

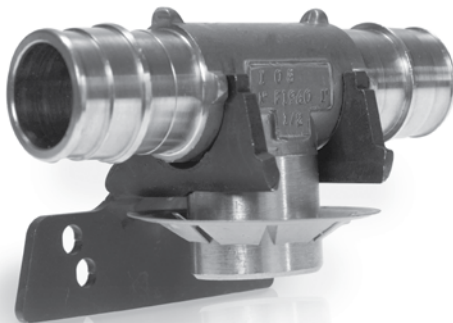


uponor

RESIDENTIAL
FIRE SAFETY SYSTEMS

**AquaSAFE™
LOOPED SYSTEM**

INSTALLATION GUIDE



A Looped, Non-stagnant,
Multipurpose Plumbing and
Residential Fire Safety System

Uponor AquaSAFE™ Looped System Installation Guide

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The AquaSAFE™ Looped System Installation Guide is a manual published for architects, engineers, building officials, plumbing and fire safety professionals, and Authorities Having Jurisdiction (AHJ). 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 www.uponor-usa.com or www.uponor.ca.

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 Underwriters Laboratories (UL).

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Section 1


General Information

Model Code Approvals, Certifications, Ratings and Material Standards

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

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

Uponor AquaPEX tubing and fittings are listed to Underwriters Laboratories (UL) and Canadian Underwriters Laboratories (C-UL) for Multipurpose piping 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. This UL listing was issued to Uponor in June of 2000.

Note: Due to limited space on the fittings, affected Uponor fittings carry the following UL and C-UL designation: . Please see the UL website, www.ul.com/database, for UL documentation for the Uponor system.

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" and 1" Uponor AquaPEX White tubing, in accordance with UL 1821 and ULC/ORD C199P.

The tubing and fittings for multipurpose 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).

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 fittings are certified compliant with

the Canadian Standards Association, CAN/CSA B137.5: Standard for Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.

Handling and Storing Uponor AquaPEX Tubing and Components

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

- Install Uponor systems according to the installation instructions of the manufacturer. Not following the instructions and guidelines in the installation guide can result in failure of Uponor systems.
- Do not store sprinkler assemblies or cover plates in areas subject to extreme temperatures (over 100°F/37.7°C).
- Uponor PEX tubing is UL-listed for fire protection systems that do not exceed 130 psi/8.9 bar at 120°F/48.9°C.
- In accordance with the UL and C-UL listings, do not use or store Uponor AquaPEX tubing in areas exposed to direct sunlight for more than 15 days.
- Do not weld, glue or use adhesives or adhesive tape with Uponor AquaPEX tubing.
- Do not apply open flame to Uponor AquaPEX tubing.
- Do not install Uponor AquaPEX tubing within 6" of any gas appliance vents, with the exception of Type B vents.
- Do not install Uponor AquaPEX tubing within 12" of any recessed light fixture unless it is insulated from the PEX line or the PEX line is insulated.
- Do not solder within 18" of Uponor AquaPEX tubing in the same water line. Make sweat connections prior to making the ProPEX® connection.
- Do not use Uponor AquaPEX tubing to convey natural gas.
- Do not use Uponor AquaPEX tubing for an electrical ground.
- Do not expose Uponor AquaPEX tubing to any organic chemicals, strong acids or strong bases.
- Do not install tubing or fittings outdoors.
- Do not use petroleum or solvent-based paints on Uponor AquaPEX tubing.
- Use only approved and appropriate firestop materials with Uponor AquaPEX tubing. Verify firestop compatibility with the firestop manufacturer.

- Do not expose Uponor AquaPEX tubing to rodents, insects or other pests.

Note: Although PEX tubing does not attract rodents, insects and other pests, 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.

- Do not subject Uponor AquaPEX tubing to impact.
- Do not install Uponor AquaPEX tubing in plenums or within 24" of air-return grills or other openings in the ceiling.
- During remodeling or ceiling repair, take appropriate steps to ensure that the tubing and sprinklers are protected from damage.
- Do not install Uponor AquaPEX tubing and fittings in combustible, concealed spaces where sprinklers are required by NFPA 13D Standard and the National Building Code of Canada (as applicable).
- Store Uponor AquaPEX tubing in its carton under cover to avoid dirt accumulation and exposure to direct sunlight. In accordance with the UL and C-UL listings, do not use or store tubing that has been exposed to direct sunlight for more than 15 days. Uponor recommends following these storage and handling guidelines for all Uponor PEX tubing.

Uponor AquaSAFE Fire Safety System Overview and Components

The AquaSAFE Fire Safety 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 the reputable Uponor AquaPEX tubing.

Uponor AquaSAFE Fire Safety offers two installation design methods:

- Uponor AquaSAFE Looped system
- Uponor AquaSAFE Network system

This guide applies to the Uponor AquaSAFE Looped system. For the Uponor AquaSAFE Network system, please refer to the Uponor AquaSAFE Network System Installation Guide. See **Figures 1-1** and **2-1** for illustrations of the looped system configuration.

In this AquaSAFE Multipurpose system, 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 designed to withstand temperatures and pressures 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" and 1" Uponor AquaPEX White tubing.

Installation of the AquaSAFE Fire Safety system must comply with:

- National Fire Protection Association 13D (Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes)
- National Building Code of Canada (as applicable)

The Uponor AquaSAFE Looped 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.

The ProPEX brass tee and multiport tee supply the cold-water fixtures (shown in **Figure 1-1**). 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.

