

# Uponor

## Uponor AquaSAFE™ System Installation Guide



## **Uponor AquaSAFE™ System Installation Guide**

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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 [uponor.com](https://www.uponor.com).

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

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

Please direct any questions regarding an application or a specific design to Uponor Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com).

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## Chapter 1

# General information

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

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

- UL
- NSF
- UPC
- CSA
- IPC

Uponor AquaPEX piping and ProPEX fittings are listed 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*.

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

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

Uponor AquaPEX piping 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°F (11 bar at 23°C)

\*This applies to ¾", 1", and 1¼" Uponor AquaPEX white piping, in compliance with UL 1821.

The piping 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 (49°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 piping carries a standard grade rating recommended by the Plastics Pipe Institute (PPI).



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

Uponor AquaPEX piping and Uponor sprinkler adapters are listed to NSF International Standard 61, which defines requirements for health effects.

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

## **AquaSAFE exposed listing installation requirements**

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

Uponor AquaPEX white piping and ProPEX fittings listed to UL 1821 may be installed without protection (exposed) in the following assemblies.

### **Unfinished basements**

- The ceiling must be horizontal and constructed using dimensional lumber (solid wood), engineered wood, or engineered wood I-joists. The minimum height from the floor to the bottom of the structure shall be 8 ft.
- Joist depth must be between 6" and 16" deep with on-center spacing between 12" and 24".
- Joists may remain exposed after installation.
- Only use listed residential pendent sprinklers with an activation temperature of 155°F (68.3°C) and 4.9 minimum K-factor in the exposed portion of the sprinkler system. Sprinkler spacing cannot be larger than 16 ft. Per NFPA 13D, install sprinklers with deflectors no more than 1¼" below the bottom of the joist to account for future finished ceilings.
- Do not install Uponor AquaPEX piping in locations with direct exposure to sunlight.
- Support piping with metal pipe straps within the first 6" from the connections to the fittings. Do not stress the connection.
- Blocking may be necessary where metal pipe hangers are required to be within 6" of the connection to the fittings.

Metal strap 6" max. from connection of pipe fitting



Metal strap 24" on center

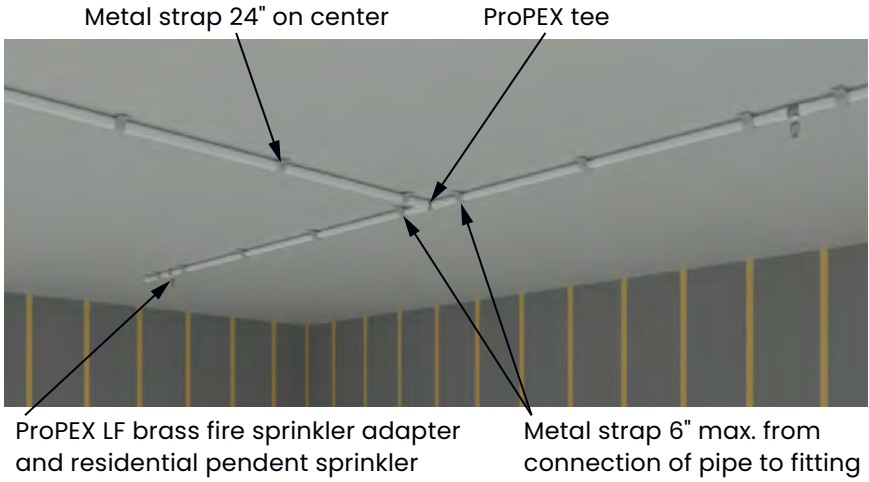
Wood blocking as required to maintain metal strapping requirements

**Figure 1-1: Tee with blocking**

- When installing parallel with joists, support piping every 24" with metal pipe hangers designed for use with non-metallic pipe/piping. Follow minimum bend radius limitations as detailed on **page 29** 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 ceilings**

- Ceiling must be horizontal and finished with a minimum  $\frac{3}{8}$ "-thick 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  $\frac{1}{2}$ "-thick, code-compliant plywood or solid sheathing.
- Support piping with metal pipe hangers within the first 6" from the connections to the fittings. Do not stress the connection.
- Blocking or metal toggle bolts may be necessary where metal pipe hangers are required to be within 6" of the connection to the fittings.

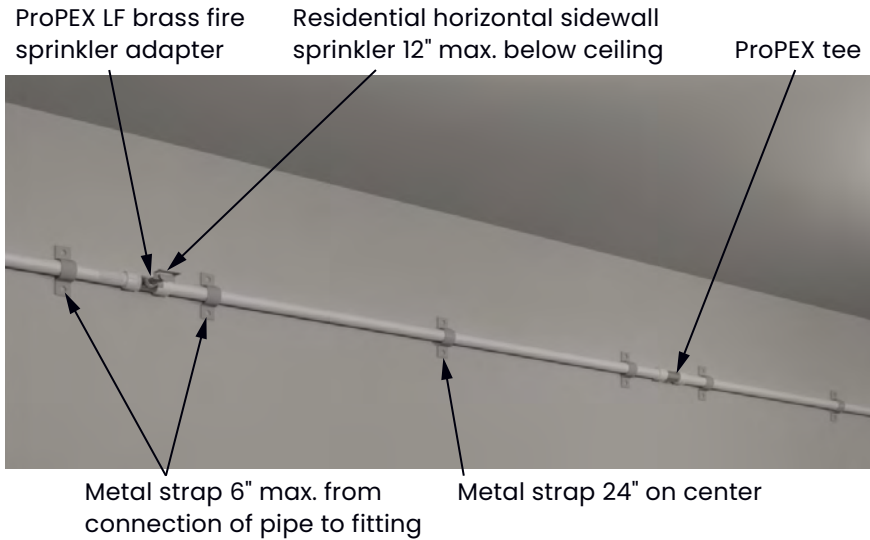


**Figure 1-2: System below finished ceiling**

- Piping shall be supported every 24" with metal supports designed for use with non-metallic pipe/piping. Follow minimum bend radius limitations as detailed on **page 29** of this installation guide.
- Only use listed residential pendent sprinklers with an activation temperature of 155°F (68.3°C) and 4.9 minimum K-factor in the exposed portion of the sprinkler system. Sprinkler spacing cannot be larger than 16 ft. Per NFPA 13D, sprinklers shall be installed with deflectors installed between 1" and 4" below the ceiling.

### **Horizontal sidewall sprinklers below finished ceilings**

- Ceiling must be horizontal and finished with a minimum  $\frac{3}{8}$ "-thick 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  $\frac{1}{2}$ "-thick, code-compliant plywood or solid sheathing. The minimum height from the floor to the bottom of the structure must be 8 ft.
- Support piping with metal pipe straps within the first 6" from the connections to the fittings. Do not stress the connection.
- Blocking or metal toggle bolts may be necessary where metal pipe hangers are required to be within 6" of the connection to the fittings.



