



## City of Portland, Oregon - Bureau of Development Services

1900 SW Fourth Avenue • Portland, Oregon 97201 | 503-823-7300 | [www.portlandoregon.gov/bds](http://www.portlandoregon.gov/bds)



### Deferred Submittal Requirements and Application

#### Applicants will provide:

☐ A copy of this application

☐ Three (3) sets of plans

☐ Two (2) set of calculations

☐ Two (2) sets of product information

Drawings and calculations must be stamped and signed by an Engineer registered in Oregon and approved by the Architect/Engineer of record for the building.

☐ Permit fee (paid at time of submittal)

☐ If the DFS includes exterior elements, plan views and elevations identifying the location(s) as approved by the Architect and Engineer of Record must be submitted.

☐ One (1) copy of your main building permit approved plans (NOTE: Approved plans do not need to be submitted if your project has a development liaison assigned.)

#### Contractor submittal information:

Contact name Austin Cheadle

Address 2000 SW 6th Ave Suite 420

City Portland State OR Zip Code 97201

Phone 971-678-5405 E-mail austine@fasterpermits.com

Value of deferred submittal 1,000 Issued main building permit # 19-105792-RS

Job site address 10840 SW 55th

Description/Scope of work Residential Fire sprinklers.

#### Fees

Deferred submittal (DFS) fees are collected in addition to the standard building review fee paid on the main building permit. DFS fees cover the cost of the additional processing and review time associated with the design build element.

The DFS fee for processing and reviewing deferred plan submittals is 10 percent of the building permit fee calculated using the value of the particular deferred portion of the project.

Minimum fee: Residential, one and two family dwelling ...\$123 for DFS with valuation of less than or equal to \$222,000

Commercial and all other projects .....\$307 for DFS with valuation of less than or equal to \$680,000

The Bureau of Development Services (BDS) fee schedule is also available on the BDS web site at [www.portlandoregon.gov/bds](http://www.portlandoregon.gov/bds) | select the Fees tab.

#### Helpful Information

Bureau of Development Services  
1900 SW 4th Avenue, Portland, OR 97201

Submit your plans to:  
Development Services Center (DSC), First  
Floor, For Hours Call 503-823-7310  
**DEFERRED SUBMITTAL REQUIREMENTS AND  
APPLICATION**

#### Important Telephone Numbers

BDS main number ..... 503-823-7300

DSC automated information line ..... 503-823-7310

Building code information ..... 503-823-1456

BDS 24 hour inspection request line ..... 503-823-7000

Residential information for  
one and two family dwellings ..... 503-823-7388

City of Portland TTY ..... 503-823-6868

*Information is subject to change.*

# Reliable®

## Model RFC43 (SIN RA0612) Model RFC49 (SIN RA0616) Flat Concealed Residential Sprinklers

Bulletin 006 Rev.D

**A Concealed Residential Sprinkler engineered for a minimum design density of 0.05 gpm/ft<sup>2</sup> with low GPM requirements.**

### Features

1. Very low water flow requirements.
2. ½" (13mm) Total adjustment.
3. Thread-On/Thread-Off or Push-On/Thread Off cover attachment option.
4. Smooth aesthetic ceiling profile.
5. Available in brass, chrome and black plated or painted finishes.

### Listings & Approval

1. Listed by Underwriters Laboratories, and certified by UL for Canada (cULus)
2. NYC MEA 258-93-E

### UL Listing Categories

Residential Automatic Sprinklers

### UL Guide Number

VKKW

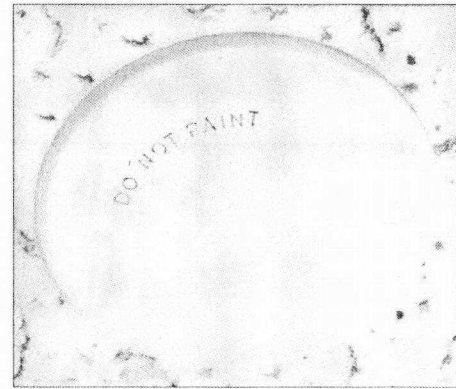
### Product Description

Model RFC43 and RFC49 Concealed Residential Sprinklers are fast response residential fusible solder link automatic sprinklers. Residential sprinklers differ from standard sprinklers primarily in their response time and water distribution patterns.

Model RFC43 and RFC49 sprinklers discharge water in a hemispherical pattern below the sprinkler deflector. Residential distribution patterns are higher and generally contain a finer droplet size than standard sprinkler patterns.

The combination of speed of operation and high discharge pattern required for residential sprinklers has demonstrated, in fire testing, an ability for controlling residential fires, and thereby providing significant evacuation time for occupants.

The RFC43 and RFC49 Sprinklers provide the best form of fire protection by combining an attractive appearance and ½" (13mm) of cover adjustment for ease of installation. The small diameter cover plate is easily and positively attached and blends into the ceiling, concealing the most dependable fire protection available, an automatic sprinkler system.



City of Portland  
Bureau of Development Services

JUN 11 2019

Reviewed for Code Compliance with the  
NFPA 13D Standard  
for Residential Sprinkler Systems

The RFC43 and RFC49 are UL Listed Residential Sprinklers to be installed in the residential portions of any occupancy in accordance with NFPA 13, 13R, & 13D.

The RFC43 and RFC49 can reduce the need for precise cutting of drop nipples. The threaded cover plate assembly can be adjusted without tools to fit accurately against the ceiling. The fire protection system need not be shut down to adjust or remove the cover plate assembly.

### Application and Installation

The RFC43 and RFC49, for residential installations, use a 165°F (74°C) fusible solder link in a tuning fork style sprinkler frame with a drop-down deflector. This assembly is recessed into the ceiling and concealed by a flat cover plate. The cover plate is attached to the skirt, using 135°F (57°C) ordinary temperature classification solder. When the ceiling temperature rises, the solder holding the cover plate releases the cover allowing the deflector to drop into position and



exposing the sprinkler inside to ceiling temperature. The subsequent operation of the solder link opens the waterway and causes the deflector to drop into position to distribute the discharging water in a hemispherical pattern below the sprinkler deflector. Any adjustment of thread engagement between the cover plate and cup will assure that the drop-down deflector is properly located below the ceiling. The residential distribution pattern contains a finer droplet size than a standard sprinkler, and the pattern produces significantly higher wall wetting.

After a 2 5/8 inch diameter hole is cut in the ceiling, the sprinkler is to be installed with the Model FC Wrench. When installing a sprinkler, the wrench is first positioned into the sprinkler/cup assembly and around the hexagonal body of the sprinkler frame. The Wrench must bottom out against the cup in order to ensure proper, safe installation. The sprinkler is then tightened into the pipe fitting. When inserting or removing the wrench from the sprinkler/cup assembly, care

should be taken to prevent damage to the sprinkler. DO NOT WRENCH ON ANY OTHER PART OF THE SPRINKLER/CUP ASSEMBLY. MODEL RFC43 AND RFC49 CONCEALED SPRINKLERS MUST BE INSTALLED ONLY WITH 135°F RATED COVERS.

Cover assemblies provide up to 1/2" (13mm) of adjustment. Turn the cover clockwise until the flange is in contact with the ceiling. For the push-on/thread-off option, the cover assembly is pushed onto the cup and final adjustment is made by turning the cover clockwise until the skirt flange makes full contact with the ceiling. Cover removal requires turning in the counter-clockwise direction.

In ceilings that have a plenum space above the sprinkler, the plenum space may have neutral or negative pressurization but must not be positively pressurized. Inspect all sprinklers after installation to ensure that the gap between the cover plate and ceiling and the 4 slots in the cup are all open and free from any air flow impediment.

## Temperature Rating

Sprinkler	Cover Plate	Max. Ambient Temp.
165°F/74°C	135°F/57°C	100°F/38°C

## Installation Data: RFC43 (SIN RA0612)

Thread Size inch (mm)	K Factor	Sprinkler Spacing ft. (m)	Maximum Distance to Wall ft. (m)	Minimum Distance between sprinklers, ft. (m)	Minimum Required Sprinkler Discharge	
					Flow gpm (Lpm)	Press. psi (bar)
1/2" (15mm)	4.3	12 x 12 (3.6x3.6)	6 (1.83)	8 (2.43)	12 (45)	7.8 (0.54)
1/2" (15mm)	4.3	14 x 14 (4.3x4.3)	7 (2.13)	8 (2.43)	13 (49)	9.1 (0.63)
1/2" (15mm)	4.3	16 x 16 (4.9x4.9)	8 (2.43)	8 (2.43)	13 (49)	9.1 (0.63)
1/2" (15mm)	4.3	18 x 18 (5.5x5.5)	9 (2.74)	8 (2.43)	18 (68)	17.5 (1.21)
1/2" (15mm)	4.3	20 x 20 (6.0x6.0)	10 (3.05)	8 (2.43)	21 (79)	23.8 (1.64)

Note: 1 bar = 100 Kpa

## Installation Data: RFC49 (RA0616)

Thread Size inch (mm)	K Factor	Sprinkler Spacing ft. (m)	Maximum Distance to Wall ft. (m)	Minimum Distance between sprinklers, ft. (m)	Minimum Required Sprinkler Discharge	
					Flow gpm (Lpm)	Press. psi (bar)
1/2" (15mm)	4.9	12 x 12 (3.6x3.6)	6 (1.83)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	14 x 14 (4.3x4.3)	7 (2.13)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	16 x 16 (4.9x4.9)	8 (2.43)	8 (2.43)	13 (49)	7.0 (0.48)
1/2" (15mm)	4.9	18 x 18 (5.5x5.5)	9 (2.74)	8 (2.43)	17 (64.3)	12.0 (0.83)
1/2" (15mm)	4.9	20 x 20 (6.0x6.0)	10 (3.05)	8 (2.43)	20 (75.7)	16.7 (1.14)

Note: 1 bar = 100 Kpa

**FOR SLOPED CEILING APPLICATIONS SEE RASCO BULLETIN 035.**

## Maintenance

Model RFC43 and RFC49 Concealed Sprinklers should be inspected quarterly and the sprinkler system maintained in accordance with NFPA 25. Do not clean sprinklers with soap and water, ammonia or any other cleaning fluids. Remove dust by using a soft brush or gentle vacuuming. Remove any sprinkler cover plate assembly which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Prior to installation, sprinklers should be maintained in the original cartons and packaging until used to minimize the potential for damage to sprinklers that would cause improper operation or non-operation.

## Model RFC43 and RFC49 Residential Concealed Sprinkler Specification

Sprinklers shall be cULus Listed low flow residential concealed sprinklers with drop-down deflector and adjustable flat cover plate engineered for a minimum design density of 0.05 gpm/ft<sup>2</sup>. Sprinkler frame and deflector shall be of bronze frame construction having a 1/2" NPT thread. Thermal element shall consist of an approved black-painted beryllium-nickel fusible solder link with symmetric lever mechanism, maintaining a Teflon-coated Belleville spring washer and machined brass cap water seal assembly containing no plastic parts. Sprinkler K-factor shall be nominal 4.3 (62.4), having a 7/16" orifice. Temperature rating shall be Ordinary 165°F (74°C); cover plate temperature rating to be

135°F (57°C). Cover plate assembly shall consist of a brass cover plate and copper alloy retainer flange allowing a 1/2" cover plate adjustment. Any secure engagement between the cover plate and the cup will assure that the drop-down deflector is properly located below the ceiling. A plastic protective cap shall be provided and factory installed inside the sprinkler cup to protect the drop-down sprinkler deflector from damage, which could occur during construction before the cover plate is installed. Standard cover finish: [Chrome] [White] [Specialty—specify]. Residential concealed sprinklers shall be Reliable Model RFC43, SIN RA0612 (Bulletin 006) or Model RFC49, SIN RA0616 (Bulletin 006).

## Ordering Information

### Specify:

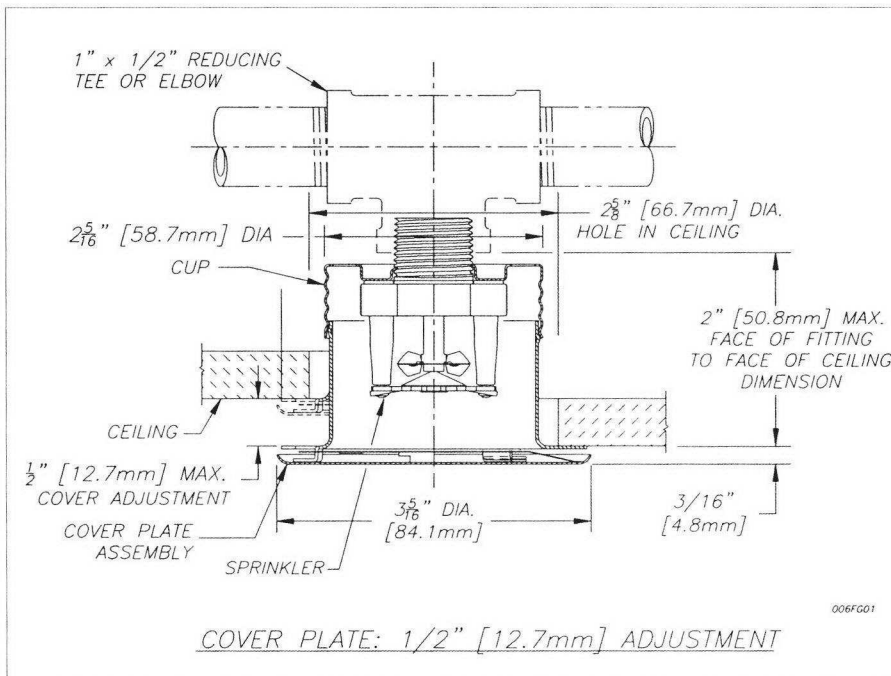
1. Sprinkler Model
2. Cover Plate Finish
3. Thread-On or Push-On Feature

## Cover Plate Finishes <sup>(1)</sup>

Standard Finishes
Chrome
White
Special Application Finishes
Bright Brass
Black Plating
Black Paint
Off White
Satin Chrome

<sup>(1)</sup> Other colors and finishes available. Consult factory for details.

**Note:** Paint or any other coatings applied over the factory finish will void all approvals and warranties.



# Reliable...For Complete Protection

Reliable offers a wide selection of sprinkler components. Following are some of the many precision-made Reliable products that guard life and property from fire around the clock.

- Automatic sprinklers
- Flush automatic sprinklers
- Recessed automatic sprinklers
- Concealed automatic sprinklers
- Adjustable automatic sprinklers
- Dry automatic sprinklers
- Intermediate level sprinklers
- Open sprinklers
- Spray nozzles
- Alarm valves
- Retarding chambers
- Dry pipe valves
- Accelerators for dry pipe valves
- Mechanical sprinkler alarms
- Electrical sprinkler alarm switches
- Water flow detectors
- Deluge valves
- Detector check valves
- Check valves
- Supertrol electrical system
- Sprinkler emergency cabinets
- Sprinkler wrenches
- Sprinkler escutcheons and guards
- Inspectors test connections
- Sight drains
- Ball drips and drum drips
- Control valve seals
- Air maintenance devices
- Air compressors
- Pressure gauges
- Identification signs
- Fire department connection

The equipment presented in this bulletin is to be installed in accordance with the latest pertinent Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances, whenever applicable. Products manufactured and distributed by RELIABLE have been protecting life and property for over 80 years, and are installed and serviced by the most highly qualified and reputable sprinkler contractors located throughout the United States, Canada and foreign countries.