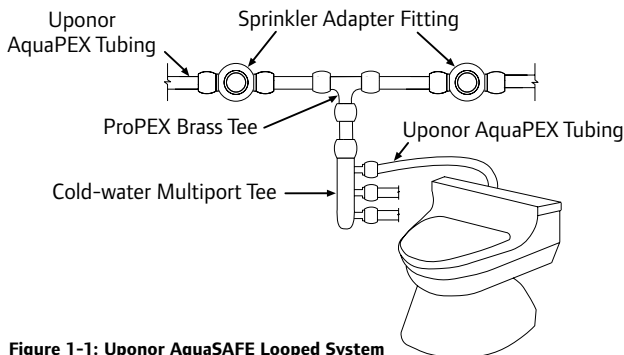





Figure 1-1: Uponor AquaSAFE Looped System

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.

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

UPONOR AquaPEX® PEX 5006 1.0IN SDR9/  B137.5 POTABLE/  130PSI
120°F UL1821/ULC-ORD C199P ( 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* xxxxxx**

*USA, Material Type, Extruder No., Year, Month, Day

**Footage marking in increments of three

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

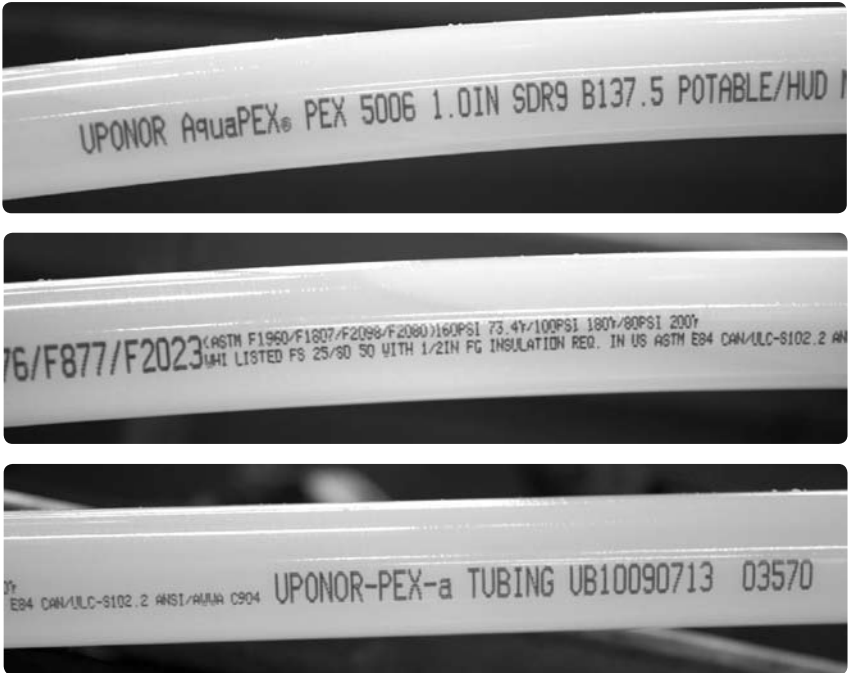






Figure 1-2: Uponor AquaPEX Tubing

Print Stream on Tubing	Explanation
UPONOR AquaPEX	Brand Name
PEX 5006	ASTM F2023 Testing I/A/W ASTM F876
½ IN	Tubing Size (Example: ½")
SDR9	Standard Dimensional Ratio of 9
 B137.5 POTABLE	Potable Water Listing by CSA
 130PSI 120° F (49° C) UL1821	Rating I/A/W UL 1821 (½", ¾" and 1" only)
ULC-ORD C199P ¹	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 F525/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 ²	Manufacturing Code to Audit Material Source
xxxxx ³	Footage Marker in Increments of 3' (three feet)

¹ For ½-inch tubing only

² USA, Material Type, Extruder No., Year, Month, Day

³ Footage marking in increments of three feet (3')

Table 1-1: Print Stream Identification

ProPEX® Sprinkler Adapters and Fittings

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

Table 1-2 shows the required tubing length needed to approximate the equivalent pressure resistance of the different types of Uponor ProPEX fittings.

Calculated Equivalent Tubing Length

Fitting Type	Tubing Size	
	¾"	1"
Tee - Run	2'	2'
Tee - 90°	6'	6'
90° Elbow	5'	6'
Coupling	2'	2'

Table 1-2: Pressure Resistance (Fittings/Tubing)



Figure 1-3: ProPEX Tee with RFC Sprinkler Head



Figure 1-4: ProPEX Elbow with HSW Sprinkler Head

Uponor ProPEX fittings, used with Uponor AquaPEX ASTM F876 and F877 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 plastic (EP), stainless steel, or 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.

Note: Brass fittings must be used to tee into sprinkler lines.

Refer to the Uponor Product Catalog for a current listing of all ProPEX brass couplings; brass elbows; brass tees; brass reducing tees; brass male threaded adapters; brass female threaded adapters and brass sweat adapters.



Figure 1-5: Uponor Tubing, Ring and ProPEX Brass Tee

Residential Sprinklers

Only National Sanitation Foundation (NSF)-listed residential fire sprinklers are compatible with AquaSAFE Fire Safety systems.

Note: Ensure that all sprinklers are installed within their listing limitations. Additionally, ensure that the Uponor Sprinkler Cabinet that remains in the home contains sprinklers identical to those installed in the system. Do not store sprinklers in areas that may experience excessive heat (over 100°F/37.3°C).

Concealed Sprinklers

A special plate covers the concealed sprinklers. This plate drops away from the sprinkler at 135°F/57.2°C. The sprinkler activates when it senses temperatures greater than 165°F/73.9°C.



Figure 1-6: Concealed Sprinklers



Figure 1-7: Concealed Sprinkler Cover Plates

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

Note: Concealed sprinklers are compliant with all editions of the NFPA 13D Standard. Do not store sprinklers in areas that may experience excessive heat (over 100°F/37.3°C).