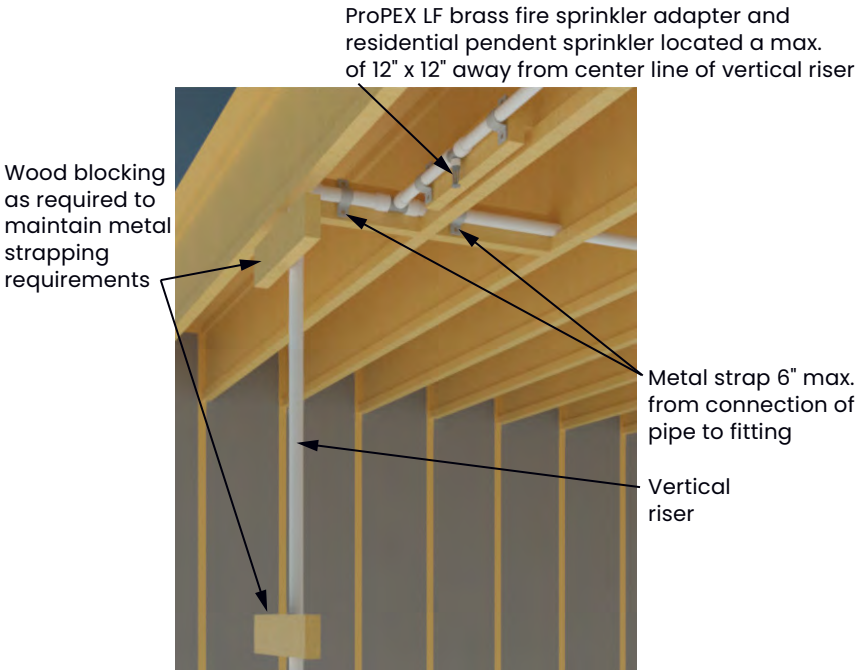
**Figure 1-3: Horizontal sidewall sprinklers below finished ceiling**

- Only use listed residential horizontal sidewall sprinklers with an activation temperature of 155°F (68.3°C) and 4.4 minimum K-factor in the exposed portion of the sprinkler system. Locate sprinklers per the manufacturer’s listings and NFPA 13D requirements but not greater than 12" from the finished ceiling.

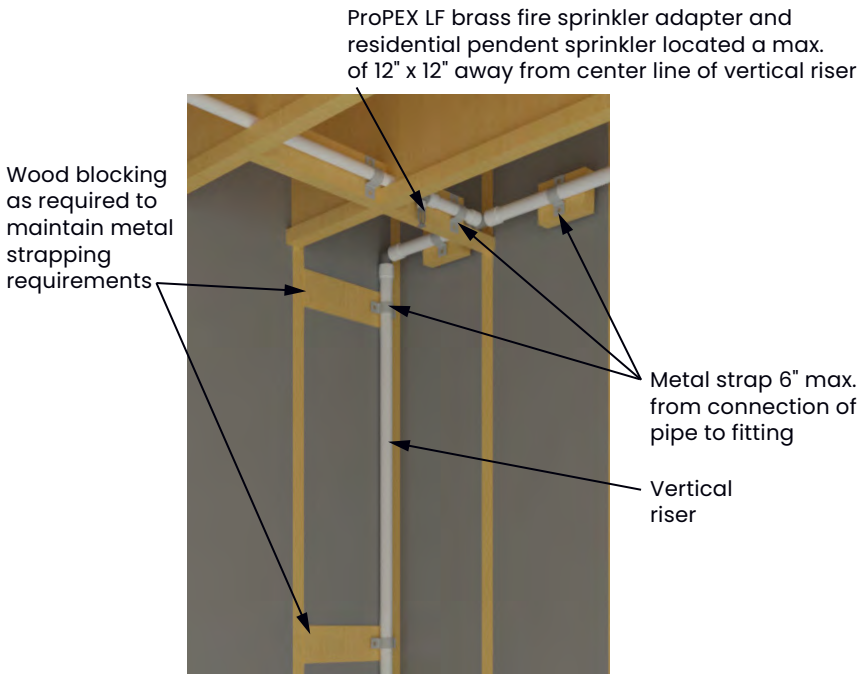
**Unfinished basements with vertical risers**

- Ceiling must be horizontal and constructed using dimensional lumber (solid wood), engineered wood, or engineered wood I-joists. The minimum height from the floor to the bottom of the structure must be 8 ft.
- Joist depth must be between 6" and 16" deep with on-center spacing between 12" and 24".
- Joists may remain exposed after installation.
- Only use listed residential pendent sprinklers with an activation temperature of 155°F (68.3°C) and 4.9 minimum K-factor in the exposed portion of the sprinkler system. Sprinkler spacing cannot be larger than 16 ft. Per NFPA 13D, sprinklers must be installed with deflectors no more than 1¼" below the bottom of the joist to account for future finished ceilings.

- When using Uponor AquaPEX pipe as a vertical riser from the water source to the main system piping, whether located in the center of the wall or in a corner, use a listed residential pendent sprinkler (stated above) located a maximum of 12" x 12" away from the centerline of the riser.
- Support the riser piping every 42" vertically and include a support within 6" from the end of the pipe connection to the fitting.



**Figure 1-4: Vertical riser mid-wall**



**Figure 1-5: Vertical riser corner**

## Handling and storing Uponor AquaPEX piping and components

Although not comprehensive, the following highlights the most common guidelines and listing requirements when handling Uponor AquaPEX piping 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 piping is listed for fire protection systems that do not exceed 130 psi (8.9 bar) 120°F (48.9°C).
- Do not use PEX piping where temperatures and pressures exceed ratings.

- Store Uponor PEX piping in its packaging under cover to avoid dirt accumulation and exposure to direct sunlight. Do not expose PEX piping to direct sunlight for more than 30 days. Do not use piping that has been exposed to direct sunlight for more than 30 days.
- Do not install PEX piping in direct view of fluorescent lighting. Do not use piping 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 piping.

**Note:** You may temporarily affix adhesive tape to Uponor PEX piping 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 piping.
- Do not install PEX piping 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 piping 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 piping is protected with suitable insulation.
- Do not solder within 18" of any PEX piping in the same water line. Make all sweat connections prior to making the fitting connection.
- Do not install PEX piping between the tub/shower valve and tub spout.
- Do not use PEX piping for an electrical ground.
- Do not spray on or allow any organic chemicals, pesticides, strong acids or strong bases to be exposed to PEX piping.
- Do not use petroleum or solvent-based paints on PEX piping.
- Use only approved and appropriate firestop materials with PEX piping. Verify firestop compatibility with the firestop manufacturer.
- Although PEX piping 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 piping to impact.

- During remodeling or ceiling repair, take appropriate precautions to protect the piping and sprinklers from damage.
- Do not install PEX piping 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, cost-effective, multipurpose system featuring dependable Uponor AquaPEX piping.

Uponor AquaSAFE systems are available in various system layouts.

**Figure 2-1 on page 18** depicts a looped system configuration. In a multipurpose system, individually heat-activated fire sprinklers attach to Uponor sprinkler adapter fittings. Flexible Uponor AquaPEX piping 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.

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 piping 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. Refer to the Uponor warranty on [uponor.com](https://www.uponor.com) 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 piping

Uponor AquaPEX piping 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.

### ProPEX sprinkler adapters and fittings

Uponor offers sprinkler adapter fittings specifically designed for the AquaSAFE system. These fittings feature ProPEX connections and a standard ½" NPT outlet for connecting fire sprinklers.

**Tables 1-1** and **1-2** show the required piping lengths needed to approximate the equivalent pressure resistance of the different types of Uponor ProPEX fittings.