Manufactured by:

# **Reliable®**

**The Reliable Automatic Sprinkler Co., Inc.**

(800) 431-1588

(800) 848-6051

(914) 829-2042

[www.reliablesprinkler.com](http://www.reliablesprinkler.com)

Sales Offices

Sales Fax

Corporate Offices

Internet Address



Revision lines indicate updated or new data  
E.G. Printed in USA 12/06 P/N 9999970261



uponor

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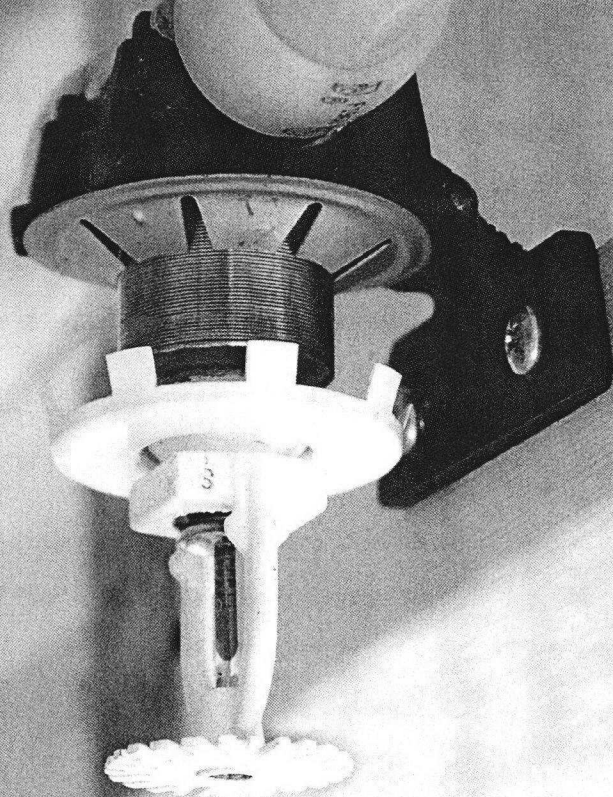
# Uponor AquaSAFE™ system installation guide

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City of Portland  
Bureau of Development Services

JUN 11 2019

Reviewed for Code Compliance with the  
NFPA 13D Standard  
for Residential Sprinkler Systems



Uponor AquaSAFE™ system installation guide

Published by Uponor

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**uponorpro.com**

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Fourth printing, August 2016

Printed in the United States of America

The Uponor AquaSAFE™ system installation guide is a manual published for architects, engineers, building officials, plumbing and fire safety professionals, and authorities having jurisdiction (AHJs). This guide describes the recommendations for installing the Uponor AquaSAFE residential fire sprinkler system in one- and two-family dwellings and manufactured homes, as specified in NFPA 13D.

Always refer to the NFPA 13D standard, and/or any other applicable codes, standards or ordinances for final determination of installation requirements.

Uponor has taken reasonable efforts in collecting, preparing and providing quality information and material in this document. However, system enhancements may result in modification of features or specifications without notice. For the most current technical information, go to the Uponor website at **uponorpro.com**.

Uponor is not liable for installation practices that deviate from this document or are not acceptable practices within the mechanical trades.

Please direct any questions regarding the suitability of an application or a specific design to a local Uponor representative by calling 800.321.4739 (U.S.) or 888.994.7726 (Canada).

**Note:** Some of the information provided in this installation guide may be pending formal documentation from listing agencies.



# Table of contents

<b>Section 1: General information .....</b>	<b>1</b>
Model code approvals, certifications, ratings and material standards .....	1
AquaSAFE exposed listing .....	2
Installation requirements.....	2
Exposed wood joist ceiling assemblies .....	2
Exposed finished ceiling assemblies .....	2
Handling and storing Uponor AquaPEX tubing and components .....	2
Uponor AquaSAFE multipurpose fire sprinkler system overview.....	3
Features and benefits .....	4
Standalone sprinkler system overview .....	4
Backflow prevention requirements .....	4
AquaSAFE system components .....	5
Uponor AquaPEX tubing.....	5
ProPEX sprinkler adapters and fittings.....	7
Equivalent tubing lengths.....	7
Residential sprinklers.....	8
Concealed sprinklers .....	8
Recessed pendent sprinklers .....	9
Flat concealed horizontal sidewall sprinklers .....	9
Recessed horizontal sidewall sprinklers.....	9
Recessed escutcheons.....	9
<b>Section 2: Design.....</b>	<b>11</b>
Sprinkler plans .....	11
Design information .....	11
Sprinkler technical data .....	12
Layout example.....	13
<b>Section 3: Installation overview .....</b>	<b>15</b>
Recommended tools .....	15
Product verification.....	15
Jobsite verification.....	15

Locating sprinkler and connection locations .....	16
Spacing from continuous obstructions.....	16
Minimum distances from heat sources.....	16
Floor-to-floor connection locations .....	17
Plumbing connection locations .....	17
Dead-end and arm-over connections .....	17
What to do if changes are required .....	17
<b>Section 4: Installing sprinkler adapters .....</b>	<b>19</b>
<b>Section 5: Installing sprinklers.....</b>	<b>23</b>
<b>Section 6: Installing tubing.....</b>	<b>25</b>
Making ProPEX® connections .....	25
General ProPEX connection tips .....	25
Making ProPEX connections with Milwaukee ProPEX expansion tools.....	27
With auto rotation (standard Milwaukee heads).....	27
Without auto rotation (standard Uponor heads) .....	28
Making ProPEX connections with ProPEX hand expander tools .....	29
Disconnecting a ProPEX brass fitting.....	30
Troubleshooting ProPEX connections .....	31
Fittings won't seal .....	31
Expansion is difficult .....	31
Expansion head slips out of tubing when making expansions.....	31
ProPEX ring slides down tubing during expansion .....	31
More than the recommended number of expansions are needed to make a connection .....	32
Cold-weather expansions .....	32
Bend radius and tubing support .....	32
Bending PEX.....	32
Reforming kinked tubing .....	32
Tubing support and tube talon guidelines .....	33
Tubing support spacing .....	33
Tubing uncoilers .....	34
Extreme temperature installations .....	35

<b>Section 7: Connecting plumbing runs.....</b>	<b>37</b>
<b>Section 8: Domestic water bypass .....</b>	<b>39</b>
Bypass components.....	39
Installation guidelines.....	40
Troubleshooting.....	40
Hard or unfiltered water issues.....	40
Flow test failure .....	40
<b>Section 9: Pressure testing .....</b>	<b>41</b>
<b>Section 10: Flow testing.....</b>	<b>43</b>
Flow test setup .....	44
Flow test assembly .....	44
Performing the test .....	45
Troubleshooting .....	45
Potential system supply problems .....	45
Potential system piping problems.....	46
Potential flow test procedure or equipment problems .....	46
<b>Section 11: Homeowner information .....</b>	<b>47</b>
Sprinkler cabinet .....	47
Warning sign .....	48
Warranty information.....	48



## Section 1


# General information

### Model code approvals, certifications, ratings and material standards

Uponor AquaPEX® tubing and ProPEX® fittings have achieved the following regulatory compliance (model code approvals, standards and certifications).

- UL      • NSF      • UPC
- C-UL   • CSA      • IPC

Uponor AquaPEX tubing and ProPEX fittings are listed to Underwriters Laboratories (UL) and Canadian Underwriters Laboratories (C-UL) for fire sprinkler systems of residential occupancies as defined in National Fire Protection Association (NFPA) 13D: *Standard for Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes*.

**Note:** Due to limited space on the products, affected Uponor products may carry one of the following UL and C-UL designations: us, cNSFus-pw-fs, cNSFus-pw-G-fs, cQAlus, and/or UL 1821. Refer to the UL, NSF or QAI websites at [ul.com](http://ul.com), [nsf.org](http://nsf.org), or [qai.org](http://qai.org) for documentation on the Uponor system.

Use only the materials specifically identified on the sprinkler plans and material lists to ensure compliance with fire protection listings.

Uponor AquaPEX tubing is manufactured in compliance with ASTM F876, ASTM F877, ASTM F1960 and ASTM F2023 as certified by NSF International.

Uponor AquaPEX tubing carries the following maximum pressure and temperature ratings.

- 80 psi at 200°F (5.5 bar at 93.3°C)
- 100 psi at 180°F (6.9 bar at 82.2°C)
- 130 psi at 120°F (8.9 bar at 48.9°C)\*
- 160 psi at 73.4°F (11 bar at 23°C)

\*This applies to ½", ¾", 1" and 1¼" Uponor AquaPEX white tubing, in compliance with UL 1821 and ULC/ORD C199P.

- The tubing and fittings for systems that are not equipped with a fire department connection are designed to have a working pressure of up to 130 psi (8.9 bar) at a temperature of 120°F (48.9°C).
- Water supplies for standalone systems must be maintained at less than 80 psi (5.5 bar) in accordance with NFPA 13D requirements.

Uponor AquaPEX tubing carries a standard grade rating recommended by the Plastics Pipe Institute (PPI).

Uponor AquaPEX tubing is listed to NSF International Standard 14, which defines requirements for ingredients, materials, products, quality assurance and marking.

Uponor AquaPEX tubing and Uponor sprinkler adapters are listed to NSF International Standard 61, which defines requirements for toxicity.

Uponor AquaPEX tubing and ProPEX fittings are certified compliant with the Canadian Standards Association, CAN/CSA B137.5: *Standard for Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications*.

## AquaSAFE exposed listing

Uponor AquaSAFE systems are now listed for use in exposed installations (basements) when installed in accordance with NFPA 13D, the QAI listing to UL 1821, *Thermoplastic Sprinkler Pipe and Fittings for Fire Protection Service* and the following guidelines.

### Installation requirements

Uponor AquaPEX white tubing and ProPEX fittings listed to UL1821 may be installed without protection (exposed) in the following assemblies:

#### Exposed wood joist ceiling assemblies

- The ceiling shall be horizontal and constructed using dimensional lumber (solid wood), engineered wood, engineered wood I-joists, or open-web wood joists (wood floor trusses).
- Joist depth between 6" and 16" deep with on-center spacing between 12" and 24". Open web wood joists may up to 18" deep.
- Joists may remain exposed after installation.
- Listed residential sprinklers with an activation temperature of 155°F (68.3°C) and 4.9 minimum K-factor shall be used in the exposed portion of the sprinkler system. Sprinkler spacing shall be no larger than 16'. Sprinklers shall be installed with deflectors no more than 1¾" below the bottom of the joist to account for future finished ceilings per NFPA 13D.
- Uponor AquaPEX tubing shall not be installed in locations with direct exposure to sunlight.
- Tubing shall be supported every 24" with metal pipe hangers designed for use with non-metallic pipe/tubing. Follow minimum bend radius limitations as detailed on **page 32** of this installation guide. Drilling through joists is an acceptable method of support if allowed by the AHJ, joist manufacturer and applicable building codes.

#### Exposed finished ceiling assemblies

- Ceiling shall be horizontal and must be finished with minimum ¾"-thickness gypsum wallboard, a suspended membrane ceiling with lay-in panels or tiles having a minimum weight of 0.35 lf/ft<sup>2</sup> installed with metallic support grids, or ½"-thick, code-complying plywood or solid sheathing.
- Tubing shall be supported every 24" with metal supports designed for use with non-metallic pipe/tubing. Follow minimum bend radius limitations as detailed on **page 32** of this installation guide. Drilling through joists is an acceptable method of support if allowed by the AHJ, joist manufacturer and applicable building codes.
- Listed residential sprinklers with an activation temperature of 155°F (68.3°C) and 4.9 minimum K-factor shall be used in the exposed portion of the sprinkler system. Sprinkler spacing shall be no larger than 16'. Sprinklers shall be installed with deflectors no more than 1¾" below the bottom of the joist to account for future finished ceilings per NFPA 13D.

## Handling and storing Uponor AquaPEX tubing and components

Although not comprehensive, the following highlights the most common guidelines and listing requirements when handling Uponor AquaPEX tubing and Uponor AquaSAFE system components:

- Install Uponor systems according to the installation instructions of the manufacturer. Failure to follow the instructions and installation guidelines can result in system function failure.
- Do not store sprinkler assemblies or cover plates in areas that may exceed 100°F (37.8°C).

- Uponor PEX tubing is listed for fire protection systems that do not exceed 130 psi (8.9 bar) 120°F (48.9°C).
- Do not use PEX tubing where temperatures and pressures exceed ratings.
- Store Uponor PEX tubing in its packaging under cover to avoid dirt accumulation and exposure to direct sunlight. Do not expose PEX tubing to direct sunlight for more than 30 days. Do not use tubing that has been exposed to direct sunlight for more than 30 days.
- Do not install PEX tubing in direct view of fluorescent lighting. Do not use tubing that has been exposed to direct fluorescent lighting for more than 30 days.
- Do not weld, glue or use adhesives or adhesive tape on PEX tubing.

**Note:** You may temporarily affix adhesive tape to Uponor PEX tubing during installation. However, to protect the integrity of the system, the tape should not be permanent. Remove the tape and residual adhesive after completing the installation.

- Do not apply open flame to PEX tubing.
- Do not install PEX tubing within 6" of any gas appliance vents, with the exception of double-wall B-vents or plastic vents, which have a minimum clearance of 1".
- Do not install PEX tubing within the first 18" of a connection to a water heater, unless otherwise allowed by code. Follow your local code requirements.
- Do not install PEX within 12" of any recessed light fixtures, unless the PEX tubing is protected with suitable insulation.
- Do not solder within 18" of any PEX tubing in the same water line. Make all sweat connections prior to making the fitting connection.
- Do not install PEX tubing between the tub/shower valve and tub spout.
- Do not use PEX tubing for an electrical ground.
- Do not spray on or allow any organic chemicals, pesticides, strong acids or strong bases to be exposed to PEX tubing.

- Do not use petroleum or solvent-based paints on PEX tubing.
- Use only approved and appropriate firestop materials with PEX tubing. Verify firestop compatibility with the firestop manufacturer.
- Although PEX tubing does not attract rodents, pests and other insects, these uninvited guests can have detrimental effects on PEX system integrity as well as duct systems, electrical systems and other integrated systems in a home. Property owners should take steps to eliminate pests.
- Do not subject PEX tubing to impact.
- During remodeling or ceiling repair, take appropriate precautions to protect the tubing and sprinklers from damage.
- Do not install PEX tubing and ProPEX fittings in combustible, concealed spaces where sprinklers are required by NFPA 13D standard and the National Building Code of Canada (as applicable).

## Uponor AquaSAFE multipurpose fire sprinkler system overview

The AquaSAFE system is a cost-effective way to provide reliable and safe home fire protection. This progressive technology combines the plumbing and fire sprinkler systems into an efficient, low-cost, multipurpose system featuring dependable Uponor AquaPEX tubing.

Uponor AquaSAFE systems are available in various system layouts. **Figure 2-1 on page 13** depicts a looped system configuration.

In a multipurpose system, individually heat-activated fire sprinklers attach to Uponor sprinkler adapter fittings. Flexible Uponor AquaPEX tubing supplies water to each sprinkler, as well as cold-water plumbing fixtures. Because the plumbing and the fire sprinkler systems are merged into one system, water availability to the sprinklers is verified each time a plumbing fixture is used.



Uponor AquaPEX tubing is made of crosslinked polyethylene (PEX) and is designed to withstand pressures and temperatures of 130 psi at 120°F (8.9 bar at 48.9°C) in accordance with UL 1821 and ULC/ORD C199P.\*

\*This applies to ½", ¾", 1" and 1¼", Uponor AquaPEX white tubing.

Installation of the AquaSAFE system must comply with the following requirements.

- NFPA 13D *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*
- National Building Code of Canada (as applicable)
- Other recognized or adopted installation criteria deemed acceptable to the AHJ

The Uponor AquaSAFE system uses sprinkler adapter fittings with a ½" NPT outlet to attach the fire sprinkler. Refer to the Uponor Product Catalog for all adapter fittings.

ProPEX tees and multiport tees supply the cold-water fixtures. Hot water is supplied directly to necessary plumbing fixtures throughout the house in a separate system.

### Features and benefits

- 25-year warranty on Uponor AquaPEX tubing and ProPEX fittings when used together\*
- Easily integrates into the plumbing system
- Improves water pressure at all fixtures
- Quickly installed using ProPEX fitting connections
- Verifies fresh water is available to the sprinklers each time an occupant uses a cold-water plumbing fixture

\* Must be installed by an Uponor-trained, licensed contractor. See [uponorpro.com/warranties](http://uponorpro.com/warranties) for details.