Figure 1-8: Recessed Pendant Sprinkler

Recessed Pendant Sprinklers

Recessed pendant sprinklers are visible in the ceiling and do not use a cover plate. Recessed sprinklers activate when temperatures exceed 155°F/68.3°C. In areas where ambient ceiling temperatures exceed 100°F/37.7°C, intermediate temperature sprinklers are required.

Note: Recessed pendant sprinklers are compliant with all editions of the NFPA 13D Standard. Do not store sprinklers in areas that may experience excessive heat (over 100°F/37.7°C).

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/68.3°C. Intermediate temperature sprinklers are required where ambient ceiling temperatures exceed 100°F/37.7°C.

Note: Recessed Horizontal Sidewall Sprinklers are compliant with all editions of NFPA 13D Standard. Do not store sprinklers in areas that may experience excessive heat (over 100°F/37.7°C).



Figure 1-9: Recessed Horizontal Sidewall (HSW) Sprinkler Head

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: Uponor Recessed Escutcheons

Section 2

Design

Sprinkler Plans

Uponor can supply all needed 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). For more information about Uponor design capabilities, contact your local manufacturer representative.

Certified designers can contact Fire Safety Support at 800.321.4739 (US) or 888.594.7726 (Canada) for more information about integrating our information into their existing sprinkler design software.

Looped Design Example

Uponor's Looped Design provides the following information:

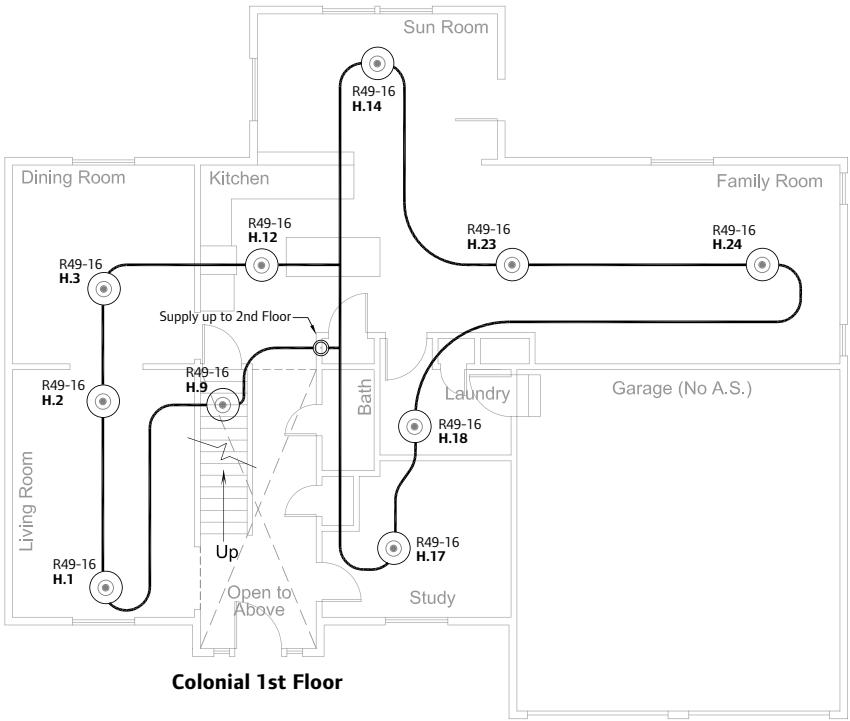
- **Model** — Type of sprinkler used.
- **Nominal Orifice Size** — The size of the orifice on the sprinkler
- **Temperature Rating** — The temperature at which the sprinkler will activate
- **k Factor** — A number that describes the size of the hole available for water-flow through the sprinkler
- **Maximum 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 ½ 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 Flow Example

Model	Temperature Rating (°F)	Temperature Rating (°C)	K Factor	Maximum Sprinkler Spacing (Feet)	Distance to Wall (Feet)	Minimum Required Sprinkler Discharge			
						Single Sprinkler		Two or More Sprinklers	
						Flow (gpm)	Pressure (psi)	Flow Each (gpm)	Pressure Each (psi)
FT RES30 (SIN R3511)	155/175	68.3/79.4	3.0	12 x 12	6	8	7.0	8	7.0
	155/175	68.3/79.4	3.0	14 x 14	7	10	11.0	10	11.0
T RES49 (SIN R3516)	155/175	68.3/79.4	4.9	16 x 16	8	13	7.0	13	7.0
	155/175	68.3/79.4	4.9	18 x 18	9	17	12.0	17	12.0
	155/175	68.3/79.4	4.9	20 x 20	10	20	16.6	20	16.6
RFC43 (SIN RA0612)	165	73.9	4.3	12 x 12	6	12	7.8	12	7.8
	165	73.9	4.3	14 x 14	7	13	9.1	13	9.1
	165	73.9	4.3	16 x 16	8	13	9.1	13	9.1
	165	73.9	4.3	18 x 18	9	18	17.5	18	17.5
RFC49 (SIN RA0616)	165	73.9	4.3	20 x 20	10	21	23.8	21	23.8
	165	73.9	4.9	12 x 12	6	13	7.0	13	7.0
	165	73.9	4.9	14 x 14	7	13	7.0	13	7.0
	165	73.9	4.9	16 x 16	8	13	7.0	13	7.0
	165	73.9	4.9	18 x 18	9	17	12.0	17	12.0
FT RES44 HSW (SIN R3516) Installed 4' - 6' Below Ceiling	165	73.9	4.9	20 x 20	10	20	16.7	20	16.7
	155/175	68.3/79.4	4.4	12 x 12	6	12	7.5	12	7.5
	155/175	68.3/79.4	4.4	14 x 14	7	14	10.2	14	10.2
	155/175	68.3/79.4	4.4	16 x 16	8	16	13.3	16	13.3
	155/175	68.3/79.4	4.4	18 x 18	8	18	16.8	18	16.8
	155/175	68.3/79.4	4.4	18 x 18	9	19	18.7	19	18.7
155/175	68.3/79.4	4.4	16 x 20	8	23	27.4	23	27.4	