### Equivalent piping lengths

Reduced fittings	Flow	Equiv. length
EP reducing coupling (1" x ¾")	Through	3
EP reducing coupling (1¼" x ¾")	Through	4
EP reducing coupling (1¼" x 1")	Through	3
EP reducing tee (¾" x ¾" x 1")	Through	2
	Branch	6
EP reducing tee (1" x ¾" x ¾")	Through	3
	Branch	17
EP reducing tee (1" x ¾" x 1")	Through	3
	Branch	16
EP reducing tee (1" x 1" x ¾")	Through	2
	Branch	7
EP reducing tee (1¼" x 1" x ¾")	Through	4
	Branch	6
EP reducing tee (1¼" x 1" x 1")	Through	11
	Branch	23
EP reducing tee (1¼" x 1¼" x ¾")	Through	3
	Branch	6
EP reducing tee (1¼" x 1¼" x 1")	Through	5
	Branch	7

**Table 1-1: Equivalent piping lengths of Uponor reduced fittings**

## Equivalent piping lengths

Standard fittings	Pipe dimension (in)			
	Flow	¾"	1"	1¼"
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 piping lengths of Uponor standard fittings**



**Figure 1-6: ProPEX tee with concealed sprinkler head**



**Figure 1-7: ProPEX tee with horizontal sidewall sprinkler**

Uponor ProPEX fittings, used with Uponor AquaPEX piping, 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 piping and expanding them simultaneously. The expanded piping and ProPEX ring then slide over the fitting. The connection is made as the PEX piping shrinks over the fitting due to the unique shape memory of Uponor AquaPEX piping.

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

## 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.

For more information, email Uponor Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com).

**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).



**Figure 1-8: Uponor PEX piping, ProPEX ring, and ProPEX EP tee**



**Figure 1-9:**  
Concealed sprinkler

### 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 1-10:**  
Concealed sprinkler  
cover plate



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



**Figure 1-11:** 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.



**Figure 1-12:**  
Flat concealed  
sidewall sprinkler

### 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 1-13:**  
**Recessed horizontal  
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 1-14: Recessed  
escutcheon**

### **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.

## Uponor AquaSAFE Qualification online training

To support the growing demand for fire safety training, Uponor now offers an online qualification program on [uponoracademyonline.com](https://uponoracademyonline.com).

This program satisfies all aspects of Uponor AquaSAFE fire safety system installations in an online, on-demand training format.

After successful completion of the program, attendees will receive a qualification certificate that satisfies any manufacturer training required by state or local authorities.

The training program is equivalent to **0.3 CEU** or **3 PDHs**.

To get started, create an account on [uponoracademyonline.com](https://uponoracademyonline.com) and purchase the AquaSAFE Qualification Program.

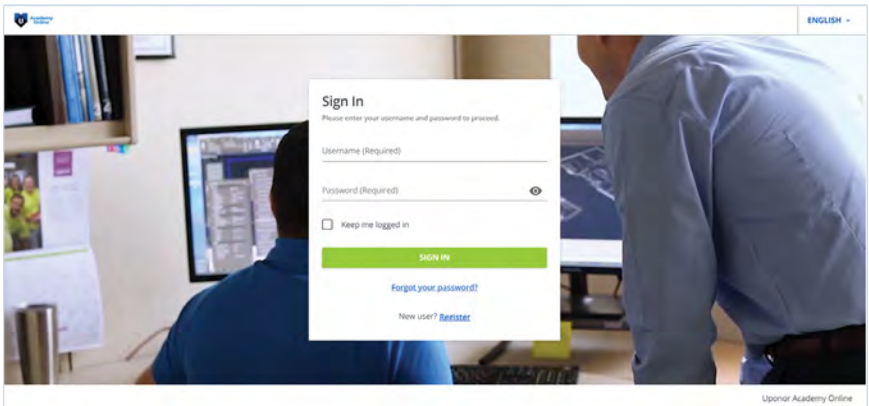


Figure 1-15: Uponor AquaSAFE Qualification on Uponor Academy Online

## Chapter 2

# Design

### Sprinkler plans

Uponor can provide a sprinkler layout design plan and engineer-stamped drawings. 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).

For information about integrating Uponor AquaSAFE details into existing sprinkler design software, certified designers can contact Uponor Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com).

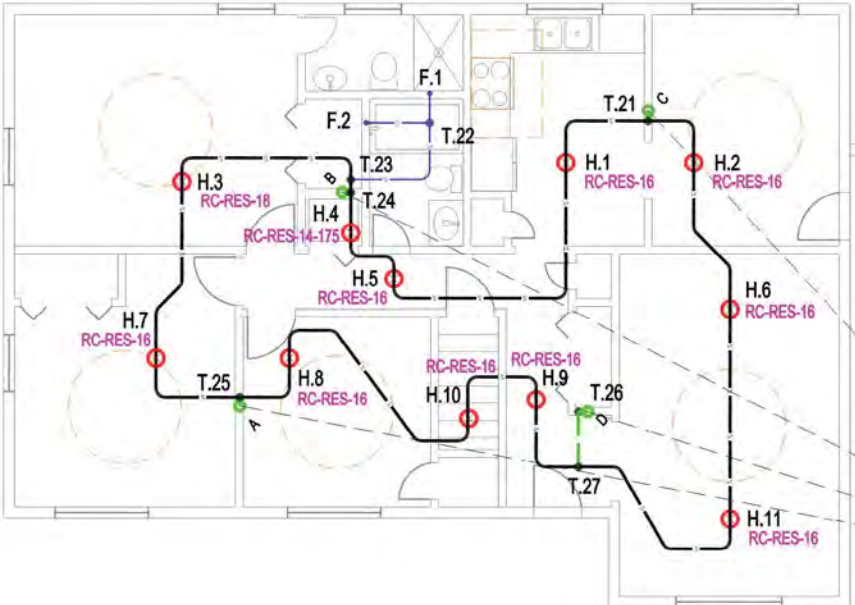
### Design information

Uponor's design provides the following information:

- **Model** – Type of sprinkler used
- **Nominal orifice size** – Size of the orifice on the sprinkler
- **Temperature rating** – Temperature 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** – 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



## Layout example



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

Figure 2-1: Layout example

## Chapter 3

# Installation overview

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

### Recommended tools

- NFPA 13D standard
- Installation instructions and spacing guidelines from sprinkler manufacturer
- ProPEX expansion tool
- Appropriate sprinkler wrench (identified on Uponor materials list) and ratchet
- Pipe cutter
- Teflon tape
- Screws: #10 x 1½" coarse-thread screws
- Uponor piping uncoiler
- Drill with drive bits and drill bits (including large bore 1¾" 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.
- Verify enough Uponor pipe talons are available for proper support of Uponor AquaPEX piping.
- Ensure protective caps are available for installation on every sprinkler.
- 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.

## Job-site verification

To verify the sprinkler plan is appropriate, walk the entire job prior to installation.

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 Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com) 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 piping locations.

**Note:** The floor-to-floor connection may be specified as a different piping 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 piping/stub-outs/fixtures with consideration of where the sprinkler piping 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 piping 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 Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com) to determine if observed changes require a redesign.

## Chapter 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 ft. off the wall.

### Installation instructions

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 Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com) if ceiling vaults or beams are not shown on the sprinkler plan.

