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Fire Sprinklers – The Ultimate Fire Fighters

Eric Skare



Presentation Description

The residential fire problem has changed over the last several decades. Although some aspects have improved, fires in newly constructed and furnished homes can become deadly in as little as a few minutes. This presentation will provide an overview of why residential fire sprinklers are so effective, and so necessary in today's environment. New materials, design approaches, and applications will be highlighted to provide insight, awareness, and understanding of fire sprinkler systems. Learn how, and why, to incorporate this life saving technology into your cutting edge building designs.

Presenter Introduction - Eric Skare

Eric Skare, product manager, fire safety for Uponor, is a certified fire protection specialist (CFPS), has been a volunteer firefighter since 2002, and is a principal member of the National Fire Protection Association (NFPA) Technical Committee on Residential Sprinkler Systems. He is actively involved in various industry associations including chairing the Fire Sprinkler committee for the Plastic Pipe and Fittings Association (PPFA) and serving on the Residential Committee and Future Leadership Committee for the National Fire Sprinkler Association (NFSA).

Learning Objectives

- **The fire problem – and the solution**
- **Fire sprinkler myths**
- **Emerging technologies**



The Fire Problem

The image shows a room in a state of complete ruin. The walls are heavily charred and peeling, revealing the underlying brickwork in several places. The ceiling is severely damaged, with large sections missing and debris hanging down. The floor is covered in a thick layer of ash and charred debris. In the center of the room, there is a brick fireplace with a dark, charred mantel. To the right, a window is visible, its frame also charred. In the foreground, there is a large, dark, charred object that appears to be a piece of furniture, possibly a sofa or chair, which has been completely destroyed. The overall atmosphere is one of devastation and loss.

Flashover

- Flashover – the point where everything in the room suddenly and simultaneously ignites
- Approximately 1,100°F to 1,500°F
- Can occur in just a few minutes





**NOTHING
SURVIVES
FLASHOVER**

Modern Furnishings



Open Floorplans



- Large open spaces
- High, vaulted ceilings
- Fewer doors
- Nothing to contain heat, smoke and toxic gases
- Fires grow and spread rapidly



Lightweight Construction

- Cost effective
- Light and strong
- Quiet
- Poor performance when exposed to fire
- Structural failure in as little as 5 minutes



Myth #1: Smoke alarms are enough to keep me safe

Smoke alarms just aren't enough anymore...

Occupants don't have time to get out of the home...