Table 2-1: Sprinkler Flow Example

Looped Design Layout Example



H.#	Sprinkler ID
Sprinkler Node Number	Type of Sprinkler and its Maximum Spacing

Figure 2-1: Example Layout – Loop Design

Section 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
- Uponor manual, battery, or pneumatic expander tool and expander heads
- Compressor and air hose (if using a pneumatic expander tool)
- Appropriate sprinkler wrench (identified on Uponor materials list) and ½" 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: 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 sprinkler heads.
- Verify quantity and type of ProPEX sprinkler adapters.
- Verify that appropriate cover plates and/or escutcheons are available to match sprinkler heads.
- Ensure protective caps are available for installation on every sprinkler head.
- 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 brass ProPEX tees to connect plumbing rough-in and for floor-to-floor connections and same-floor interconnection of sprinkler loops.

Jobsite Verification

To verify that the sprinkler plan is appropriate, walk the entire job prior to installation. Contact the Uponor Design Department at 888.594.7726 to determine if observed changes require a redesign.

- Verify that the sprinkler plans match the layout of the residence. Confirm that walls, beams, ceiling vaults, and other features are consistent with the sprinkler plan and that 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.

Mark Sprinkler Head Locations

Spacing from Continuous Obstructions

If obstructions exist that are not shown on the sprinkler plan, refer to NFPA 13D, Section 8.2.5: Obstructions to Residential Sprinklers also refer to the sprinkler manufacturer's installation instructions for proper sprinkler placement. If additional sprinklers are required to avoid obstructions, contact the Uponor Design Department at (888.594.7726) to determine if a redesign is necessary.

Minimum Distances from Heat Sources

The following table provides information from NFPA 13D, Table 7.5.5.3: Minimum Distances for Ordinary Temperature Residential Sprinklers. 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 head 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 sprinkler heads, or significant relocation of sprinkler heads, contact the Uponor Design Department to determine if observed changes require a redesign (888.594.7726).

Section 4

Install Sprinkler Adapters

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

Example: R49 -16 signifies a recessed 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 feet apart, do not place farther than eight feet 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: Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes. Vaulted ceilings and obstructions added after the system design is completed can interfere with

proper sprinkler operation. Contact the Uponor Design Department (888.594.7726) if ceiling vaults or beams are not shown on the sprinkler plan.

Note: The sprinkler plan will identify the most hydraulically remote head(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.
 - b. 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.