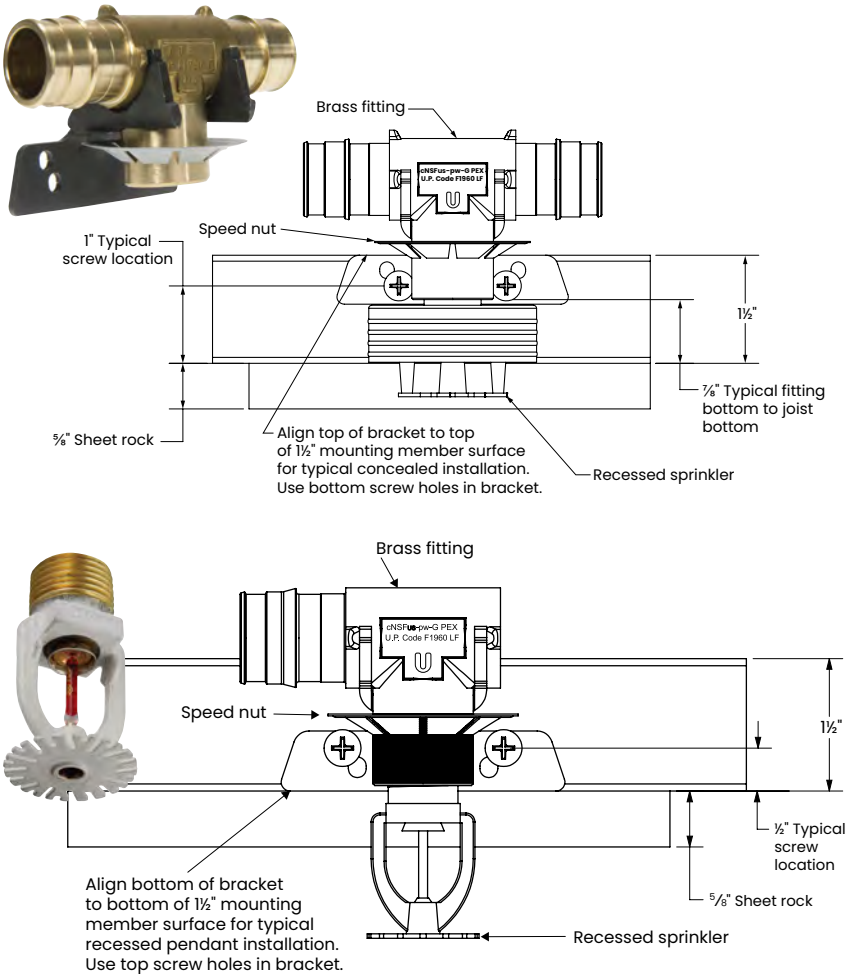
**Note:** The sprinkler plan will identify the most hydraulically remote sprinkler(s) that will be used for flow-verification testing. To save time during that procedure, make sure these sprinkler locations are clearly defined during installation.

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

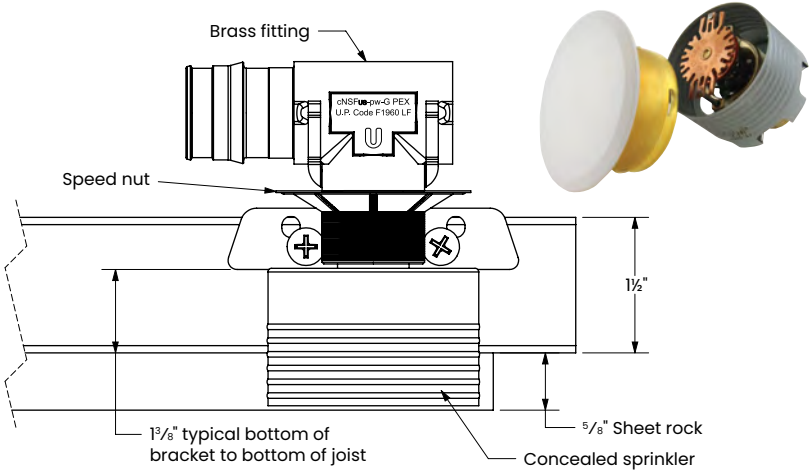
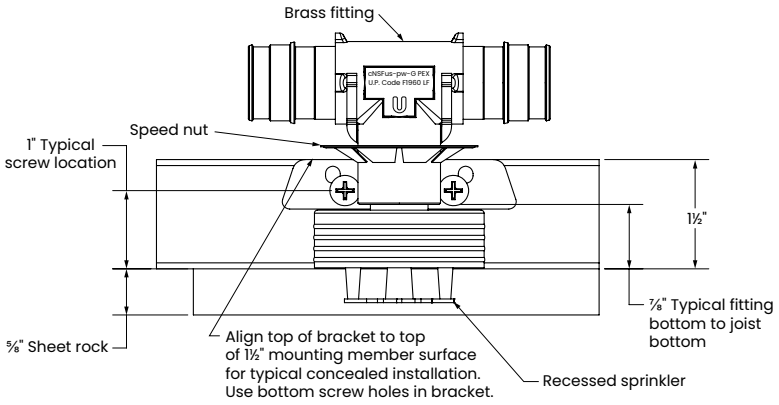
placement of brackets and adapters, paying close attention to the ceiling type and sprinkler model.

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.

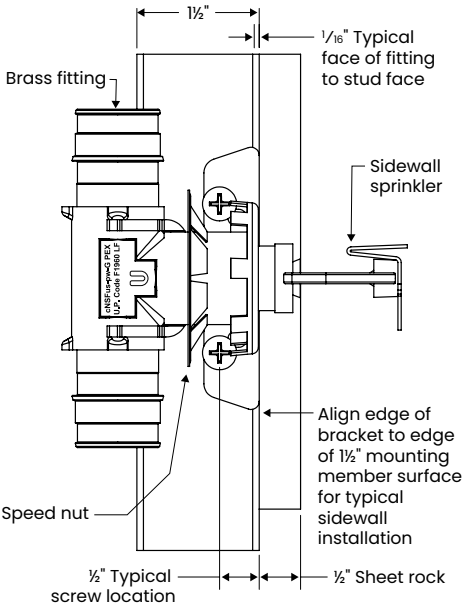


**Figure 4-1: Recessed assembly sprinkler placement**



**Figure 4-2: Concealed assembly sprinkler placement**

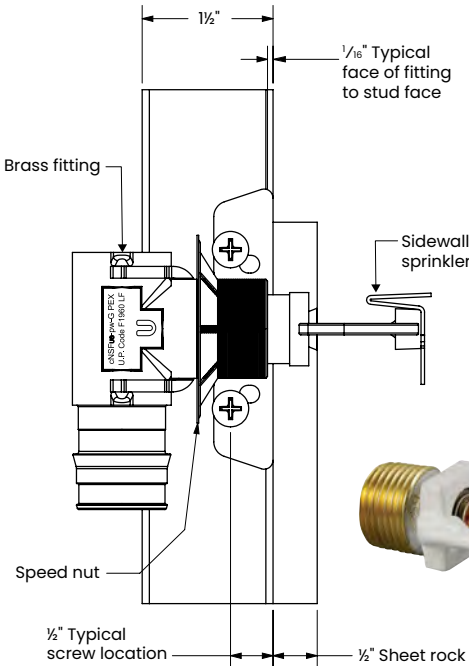




**Note:** Dimensions shown are for typical ceiling or wall construction and may not apply in all situations. The sprinkler plans may contain different information based on details supplied on the design request form and/or submitted construction drawings.

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).