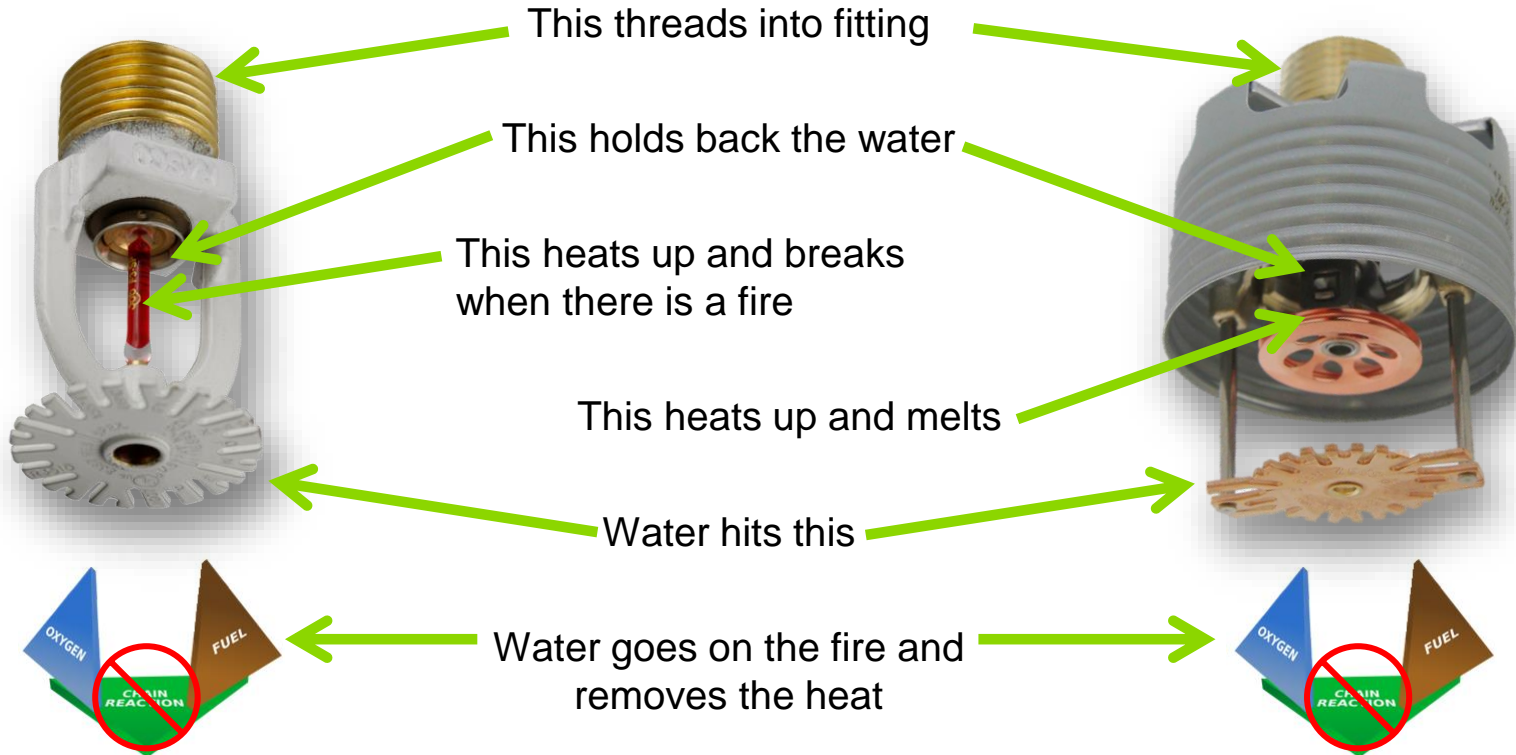
Flashover and structural collapse can occur in as little as just a few minutes...

Fire sprinklers are the solution



Fire Sprinkler Overview

Sprinkler Basics



Fire Sprinkler vs. Fire Hose



Myth #2: When one goes off they all go off

Myth #3: My house will get flooded if I burn the toast

Individually heat activated...

Will not activate by smoke...

10-15 gallons per minute vs 150 gallons per minute...

Fire damage, firefighter damage, or...

A fire sprinkler controlling the fire when it is small

Codes and standards

Sprinkler system installation requirements typically in accordance with NFPA (National Fire Protection Association) standards:

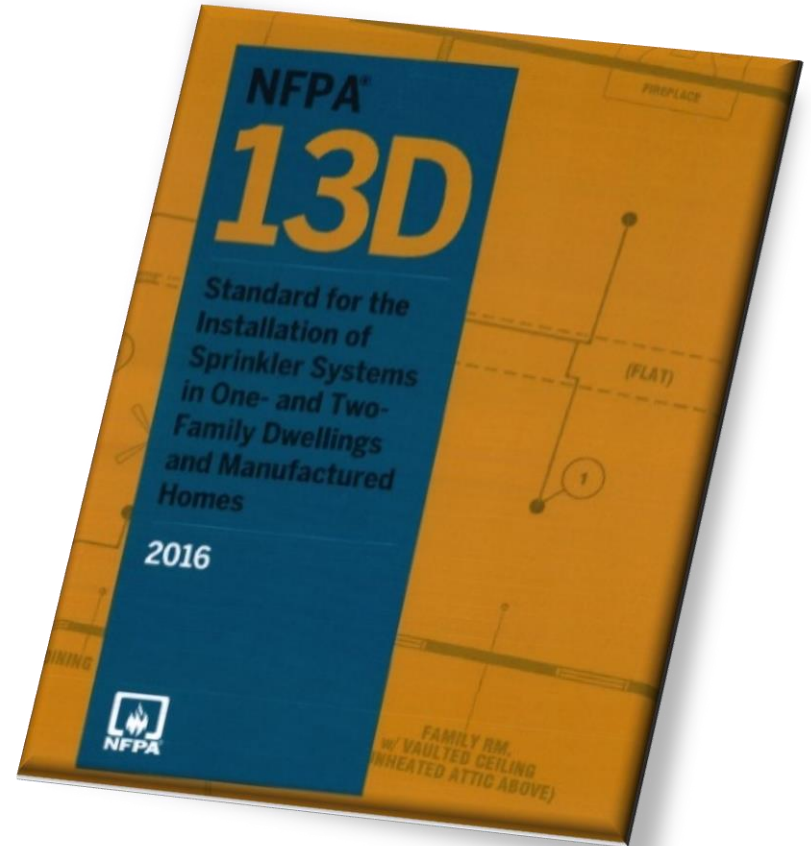
- NFPA 13
- NFPA 13R
- NFPA 13D — life safety