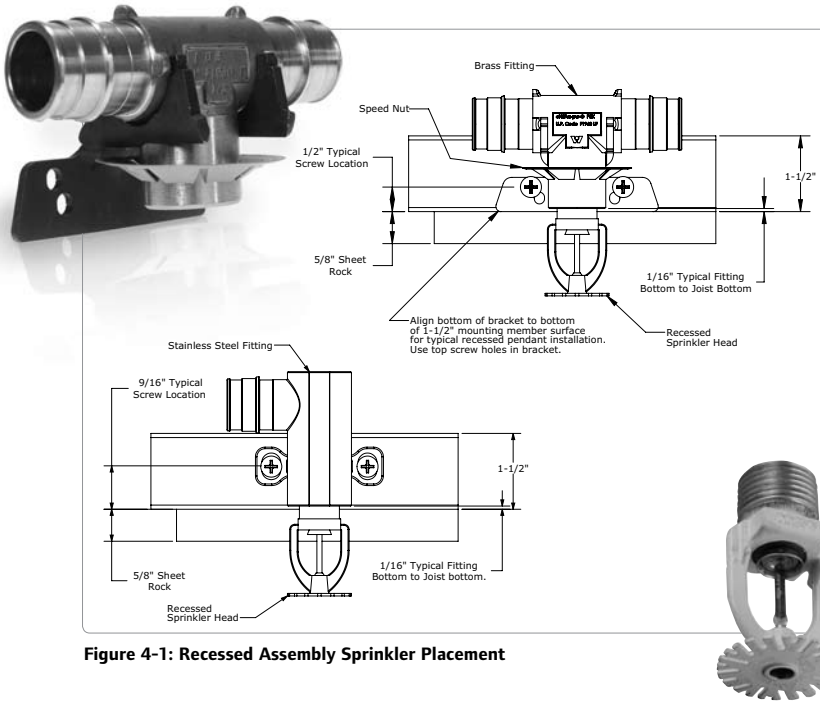


Figure 4-1: Recessed Assembly Sprinkler Placement

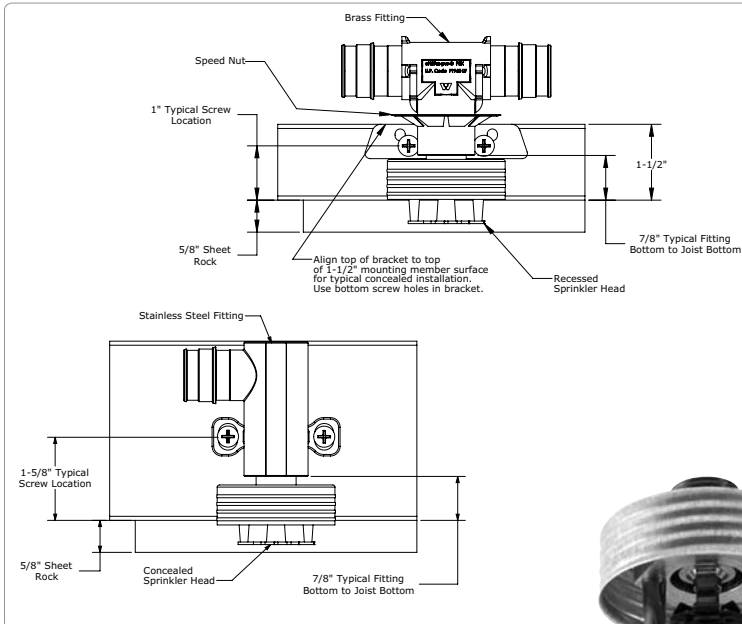


Figure 4-2: Concealed Assembly Sprinkler Placement

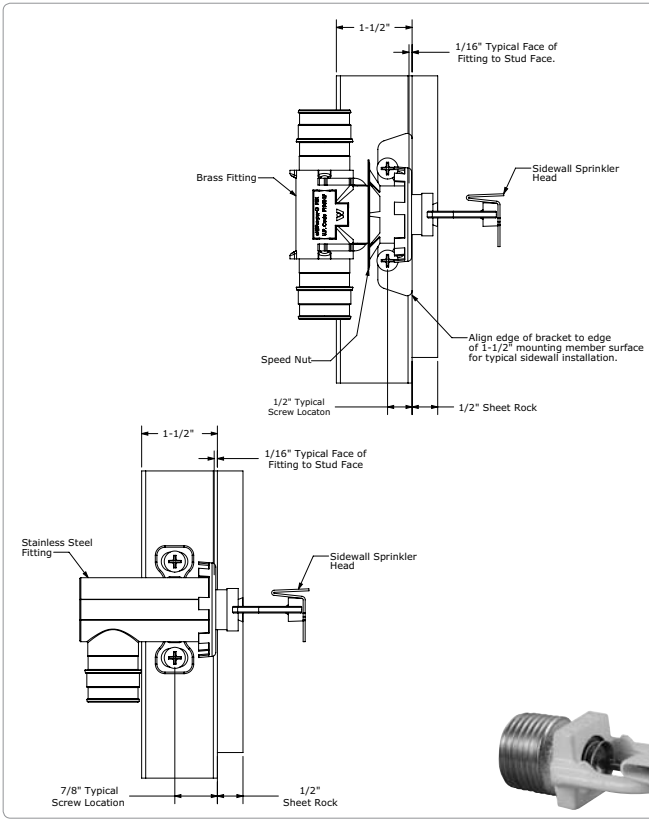


Figure 4-3: Horizontal Sidewall Sprinkler Placement

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.

When mounting stainless steel sprinkler adapters, certain situations or construction methods may require blocking to support the adapter adequately.

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

Section 5

Install Sprinkler Heads

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 head until it bottoms out.
2. Wrap the threads on the sprinkler head with three wraps of Teflon tape when installing the sprinkler head 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 head into the sprinkler adapter. You should obtain a leak-tight connection with a maximum torque of 14 ft.-lbs. to 21 ft.-lbs. (approximately 2 turns past hand tight). Do not over-tighten.



Important:

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

Note: To save time during flow verification testing, do not fully tighten the sprinkler heads at the most hydraulically remote location(s), as they will be

removed during that procedure. Refer to **Section 9: Flow Test** for more details.

Concealed Sprinkler Wrench
for CCP (domed cover plate)



Recessed Sprinkler Wrench



Concealed Sprinkler Wrench
for RFC (flat cover plate)



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 provides up to 1/2" adjustment. There will be a small gap between 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 allow for up to 1/2" adjustment.



Caution: To protect the sprinkler from damage due to finishing work, cover sprinkler 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 or domed 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

Install Tubing

- Using proper ProPEX connection procedures, attach the Uponor AquaPEX tubing to the sprinkler adapters.
- To feed plumbing fixtures, install a ProPEX brass 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.

ProPEX Connections

Making ProPEX Connections

Make strong, reliable connections by using one of the Uponor ProPEX Expander tools (battery, air or hand). The steps are very similar for all three tools — with a slight variation in **step 3** on **page 24**.

1. Make a square cut on 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

2. Slide the ProPEX ring over the end of the tubing. Make sure the end of the ring extends over the end of the tubing no more than $\frac{1}{16}$ " (1.6mm).



Figure 6-2

- When using the ProPEX Hand Expander tool, 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 (See **Figures 6-3** through **6-5**). Full expansions are necessary to make a proper connection. Bring the handles together to expand. Separate the handles, remove the head slightly from the tubing and rotate it one-eighth turn. Slide the tool head into the tubing until it stops in the newly rotated position and expand again.



Figure 6-3

When using the ProPEX Air or Battery Expander tools, slide the expander head into the tubing until it stops. Full expansions are necessary to make a proper connection. Press the trigger to expand. Release the trigger, remove the head slightly from the tubing and rotate it one-eighth turn after each expansion. Slide the tool head into the tubing until it stops in the newly rotated position and expand again.



Figure 6-4

Important: Rotate the tool one-eighth turn in either direction after each expansion to provide smooth and even expansion of the tubing. It is important to reposition the head after each expansion. Otherwise, the segments on the tool head may cause deep grooves in the tubing. These grooves can result in potential leak paths.

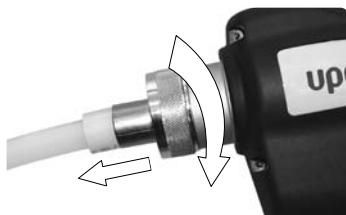


Figure 6-5

Note: It is not necessary to rotate the tool in only one direction. Alternating the turning direction will ease expansion in confined spaces. **Figures 6-6** and **6-7** show enlarged views inside expanded tubing.