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

## Chapter 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 **Chapter 11: Flow testing** for more details.

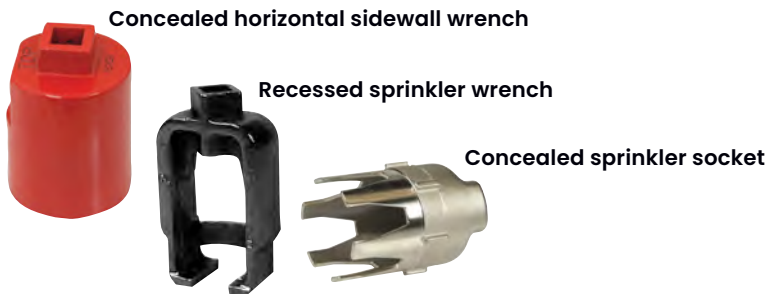


Figure 5-1: Sprinkler wrench types

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.
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 ½" 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 ½" 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.

## Chapter 6

# Installing piping

### Bend radius and piping support

#### Bending PEX

Refer to **Table 6-1** for the minimum bend radius of Uponor AquaPEX piping. When making bends less than 12" in diameter, be sure to make the bends slowly and carefully to avoid over bending or kinking the piping.

#### Piping support and pipe talon guidelines

1. Uponor recommends plastic piping supports (pipe talons) but metal piping supports designed for plastic piping are acceptable and required for exposed applications. Ensure proper orientation of the pipe talon as shown in **Figure 6-1**.
2. Do not use supports that will damage the piping. Inspect metal supports for sharp edges.
3. The linear expansion rate for Uponor AquaPEX piping is approximately 1.1" per 10°F (12°C) temperature change for every 100' of piping.

Piping size	Bend radius
½"	3¾"
¾"	5¼"
1"	6¾"
1¼"	8¼"

**Table 6-1: Minimum bend radius**



**Figure 6-1: Pipe talon**

4. Allow ⅛" to ⅜" longitudinal clearance per foot of run to accommodate thermal expansion when installing piping runs. Allow piping to dip between supports.

**Note:** Do not pull piping tight during installation.

5. Do not rigidly anchor Uponor AquaPEX piping with supports. Allow enough piping for freedom of movement to expand and contract.
6. Allow adequate clearance between PEX piping and the structure (bored holes or sleeves) to allow freedom of movement for thermal expansion and contraction

### Piping support spacing

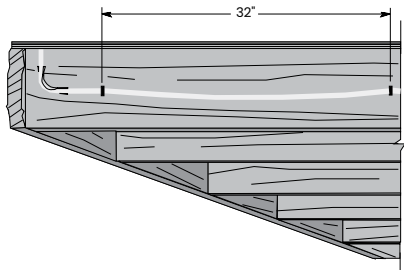
Anchor Uponor AquaPEX piping securely enough to support the piping, yet relaxed enough to allow the piping to expand and contract.

1. Along horizontal runs, install supports every 32". If horizontal runs are continuously supported, place the piping supports at 6' intervals (see **Figure 6-3**).
2. Along vertical runs, install supports every 4' to 5' at each floor and at a mid-story guide (see **Figure 6-4**).

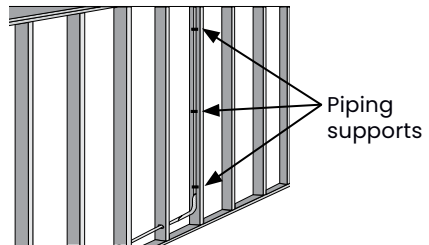
**Note:** When piping is installed in an area that will be left exposed or unfinished, metal piping supports are required every 24". (see **Figure 6-2**)



**Figure 6-2: Metal piping supports**



**Figure 6-3: Horizontal runs**



**Figure 6-4: Vertical runs**

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

## Reforming kinked piping

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

1. Straighten the kinked portion of the piping.
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 piping returns to its original size and shape. Do not use an open flame.



**Caution:** Only heat the Uponor AquaPEX piping long enough to remove the kink. Remove the heat source from the piping 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 piping.

3. Let the repaired Uponor AquaPEX piping cool undisturbed to room temperature. When the piping returns to its original appearance, the repair is complete.



**Caution:** The surface temperature of the piping must not exceed 338°F (170°C). DO NOT apply direct flame to Uponor AquaPEX piping.

Uponor AquaPEX piping repaired according to these recommendations will return to its original shape and strength. If Uponor AquaPEX piping 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 piping, 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.

**Note:** In accordance with UL and C-UL listings, when protection for the piping 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

### Piping uncoilers

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

- Pipe uncoiler (E6061000)
- Deluxe pipe uncoiler (E6061100)
- Select uncoiler (E6062000)
- Compact select uncoiler (E6063000)



Figure 6-5: Pipe uncoiler (E6061000)



Figure 6-6: Deluxe pipe uncoiler (E6061100)



Figure 6-7: Select uncoiler (E6062000)

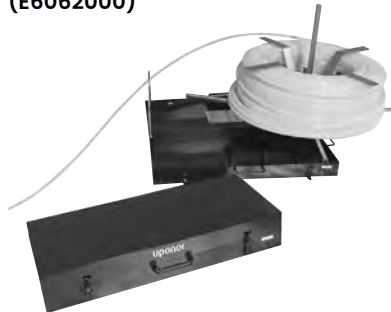


Figure 6-8: Compact select uncoiler (E6063000)

## 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 piping 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.





## Chapter 7

# Making ProPEX connections

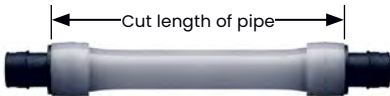
Uponor ProPEX ASTM F1960 (CAN/CSA B137.5) cold-expansion fittings make solid, permanent, manufactured connections without the need for torches, glues, solder, flux, or gauges. The unique shape memory of Uponor PEX piping forms a tight seal around the fitting, creating a strong, reliable connection. This chapter shows how to make proper ProPEX connections using one of the following tools.



- Milwaukee M12, M12 FUEL, M18, or M18 FUEL ProPEX expansion tools
- Milwaukee M18 FORCE LOGIC ProPEX Expansion Tool
- ProPEX 201 Corded Expander Tool
- ProPEX Hand Expander Tool

### Distance between fittings

Uponor requires a minimum distance between ProPEX fittings to avoid damaging the fittings during installation and to protect against elevated stress on the pipe and fittings. Refer to **Table 7-1** for the minimum distance between fittings, which is



**Figure 7-1: Distance between fittings** expressed as cut length of pipe.

Nominal fitting size	Cut length of pipe
½"	2"
¾"	3"
1"	3½"
1¼"	4½"
1½"	4½"
2"	6"
2½"	7½"
3"	9"

**Table 7-1: Minimum distance between ProPEX fittings**

### General ProPEX connection tips

- If the fitting does not slide into the piping all the way to the stop, immediately remove it from the piping and expand the piping one final time.

**Note:** To avoid over-expanding the piping, do not hold the piping in the expanded position.

- **Table 7-2** shows 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 piping 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 1/16" (1 mm) between the ring and the shoulder of the fitting, the connection must be replaced. Square cut the piping 2" away from the fitting for 3/8" to 1" pipe, 3" away for 1 1/4" to 2" pipe, and 5" away for 2 1/2" and 3" pipe prior to making the new connection.
- Brass ProPEX fittings can be disconnected and reused. EP fittings must be discarded. Be sure to follow the recommended minimum distance between ProPEX fittings shown in **Table 7-1**.