Model building codes require sprinklers

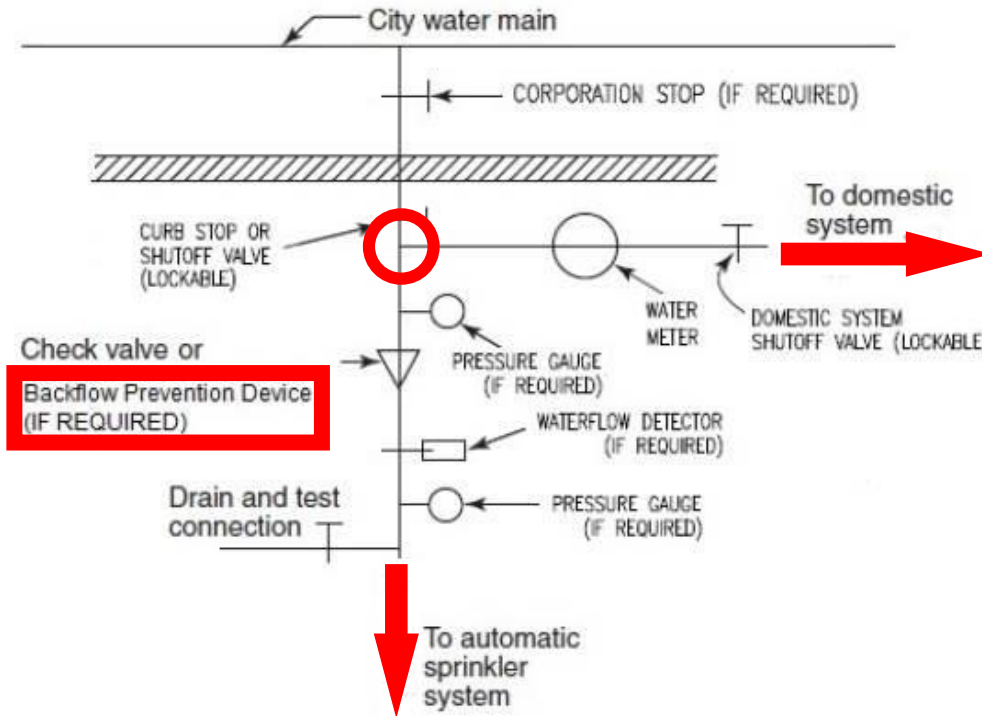


NFPA 13D

- Developed subcommittee in 1973
- Adopted in 1975
- Purpose is to prevent flashover
- Improve the chances for escape or evacuation
- One- and two-family dwellings, manufactured homes and townhomes
- Life-safety system