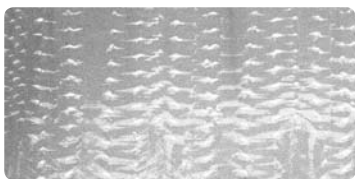


Figure 6-6 Expansion with Proper Rotation

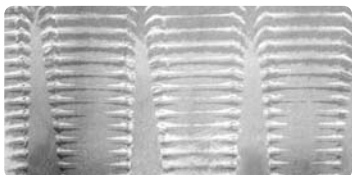


Figure 6-7 Expansion without Proper Rotation



Figure 6-8



Figure 6-9

- Repeat the expansion process until the tubing and ring are snug against the shoulder on the expander head. See **Table 6-1** on **page 27** for the recommended number of expansions for each tubing size.

Note: The “H” in the chart refers to the H-series expander heads, used only with the ProPEX Battery Expander tools.

- Immediately remove the ProPEX Expander tool. As you slide the tubing over the fitting, you should feel some resistance. If the tubing reaches the shoulder of the fitting without any resistance, the tubing may be overly expanded and may require additional time to shrink over the fitting completely. Tubing and ProPEX ring should seat against the shoulder of the fitting for a proper connection.

Important Tips for a Proper ProPEX Connection

- 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 overly expanding the tubing, do not hold the tubing in the expanded position.

- The recommended number of expansions is listed in **Table 6-1**. 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.
- Good connections result when the ProPEX ring rests snugly against the stop of the ProPEX

fitting shoulder. If there is more than $\frac{1}{16}$ " 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.

The following troubleshooting tips are helpful for making proper ProPEX connections.

If Expansion is Difficult

- Make sure the internal cone is properly greased.

If Expansion Head Slips Out of Tubing During Expansion:

- Ensure the tubing and ProPEX Ring are dry.
- Make sure that grease is not getting into the tubing.
- Examine the segment fingers of the expander head to ensure no fingers are bent.

If 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 across the tubing during expansion.
- If you anticipate the ring sliding down, position the ProPEX 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, you

can 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.

If More Expansions Than Recommended Are Needed for a Connection:

- Make sure that the head is hand-tightened to the ProPEX Expander tool.
- Examine the segment fingers of the expander head to ensure that none is bent.
- Be sure to completely cycle the tool on each expansion (i.e., close the hand tool handle or release the battery expander tool trigger).

Using Auto Rotation

Note: Only Uponor or Milwaukee Expansion Tools with Uponor standard heads can use the ProPEX Auto Rotation Adapter (Q6323810). Milwaukee M12 and M18 ProPEX Expander Tools with Milwaukee heads have auto rotation built in.

1. Lightly grease the cone of the ProPEX Expander Tool (hand, air or battery). See **Figure 6-10** on **page 28**.
2. Thread the ProPEX Auto Rotation Adapter (Q6323810) onto the tool. Remove excess oil from adapter cone, then lightly grease cone. See **Figure 6-11** on **page 28**.

3. Select an Uponor standard expander head only. (Uponor H-heads are not compatible.)
4. Thread standard expander head onto the ProPEX Auto Rotation Adapter (Q6323810). See **Figure 6-12** on **page 28**.
5. Square cut the PEX tubing perpendicular to the length of the tubing. See **Figure 6-13** on **page 28**.
6. Slide the ProPEX ring over the end of the tubing. Extend the end of the ring over end of the tubing no more than $\frac{1}{16}$ ". See **Figure 6-14** on **page 28**.
7. Gently slide the expander head into the tubing until it stops. Do not force the expander head into the tubing. See **Figure 6-15** on **page 28**.
8. Perform the expansion and repeat. See **Table 6-1** for the recommended number of expansions. After each expansion, remove the tool from the tubing to allow rotation then reinsert tubing for the next expansion. See **Figure 6-16** on **page 28**.
9. Expansion is complete when the tubing and ring are snug against the shoulder on the expander head. See **Figure 6-17** on **page 28**.
10. Immediately remove the ProPEX Expander tool. You should feel resistance as you insert the fitting. See **Figure 6-18** on **page 28**.

Note: You do not need to rotate the tubing or the ProPEX Expander tool. The expander head may not rotate after each expansion on 1" tubing. This will not affect the quality of the connection.

Cold-weather Expansions

- Temperature affects 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.
- The temperature must be above 5°F/-15°C to make ProPEX connections.
- Fewer expansions are necessary in temperatures below 40°F/4.4°C.

Note: At colder temperatures (below 40°F/4.4°C), it will take longer for ProPEX connections to seal under pressure. If air leaks are found during pressure tests in cold weather, use a heat gun (with care) to warm up connections all

Tubing Size	Standard Head	H-head
$\frac{1}{2}$ "	3 – 5	-
$\frac{3}{4}$ "	7 – 9	-
1"	12 – 14	6-7

Table 6-1: Recommended Number of Expansions

Note: The recommended expansions are appropriate for both Uponor and Milwaukee ProPEX Expander tools.

the way around the circumference of the tubing for about 15

seconds so that the tubing becomes warm to the touch.



Figure 6-10



Figure 6-15



Figure 6-11



Figure 6-16



Figure 6-12



Figure 6-17



Figure 6-13




Figure 6-18



Figure 6-14

Important: Do not let the tubing get hot enough so that it damages the outer polyethylene layer. Never allow direct flame to touch tubing surface. Use continuous movements to avoid over-heating. Even in cold weather, a heat gun is normally not required.

 **Caution:** When warming connections, protect sprinklers and cover plates from excessive heat. Temperatures greater than 155°F/68.3°C will cause the glass bulb of the sprinkler to burst, activating discharge.

Bend Radius and Bend Support

Bending PEX

Refer to **Table 6-2** 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 overly bending or kinking the tubing.

Tubing Size	Bend Radius
½"	3¾"
¾"	5¼"
1"	6¾"


Table 6-2: Uponor AquaPEX 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/129.4°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 also suitable. Attach metal tubing supports with #10 x 1¼" coarse drywall screws. Ensure proper orientation of the tube talon as shown in **Figure 6-19**.