Pipe size	Milwaukee ProPEX expansion tools		
	M12 with standard heads (2432)	M12 FUEL with RAPID SEAL™ heads (2532)	M18 (2632)
3/8"	6-7	6-10	5
1/2"	7-8	5-8	9
5/8"	9-10	6-10	9
3/4"	11-12	7-12	10
1"	17-18	12-18	19
1 1/4"	—	—	9
1 1/2"	—	—	10
2"	—	—	—
2 1/2"	—	—	—
3"	—	—	—

**Table 7-2: Recommended number of expansions for 3/8" to 3" piping at 73.4°F (23°C)**

## Making ProPEX connections with Milwaukee M12, M12 FUEL, M18, or M18 FUEL expansion tools



Figure 7-2: 3/8" and 1/2" Milwaukee expansion heads



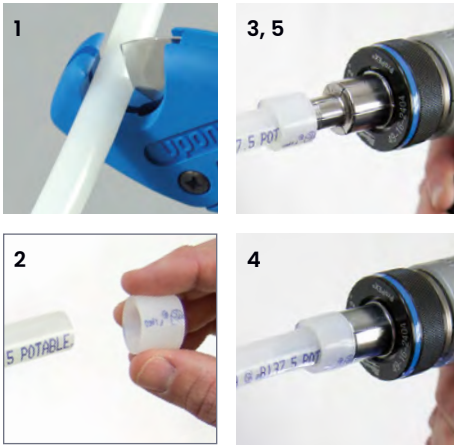
Figure 7-3: 3/4" to 3" Milwaukee expansion heads

**Note:** All standard Uponor expander heads are compatible with the M12 and M18 tools. Uponor expander heads will not auto-rotate on the Milwaukee tools (only Milwaukee expansion heads will auto-rotate on the M12 and M18). H-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.

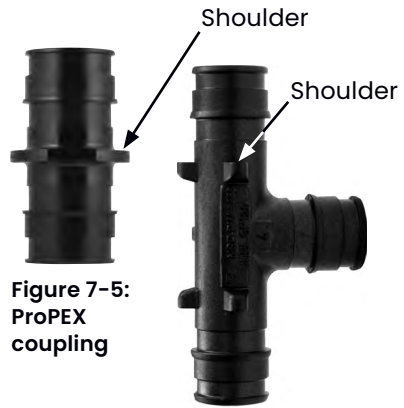
**Important!** Making expansions are slightly different when using a tool that features auto rotation. When making a ProPEX connection, be sure to follow the guidelines for the tool you are using in your application.

Pipe size	Milwaukee ProPEX expansion tools	Uponor ProPEX expander tools		
	M18 FORCE LOGIC (2633)	Manual	100/150	201
3/8"	—	5	7	—
1/2"	—	4	4	—
5/8"	—	9	9H	—
3/4"	—	14	7H	—
1"	—	—	7H	—
1 1/4"	—	—	8H	—
1 1/2"	—	—	—	—
2"	4	—	—	5H
2 1/2"	5	—	—	—
3"	7	—	—	—

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



**Figure 7-4: Expansion with Milwaukee M12 and M12 FUEL ProPEX expansion tools**



**Figure 7-5: ProPEX coupling**

**Figure 7-6: ProPEX tee**

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Slide the ProPEX ring over the end of the piping until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the piping no more than  $\frac{1}{16}$ " (1 mm).

**Important!** If making a  $\frac{3}{8}$ " ProPEX connection, first expand each side of the ring before placing it on the piping. Refer to the "Making  $\frac{3}{8}$ " ProPEX connections" instructions on **page 46** for further information.

### **With auto rotation (standard Milwaukee heads)**

3. Milwaukee ProPEX expansion tools come with built-in auto rotation. If using a Milwaukee expansion head, simply hold the piping and tool in place while holding the trigger to expand the piping. The head will automatically rotate to ensure the piping is evenly expanded. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expansion head. See **Table 7-2** for the recommended number of expansions for each piping size.

**Note:** Do not force the pipe onto the expansion head. Ensure the expansion head is rotating during each expansion.



Figure 7-7: Inserting ProPEX fitting into 1/2" Uponor PEX piping

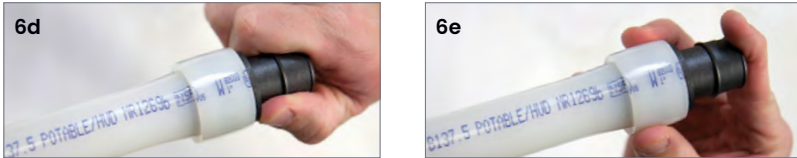


Figure 7-8: Inserting ProPEX fitting into 1" Uponor PEX piping

**Without auto rotation (standard Uponor heads)**

4. Press the trigger to expand the piping.
5. Release the trigger, remove the head from the piping, rotate it 1/8 turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expansion head. See **Table 7-2** for the recommended number of expansions.

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

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

**Important!** Only perform the necessary number of expansions. DO NOT over expand the pipe. You should feel some resistance as the fitting goes into the piping. If you do not feel any resistance, the piping may be over expanded and will require additional time to shrink over the fitting.

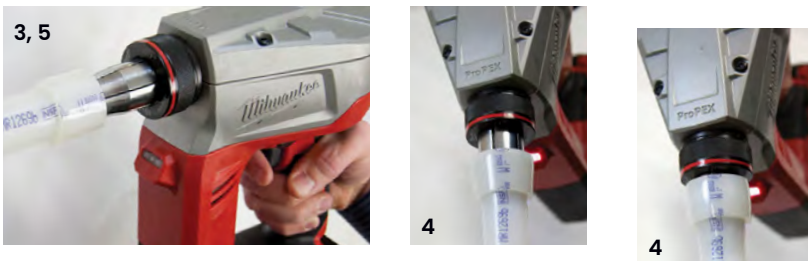


Figure 7-9: Expansion with Milwaukee M18 ProPEX Expansion Tool

# Making ProPEX connections with Milwaukee M18 FORCE LOGIC ProPEX expansion tools

## FORCE LOGIC expansion head installation

The Milwaukee FORCE LOGIC ProPEX Expansion Tool for 2", 2½", and 3" Uponor PEX pipe features an auto-rotating head with specially designed alignment cogs. This requires slightly different head installation than the M12 and M18 ProPEX expansion tools for ¾" to 1½" pipe sizes.

1. Remove the battery pack and place the FORCE LOGIC tool in the upright position (cone up).



Figure 7-10: FORCE LOGIC expansion head installation

2. Verify the expansion cone is fully retracted.
3. Screw the head onto the tool (clockwise). Hand-tighten securely. Do not over tighten. Ensure the expansion head fits flush against the tool

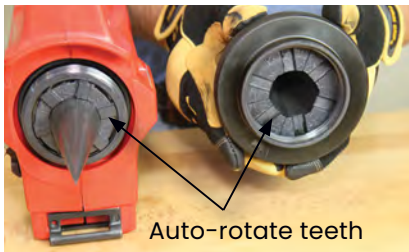


Figure 7-11: FORCE LOGIC expansion head auto-rotate teeth

4. Check the installation.
  - a. Ensure the head segments do not "flower"



Figure 7-12: Incorrect expansion head "flowering"

- b. If the head flowers, correct the installation by loosening the head slightly and rotating the segments until they engage in the cogs. Re-tighten the head.



