Guidelines for earning IACET CEUs

- Attendee must register/sign in with all required info.
- Attendee must attend the entire online session (monitored by polling and the host)
- Attendee must actively participate in classroom discussions via polling and chat
- Attendee must achieve a passing score of 70% or higher on the final assessment (within 24 hrs.)
- Successful completion will earn attendee 0.1 CEU
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Portfolio of Flagship Brands
Objectives

- Describe the impact of residential fire sprinklers on residential fires
- Review what the NFPA is and the development process for applicable codes
- Name and navigate applicable codes (NFPA 13, 13R, 13D, IRC)
- Distinguish characteristics between "Residential" sprinklers and Standard "Spray" (Commercial) sprinklers
- Explain how residential sprinklers are listed, approved and developed.
- Identify residential sprinklers, system types, and sprinkler system components
How does an Automatic Sprinkler Fight a Fire?

- Three things must be present at the same time in order to produce fire:
  - Some sort of **fuel** or combustible material
  - Enough **heat** to raise the material to its ignition temperature
  - Enough **oxygen** to sustain combustion

## Residential Fire Growth Timeline

**HOME FIRE TIMELINE**
Residential Fire Growth

- Residential sprinklers prevent **flashover**

![Pre-Flashover](image1.png) ![Post-Flashover](image2.png)

Water Distribution Characteristics

- The primary focus for residential sprinklers is life-safety
- Gives the occupants 10 minutes to evacuate the occupancy
- High wall wetting is critical to sprinkler success
Preventing Flashover Saves Property Too

- A secondary benefit to residential sprinklers is property protection

The Difference with Sprinklers

- A similar sized home in the same jurisdiction was protected with a residential sprinkler system
Side-by-Side Burn Video

Understanding the Residential Fire Problem

- In a report prepared by NFPA for the period 2013-2017 the following statistics were recorded:

- US fire departments responded to an estimated average of 354,400 home structure fires per year.
- Cooking was the leading cause of home fires and home fire injuries, while smoking was the leading cause of home fire deaths.
- 80% of fire deaths and 75% of all reported injuries were caused by home fires.
Understanding the Residential Fire Problem

<table>
<thead>
<tr>
<th>In 2017</th>
<th>Trend since 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fires</td>
<td>1,319,500</td>
</tr>
<tr>
<td></td>
<td>-6.2%</td>
</tr>
<tr>
<td>Deaths</td>
<td>3,400</td>
</tr>
<tr>
<td></td>
<td>+9.6%</td>
</tr>
<tr>
<td>Injuries</td>
<td>14,670</td>
</tr>
<tr>
<td></td>
<td>-15.8%</td>
</tr>
</tbody>
</table>

- In 2018, fire departments across the USA responded to a home fire every 87 seconds.
- Research conducted by the National Institute of Standards and Technology (NIST) has shown that home fires become deadly in as few as three minutes.

Residential Sprinkler Standards

- There are four nationally recognized standards that govern fire sprinkler systems:
  - NFPA 13 – commercial occupancies, high-rise residential
  - NFPA 13R – multi-family residential up to, and including, 4-stories in height
  - NFPA 13D – one- and two-family dwellings and manufactured homes (including townhomes)
  - IRC (P2904) – Prescriptive design for one- and two-family dwellings and townhomes
Differences Between NFPA 13, 13R, and 13D

- Property Protection
- Fully sprinklered building
- Discharge Density of .1 gpm/sqft

- Life Safety Only
- Any residential buildings up to 4 stories in height
- Sized for four sprinklers maximum
- Many listed components required
- Piping must be separate system
- Garages must be sprinklered
- Discharge Density of .05 gpm/sqft

- Life Safety Only
- One and two-family dwellings
- Sized for two heads flowing
- Few listed components required
- Garages do not have be sprinklered
- Discharge Density of .05 gpm/sqft

Poll #1

Please answer the poll that pops up on the screen
Participating is required to earn CEUs
### Types of Residential Sprinklers Systems

- **Wet Pipe Sprinkler System:**
  - **NFPA 13R: 3.3.13.3 Wet Pipe Sprinkler System.** A sprinkler system employing automatic sprinkler attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by the heat of the fire.

- **Dry Pipe Sprinkler System:**
  - **NFPA 13R: 3.3.13.1 Dry Pipe Sprinkler System.** A sprinkler system employing automatic sprinkler attached to a piping system that contains air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinkler.

### Wet Pipe Sprinkler System

- **NFPA 13R: 5.4.1** A wet system shall be used where piping is installed in areas that can be maintained reliably above 40°F (4°C).