## Standalone sprinkler system overview

Uponor AquaSAFE products may also be installed as a standalone sprinkler system as allowed by NFPA 13D. Standalone fire sprinkler systems utilize the same individually heat-activated fire sprinklers as in multipurpose systems, but they are supplied by completely separate piping serving only the fire sprinklers. Standalone sprinkler systems typically require backflow prevention because the water in the sprinkler piping is stagnant. NFPA 13D requires the water supply for PEX-based standalone systems to be limited to 80 psi (5.5 bar) or less. If the maximum static pressure of the water supply is more than 80 psi (5.5 bar), a pressure-reducing valve may be employed to limit the pressure but an automatic means of pressure relief must be installed on the sprinkler system piping.

As with multipurpose systems, Uponor PEX and ProPEX fittings may not be used on standalone systems with a fire department connection.

### Backflow prevention requirements

With non-stagnant multipurpose fire sprinkler and plumbing systems, backflow prevention devices are not typically required. Check local code for any applicable backflow requirements. Backflow prevention may be required with standalone systems.

# AquaSAFE system components

## Uponor AquaPEX tubing

Uponor AquaPEX tubing is an installation-friendly construction product. The flexibility of Uponor AquaPEX allows the installer to eliminate many of the joints normally

required with a rigid piping system—saving installation time and expense. Uponor recommends the procedures outlined in this section to simplify installation.

UPONOR AquaPEX® PEX 5106 1.0IN SDR9/  B137.5 POTABLE/  US 130PSI 120°F UL1821/ULC-ORD C199P (  NSF) ASTM F876/F877/F2023) (ASTM F1960/F1807/F2098/F2080)/ICCSR-1099/ICBO ES ER4407/HUD MR1269b (WHI-LISTED CAN/US FS25/SD50)/160PSI 73.4°F/100PSI 180°F/80PSI 200°F UPONOR-PEX-a TUBING UN04950127<sup>1</sup> xxxxxx<sup>2</sup>

An example of the labeling (print line) on Uponor AquaPEX tubing reads as:

<sup>1</sup>USA, material type, extruder no., year, month, day

<sup>2</sup>Footage marking in increments of five

For an explanation of each marking, refer to **Table 1-1** on the following page.

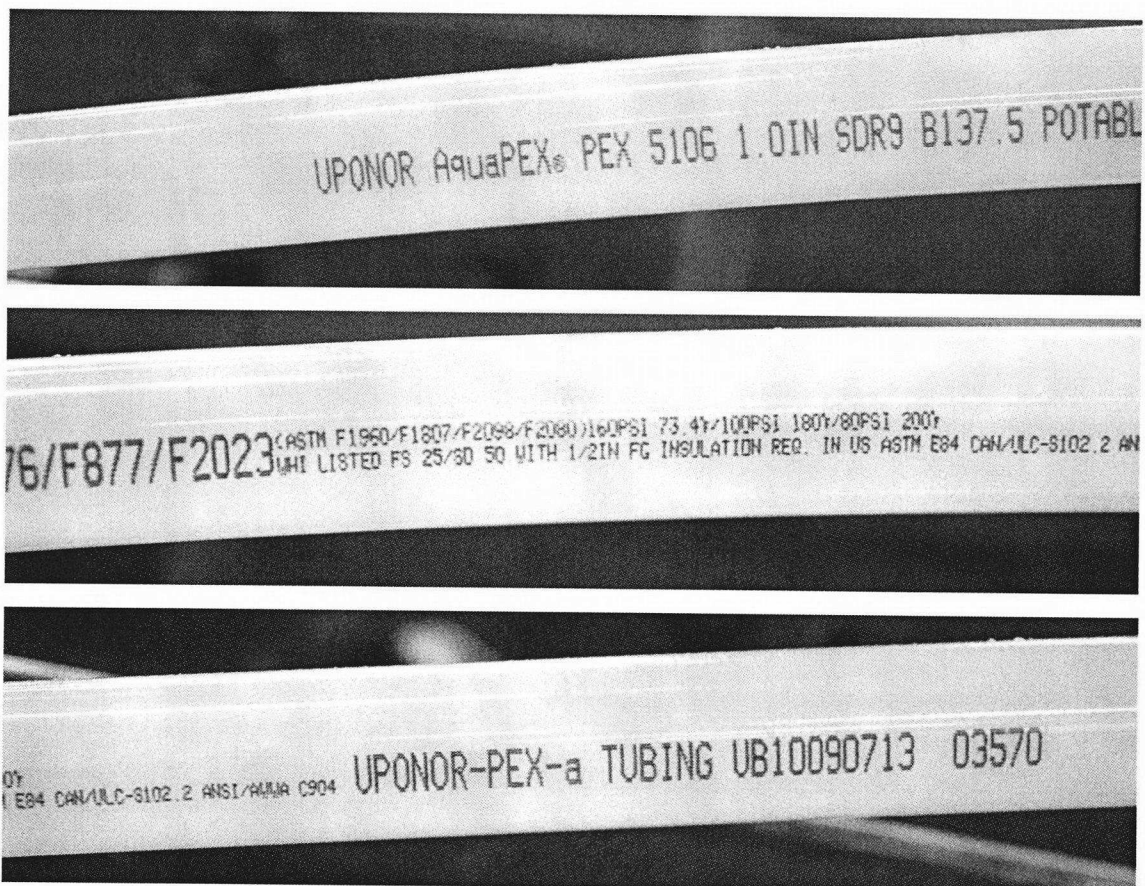





Figure 1-1: Uponor AquaPEX tubing

Print stream on tubing	Explanation
UPONOR AquaPEX	Brand name
PEX 5106	ASTM F2023 testing I/A/W ASTM F876
½IN	Tubing size (example: ½")
SDR9	Standard dimensional ratio of 9
 B137.5 POTABLE	Potable water listing by CSA
UL1821 130PSI 120°F (49°C)	Rating I/A/W UL 1821 (½", ¾", 1" and 1¼" only)
ULC-ORD C199P	Canadian rating I/A/W UL1821 and C199P
 ASTM F876/F877/F2023	ASTM tubing standards listed by NSF
ASTM F1960/F2080/F1807	ASTM fitting standards listed by NSF
	IAPMO reports 3558, 3960
ICC ESR-1099	ICC Evaluation Services Report ESR-1099
ICC ESR1529	ICC Evaluation Services Report ESR 1529
HUD MR1269d	HUD Material Release Report 1269d
WHI-LISTED CAN/US FS25/SD50	Warnock Hersey listing for 25/50 plenum rating
160PSI 73.4°F (23°C)/100PSI 180°F (82°C)/80PSI 200°F (93°C)	Hydrostatic ratings from PPI in accordance with ASTM F876
UPONOR PEX-a TUBING	Type of crosslinking (PEX-a)
UN04950127 <sup>1</sup>	Manufacturing code to audit material source
xxxxxx <sup>2</sup>	Footage marker in increments of five feet

**Table 1-1: Print stream identification**

<sup>1</sup> USA, material type, extruder no., year, month, day

<sup>2</sup> Footage marking in increments of 5'

## ProPEX sprinkler adapters and fittings

Uponor offers sprinkler adapter fittings specifically designed for the AquaSAFE system. These fittings feature ProPEX connections and a standard 1/2" NPT outlet for connecting fire sprinklers.

Tables 1-2, 1-3 and 1-4 show the required tubing lengths needed to approximate the equivalent pressure resistance of the different types of Uponor ProPEX fittings.

Reducing fittings	Flow	Equiv. length
EP reducing coupling (1" x 3/4")	Through	3
EP reducing coupling (1 1/4" x 3/4")	Through	4
EP reducing coupling (1 1/4" x 1")	Through	3
EP reducing tee (3/4" x 3/4" x 1")	Through	2
	Branch	6
EP reducing tee (1" x 3/4" x 3/4")	Through	3
	Branch	17
EP reducing tee (1" x 3/4" x 1")	Through	3
	Branch	16
EP reducing tee (1" x 1" x 3/4")	Through	2
	Branch	7
EP reducing tee (1 1/4" x 1" x 3/4")	Through	4
	Branch	6
EP reducing tee (1 1/4" x 1" x 1")	Through	11
	Branch	23
EP reducing tee (1 1/4" x 1 1/4" x 3/4")	Through	3
	Branch	6
EP reducing tee (1 1/4" x 1 1/4" x 1")	Through	5
	Branch	7

Table 1-3: Equivalent tubing lengths of Uponor reducing fittings

## Equivalent tubing lengths

Standard fitting type	Pipe dimension (in)			
	Flow	3/4"	1"	1 1/4"
EP coupling	Through	1	1	1
Brass coupling	Through	1	1	—
EP elbow	Through	11	12	11
Brass elbow	Through	5	6	—
EP tee	Through	2	2	4
	Branch	17	14	9
Brass tee	Through	1	1	—
	Branch	6	6	—
Brass sweat adapter	Through	3	3	4
Brass male threaded adapter	Through	3	4	5
Brass female threaded adapter	Through	3	4	5

Table 1-2: Equivalent tubing lengths of Uponor standard fittings

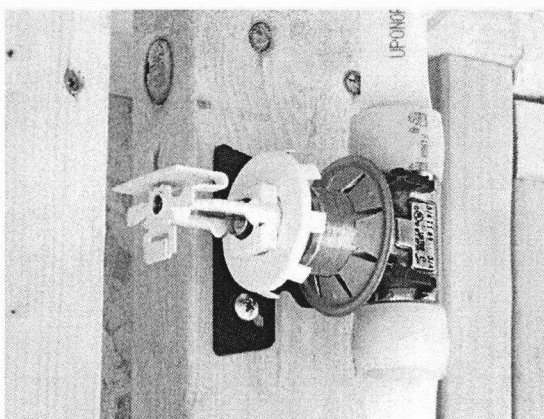
Flow-through multiport tees (1/2" outlets)	Flow	Equiv. length
EP Flow-through multiport tee, 2 outlets, 3/4" x 3/4" ProPEX	Through	2
EP Flow-through multiport tee, 3 outlets, 1" x 3/4" ProPEX	Through	4
EP Flow-through multiport tee, 3 outlets, 3/4" x 3/4" ProPEX	Through	9
EP Flow-through multiport tee, 4 outlets, 3/4" x 3/4" ProPEX	Through	9
EP Flow-through multiport tee, 4 outlets, 1" x 1" ProPEX	Through	2
EP Flow-through multiport tee, 4 outlets, 1" x 3/4" ProPEX	Through	3
EP Flow-through multiport tee, 6 outlets, 3/4" x 3/4" ProPEX	Through	4
EP Flow-through multiport tee, 6 outlets, 1" x 3/4" ProPEX	Through	4
EP Flow-through multiport tee, 6 outlets, 1" x 1" ProPEX	Through	3

Table 1-4: Equivalent tubing lengths of Uponor flow-through multiport tees





**Figure 1-2: ProPEX tee with concealed sprinkler head**

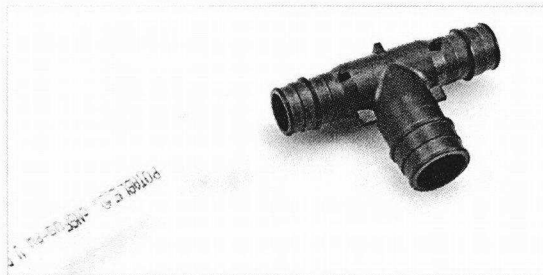


**Figure 1-3: ProPEX tee with horizontal sidewall sprinkler**

Uponor ProPEX fittings, used with Uponor AquaPEX tubing, are manufactured according to the ASTM F1960 standard. Uponor offers a complete line of NSF 61-listed ProPEX fittings. ProPEX fittings are made from engineered polymer (EP) or lead-free (LF) brass for various connection needs.

Connections are made by sliding a ProPEX ring over the PEX tubing and expanding them simultaneously. The expanded tubing and ProPEX ring then slide over the fitting. The connection is made as the PEX tubing shrinks over the fitting due to the unique shape memory of Uponor AquaPEX tubing.

Refer to the Uponor Product Catalog for a current listing of all ProPEX fittings listed for use in fire protection systems.



**Figure 1-4: Uponor PEX tubing, ProPEX ring and ProPEX EP tee**

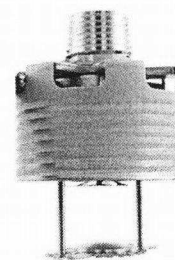
## Residential sprinklers

Only NSF-listed residential fire sprinklers are compatible with AquaSAFE multipurpose fire safety systems. Other residential sprinklers not shown in the Uponor Product Catalog may be used with standalone systems. Contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email or [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) for more information.

**Note:** Ensure all sprinklers are installed within their listing limitations. Sprinklers shown here and in the Uponor Product Catalog are compliant with the NFPA 13D standard. Do not store sprinklers in areas that may exceed 100°F (37.8°C).

## Concealed sprinklers

Concealed sprinklers feature a plate that drops away from the sprinkler when the temperature reaches between 135°F (57°C) and 140°F (60°C). The sprinkler activates when the temperature reaches between 162°F (72°C) and 165°F (74°C). In areas where ambient ceiling temperatures exceed 100°F (38°C), intermediate-temperature sprinklers are required.



**Figure 1-5: Concealed sprinkler**

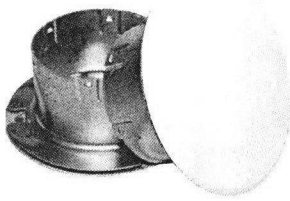


Figure 1-6: Concealed sprinkler cover plate



**Caution:** Do not paint cover plates. Paint coverage may interfere with the heat sensitivity of the sprinkler.

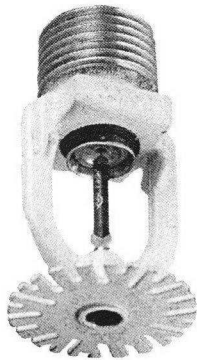


Figure 1-7: Recessed pendent sprinkler

### Recessed pendent sprinklers

Recessed pendent sprinklers are visible in the ceiling and do not use a cover plate. Recessed sprinklers activate when temperatures exceed 155°F (68°C). In areas where ambient ceiling temperatures exceed 100°F (38°C), intermediate temperature sprinklers are required.

### Flat concealed horizontal sidewall sprinklers

Flat concealed horizontal sidewall sprinklers are installed in the wall and concealed by a special flat cover plate that releases prior to sprinkler operation at 165°F (74°C).

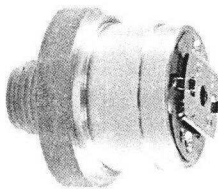


Figure 1-8: Flat concealed sidewall sprinkler

### Recessed horizontal sidewall sprinklers

Recessed horizontal sidewall sprinklers protrude through the wall of the room, typically between 4" and 6" below the ceiling.

The sidewall sprinkler activates when temperatures exceed 155°F (68°C). Intermediate temperature sprinklers are required where ambient ceiling temperatures exceed 100°F (38°C).

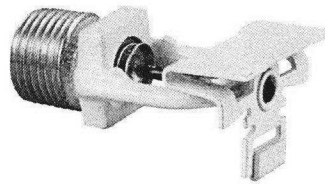


Figure 1-9: Recessed horizontal sidewall sprinkler

### Recessed escutcheons

Recessed escutcheons include a tension collar, and are available in white or bronze to provide a finished appearance for sprinklers.



**Caution:** Do not paint over the sprinklers and cover plates. Paint may interfere with the heat sensitivity of the sprinkler, and disturbances may damage the sprinkler.

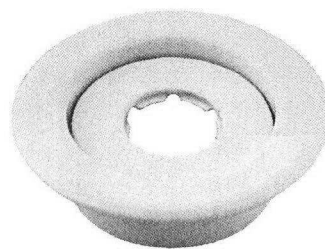


Figure 1-10: Recessed escutcheon

## Section 2

# Design

### Sprinkler plans

Uponor can supply all necessary sprinkler layout design plans. Uponor designers use hydraulic calculation software to create system layouts that provide reliable fire sprinkler protection. This software specifies the proper sprinkler locations, necessary flow rates and pressures. The resulting designs comply with nationally recognized fire codes and standards and meet the requirements of the NFPA 13D standard and the National Building Code of Canada (as applicable).

Contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) for information. Certified designers can contact Uponor Design Services for information about integrating Uponor AquaSAFE details into existing sprinkler design software.

### Design information

Uponor's design provides the following information:

- **Model** — Type of sprinkler used
- **Nominal orifice size** — The size of the orifice on the sprinkler
- **Temperature rating** — The temperature at which the sprinkler will activate
- **K factor** — A number that describes the size of the hole available for water flow through the sprinkler
- **Maximum sprinkler spacing** — The maximum spacing between the sprinklers (determined by the designer and indicated for each sprinkler on the layout)
- **Maximum distance to wall** — The maximum distance the sprinkler may be placed from the wall (equal to half the maximum sprinkler spacing designated on the layout)
- **Single sprinkler** — When performing a single-sprinkler flow verification test, the pressure and flow requirements for that sprinkler at various spacing
- **Two or more sprinklers** — When performing a flow verification test for two or more sprinklers, the pressure and flow requirements for those sprinklers at the selected spacing

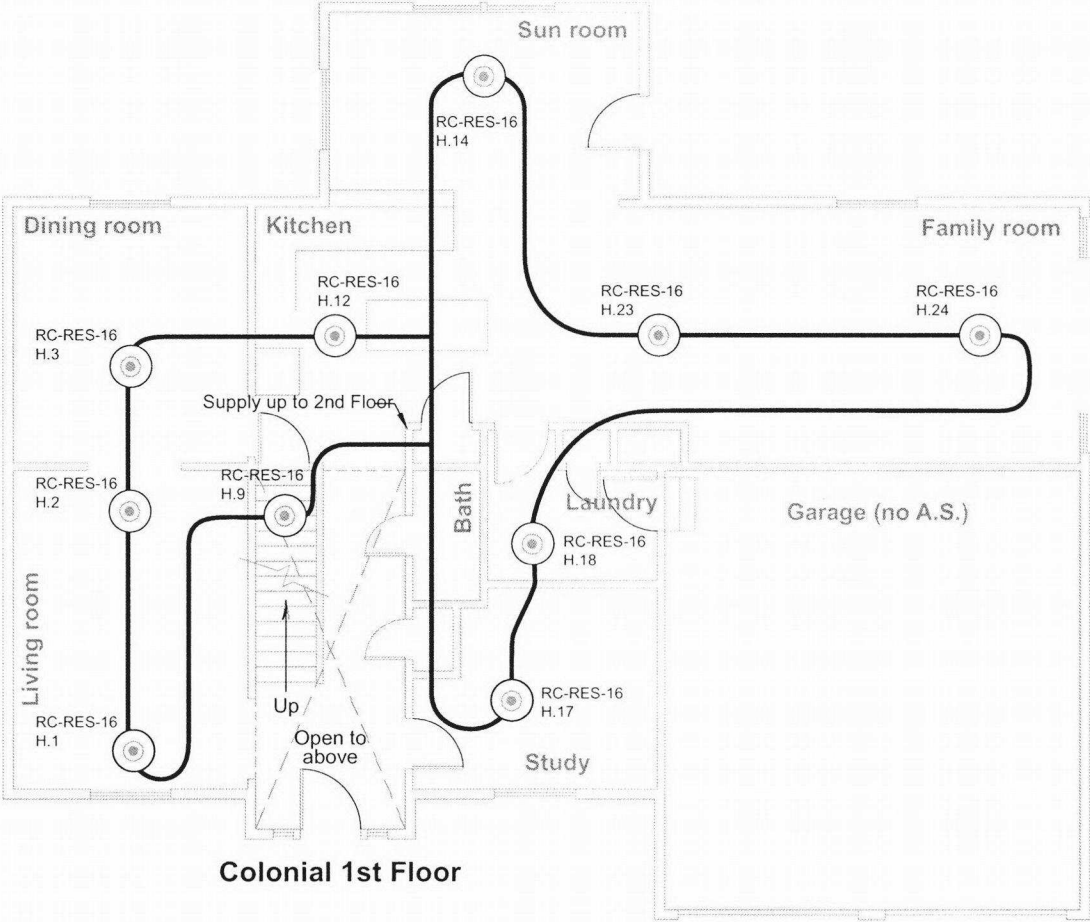
## Sprinkler technical data

Part no.	Model	Temp. rating (°F/°C)	K factor	Max. sprinkler spacing (ft./m)	Flow (gpm/lpm)	Pressure (psi/bar)
LF74970FWC	RC-RES	162/72	4.9	12x12/3.7x3.7	13/49.2	7.0/0.48
				14x14/4.3x4.3	13/49.2	7.0/0.48
				16x16/4.9x4.9	13/49.2	7.0/0.48
				18x18/5.5x5.5	17/64.3	12.0/0.83
				20x20/6.1x6.1	21/79.5	18.4/1.27
LF74971FW	RC-RES	175/79	4.9	12x12/3.7x3.7	13/49.2	7.0/0.48
				14x14/4.3x4.3	13/49.2	7.0/0.48
				16x16/4.9x4.9	14/53.0	8.2/0.57
LF3000WH	VK4700	155/68	3.0	18x18/5.5x5.5	18/68.1	13.5/0.93
				12x12/3.7x3.7	8/30.3	7.1/0.49
				14x14/4.3x4.3	10/37.9	11.1/0.77
LF73001WH	VK4700	175/79	3.0	16x16/4.9x4.9	13/49.2	18.8/1.29
				12x12/3.7x3.7	8/30.3	7.1/0.49
				14x14/4.3x4.3	10/37.9	11.1/0.77
LF74900WH	VK4680	155/68	4.9	16x16/4.9x4.9	13/49.2	7.0/0.48
				18x18/5.5x5.5	17/64.4	12.0/0.83
				20x20/6.1x6.1	20/75.7	16.7/1.15
				12x12/3.7x3.7	13/49.2	7.0/0.48
				14x14/4.3x4.3	13/49.2	7.0/0.48
LF74901WH	VK4680	175/79	4.9	16x16/4.9x4.9	13/49.2	7.0/0.48
				18x18/5.5x5.5	17/64.4	12.0/0.83
				20x20/6.1x6.1	20/75.7	16.7/1.15
				12x12/3.7x3.7	13/49.2	9.6/0.66
				14x14/4.3x4.3	14/53.0	11.1/0.77
LF74300HW	VK4840	155/68	4.2	16x16/4.9x4.9	16/60.6	14.5/1.00
				16x18/4.9x5.5	19/71.9	20.5/1.41
				16x20/4.9x6.1	22/83.3	27.4/1.89
				12x12/3.7x3.7	13/49.2	9.6/0.66
				14x14/4.3x4.3	15/56.8	12.8/0.88
LF74301HW	VK4840	175/79	4.2	16x16/4.9x4.9	17/64.4	16.4/1.13
				16x18/4.9x5.5	19/71.9	20.5/1.41
				16x20/4.9x6.1	22/83.3	27.4/1.89
				12x12/3.7x3.7	11/41.7	7.6/0.52
				14x14/4.3x4.3	13/49.3	10.6/0.73
LF74000HS	VK4800	165/74	4.0	16x16/4.9x4.9	16/60.6	16.0/1.10
				16x18/4.9x5.5	17/64.4	18.1/1.25

Table 2-1: Sprinkler flow example



Layout example



H.#	Sprinkler ID
Sprinkler node number	Type of sprinkler and its maximum spacing

Figure 2-1: Layout example

## Section 3

# Installation overview

**Important!** Ensure a qualified, Uponor-trained AquaSAFE installer is always on the jobsite during installation.

### Recommended tools

- NFPA 13D standard
- Installation instructions and spacing guidelines from sprinkler manufacturer
- ProPEX expander tool
- Appropriate sprinkler wrench (identified on Uponor materials list) and ratchet
- Tube cutter
- Teflon tape
- Screws: #10 x 1½" coarse-thread screws
- Uponor tubing uncoiler
- Drill with drive bits and drill bits (including large bore: 1⅜" to 3")
- Circular saw
- Tape measure
- Hammer
- Wrenches (2) or adjustable pliers
- Speed square
- Level
- Plumb bob and/or chalk string
- Permanent marker
- Heat gun
- Extension cords and portable lighting
- Ladder(s) and/or scaffolding

### Product verification

- Verify quantity and type of sprinklers.
- Verify quantity and type of ProPEX sprinkler adapters.
- Verify appropriate cover plates and/or escutcheons are available for each sprinkler.
- Ensure protective caps are available for installation on every sprinkler.
- Verify enough Uponor tube talons are available for proper support of Uponor AquaPEX tubing.
- Ensure ProPEX plugs are available to plug plumbing rough-in for flow test.
- Verify quantity and type of ProPEX tees to connect plumbing rough-in and for floor-to-floor connections and same-floor interconnection of sprinkler loops.

### Jobsite verification

To verify the sprinkler plan is appropriate, walk the entire job prior to installation. Contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) to determine if observed changes require a redesign.

Verify the sprinkler plans match the layout of the residence. Confirm walls, beams, ceiling vaults, and other features are consistent with the sprinkler plan and any other architectural features of the building have not changed.

- Verify adequate water supply. Ensure water supply details match the sprinkler plan, design parameters and confirm appropriate water meter.
- Verify the final elevations match those submitted on the design request form. The sprinkler system was designed with these parameters, and differences can result in flow and pressure inconsistencies.

## Locating sprinkler and connection locations

The sprinkler plan will identify the basic location for all sprinklers. Mark the location of sprinklers with consideration of obstructions, minimum sprinkler spacing requirements, maximum sprinkler coverage, possible shadow areas, etc. Refer to NFPA 13D and/or the sprinkler manufacturer's installation instructions for additional information.

## Spacing from continuous obstructions

If obstructions exist that are not shown on the sprinkler plan, refer to NFPA 13D and/or the sprinkler manufacturer's installation instructions for proper sprinkler placement. If additional sprinklers are required to avoid obstructions, contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) to determine if a redesign is necessary.

## Minimum distances from heat sources

The following table provides information from NFPA 13D. Use this table to calculate the distance sprinklers should be from any existing heat sources in the building.

Heat source	Minimum distance from edge of source
Side of open or recessed fireplace	36"
Front of recessed fireplace	60"
Coal- or wood-burning stove	42"
Kitchen range	18"
Wall oven	18"
Hot-air flues	18"
Un-insulated heat ducts	18"
Un-insulated hot water pipes	12"
Side of ceiling- or wall-mounted hot-air diffusers	24"
Front of ceiling- or wall-mounted hot-air diffusers	36"
Hot-water heater or furnace	6"
Light fixture (0 W – 250 W)	6"
Light fixture (250 W – 499 W)	12"

Table 3-1: Minimum distances from heat sources

## Floor-to-floor connection locations

The sprinkler plan will identify the basic location for floor-to-floor connections of sprinkler loops. Mark these locations at the floor and ceiling, taking into account the sprinkler and tubing locations.

**Note:** The floor-to-floor connection may be specified as a different tubing size than the sprinkler loops.

## Plumbing connection locations

The sprinkler plan will also identify the basic location for plumbing connections to sprinkler loops. Mark the appropriate locations of the plumbing tubing/stub-outs/fixtures with consideration of where the sprinkler tubing will be located.

## Dead-end and arm-over connections

If any dead ends or arm overs are identified on the sprinkler plans, examine these areas for optimum tubing location to minimize the distance of the dead end runs.

## What to do if changes are required

If any features or obstructions require the addition or deletion of sprinklers, or significant relocation of sprinklers, contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) to determine if observed changes require a redesign.



## Section 4

# Installing sprinkler adapters

The design printout shows sprinkler placement and spacing. The number after the dash indicates proper sprinkler spacing (in square feet).

**Example:** RC-RES-16 signifies a concealed 4.9k sprinkler, designed to cover a 16' x 16' area. The maximum distance off any wall is equal to half the distance of the maximum spacing selected. For example, if the design dictates that the sprinklers are spaced 16' apart, do not place farther than 8' off the wall.

Installation instructions as follows.

1. The design printout should list the type of sprinkler to use in your installation.
2. Use the sprinkler design printout to determine the proper location for installing the sprinkler adapters.



**Caution:** Avoid obstructions that may interfere with sprinkler discharge when mounting sprinkler assemblies. Anticipate the use of fans, surface-mounted lighting, beams and slopes. For specific clearance requirements, refer to NFPA 13D. Vaulted ceilings and obstructions added after the system design is completed can interfere with proper sprinkler operation.

Contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada) if ceiling vaults or beams are not shown on the sprinkler plan.

**Note:** The sprinkler plan will identify the most hydraulically remote sprinkler(s) that will be used for flow-verification testing. To save time during that procedure, make sure these sprinkler locations are clearly defined during installation.

3. Attach the sprinkler-mounting bracket or sprinkler adapter to the structure with two #10 x 1½" coarse-thread screws. If using the lower set of mounting holes, install a third screw in the center hole of the bracket. Refer to the sprinkler plan mounting details for correct placement of brackets and adapters, paying close attention to the ceiling type and sprinkler model.
4. Install sprinkler adapters into mounting brackets, if necessary.
  - a. Snap sprinkler adapter into mounting bracket.
5. Install push-on nut over the threaded portion of the sprinkler adapter.

