Case Study: Prince George’s County, Maryland

• Prince George’s County, Maryland*
  – Recorded 13,494 single-family home and townhouse fires

• Homes with Fire Sprinkler Systems
  – 245 homes were protected with fire sprinkler systems
  – No deaths and only 6 injuries reported

• Homes without Fire Sprinkler Systems
  – 13,249 homes were not protected with fire sprinkler systems
  – 101 deaths and 328 injuries reported
Case Study: Prince George’s County, Maryland

Another important advantage of home fire sprinklers is property protection. From 1992-2007, the fire department recorded $134,711,199 of damage due to fire loss for single-family homes and townhouses.
Today’s Homes Burn Quicker

- Reduced risk of injury
  - Modern homes are made with lightweight materials that tend to burn more quickly, increasing risk of structural collapse
- Reduced risk of death related to structural collapse
  - In unsprinklered homes, firefighters don’t know what kind of fire situation they are walking into
NFPA 13D

• Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

• In accordance with NFPA 13D, Fire Sprinklers are Expected to:
  – Aid in the detection and control of home fires;
  – Provide improved protection against injury and life loss;
  – Prevent flashover (total simultaneous ignition of combustible materials) in the room of fire origin; and
  – Improve the chance for occupants to escape or to be evacuated.
NFPA 13D

- Compliance with NFPA 13D is intended to prevent injury and life loss.
- The standard requires at least 10 minutes of sprinkler water on the fire in its initial stage of development.
  - Time to exit safely
  - Time for fire department to respond
- A single fire sprinkler flows approximately 15 gallons per minute.
NFPA 13D Requirements

NFPA 13D requires fire sprinklers to be installed only in living areas. The standard does not require fire sprinklers in:

- bathrooms less than 55 sq ft., certain small closets or pantries;
- garages, carports or attached open structures (porches), attics, crawl spaces and concealed spaces not used for living purposes, storage or mechanical equipment;
- entrance vestibules that are not the only means of egress.

Local building authorities may have requirements that exceed NFPA 13D, so it is necessary to determine local requirements ahead of time.
NFPA 13D Accepted Systems

- Two common types of fire sprinkler systems acceptable under NFPA 13D:
  - Stand-alone, or independent systems
    - separate piping for fire sprinkler system and domestic water supply
  - Multipurpose, or combined (network) systems
    - same piping used for household cold water and fire sprinkler system
When the water supply is a well, or there is not enough water pressure, a holding tank is used. A pump and a 300-gallon tank provide the 10 minutes of water supply required by NFPA 13D.
NFPA 13D Components: Fire Sprinklers

- The fire sprinkler system designer determines the piping design and the appropriate number, type, and layout of sprinklers along the piping.
- In many rooms a single fire sprinkler can protect the room.
  - Fire sprinklers typically cover a minimum 12 x 12-foot area
  - Extended-range fire sprinklers cover up to a 20 x 20-foot area
NFPA 13D Components: Piping

- Home fire sprinklers have become more economical and easier to install.
- Chloro-polyvinyl chloride (CPVC) piping, cross-linked polyethylene (PEX) tubing and other listed non-metallic piping simplify installation.
NFPA 13D Components: Piping

• NFPA 13D includes information for installation of fire sprinkler systems in areas where freezing may occur.
• When freezing is a concern, pipe can be installed in interior walls using sidewall fire sprinklers.
• In finished attics and in warm regions, pipe can be run up into the attic and ceiling fire sprinklers can be used.
Typical Fire Sprinkler Water Supply

- In a typical stand-alone system the water supply for the fire sprinklers comes from the household water main
  - There will be a T-connection between the main and the water meter, feeding water to the fire sprinklers. This is called the riser
    - Riser includes the pressure gauge, a flow switch, a backflow valve (where required), and the test and drain assembly
Today's home fire sprinklers are inconspicuous – smaller than recessed lighting or smoke alarms.

- Can be custom-painted by manufacturer and concealed beneath color-matched plates
NFPA Maintenance Recommendations

• Once a month:
  – Check to be sure all valves are open.
  – If you have a water storage tank, make sure it is full.
  – Test the pump (if you have one), to be sure it starts.

• Twice a year:
  – If you have a water flow device, test it and your monitoring service (if any).

• Year-Round
  – Look at all fire sprinklers and inspect any visible pipes to make sure nothing is hanging from them. Make sure nothing is obstructing any fire sprinkler.
Trade-Up Options

Many municipalities offer what’s known as “trade ups” for developers who include fire sprinklers in new homes.