- **NFPA 13R: 5.4.4** Water-filled piping shall be permitted to be installed in areas subject to freezing when heat loss calculations performed by a professional engineer verify that the system will not freeze.
Dry Pipe Sprinkler System

- A system in areas subject to freezing that cannot be maintained at or above 40°F, shall be protected with one of the following:
  1) Antifreeze system using a listed antifreeze solution
  2) Dry pipe system
  3) Preaction system
  4) Listed dry pendent, dry upright, or dry sidewall sprinklers extended from pipe in heated areas
  5) Heat tracing

Dry Pipe Sprinkler System

- Dry systems can utilize a Residential Control Panel (RCP-1)
  - An integrated valve manifold, air pressure, and electronic control package for controlling the release of water into residential dry pipe sprinkler systems.
Sprinkler System Components

- Fire Sprinkler Supply Piping
- Residential Riser Manifold
  - Test/Drain valve
  - Water-flow switch
  - System pressure gauge
- Domestic Water Supply Piping
- Residential Domestic Shut-off Valve

Piping Materials

- Steel
- Copper
- PEX
- CPVC

- Plastic pipe must be listed
NFPA 13D Stand-alone Systems

- **3.3.12.9* Stand-Alone Sprinkler System.** A sprinkler system where the aboveground piping serves only fire sprinklers.

NFPA 13D Multipurpose Systems

- **3.3.12.3* Multipurpose Piping Sprinkler System.** A piping system intended to serve both domestic needs in excess of a single fixture and fire protection needs from one common piping system throughout the dwelling unit(s).
Poll #2

Please answer the poll that pops up on the screen
Participation is required to earn CEUs

Fast Response vs. Quick Response

- **Fast response** describes the thermal sensitivity of an automatic sprinkler operating element
  - Standard Coverage & Extended Coverage Quick Response
  - Residential
  - Early Suppression Fast Response (ESFR)

- **Quick response** describes how an automatic sprinkler performs in standardized testing based on a set activation time & a set room geometry. The only listed quick response sprinklers are:
  - Standard Coverage Quick Response
  - Extended Coverage Quick Response
“Quick Response” Sprinklers vs. “Residential” Sprinklers

- Definitions from NFPA 13-2019:
  - **3.3.205.4.16 Quick-Response (QR) Sprinkler.** A type of spray sprinkler that has a thermal element with an RTI of 50 (meter-seconds)^{1/2} or less and is listed as a quick-response sprinkler for its intended use.
  
  - **3.3.205.4.17 Residential Sprinkler.** A type of fast-response sprinkler having a thermal element with an RTI of 50 (meter-seconds)^{1/2} or less that has been specifically investigated for its ability to enhance survivability in the room of fire origin and that is listed for use in the protection of dwelling units.

- What is “Fast Response”?
  - **3.3.205.2 General Sprinkler Characteristics.** The following are characteristics of a sprinkler that define its ability to control or extinguish a fire. (1) Thermal sensitivity. A measure of the rapidity with which the thermal element operates as installed in a specific sprinkler or sprinkler assembly. One measure of thermal sensitivity is the response time index (RTI) as measured under standardized test conditions. (a) Sprinklers defined as fast response have a thermal element with an RTI of 50 (ms)^{1/2} or less…

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Residential Sprinkler Discharge Patterns

- Residential Sprinkler
- Standard Spray Sprinkler
Residential vs. Standard Coverage Spray Patterns

K 4.9 Residential Pendent

20' x 20' (6.1 m x 6.1 m) Maximum Coverage Area
20 GPM (75.7 LPM) Flow

K 5.6 Standard Spray Pendent

Residential Sprinkler Listings
UL 1626 Fire Test

Residential Sprinkler Sensitivity and Response

- A fire sprinkler uses on average 25 gpm (94.6 lpm)
- Maximum temperature at average human height, 5’ 3” from floor: 200°F (93°C)
- Maximum temperature at ceiling: 600°F (316°C)
- No more than 130°F (54.4°C) for 2 min
Poll #3

Please answer the poll that pops up on the screen
Participation is required to earn CEUs

Residential Sprinkler Data Sheet

- Comprises all pertinent technical/design related information

- Updated regularly and available on [www.tyco-fire.com](http://www.tyco-fire.com)
Residential Sprinklers

Flush

Concealed

Recessed

Flush and Recessed Sprinklers
Concealed Sprinklers

- **Operation**
  - A Cover Plate, which is normally soldered to the Retainer Ring at three points, falls away to expose the Sprinkler Assembly.
  - The sprinkler deflector may be fixed or supported by the Guide Pins that allow the deflector to drop down to its operational position.
  - When the rated temperature of the sprinkler is reached, the sprinkler activates allowing water to flow.
Concealed Pendent Sprinkler Activation