Figure 6-19: Tube Talon



Figure 6-20: Metal Tubing Supports

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/12.2°C temperature change for every 100 feet of tubing.
 4. Allow ⅛" to ⅜" 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.
 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 6-21**.

2. Along vertical runs, install supports every 4' to 5' at each floor and at a mid-story guide. See **Figure 6-22**.

Note: In accordance with UL and C-UL listings, provide protection for the tubing and fittings. 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

Note: Do not rough-in the tubing and leave it exposed.

Purchase an Uponor Select Uncoiler (E6062000), Compact Select Uncoiler (E6063000), Tube Uncoiler (E6061000) or Deluxe Tube Uncoiler (E6061100) for easy, convenient uncoiling of PEX tubing.

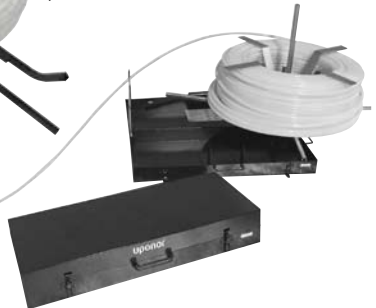
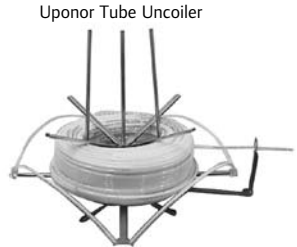
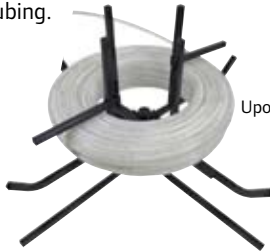


Figure 6-23: Uponor Uncoilers

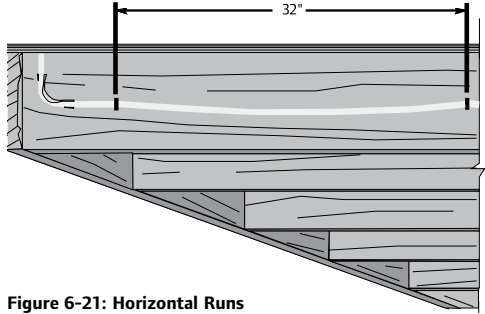


Figure 6-21: Horizontal Runs

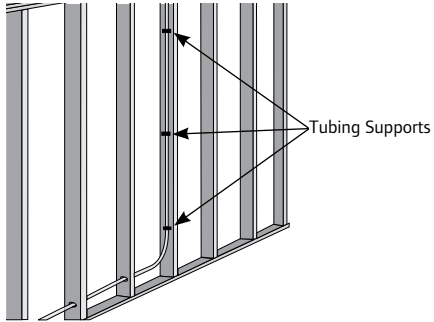


Figure 6-22: Vertical Runs

Extreme Temperature Installations

AquaSAFE Residential Fire Safety 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.

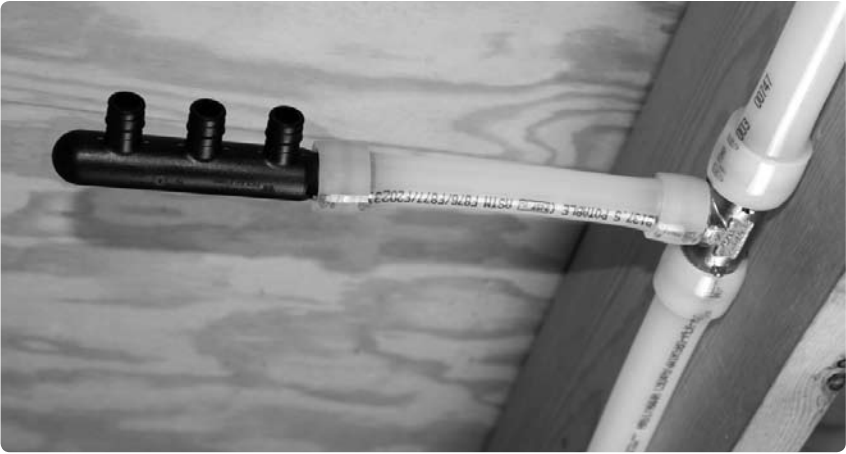
Consultation with local building officials is encouraged to ensure compliance with local building codes.

Section 7

Connect Plumbing Runs

To feed plumbing fixtures, install a ProPEX brass tee in the AquaSAFE loop. From this 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. Ensure plumbing runs have been plugged to allow pressure and flow verification testing.



Section 8

Pressure Test

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



Figure 8-1: Pressure Test at Normal Operating Water Pressure

If you find leaky connections during pressure tests in cold weather, use a heat gun* to warm up connections around the circumference of the tubing for 15 seconds.

*Any 450-watt electric heat gun will work for this purpose.

Note: Ensure that you do not overheat the tubing.

When using the heat gun, protect sprinklers and cover plates from excessive heat. Temperatures greater than 155°F/68.3°C will cause the glass bulb of the sprinkler to burst, activating discharge.

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.

Section 9

Flow Test

To ensure the system provides enough water for proper fire sprinkler performance, you should conduct a flow verification test. Trained installers who complete a flow verification test may offer their customers a 25-year limited warranty on Uponor AquaPEX tubing and ProPEX fittings.

For full warranty details, go to www.uponor-usa.com/warranties or www.uponor.ca/warranties.

Note: The NFPA 13D Installation Standard does not require flow verification.

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.