**Note:** The sprinkler adapter and mounting bracket can also be pre-assembled (with or without) the sprinkler head.

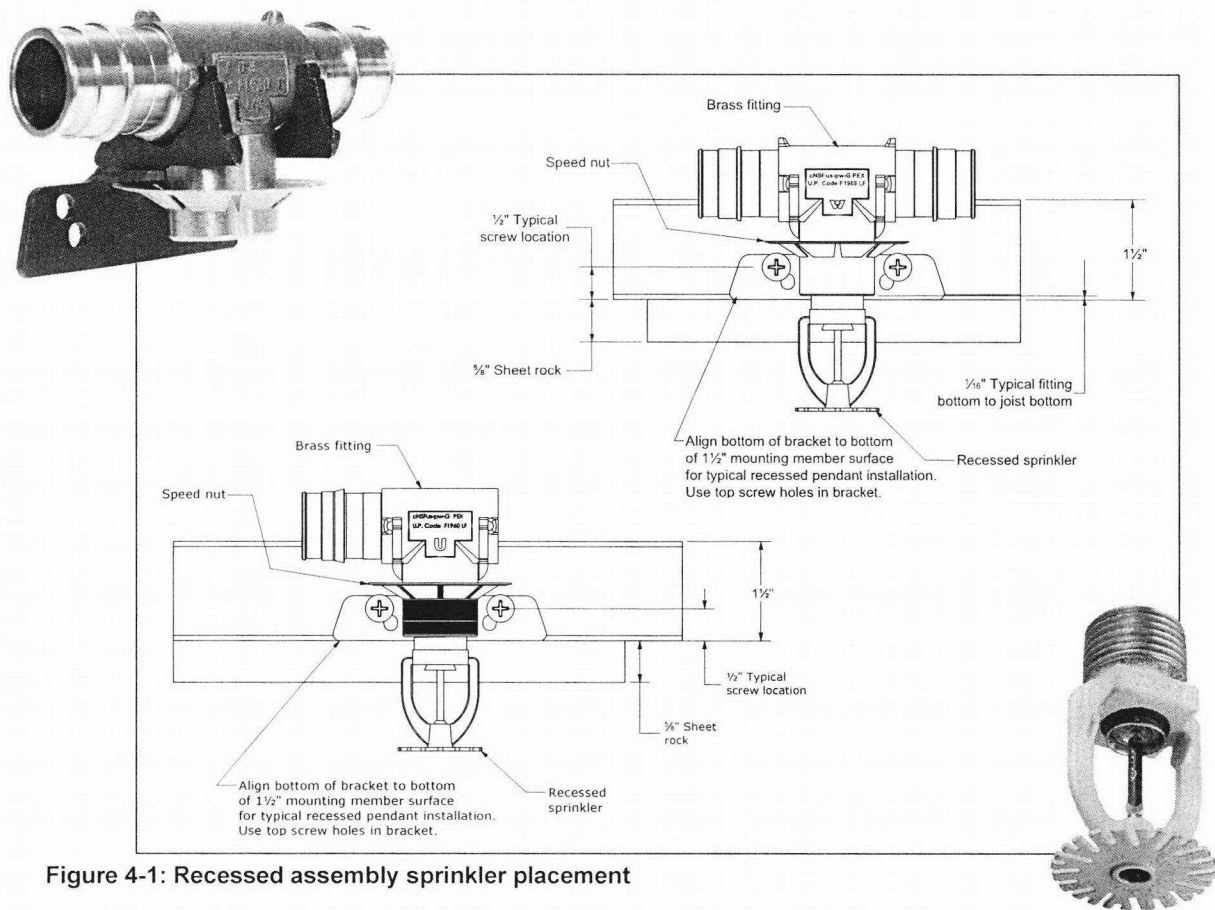


Figure 4-1: Recessed assembly sprinkler placement

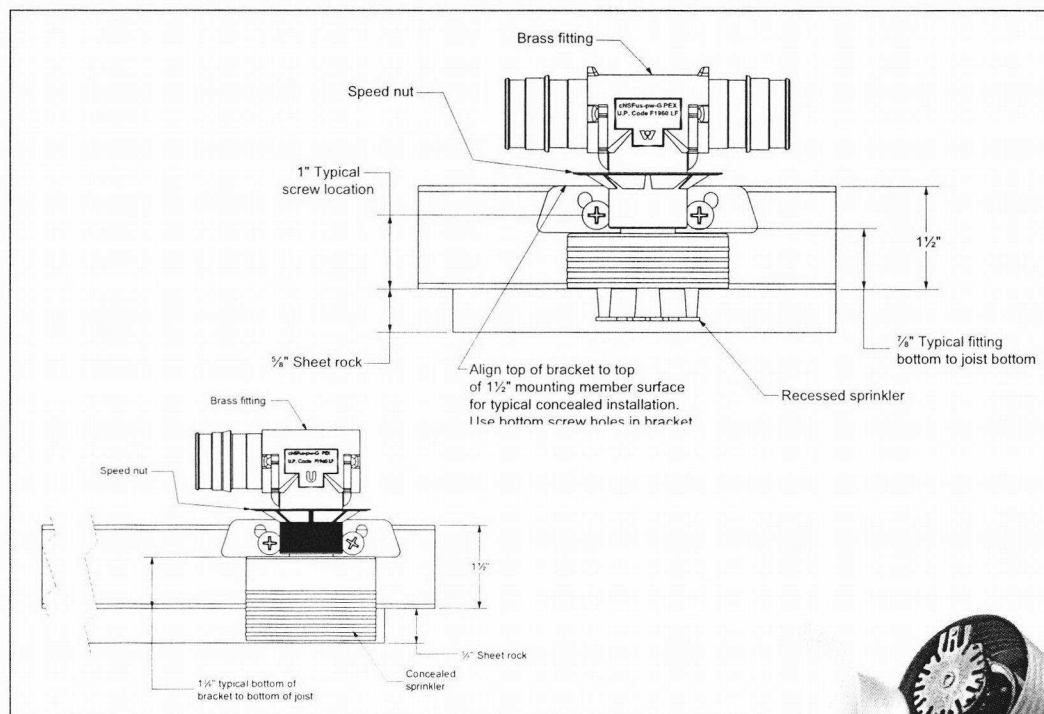
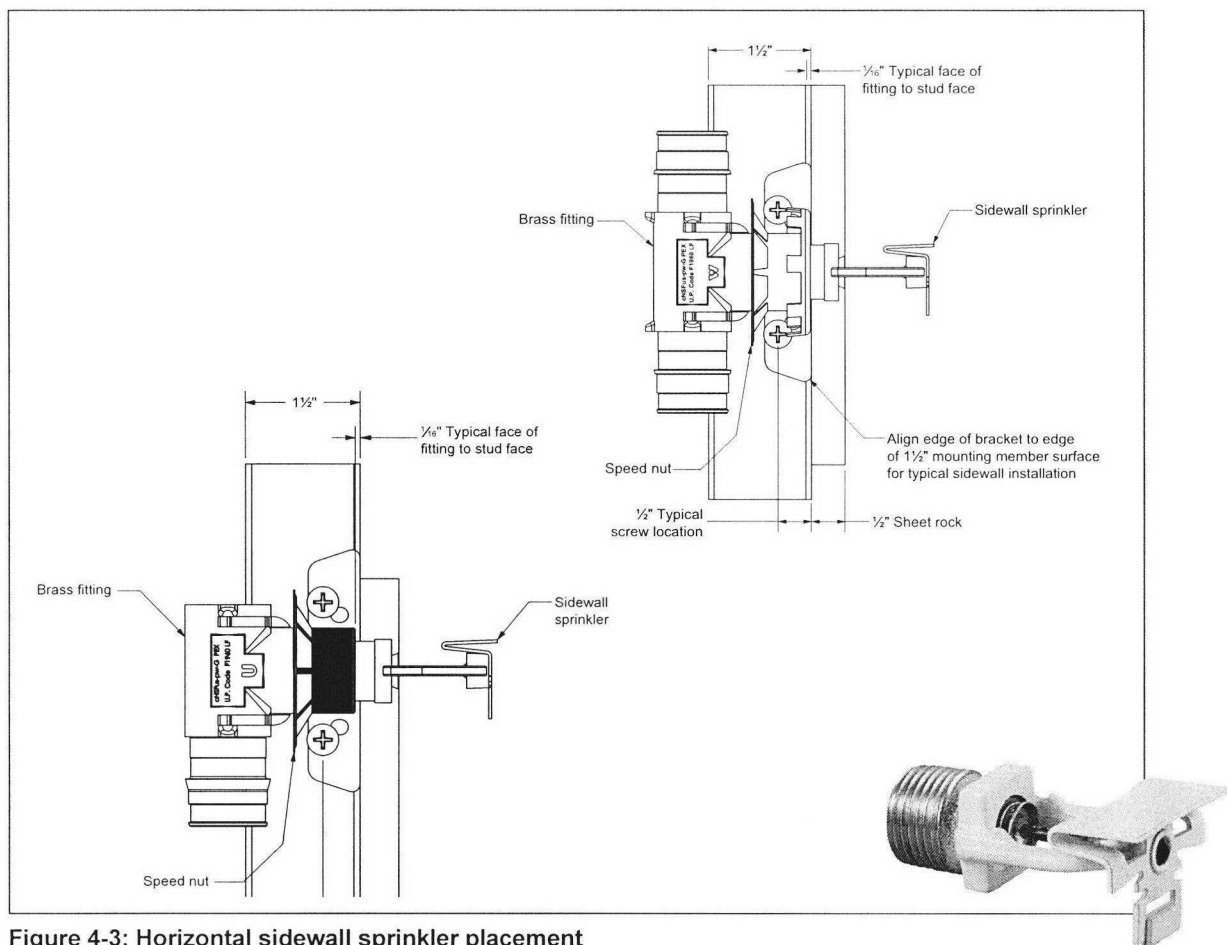


Figure 4-2: Concealed assembly sprinkler placement



**Figure 4-3: Horizontal sidewall sprinkler placement**

**Note:** Dimensions shown are for typical ceiling or wall construction and may not apply in all situations. The sprinkler plans may contain different information based on details supplied on the design request form and/or submitted construction drawings.

Blocking may be required to adequately support the sprinkler adapter in certain situations.

**Important!** After installing the first sprinkler adapter, verify the correct placement by temporarily installing all components (sprinkler, cover plate or escutcheon, and a representation of the ceiling thickness).

## Section 5

# Installing sprinklers

It is important to follow all installation instructions of the sprinkler manufacturer completely.

1. For pendent or horizontal sidewall sprinklers, thread the tension ring onto the sprinkler until it bottoms out.
2. Wrap the threads on the sprinkler with three wraps of Teflon tape when installing the sprinkler into the sprinkler adapter. Do not use any leak-stopping additives in any fire sprinkler system.
3. Using the appropriate sprinkler wrench (see **Figure 5-1**) and following the sprinkler installation instructions, carefully tighten the sprinkler into the sprinkler adapter. You should obtain a leak-tight connection with a torque of 7 ft.-lbs. to 21 ft.-lbs. (approximately two turns past hand tight). Do not over-tighten. Always refer to the sprinkler manufacturer's data sheet for specific installation guidelines.

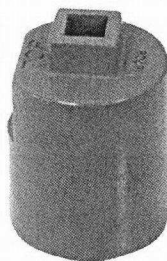
**Important!** Horizontal sidewall sprinkler deflectors must be installed parallel to the plane of the ceiling.

**Note:** To save time and materials during flow verification testing, do not install the sprinklers at the most hydraulically remote location(s), as they will be removed during that procedure and are not allowed to be reinstalled per NFPA 13D.

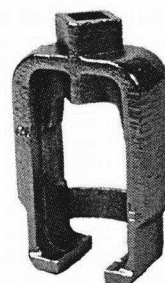
Refer to **Section 10: Flow testing** for more details.

4. Install concealed cover plates and/or escutcheons only after the completion of ceiling construction. Leave protective caps on all sprinklers until construction is complete.

Concealed horizontal sidewall wrench



Recessed sprinkler wrench



Concealed sprinkler socket

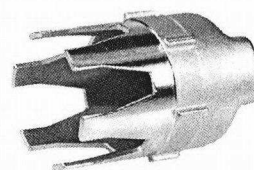


Figure 5-1: Sprinkler wrench types

5. After the ceiling is finished, install the concealed cover plates by turning the cover clockwise until the flange is in contact with the ceiling. The cover plate assembly typically provides up to 1/2" adjustment. There will be a small gap between the flange and the ceiling when properly installed. Escutcheons are installed on the tension ring and are pressed into place until the flange is tight against the ceiling. Escutcheons typically allow for up to 1/2" adjustment.



**Caution:** To protect the sprinkler from damage due to finishing work, cover the sprinkler with the plastic cover provided with the sprinkler. Paint and gypsum wallboard can damage a sprinkler if not properly protected. After all finishing work is complete and ceiling or wallboard is in place and painted, install the cover plates on the concealed sprinklers or the escutcheon on the recessed or horizontal sidewall sprinklers. The flat cover plate and recessed escutcheon easily slide over the sprinkler using a twisting motion.



## Section 6

# Installing tubing

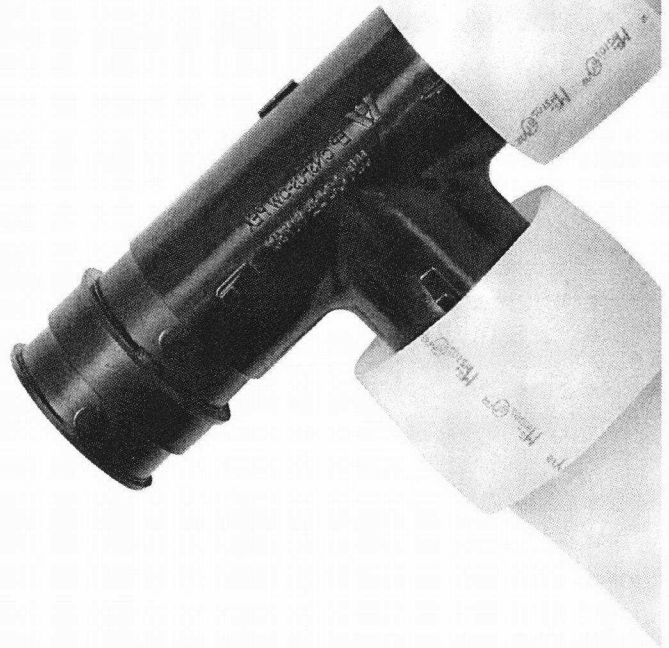
- Using proper ProPEX connection procedures, attach the Uponor AquaPEX tubing to the sprinkler adapters.
- To feed plumbing fixtures, install a ProPEX tee in the AquaSAFE looped system. From this tee, you can feed Uponor AquaPEX tubing into a multiport tee to supply multiple fixtures, or you can install a dedicated feed to serve an individual fixture.
- Ensure that you maintain proper spacing between Uponor AquaPEX and uninsulated ducts, can lights, etc.

## Making ProPEX connections

Uponor ProPEX F1960 cold-expansion fittings make solid, permanent, manufactured connections without the need for torches, glues, solder, flux or gauges. The unique shape memory of Uponor PEX tubing forms a tight seal around the fitting, creating a strong, reliable connection.

This section shows how to make proper ProPEX connections using one of the following tools.

- Milwaukee® M12™ or M18™ expansion tools
- ProPEX hand expander tools



## General ProPEX connection tips

- If the fitting does not slide into the tubing all the way to the stop, immediately remove it from the tubing and expand the tubing one final time.  
**Note:** To avoid over-expanding the tubing, do not hold the tubing in the expanded position.
- **Table 6-1** on **page 26** provides the recommended number of expansions. Experience, technique and weather conditions influence the actual number of expansions. Fewer expansions may be necessary under certain conditions. The correct number of expansions is the amount necessary for the tubing and the shoulder of the fitting to fit snugly together.

- Ensure the ProPEX ring rests snugly against the fitting shoulder. If there is more than  $\frac{1}{16}$ " (1mm) between the ring and the shoulder of the fitting, square cut the tubing 2" away from the fitting, and make another connection using a new ProPEX ring and fitting. Brass ProPEX fittings can be disconnected and reused. EP fittings must be discarded. Be sure to follow the recommended minimum distance between ProPEX fittings chart in **Table 6-2**.

**Important!** Making expansions are slightly different when using a tool that features auto rotation. When making a ProPEX connection, be sure to follow the guidelines for the tool you are using in your application.

**Note:** All standard Uponor expander heads are compatible with Milwaukee M12 and M18 ProPEX expansion tools. Uponor expander heads will not auto rotate on the Milwaukee tools (only Milwaukee expansion heads will auto rotate on the M12 and M18 tools). Uponor H-series expander heads are not compatible with Milwaukee tools and Milwaukee heads are not compatible with Uponor tools. Milwaukee heads are easily distinguished by color coding and the Milwaukee logo.

Tubing size	Milwaukee ProPEX tools		Uponor ProPEX tools		
	M12	M18	Manual	100 & 150	201
$\frac{1}{2}$ "	5	6	4	4	—
$\frac{3}{4}$ "	9	8	9	9H	—
1"	13	5	14	7H	—
1 $\frac{1}{4}$ "	—	7	—	7H	—

Table 6-1: Recommended number of expansions for  $\frac{1}{2}$ " to 1 $\frac{1}{4}$ " tubing at 73.4°F (23°C)

**Note:** "H" in the table refers to the Uponor H-series expander heads.

Nominal fitting size	Cut length of pipe
$\frac{1}{2}$ "	2"
$\frac{3}{4}$ "	3"
1"	3 $\frac{1}{2}$ "
1 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "

Table 6-2: Minimum distance between ProPEX fittings

## Making ProPEX connections with Milwaukee ProPEX expansion tools

1. Square cut the PEX tubing perpendicular to the length of the tubing. Remove all excess material or burrs that might affect the fitting connection.

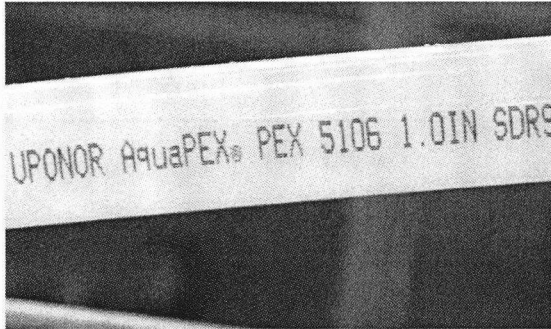


Figure 6-1: Cut tubing

2. Slide the ProPEX ring over the end of the tubing until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the tubing no more than  $\frac{1}{16}$ " (1mm).