How Decorative Escutcheons & Concealed Cover Plates Affect Sprinkler Sensitivity

- Recessed sprinklers:
  - Equivalent to pendent sprinklers having a similar thermal response sensitivity installed 8” (200 mm) below smooth unobstructed ceilings

- Concealed sprinklers:
  - Equivalent to pendent sprinklers having a similar thermal response sensitivity installed 12” (300 mm) below smooth unobstructed ceilings
Residential Sprinklers

Rapid Response Series LFII Pendent Sprinklers

TY3934
K5.8 Pendent and Recessed Pendent

TY2234
K4.9 Pendent, Recessed Pendent, and Domed-Plate Concealed

TY4234
K6.9 Pendent, Recessed Pendent and Concealed Pendent

TY1234
K3.0 Pendent

TY3596
K4.9 Concealed Pendent Flat Plate Sprinkler for Wet and Dry Pipe Systems

TY2234
K4.9 Domed-Plate Concealed Pendent Sprinkler for Wet and Dry Pipe Systems
Residential Sprinklers

Rapid Response Series LFII Horizontal Sidewall Sprinklers

TY1334 K4.2 Horizontal Sidewall

TY2334 K4.4 Horizontal Sidewall

TY3334 K5.6 Horizontal Sidewall

TY4334 K5.8 Horizontal Sidewall

Dry Residential Sprinklers

Recessed Pendant

Domed Concealed

Flat Plate Concealed

Recessed Sidewall
Residential Sprinklers

Rapid Response Series LFII Dry Sprinklers

TY2235
K4.9 Recessed Pendent, Dry Type, Wet & Dry Pipe Systems

TY2335
K4.4 Horizontal Sidewall, Dry Type for Wet Pipe Systems

Residential Sprinklers

Dry Sprinklers – Exposed Barrel Length

HEATED AREA
FACE OF SPRINKLER FITTING
DSB-2 BOOT

EXPOSURE LENGTH
(SEE DESIGN CRITERIA SECTION)
Can I Paint?

The sprinkler itself?  The escutcheon?  The cover plate?

Questions?

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(401) 781-8220
Residential Sprinkler Sensitivity and Response

- Survivable conditions were established with the following temperatures:
  - Maximum gas temperature at 5.25 feet (1.6m) of 200°F (93°C)
    - Never more than 130°F (54°C) for any 2 minute span
    - Maximum ceiling temperature of 600°F (316°C)
  - Fires had to be attacked while still small if they were to be controlled with the water supplies typically available in residences.
    - 20 – 30 gpm (76 – 114 lpm)

The Overall Fire Picture

- Every 79 seconds a home catches fire
- Each year over 300,000 fires take the lives of nearly 3,000 people
  - Between 2011 and 2015, US fire departments responded to an average of 358,500 home structure fires per year
  - Average of 2,510 civilian fire deaths, 12,300 civilian fire injuries, and $6.7 billion in direct damage.
  - On average, 7 people died in U.S. home fires per day
- 80% of fire deaths occur in the home
- **Roughly 34% of the home fire deaths were caused by fires in which a smoke alarm was present and operated**
Understanding the Residential Fire Problem

Most fires and fire deaths occur in one- and two-family homes.

Reported Structure Fires by Property Use
2010 - 2014 Averages

<table>
<thead>
<tr>
<th></th>
<th>Fires (10,000)</th>
<th>Civilian Deaths</th>
<th>Civilian Injuries</th>
<th>Direct Property Damage (Millions USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartment, Tenement, Flat, or Multi-Family</td>
<td>107,760 (22.2%)</td>
<td>413 (15.2%)</td>
<td>4,278 (29.2%)</td>
<td>$1,271 (13.1%)</td>
</tr>
<tr>
<td>One- or Two-Family Dwelling or Manufactured Home</td>
<td>250,550 (51.6%)</td>
<td>2,104 (77.5%)</td>
<td>8,443 (57.6%)</td>
<td>$5,438 (56.0%)</td>
</tr>
</tbody>
</table>

Source: NFIRS 5.0 and NFPA survey

Where do Residential Fires Occur?

Most FATAL home fires start in the living room or bedroom.

Fact: 18% of home fire deaths resulted from fires beginning with upholstered furniture.
Questions

- Is a Listed Residential Sprinkler a “fast response” sprinkler?
  - Yes

- Are all sprinklers with “fast response” operating elements listed as “quick response”?
  - No

- Give an example of a sprinkler with a “fast response” operating element but not listed as “quick response”
  - Extended Coverage Ordinary Hazard Sprinklers
  - ESFR
  - Residential Sprinklers