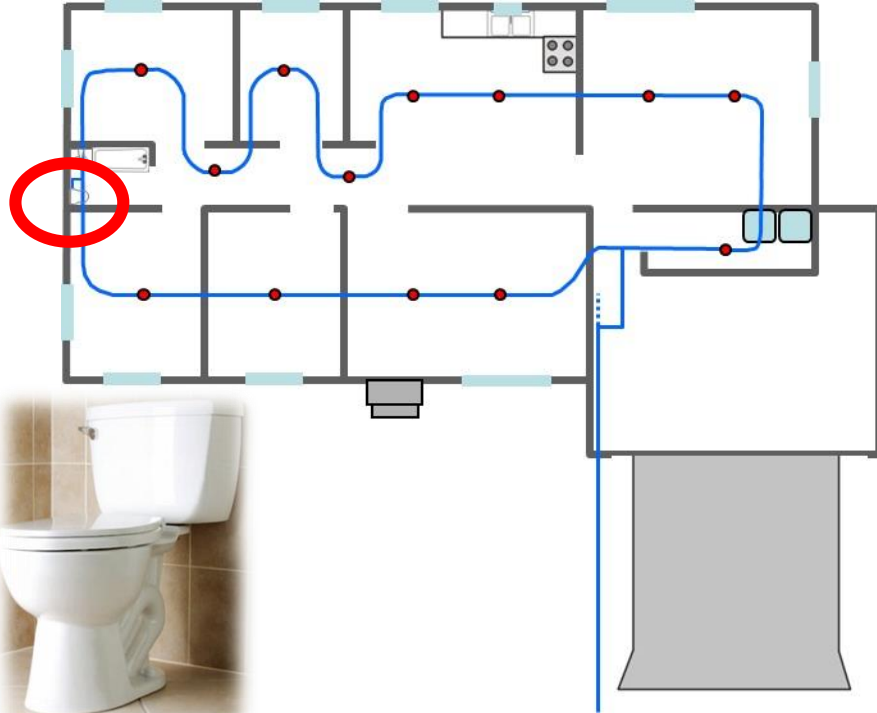
Standalone Sprinkler System



- Dedicated piping for fire sprinkler system
- Backflow prevention usually required
- Usually installed with CPVC pipe

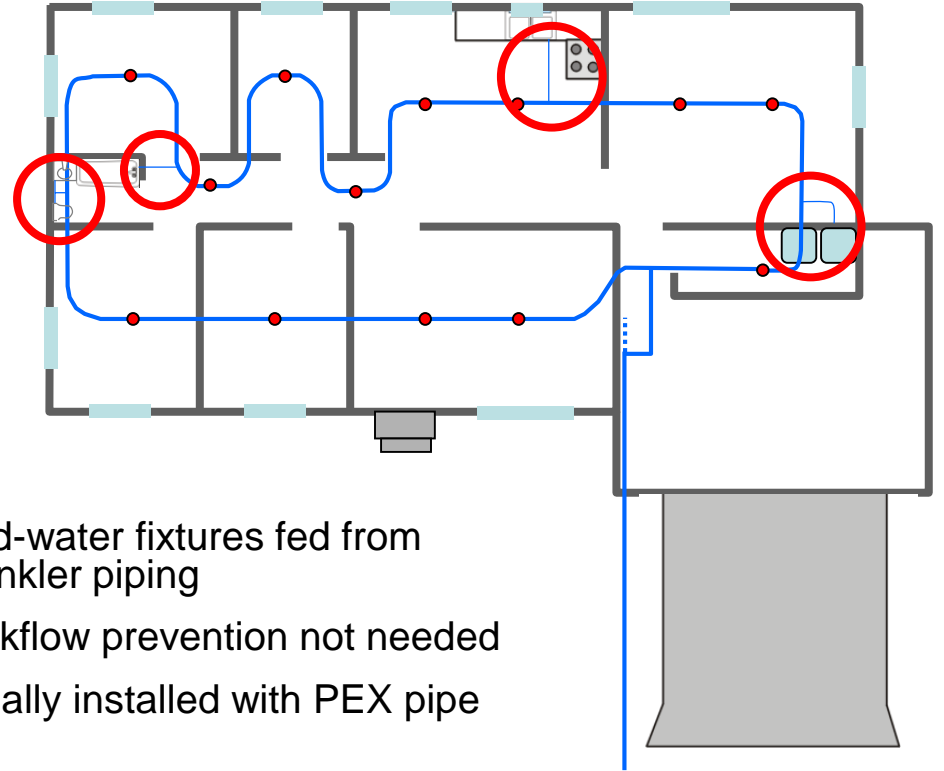


Passive Purge Sprinkler System



- Single toilet fed by sprinkler piping
- Backflow prevention may be required
- Installed with PEX or CPVC pipe

Multipurpose Sprinkler System



- Cold-water fixtures fed from sprinkler piping
- Backflow prevention not needed
- Usually installed with PEX pipe

Multipurpose Sprinkler System

- Less piping in the home
- Non-stagnant system
- Backflow prevention not needed
- Homeowner “tests” their system every day!