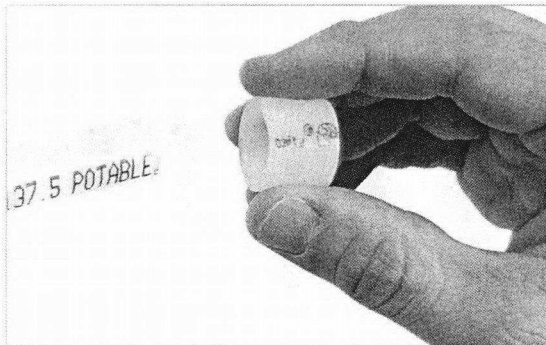


Figure 6-2: Install ProPEX ring

## With auto rotation (standard Milwaukee heads)

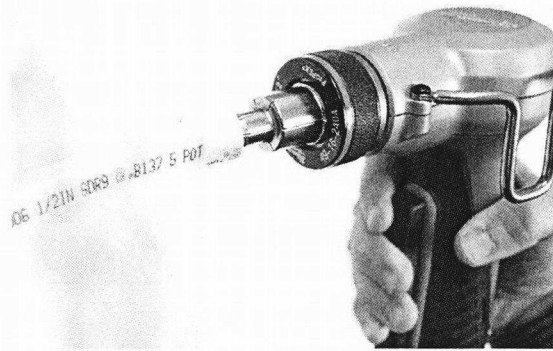


Figure 6-3: Expand tubing

3. Milwaukee ProPEX expansion tools come with built-in auto rotation. If using a Milwaukee expansion head, simply hold the tubing and tool in place while holding the trigger to expand the tubing. The head will automatically rotate to ensure the tubing is evenly expanded. Continue expanding until the tubing and ring are snug against the shoulder on the expander head. See **Table 6-1** on **page 26** for the recommended number of expansions for each tubing size.

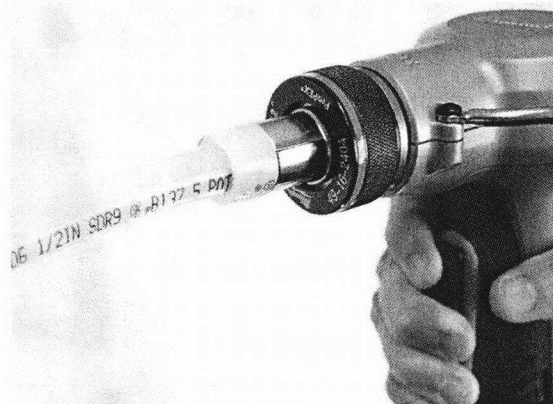


Figure 6-4: Expand until ring is snug against expander head

### Without auto rotation (standard Uponor heads)

4. Press the trigger to expand the tubing.
5. Release the trigger, remove the head from the tubing, rotate it  $\frac{1}{8}$  turn and slide the head back into the tubing. Continue expanding and rotating until the tubing and ring are snug against the shoulder on the expander head. See **Table 6-1** on **page 26** for the recommended number of expansions.

**Important!** Rotating the tool between expansions will provide smooth, even expansion of the tubing. Failure to rotate the tool will cause deep grooves in the tubing which can result in potential leak paths.

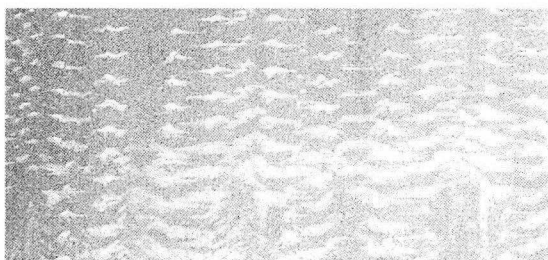


Figure 6-5: Expansion with proper rotation

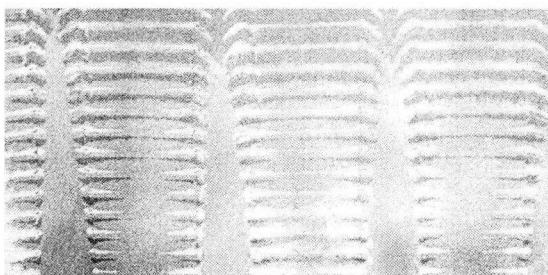


Figure 6-6: Expansion without proper rotation

6. After the final expansion, immediately remove the tool and insert the fitting. Ensure the tubing and ring seat against the shoulder of the fitting.

**Important!** You should feel some resistance as the fitting goes into the tubing. If you do not feel any resistance, the tubing may be over expanded and will require additional time to shrink over the fitting.



Figure 6-7: Insert fitting

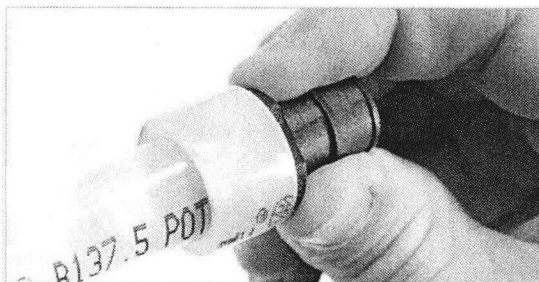


Figure 6-8: Ensure tubing and ring seat against shoulder of fitting



## Making ProPEX connections with ProPEX hand expander tools

1. Square cut the PEX tubing perpendicular to the length of the tubing. Remove all excess material or burrs that might affect the fitting connection.

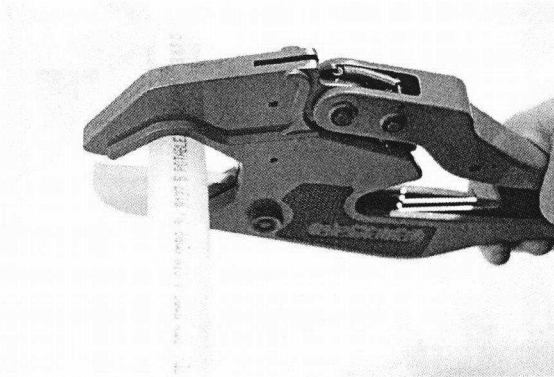


Figure 6-9: Expansion with proper rotation

2. Slide the ProPEX ring over the end of the tubing until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the tubing no more than  $\frac{1}{16}$  (1mm).

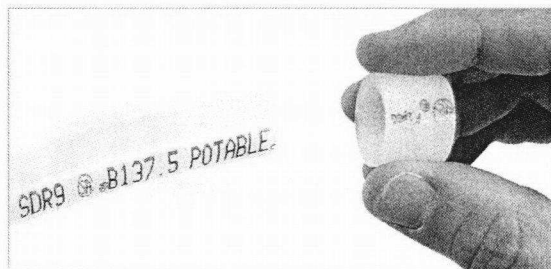


Figure 6-10: Install ProPEX ring

3. When using a ProPEX Hand Expander Tool without the ProPEX Auto Rotation Adapter, brace the free handle of the tool against your hip, or place one hand on each handle. Fully separate the handles and slide the expander head into the tubing until it stops. Full expansions are necessary to make a proper connection. Bring the handles together to expand. Separate the handles, remove the head from the tubing, rotate it  $\frac{1}{8}$  turn and slide the head back into the tubing. Continue expanding and rotating until the tubing and ring are snug against the shoulder on the expander head. See **Table 6-1** on **page 26** for the recommended number of expansions for each tubing size.

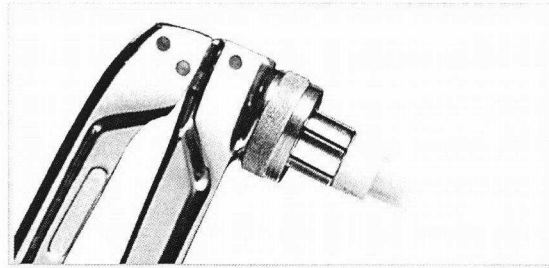


Figure 6-11: Expand the tubing

**Important!** Rotating the tool between expansions will provide smooth, even expansion of the tubing. Failure to rotate the tool will cause deep grooves in the tubing which can result in potential leak paths. See **Figure 6-5** and **Figure 6-6** on **page 28**.

4. After the final expansion, immediately remove the tool and insert the fitting. Ensure the tubing and ring seat against the shoulder of the fitting.

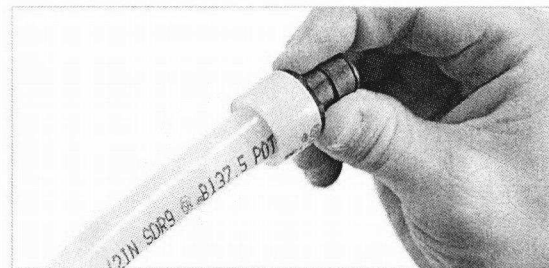


Figure 6-12: Insert fitting

**Important!** You should feel some resistance as the fitting goes into the tubing. If you do not feel any resistance, the tubing may be over expanded and will require additional time to shrink over the fitting. See **Figure 6-5** and **Figure 6-6** on **page 28**.

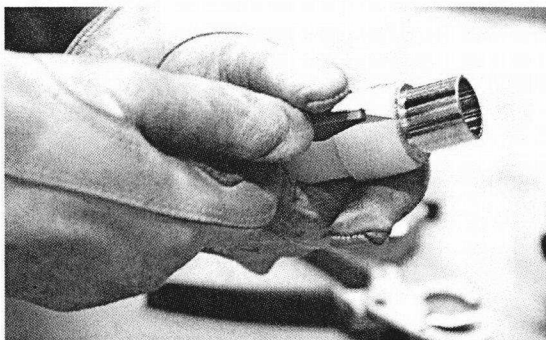


Figure 6-13: Cut ring

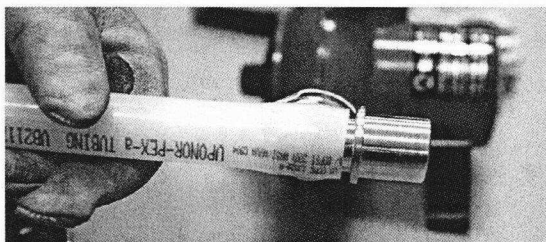


Figure 6-14: Gently heat tubing



Figure 6-15: Remove fitting



Figure 6-16: Measure 2" of tubing

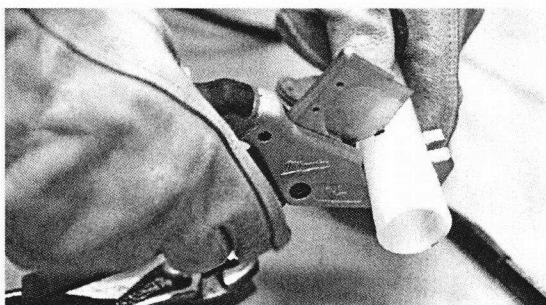


Figure 6-17: Cut tubing

## Disconnecting a ProPEX brass fitting

ProPEX brass and EP fittings are manufactured connections that can be concealed in walls, ceilings and floors. When necessary, ProPEX brass fittings can be disconnected.

**Important!** EP fittings cannot be reclaimed.

Refer to the following guidelines for disconnecting a ProPEX brass fitting.

1. Ensure the system is not pressurized.
2. Use a utility knife to carefully cut through the ProPEX ring.

**Important!** Do not heat the ring prior to cutting it. Take care to cut only the ring and not the tubing or fitting. Gouges in the fitting may result in leaks. If you accidentally damage the fitting, you must discard it.

3. Remove the ProPEX ring from the tubing.
4. After removing the ring, apply heat directly around the fitting and tubing connection. Gently work the tubing back and forth while pulling slightly away from the fitting until the tubing separates from the fitting.
5. After removing the fitting, measure 2" (minimum) from the end of the tubing.
6. Square cut the tubing at the 2" marking.
7. Allow the fitting to cool before making the new connection.
8. Use a new ProPEX ring and follow the steps to make a new connection.

## Troubleshooting ProPEX connections

Trouble-free ProPEX installations begin with a tool that is maintained in proper working condition. If the tool or segment fingers are damaged, it is very difficult to make a proper connection. Refer to the following guidelines to assist with challenges in the field.

### Fittings won't seal

- Make sure the expander head is securely tightened onto the tool.
- Ensure the segment fingers are not bent. If the head does not completely close when the drive unit is fully retracted or the handles of the manual tool are open, replace the head.
- Examine the tool for excess grease on the segment fingers. Remove excess grease prior to making connections.
- Check the fitting for damage. Nicks and gouges will cause the fitting to leak.
- Make sure the internal driver cone is not damaged or bent.
- Make sure the last expansion is not held in the expanded position before the fitting is inserted. You should feel some resistance as the fitting goes into the tubing. If you do not feel any resistance, the tubing may be over expanded and will require additional time to shrink over the fitting.
- Be sure to rotate the tool  $\frac{1}{8}$  turn after each expansion to avoid deep grooves in the tubing which can result in potential leak paths.

### Expansion is difficult

- Make sure the internal cone is properly greased.

### Expansion head slips out of tubing when making expansions

- Ensure the tubing and ProPEX ring are dry.
- Make sure that grease is not getting into the tubing.
- Examine the segment fingers to ensure they are not damaged or bent.

### ProPEX ring slides down tubing during expansion

- Ensure your hands are clean while handling the tubing. Any sweat or oils on your hands can act as a lubricant. Due to the smoothness of PEX, any form of lubricant can cause the ProPEX ring to slide down the tubing during expansion.
- If you anticipate the ProPEX ring may possibly slide down, position the ring slightly farther over the end of the tubing and make the first couple of expansions slowly. Once the ring and the tubing begin to expand together, continue with the normal number and type of expansions.
- Place your thumb against the ProPEX ring to help support it and feel for any movement. If caught early, you can slide the ring up the tubing and expand as described in the previous bullet point.



### More than the recommended number of expansions are needed to make a connection

- Ensure the head is hand-tightened to the expander tool.
- Examine the segment fingers for damage.
- Be sure to completely cycle the tool on each expansion (i.e., close the manual tool handle or release the trigger).

### Cold-weather expansions

- Temperatures affect the time required for the tubing and ring to shrink onto the fitting. The colder the temperature, the slower the contraction time.
- Warming ProPEX fittings and ProPEX rings reduces contraction time. Put fittings and rings in your pockets prior to installation to keep them warm.
- Make ProPEX connections at temperatures above 5°F (-15°C).
- Fewer expansions are necessary in temperatures below 40°F (4.4°C).

## Bend radius and tubing support

### Bending PEX

Refer to **Table 6-3** for the minimum bend radius of Uponor AquaPEX tubing. When making bends less than 12" in diameter, be sure to make the bends slowly and carefully to avoid over bending or kinking the tubing.



Tubing size	Bend radius
½"	3¼"
¾"	5¼"
1"	6¾"
1¼"	8¼"

Table 6-3: Minimum bend radius

The following section provides instructions for reforming kinked tubing. Bend supports are available for Uponor AquaPEX tubing and may be used to facilitate 90-degree rigid bends.


### Reforming kinked tubing

If the tubing kinks and hinders flow, perform the following steps for an easy repair.

1. Straighten the kinked portion of the tubing.
2. Heat the kinked area to approximately 265°F (130°C) with an electric heat gun (approximately 450 watts of power). Apply the heat evenly until the tubing returns to its original size and shape. Do not use an open flame.  
 **Caution:** Only heat the Uponor AquaPEX tubing long enough to remove the kink. Remove the heat source from the tubing as soon as possible; excessive heat may harm the outer polyethylene layer. Damage to the outer layer is only aesthetic; it does not affect the performance of the tubing.
3. Let the repaired Uponor AquaPEX tubing cool undisturbed to room temperature. When the tubing returns to its original appearance, the repair is complete.  
 **Caution:** The surface temperature of the tubing must not exceed 338°F (170°C). DO NOT apply direct flame to Uponor AquaPEX tubing.

Uponor AquaPEX tubing repaired according to these recommendations will return to its original shape and strength. If Uponor AquaPEX tubing is sliced, punctured or otherwise damaged beyond the capacity of the crosslinked memory, it is necessary to remove and replace the entire section.

**Note:** Do not weld PEX or attempt to repair with adhesives.

 **Caution:** When reforming kinked tubing, protect sprinklers and cover plates from excessive heat. These devices are heat sensitive. Excessive temperatures may cause the glass bulb of the sprinkler to burst, activating discharge.