Figure 7-13: Correct expansion head alignment

- c. Rotate the six expansion segments in the clockwise direction. They will rotate freely. They should not rotate counter clockwise.
- d. The expansion head collar will fit flush against the tool.

### Making a ProPEX connection

1. Square cut the pipe perpendicular to the length, and remove all excess material or burrs.



Figure 7-14: Cut pipe

2. Slide the ProPEX ring over the end of the piping until it reaches the stop edge.



Figure 7-15: Add ring



Figure 7-16: Ensure ring reaches stop edge

3. The tool features auto rotation so the head will automatically rotate to ensure the piping is evenly expanded.

**Note:** To cancel the expansion process quickly, pull and release the trigger.

4. Press the trigger to initiate the rotation of the head. A green light will turn on and the work light will blink. Insert the pipe and ring and release the trigger. When the expansion head has reached its maximum diameter, it will retract.

**Important!** Do not force the pipe and ring on the head



Figure 7-17: Begin expanding

during any expansion.

5. After the tool has retracted, the green indicator light blinks three times. Press the trigger and repeat the expansion process.



- Repeat the process until the pipe and ring are snug against the shoulder of the expansion head. Repeat the expansion one or two more times depending on the ambient temperature.

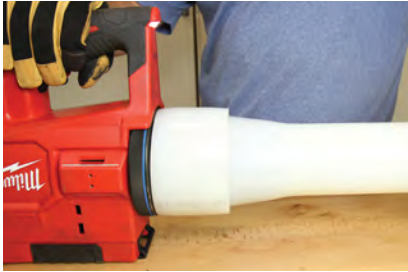


Figure 7-18: Expand to shoulder

- Note:** Colder temperatures require fewer expansions.
- After final expansion, immediately remove the tool and insert the fitting.



Figure 7-19: Insert fitting

## Making ProPEX connections with ProPEX 201 corded expander tool

- Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
- Slide the ProPEX ring over the end of the piping until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the piping no more than  $\frac{1}{16}$ " (1 mm).



Figure 7-20: Cut pipe



Figure 7-21: Add ring

3. Slide the expander head into the piping until it stops. Full expansions are necessary to make a proper connection.



Figure 7-22: Slide head into piping

4. Press the trigger to expand the piping.



Figure 7-23: Begin expanding

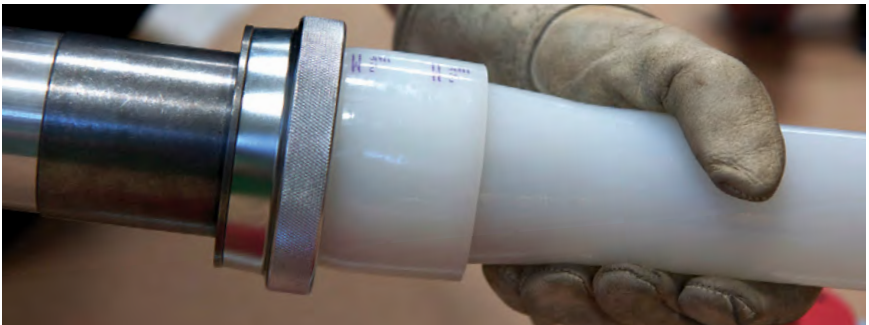
5. Release the trigger, remove the head from the piping, rotate it  $\frac{1}{8}$  turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expander head. See **Table 7-2**.

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

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



**Figure 7-24: Rotate head**



**Figure 7-25: Expand to shoulder**



**Figure 7-26: Insert fitting**



**Figure 7-27: Ensure piping and ring seat against shoulder of fitting**



**Figure 7-28: ProPEX EP tee connected to pipe**



**Figure 7-29: ProPEX brass fitting connected to pipe**

## Making $\frac{3}{8}$ " ProPEX connections

When making a  $\frac{3}{8}$ " ProPEX connection, expand the ring once on each side to properly fit over the piping. Refer to the following instructions to make a  $\frac{3}{8}$ " ProPEX connection.

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Expand each side of the ring once.
3. Slide the expanded ring over the end of the piping. Extend the end of the piping no more than  $\frac{1}{16}$ " (1 mm).
4. After the ring is on the piping, continue with the regular steps for making a proper connection with your specific tool.



Figure 7-30: E6081128 pipe cutter (plastic)

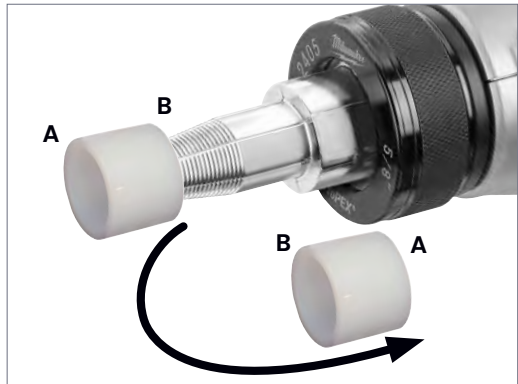


Figure 7-31: Expand each side of the ring

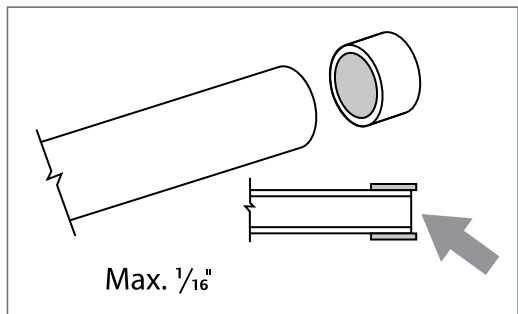


Figure 7-32: Slide the expanded ring over the end of the piping

### Important tips for a proper $\frac{3}{8}$ " ProPEX connection

- The thicker  $\frac{3}{8}$ " ProPEX Ring shrinks over the fitting faster than larger-sized rings.
- When the temperature is below 40°F (4.4°C), fewer expansions are required.

## Proper expansion tool and head maintenance

- Use a lint-free cloth to apply a light coat of lubricant to the cone prior to making any ProPEX connections.
- If used regularly, apply the lubricant daily to the cone of the ProPEX expansion tool. Failure to keep the tool lubricated may result in improper connections.



**Caution:** Excessive lubrication may result in improper connections. Only use a small amount of lubrication to keep the tool working properly.

- Keep all other parts of the tool free from lubricant.
- Once a month, soak the heads in degreasing agent to remove any grease from between the segments. Clean the cone using a clean, dry cloth.

## 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 piping 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 piping.
4. After removing the ring, apply heat directly around the fitting and piping connection. **Do not use open flame.** Gently work the piping back and forth while pulling slightly away from the fitting until the piping separates from the fitting.



Figure 7-33: Cut ring



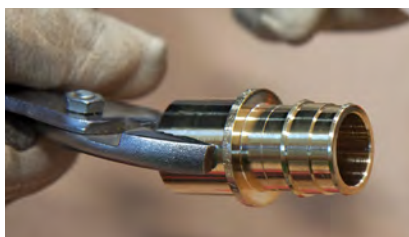
Figure 7-34: Remove ring



Figure 7-35: Heat connection



**Figure 7-36: Work piping back and forth**



**Figure 7-37: Remove fitting**

5. After removing the fitting, measure:
  - 2" (50.8 mm) minimum for 3/8" to 1" pipe
  - 3" (76.2 mm) minimum for 1 1/4" to 2" pipe
  - 5" (127 mm) minimum for 2 1/2" and 3" pipe



**Figure 7-38: Measure from end of pipe**

6. Square cut the piping at the proper marking.



**Figure 7-39: Cut pipe at 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 expansion 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 piping. If you do not feel any resistance, the piping 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 piping which can result in potential leak paths.