Attic Insulation

- For cold regions: $R_o = R_i (T_o - 40) / (40 - T_i)$
- For hot regions: $R_o = R_i (T_o - 120) / (120 - T_i)$
- Where
 - T_i = indoor, conditioned living space
 - T_o = outdoor, unconditioned attic space
 - R_i = R-value of insulation between tubing and conditioned living space below
 - R_o = R-value of insulation above tubing

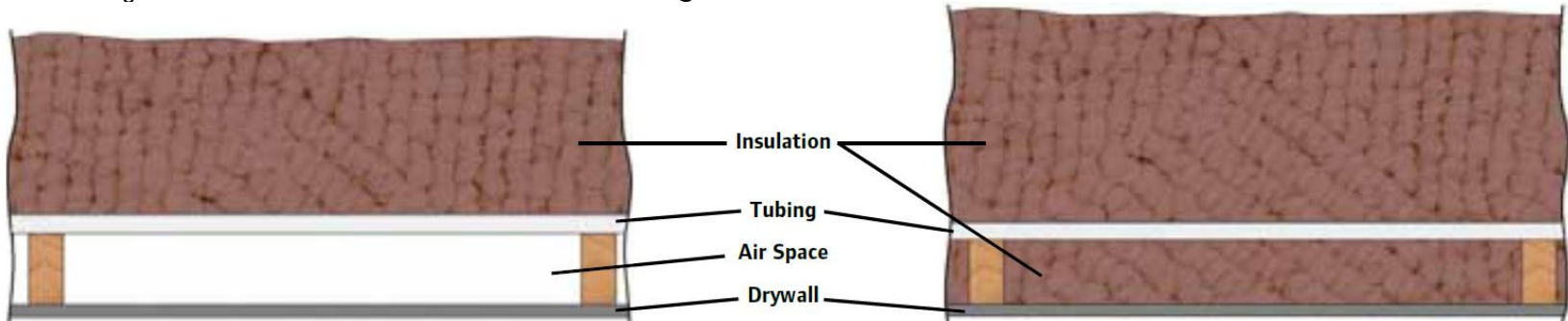


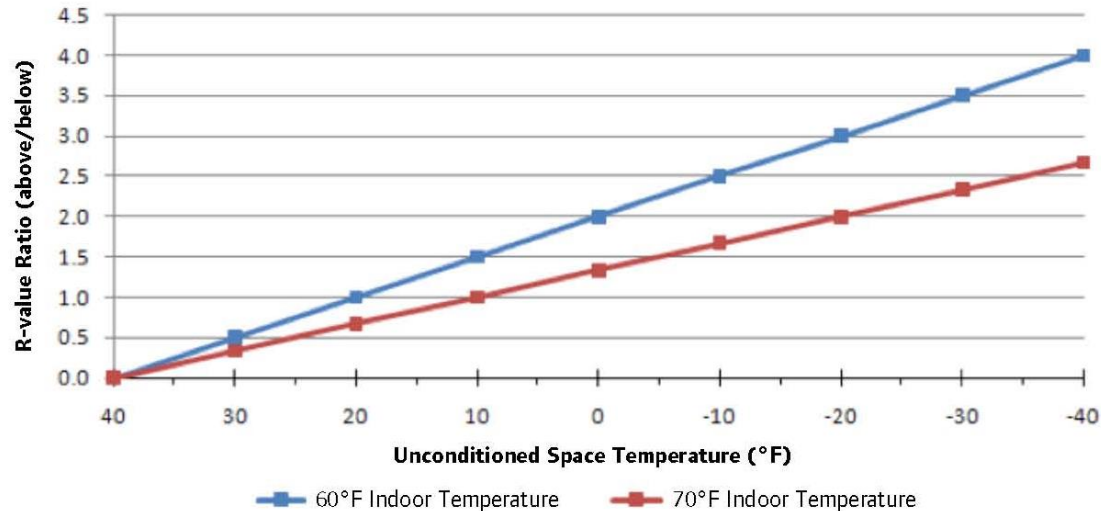
Figure 1: Preferred Installation Method

Figure 2: Alternative Installation Method

Attic Insulation

- For cold regions: $R_o = R_i (T_o - 40) / (40 - T_i)$
- For hot regions: $R_o = R_i (T_o - 120) / (120 - T_i)$