## Tubing support and tube talon guidelines

1. Uponor recommends plastic tubing supports (tube talons) but metal tubing supports designed for plastic tubing are acceptable and required for exposed applications. Ensure proper orientation of the tube talon as shown in **Figure 6-18**.
  2. Do not use supports that will damage the tubing. Inspect metal supports for sharp edges.
  3. The linear expansion rate for Uponor AquaPEX tubing is approximately 1.1" per 10°F (12°C) temperature change for every 100' of tubing.
  4. Allow  $\frac{1}{8}$ " to  $\frac{3}{16}$ " longitudinal clearance per foot of run to accommodate thermal expansion when installing tubing runs. Allow tubing to dip between supports.
- Note:** Do not pull tubing tight during installation.
5. Do not rigidly anchor Uponor AquaPEX tubing with supports. Allow enough tubing for freedom of movement to expand and contract.

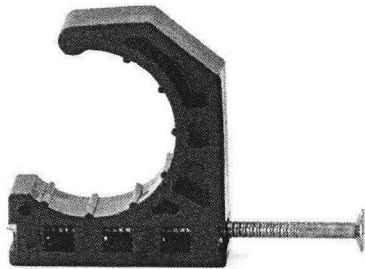


Figure 6-18: Tube talon

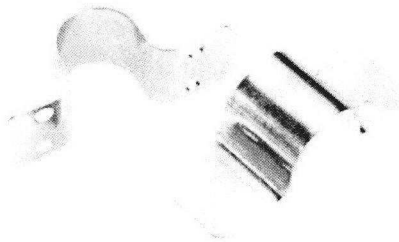


Figure 6-19: Metal tubing supports

6. Allow adequate clearance between PEX tubing and the structure (bored holes or sleeves) to allow freedom of movement for thermal expansion and contraction.

## Tubing support spacing

Anchor Uponor AquaPEX tubing securely enough to support the tubing, yet relaxed enough to allow the tubing to expand and contract.

1. Along horizontal runs, install supports every 32". If horizontal runs are continuously supported, place the tubing supports at 6' intervals (see **Figure 6-20**).
2. Along vertical runs, install supports every 4' to 5' at each floor and at a mid-story guide (see **Figure 6-21**).

**Note:** When tubing is installed in an area that will be left exposed or unfinished, metal tubing supports are required every 24".

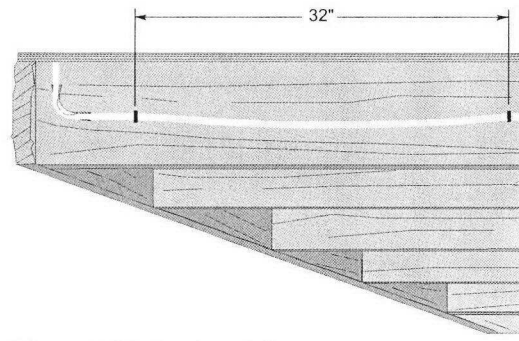


Figure 6-20: Horizontal runs

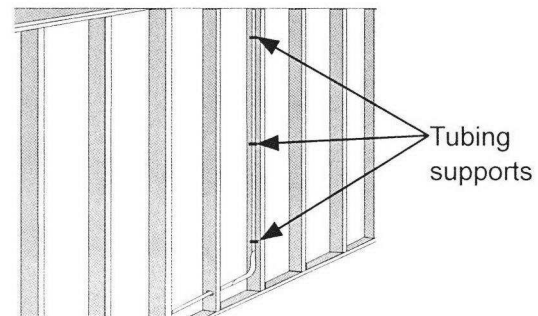


Figure 6-21: Vertical runs

**Note:** In accordance with UL and C-UL listings, when protection for the tubing and fittings is provided, the minimum protection consists of either:

- One layer of  $\frac{3}{8}$ " (9.5mm) gypsum wallboard
- A suspended membrane ceiling with lay-in panels or tiles weighing greater than 0.35 lbs. per square foot (1.7kg per square meter) when installed with metallic support grids
- $\frac{1}{2}$ " (13mm) plywood soffits
- One layer of  $\frac{1}{2}$ " (13mm) plywood

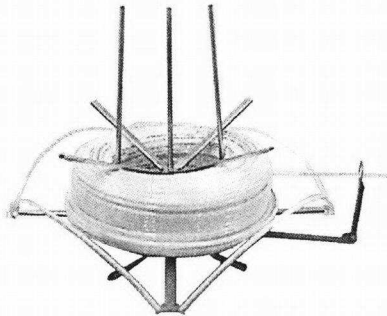


Figure 6-22: Tube uncoiler (E6061000)

## Tubing uncoilers

The following uncoilers are available for faster, more efficient PEX tubing installs.

- Tube uncoiler (E6061000)
- Deluxe tube uncoiler (E6061100)
- Select uncoiler (E6062000)
- Compact select uncoiler (E6063000)

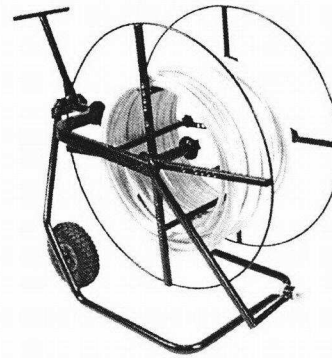


Figure 6-24: Select uncoiler (E6062000)

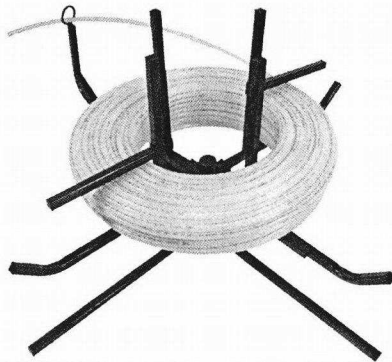


Figure 6-23: Deluxe tube uncoiler (E6061100)

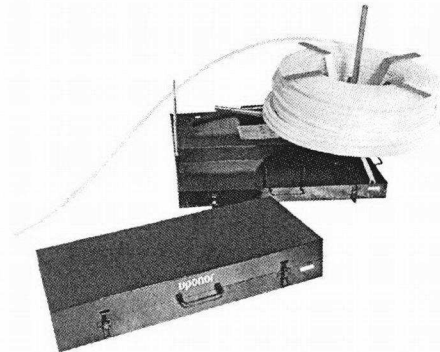


Figure 6-25: Compact select uncoiler (E6063000)

## Extreme temperature installations

AquaSAFE systems are often installed in attics or other areas exposed to temperature extremes of heat and/or cold. Follow the recommended extreme weather installation instructions to isolate and protect system components from extreme temperatures. Because this system also delivers domestic cold water directly to plumbing fixtures, Uponor highly recommends that you protect the tubing with adequate insulation in warm weather areas to minimize heating of the cold water supply.

Installation methods include, but are not limited to:

- Tenting over the fire sprinkler piping
- Additional layers of batt insulation
- Increased depth of blown-in insulation



**Caution:** If you will be installing spray foam insulation, make sure to protect all components during application. Consult with the spray foam manufacturer to ensure compatibility with all products before application.

Consultation with local building officials is encouraged to ensure compliance with local building codes.

## Section 7

# Connecting plumbing runs

To feed plumbing fixtures, install ProPEX tees or flow-through multiport tees in the AquaSAFE loop. From the tee, you can feed Uponor AquaPEX tubing into a multiport tee to supply cold water to multiple fixtures, or you can install a dedicated run to supply an

individual fixture. From flow-through multiport tees you can install ½" Uponor AquaPEX to multiple cold-water fixtures directly. Ensure plumbing runs have been plugged to allow pressure and flow verification testing.

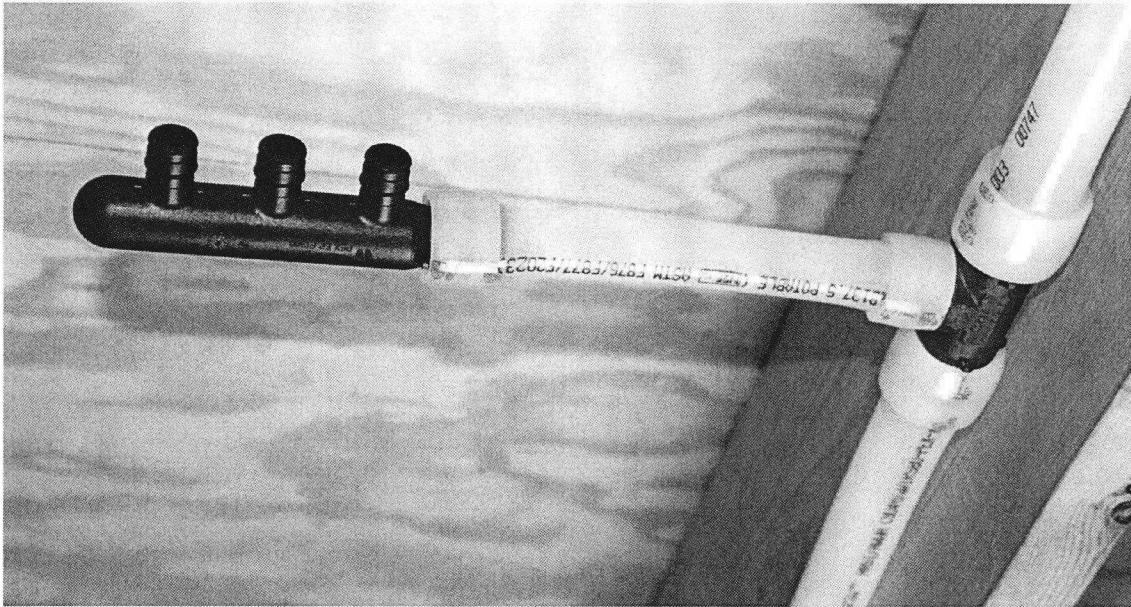


Figure 7-1: Feed plumbing fixtures via EP multiport tees



Figure 7-2: Uponor LF brass fire sprinkler adapters



## Section 8

# Domestic water bypass

A domestic water bypass allows the Uponor AquaSAFE fire sprinkler system to operate properly even when flow-restricting devices, such as water softeners and filtration systems, are present in the home.

When a sprinkler activates and water pressure drops significantly, a PRV opens and routes the water directly to the sprinkler system, taking the path of least resistance, thus avoiding the flow-restricting device.

The PRV opens only during sprinkler activation and not domestic use. Therefore, the flow-restricting device does not negatively impact the water supply of the fire sprinkler system and allows homeowners

to use regular residential plumbing devices versus commercial devices.

**Note:** When the flow switch detects water flow through the bypass, it can activate an optional alarm, which alerts occupants that the sprinkler system is operating.

### Bypass components

- PRV
- Pressure gauge
- Alarm flow switch (if required)
- Electric alarm bell, horn or strobe light (if required)
- Required tubing and fittings

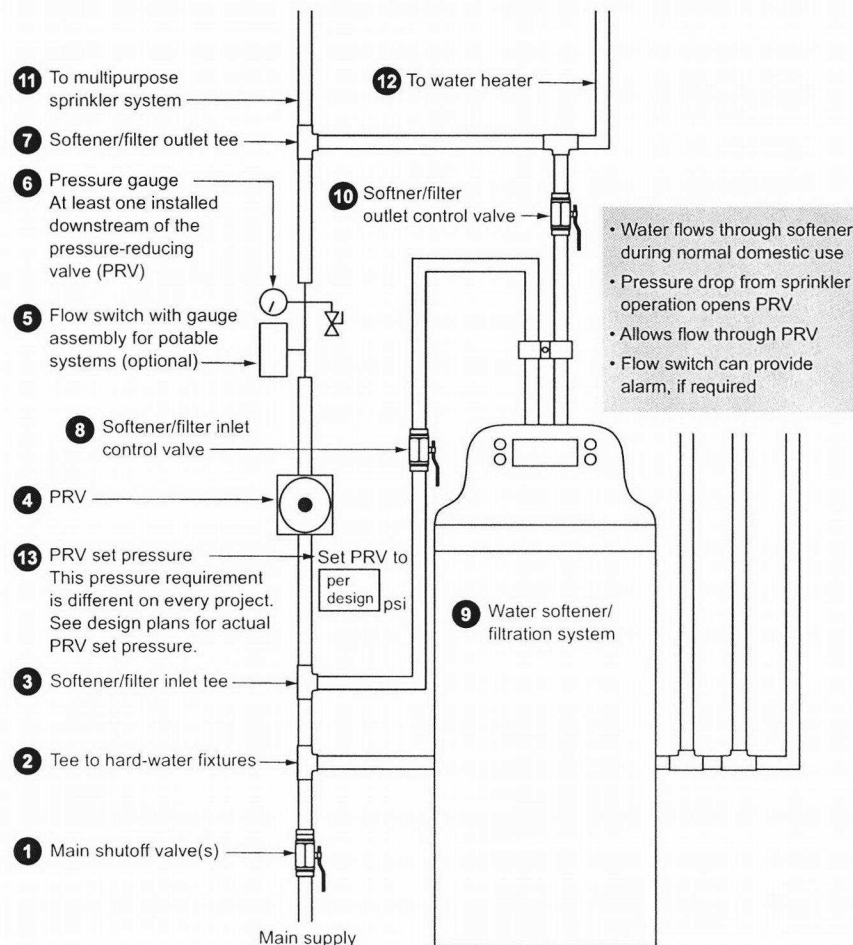


Figure 8-1: Domestic water bypass installation with optional flow switch

## Installation guidelines

Refer to **Figure 8-1** and use the following steps to install a domestic water bypass.

1. Install the domestic water bypass line.  
There needs to be a straight line from the main shutoff valve (1) to the PRV (4) and also from the PRV to the softener/filter outlet tee (7). This will ensure proper operation of the fire sprinkler system. If additional 90-degree elbows are installed on the piping through the PRV, contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) to recalculate the system.
2. Close the softener/filter inlet control valve (8). All of the water will now flow through the PRV and not through the domestic water softener/filtration system (9).
3. Now that the water softener/filtration system (9) is isolated, open a single plumbing fixture downstream of the PRV. The pressure gauge (6) will show a pressure drop downstream of the PRV. The pressure gauge (6) reading will continue to drop until it reaches the point at which the PRV is preset.
4. If the flowing pressure on the pressure gauge (6) is lower or higher than the pressure indicated on the bypass detail in the set pressure box (13), turn the adjusting nut on the PRV until the pressure gauge (6) reading matches the pressure on the bypass detail. DO NOT adjust the PRV so that the downstream pressure is lower than that shown on the bypass detail. Doing so will cause the sprinkler system to fail.
5. Open the softener/filter inlet control valve (8). The pressure gauge (6) reading will increase. The water is now flowing through the water softener/filtration system (9) only. If a sprinkler activates, the downstream pressure will drop below the PRV set point and water will flow through the PRV (4), thus introducing hard or unfiltered water into the system.

6. Turn off all domestic fixtures and perform the fire sprinkler flow test. If the PRV (4) has been set correctly, the flow test should be successful.
7. After the flow test is completed, open multiple outlets downstream of the PRV (4). Make note of how many outlets can be flowing before the pressure is equal to or below the PRV set pressure. Inform the customer that they will be able to flow a specified number of outlets simultaneously. If the customer exceeds that number of flowing fixtures, the system will receive hard or unfiltered water.

## Troubleshooting

### Hard or unfiltered water issues

1. The customer is exceeding the maximum amount of plumbing fixtures they can have flowing simultaneously. Inform them they can also test the system by repeating **step 7** in the installation guidelines.
2. The city pressure has changed significantly. If this occurs, the PRV will have to be readjusted.
3. The water softener is too small for the domestic-use needs or is malfunctioning. The customer may need to purchase a water softener with higher-flow characteristics or have it repaired.
4. The PRV has been set too high.

### Flow test failure

1. Make sure the PRV set pressure in the field is equal to or higher than the set pressure shown on the plan. If the actual PRV set pressure is lower than the set pressure shown on the bypass detail (13), there will not be enough pressure available to perform a successful flow test.
2. Contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) to verify the friction loss across the PRV is not too great and to see if there is something else causing a flow restriction.

## Section 9

# Pressure testing

The NFPA 13D standard specifies testing at normal system operating pressure. The Uponor AquaSAFE system should be pressure tested in accordance with NFPA 13D. If local plumbing code requirements are more stringent, follow your local code.