- **Street Width Reduction**
  - Traffic lanes may be narrowed, substantially reducing the amount of pavement in every linear foot of street in the development.

- **Longer Dead-End Streets**
  - Dead-end streets may be increased in length, allowing additional building lots to be accessed.

- **Tee Turnarounds Permitted**
  - The permitted use of tee turnarounds in sprinklered developments can create at least one additional lot per cul-de-sac.

- **Increased Street Grades and Building Setbacks**
  - Steeper street grades and building locations further from paved vehicle access may be permitted.

- **Other trade ups include additional units and increased hydrant spacing.**
Trade-Up Options

• Building code alternatives may further offset installation costs.
  – Reduction in fire-rated portioning requirements between living spaces and other spaces
Environmental Impact of Fire Sprinklers

• An HFSC and FM Global study explored the environmental impacts of sprinklered and non-sprinklered homes.

• The testing examined:
  – Types, quantity and duration of air and water pollutants
  – Water uses from fire sprinklers vs. firefighter hoses
  – Impact of burning household furnishings
  – Carbon footprint of rebuilding
Environmental Impact of Fire Sprinklers

This research proved that automatic fire sprinklers:

• Reduced greenhouse gases by 98%
• Reduced water usage by up to 91%
• Reduced fire damage by up to 97%
• Reduced water pollution

Damage Findings

• Unsprinklered room = 100% damage
• Sprinklered room = 3% damage
Water Usage: Fire Sprinklers vs. Fire Hoses

• A report documenting home fire sprinkler installation in Scottsdale, Arizona, found that a fire sprinkler uses, on average, 341 gallons of water to control a fire.
  – Firefighters, on average, use 2,935 gallons of water
    • That’s more than 8½ times the water use to contain and fight a home fire
Refuting Myths

**Myth:** The water damage from fire sprinklers is worse than a fire.
**Fact:** A fire sprinkler activates during the early stages of a fire before it grows and spreads. It controls a fire with only a tiny fraction of the water used by fire department hoses.

**Myth:** Fire sprinklers go off accidentally, causing unnecessary water damage.
**Fact:** Fire sprinklers are individually activated by the extreme heat of a fire. Smoke from burnt toast or cooking will not activate a fire sprinkler.

**Myth:** Fire sprinklers operate all at once, flooding every room in the house.
**Fact:** Fire sprinklers activate independently; only the fire sprinkler closest to the fire will activate, spraying water directly on the fire, not the rest of the house.

**Myth:** Fire sprinklers will leak.
**Fact:** Fire sprinklers are no more likely to leak than the other plumbing in a home.
Refuting Myths

**Myth:** Fire sprinklers are ugly.
**Fact:** Modern home fire sprinklers are inconspicuous and can be mounted flush with walls or ceilings. Some fire sprinklers can even be concealed.

**Myth:** Fire sprinklers will freeze in the winter.
**Fact:** When correctly installed according to NFPA 13D guidelines, freezing is not an issue. Methods include installing fire sprinkler piping in interior walls and avoiding unheated attics.

**Myth:** Smoke alarms are all a home needs.
**Fact:** Smoke alarms are essential in every home. But they can only detect a fire and signal a warning. Fire sprinklers detect the fire and automatically control it.

**Myth:** Fire sprinklers cost too much.
**Fact:** Increasing demand is driving the cost down. Research by the nonprofit Fire Protection Research Foundation reports that the national average is $1.61 per sprinklered square foot. Fire sprinklers increase a home's value and marketability.
Summary

• Fires kill more people in the U.S. every year than all natural disasters combined.

• Installing both smoke alarms and a fire sprinkler system reduces the risk of death in a home fire by 83%, relative to having neither.

• Remember, only the fire sprinkler closest to the fire will activate, spraying water directly on the fire.

• According to the Scottsdale, Arizona report, fire hoses, on average, use more than 8½ times the water that fire sprinklers do to contain a fire.

• The likelihood that a fire sprinkler will accidently discharge because of a manufacturing defect is extremely rare.

• Modern home fire sprinklers provide unobtrusive protection.
Summary

Fire sprinklers can save money for developers, builders, homeowners, and communities.

Fire sprinklers benefit communities by:
• Protecting residents for generations
• Protecting firefighters
• Reducing insurance costs
• Increasing the value of the house/development/community
• Helping real estate professionals sell homes
• Protecting the environment
Resources

- Home Fire Sprinkler Coalition (HFSC): www.homefiresprinkler.org
- Prince George’s County, Maryland Case Study: www.homefiresprinkler.org/fire-department-work-with-local-officials
Thank you

Please contact us with questions:

www.homefiresprinkler.org