R-value Ratio vs. Attic Temperature — Protection from Cold



Graph 1: R-value Ratio vs. Attic Temperature — Protection from Cold

Vapor Barriers – Recessed Sprinklers

All penetrations must be sealed

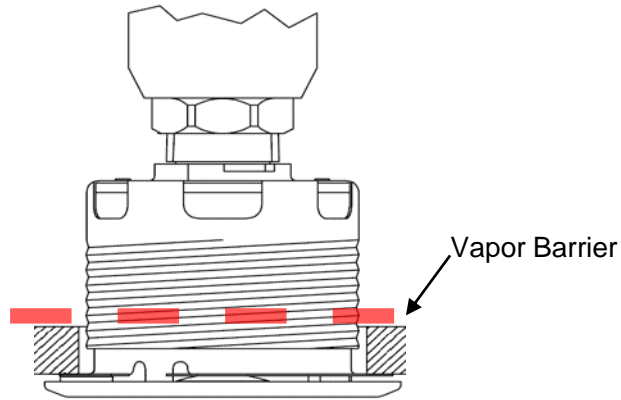


No issues with semi-recessed sprinklers

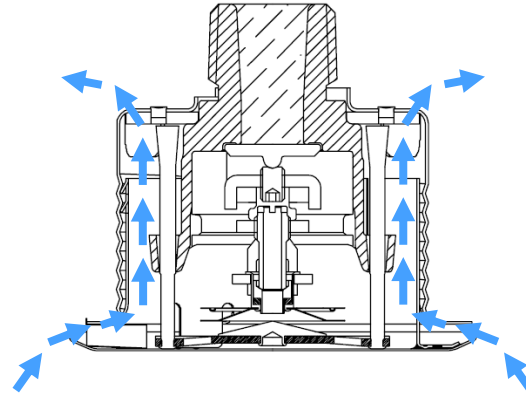


Vapor Barriers – Concealed Sprinklers

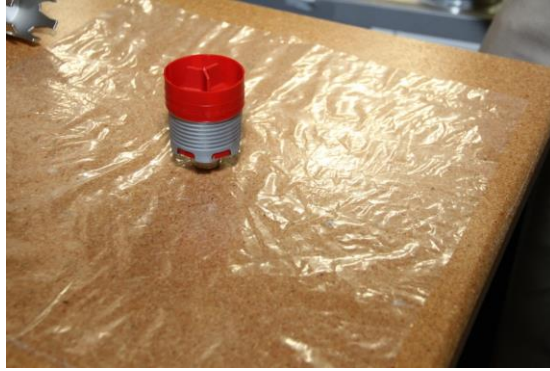
Insulator will want to seal around cup of flat concealed sprinkler head



Air must flow up through the sprinkler and out the top for correct operation



Vapor Barrier Solutions



AquaSAFE™ exposed listing

Approved to be installed and left exposed in:

- Dimensional lumber
- Engineered wood (LVL, Glulam)
- Wood I-joist
- Open-web wood joists (wood floor trusses)



"New" Technology

- Flexible PEX tubing
- Multipurpose – fire and plumbing combined
- Protecting exposed lightweight construction materials
- The forgotten system...hopefully



Summary – Learning Objectives

The fire problem – and solution

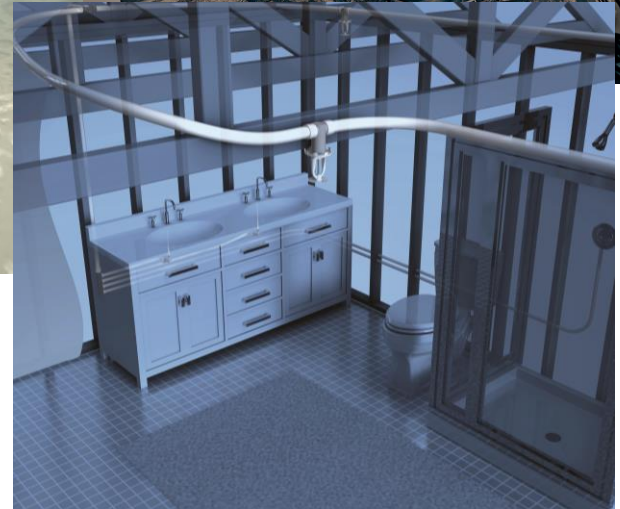
- Modern furnishings
- Open floor plans
- Modern (lightweight) construction

Fire sprinkler myths

- Smoke alarms are enough to keep me safe
- When one goes off they all go off
- My house will get flooded if I burn toast

Emerging technologies

- Multipurpose systems
- Flexible piping and system design
- Exposed applications



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Thank you

Eric Skare

eric.skare@uponor.com

612-345-0073