**Caution:** To protect the sprinkler from damage due to finishing work, cover the head with the plastic cover provided with the sprinkler. Paint and sheetrock can damage a sprinkler if not properly protected. After all finishing work is complete and sheetrock is in place and painted, attach the flat cover plate of the concealed sprinkler or the recessed escutcheon of the recessed sprinkler. The flat cover plate and recessed escutcheon easily slide over the sprinkler using a twisting motion.

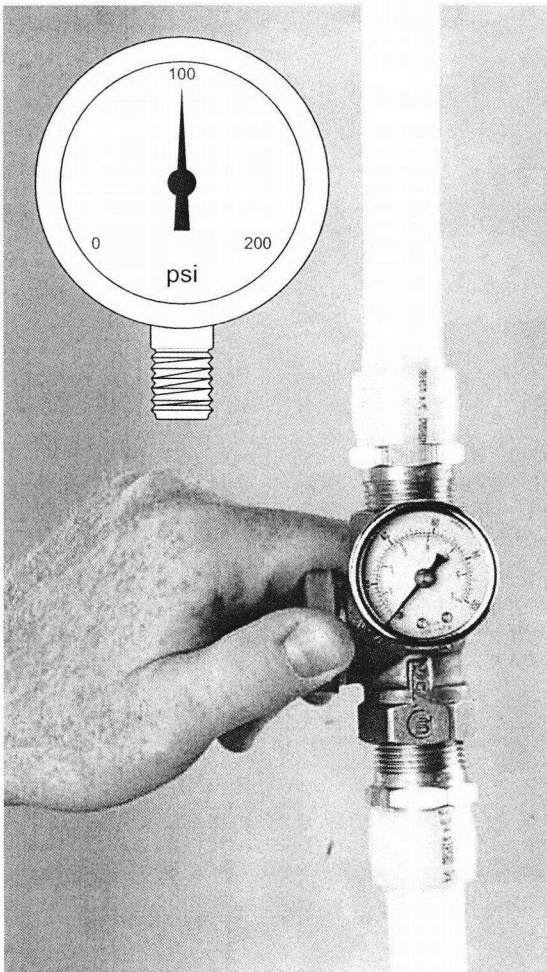


Figure 9-1: Pressure test at normal operating water pressure

## Section 10

# Flow testing

Uponor requires a flow test after every AquaSAFE installation to ensure the system is installed properly and to offer peace of mind to all parties involved, including the designer, the AHJ (local fire marshal or reviewing authority), and the installing contractor. Performing a flow test also protects all parties in the event any subsequent modifications negatively affect system performance.

**Note:** Although the NFPA 13D standard does not require flow verification testing, it may be required by the AHJ or local ordinances.

Before performing a flow verification test, confirm the water pressures by contacting the water and sewer department of your local city. Ensure the available water pressure matches the pressure used in the system design.

**Note:** The sprinkler plan indicates the most hydraulically remote sprinkler (or pair of sprinklers). For test requirements on other sprinklers, consult your local code.

**Note:** It is a good idea to notify the fire inspector at least 24 hours prior to performing a flow verification test. This may speed up the inspection process and eliminate the need to repeat the test for the inspector.



Figure 10-1: AquaSAFE flow test



## Flow test setup

The four following requirements are necessary for a proper flow test.

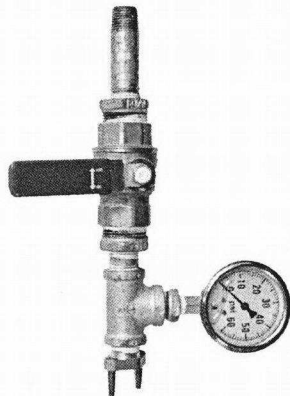


Figure 10-2: Flow test assembly

1. Pressure gauge installed immediately downstream from the system's main shutoff valve
2. Marked bucket capable of holding 30 gallons of water
3. Long piece of 2" or larger rigid pipe
4. Flow test assembly (see Figure 10-2)

The pressure gauge records the residual pressure during the flow test. To measure accurately, the gauge must have a maximum pressure reading that is slightly higher than the normal static pressure.

For example, if the static pressure is 65 psi, install an 80 psi gauge. Note that a gauge that reads too high will not measure the lower residual pressures adequately.

The pressure gauge is also critical should troubleshooting be necessary. (Refer to the Troubleshooting section on **page 45**.)

### Flow test assembly

The flow test assembly consists of the following parts (see Figure 10-2).

- Short, ½" galvanized, threaded nipple (4" max.)
- Two ½" x 1" galvanized, threaded bushings
- 1" full-port ball valve
- Appropriate sprinkler orifice

You can add an optional gauge trim consisting of an additional short, galvanized threaded nipple, a ½" galvanized threaded tee, a ½" x ¼" galvanized threaded bushing and a 30 psi or 60 psi pressure gauge.

The flow test bucket can be anything that can hold 30 gallons of water (see Figure 10-3). This bucket will need to be marked before performing the flow test. To mark the bucket, fill the bucket in one-gallon increments and mark each water level with a waterproof marker until you reach the 30-gallon level. Make sure all measurements are as accurate as possible since slight variations could dramatically affect the final waterline. This bucket can be used for multiple flow tests.

The rigid pipe can be cut-to-length on the jobsite. It is used to direct the flow of water into the bucket.

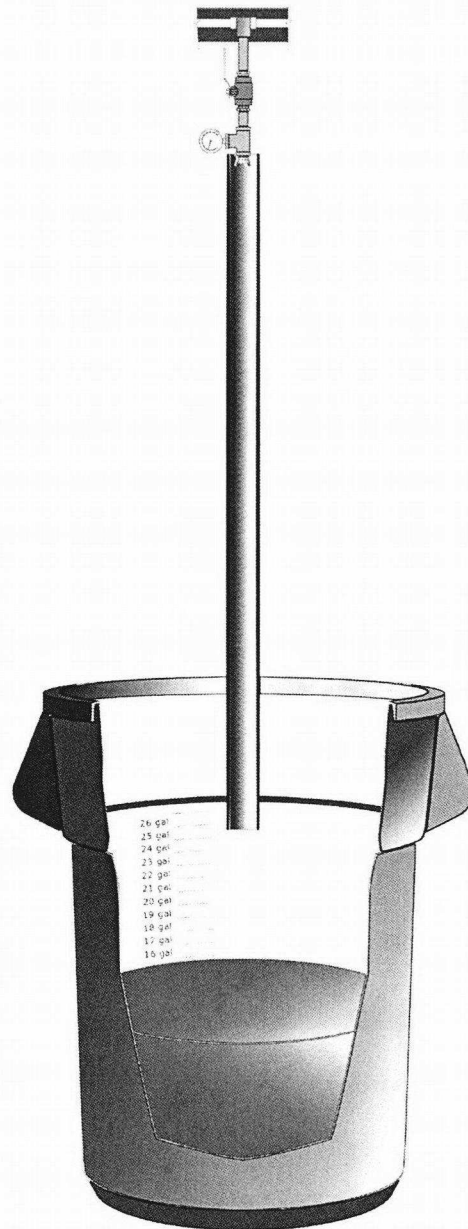


Figure 10-3: Flow test bucket

## Performing the test

1. Locate the most hydraulically demanding sprinkler. The demanding sprinkler is shown on the fire protection drawing in the 'hydraulically most remote sprinkler' detail.
2. With the system turned off and drained, remove the sprinkler from the sprinkler head adapter fitting.
3. Insert the flow test assembly.
4. Attach the test orifice to the end of the test assembly. The test orifice must match the size of the hydraulically demanding sprinkler head. Dismantling a spare sprinkler is the best way to ensure you have the proper orifice size.
5. Charge and fill the system.
6. Open the ball valve on the test assembly and flow water until air is completely out of the system. Trapped air will negatively affect the flow test.
7. Once air is purged, close the ball valve on the test assembly and prepare the test bucket.
8. Open the apparatus and perform a timed flow for one minute.
9. If the amount of water in the bucket matches or exceeds the calculated flow on the plan, the flow test is a success.
10. If the water in the bucket does not equal the calculated flow on the plan, review the troubleshooting checklist and perform the flow test again.
11. After a successful flow test, complete the Uponor AquaSAFE flow test form and send a copy of the results to Uponor Design Services and the AHJ (when required). It is also important to keep a copy for yourself.

## Troubleshooting

All flow test failures fit into one of the following three categories.

1. Problem in the system supply
2. Problem in the system piping
3. Problem in the flow test procedure or equipment

In the event of a flow test failure, make sure all valves (angle-stop valve, curb stop, main shutoff valve, flow test kit valve, etc.) are completely open and free from obstruction.

Perform the flow test again and get an accurate residual (flowing) pressure from the gauge you installed. Since each system has been hydraulically calculated to perform at a certain pressure at the main shutoff valve, the pressure reading will help determine whether the problem is upstream in the supply pipe or downstream in either the system or flow test assembly. After you have a pressure reading, contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com) (Canada).

### Potential system supply problems

- Underground pipe sizes do not match those shown on the plan
- Pipe distances do not match those shown on the plan
- Meter size is different (verify both inlet and outlet side of the meter)
- Additional fittings have been installed
- Extra valves have been installed
- Pressure-reducing valve (PRV) (if present) is not completely open
- PRV (if present) does not match size, make or model shown on the plan
- Elevations do not match those shown on the plans
- Supply pump/booster pump does not match the plan requirements

### **Potential system piping problems**

- Trapped air
- Kinked or flattened tubing
- Missing cross connections or other missing tubing
- PRV (if present) is not completely open
- PRV (if present) does not match size, make or model shown on the plan
- Tubing sizes do not match those shown on the plan
- Tee orientations do not match those shown on the plan
- Layout has been changed without contacting Uponor Design Services

### **Potential flow test procedure or equipment problems**

- Test was not performed for the full 60 seconds
- Test bucket is improperly marked
- The incorrect test orifice was used
- The water was directed through a flexible line into the bucket instead of a rigid pipe resulting in high friction loss
- The nipples on the test assembly are too long resulting in high friction loss
- The test valve is defective
- The test valve is not full port
- Teflon tape is causing an obstruction



## Section 11

# Homeowner information

### Sprinkler cabinet

Although not required by NFPA 13D, Uponor recommends installing an Uponor sprinkler cabinet near the main water shutoff valve. Keep at least one spare sprinkler of each type in the cabinet for easy access to replacements. Check local code requirements for any additional spare sprinkler or cabinet requirements.



**Caution:** Do not store sprinklers in areas that may exceed 100°F (37.8°C).

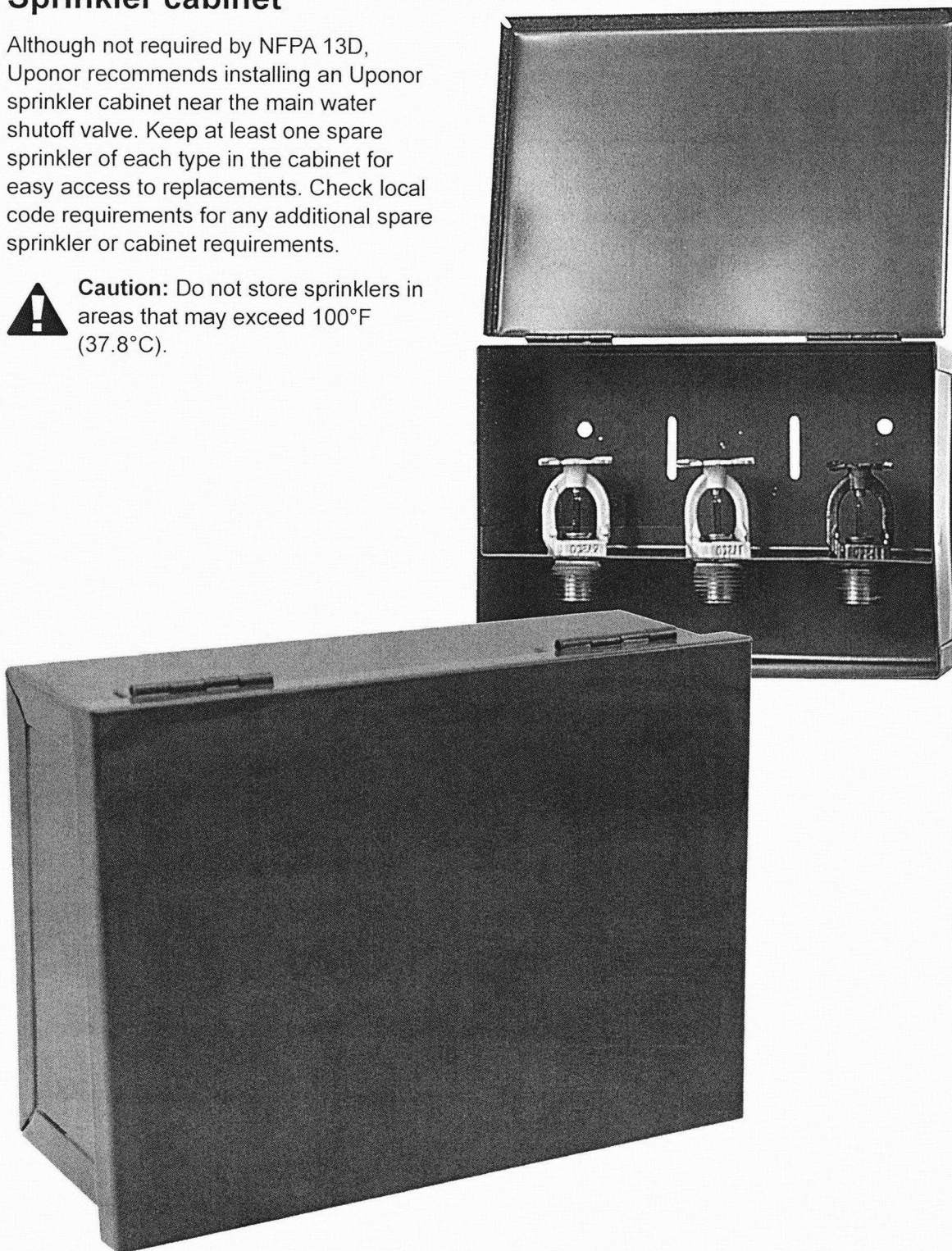


Figure 11-1: Sprinkler cabinet



## Warning sign

The Uponor AquaSAFE homeowner guidelines and a red warning sign are provided with the sprinkler design. The warning sign advises the homeowner that modifications to the system should not be made without consulting a fire protection specialist. Affix the warning sign adjacent to the primary shutoff valve.

**Important!** The warning sign must be affixed adjacent to the main shutoff valve per NFPA 13D requirements. If a replacement warning sign is needed, contact Uponor Design Services at 888.594.7726 (U.S.) or 888.994.7726 (Canada) or email [design.services@uponor.com](mailto:design.services@uponor.com) (U.S.) or [design.ca@uponor.com](mailto:design.ca@uponor.com).

## Warranty information

For warranty information, go to [uponorpro.com/warranties](http://uponorpro.com/warranties).

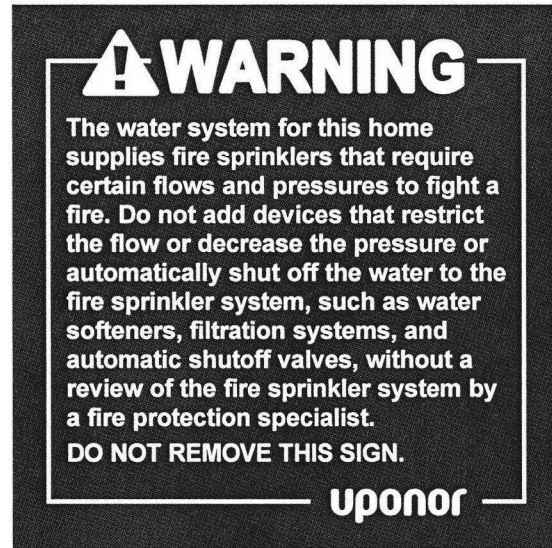


Figure 11-2: Warning sign

[illegible]



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