## **Expansion is difficult**

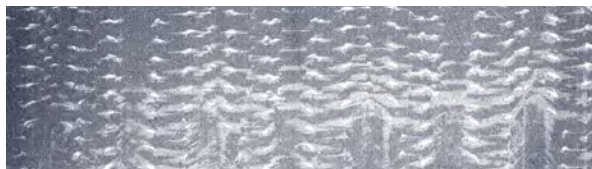
- Make sure the internal cone is properly greased.

## **Expansion head slips out of piping when making expansions**

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

## **ProPEX ring slides down piping during expansion**

- Ensure your hands are clean while handling the piping. 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 piping during expansion.



**Figure 7-40: Expansion with proper rotation**



**Figure 7-41: Expansion without proper rotation**

- If you anticipate the ProPEX ring may possibly slide down, position the ring slightly farther over the end of the piping and make the first couple of expansions slowly. Once the ring and the piping 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 piping 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 expansion 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**

- Uponor recommends the use of the Milwaukee M12 FUEL ProPEX expansion tool with RAPID SEAL™ heads for cold-weather installation of  $\frac{3}{8}$ " to 1" Uponor piping systems.
- Temperatures affect the time required for the piping 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.
- Fewer expansions are necessary in temperatures below 40°F (4.4°C).

**Note:** Do not use a heat gun on EP fittings to speed up the contraction time as this could result in damage to the fitting.



## Chapter 8

# 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 piping 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 8-1: Feed plumbing fixtures via EP multiport tees



Figure 8-2: Uponor LF brass fire sprinkler adapters



## Chapter 9

# 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 piping and fittings

## Installation guidelines

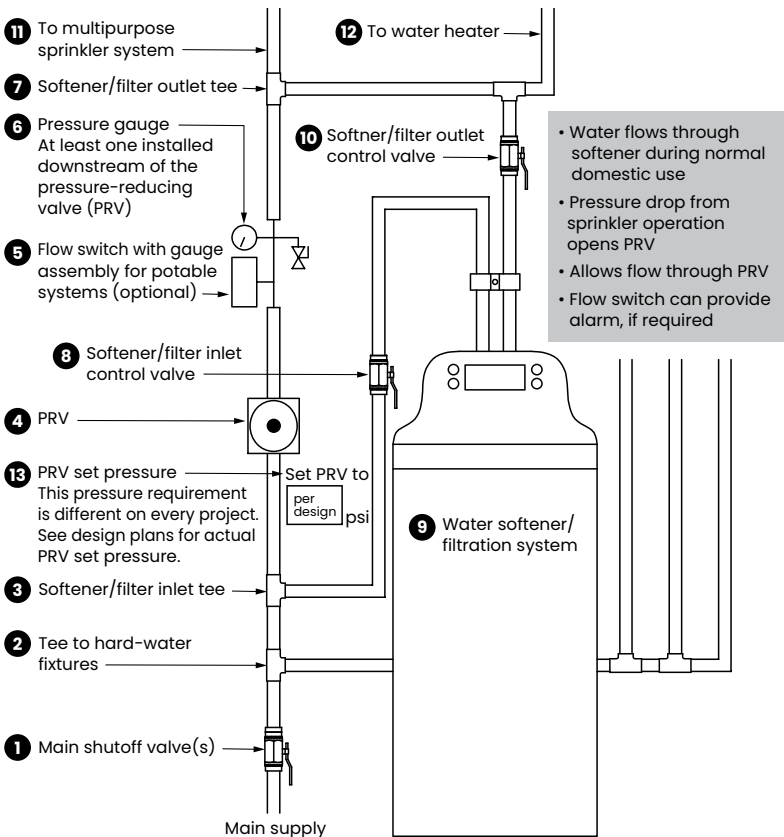
Refer to **Figure 9-1** and use the following steps to install a domestic water bypass.

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 Construction Services to recalculate the system.

Visit: [uponor.com/construction-services](http://uponor.com/construction-services)

Email: [nasupport@uponor.com](mailto:nasupport@uponor.com)

U.S.: 800.321.4739, Canada: 888.594.7726



**Figure 9-1: Domestic water bypass installation with optional flow switch**

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 Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com) to verify the friction loss across the PRV is not too great and to see if there is something else causing a flow restriction.

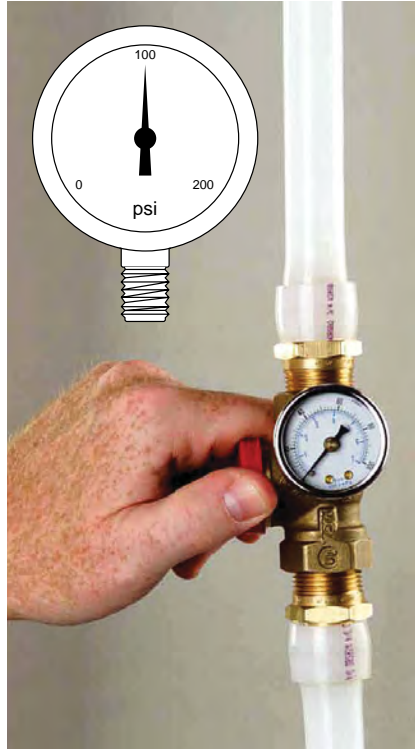
## Chapter 10

# 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 10-1:** Pressure test at normal operating water pressure



## Chapter 11

# 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 11-1: AquaSAFE flow test

## Flow test setup

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

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 11-2**)

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 64.**)

## Flow test assembly

The flow test assembly consists of the following parts (see **Figure 11-2**).

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



**Figure 11-2: Flow test assembly**



**Figure 11-3: Flow test bucket**

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 11-3**). 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.

## 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 Construction 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 Construction Services at:

**Visit:** [uponor.com/construction-services](https://www.uponor.com/construction-services)

**Email:** [nasupport@uponor.com](mailto:nasupport@uponor.com)

**U.S.:** 800.321.4739, **Canada:** 888.594.7726

## 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 piping
- Missing cross connections or other missing piping
- PRV (if present) is not completely open
- PRV (if present) does not match size, make or model shown on the plan
- Piping 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 Construction 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





## Chapter 12

# 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 12-1: 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 Construction Services at [design.services@uponor.com](mailto:design.services@uponor.com).

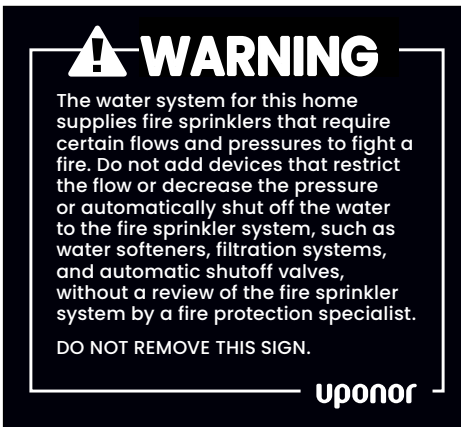


Figure 12-2: Warning sign

## Warranty information

For warranty information, search "Warranty" on [uponor.com](http://uponor.com).



# Moving > Forward

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