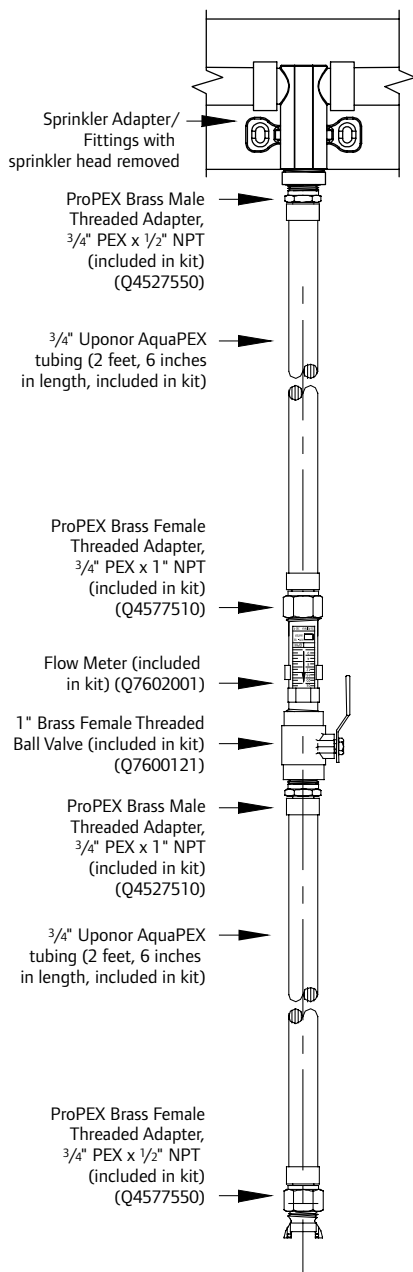


Figure 9-1: Flow Test Kit

Flow Verification Kit

The Flow Verification Kit attaches to the sprinkler adapter for proper flow measurement. The kit contains the following items:

- Flow-control valve
- Uponor flow meter
- Five test orifices
- One 3/4" PEX x 1/2" FNPT threaded adapter
- One 3/4" PEX x 1/2" MNPT threaded adapter
- One 3/4" PEX x 1" FNPT threaded adapter
- One 3/4" PEX x 1" MNPT threaded Adapter

Performing the Flow Verification Test

All flow-restricting devices (water softener, etc.) must be in place when you perform a flow verification test.

1. Ensure that you have the water turned off.
2. If you have already inserted the sprinkler into the 1/2" threaded outlet, carefully unscrew the sprinkler from the sprinkler adapter. Place the sprinkler in a safe place to avoid any damage.
3. Assemble the PEX pieces using the threaded fittings. The flow meter must be installed above the control valve. Ensure the arrow on the flow meter is pointing in the direction of the water flow.

4. Install the correct orifice in the bottom of the flow verification kit. Refer to the design printout for the orifice with the appropriate k factor.
5. Attach the flow verification kit to the ½" NPT connection of the sprinkler adapter. Ensure the valve is closed.

Note: Install a pressure gauge at the manifold location. You must take a pressure reading from this gauge during the flow test.
6. Ensure that you have installed the proper sprinkler orifice adapter to the bottom of the flow verification kit.
7. Pressurize the system to its working pressure.
8. Open the valve and bleed air from the system.
9. Close the valve completely.
10. Record the static pressure reading on the gauge near the manifold.
11. Open the valve until the plunger on the flow meter settles into position. This may take less than one minute. Using the markers on the flow meter, determine the flow through the test device. Record the residual pressure reading on the manifold gauge while the water is flowing.
12. Compare the results with the gallons per minute required on the sprinkler data sheet. Test results must equal or exceed the required flow for proper operation and warranty coverage.

Note: If the AHJ requires a multiple head test, additional flow verification kits are necessary.
13. Pull all Teflon tape off detached sprinkler.
14. Apply new Teflon tape to the threads of the sprinkler (three wraps).
15. Using the appropriate sprinkler wrench and following the sprinkler installation instructions, carefully tighten the sprinkler head into the sprinkler adapter. You should obtain a leak-tight connection with a maximum torque of 14 ft.-lbs. to 21 ft.-lbs. (approximately 2 turns past hand tight). Do not over-tighten.



Figure 9-2: Flow Meter

16. Once you have verified the proper flow rate, fill out the Flow Test Verification form and fax to Uponor Technical Services Department at 952.997.1731. Keep a copy for your own records. The AHJ may also require a copy.

Performing the Flow Verification Test Without the Flow Meter

The installer can also conduct the flow verification test without the use of the Flow Test Kit, a practice sometimes referred to as the Bucket Test Method, using the following steps.

1. Ensure that you have the water turned off.
2. If you have already inserted the sprinkler into the ½" threaded outlet, carefully unscrew the sprinkler from the sprinkler adapter. Place the sprinkler in a safe place to avoid any damage.
3. Construct a flow test assembly using a 1" full bore ball valve with threaded adapters and ¾" PEX tubing, that threads into the ½" NPT sprinkler adapter and terminates with the correct test orifice.
4. Using a one-gallon container, carefully mark the fill-lines in a large bucket (such as a 20- or 30-gallon garbage container) with a permanent marker. You should mark at the 5-, 8- and 10-gallon levels; then at each gallon up to or exceeding the minimum required flow from the sprinkler (as identified on the sprinkler plan).
5. Attach the flow test assembly to the ½" NPT connection of the sprinkler adapter. Ensure the valve is closed.

Note: Install a pressure gauge at the manifold location. You must take a pressure reading from this gauge during the flow test.

6. Ensure that you have installed the proper sprinkler orifice adapter to the bottom of the flow test assembly.
7. Pressurize the system to its working pressure.
8. Open the valve and bleed air from the system.
9. Close the valve completely.
10. Record the static pressure reading on the gauge near the manifold.
11. Open the valve and start a timer or stopwatch. Flow water for one minute and record the number of gallons in the bucket. If the minimum volume of water is reached as indicated on the sprinkler plan before one minute has elapsed, the test may be stopped as the flow rate exceeds the requirements.
12. Compare the results with the gallons per minute required on the sprinkler data sheet.

Test results must equal or exceed the required flow for proper operation and warranty coverage.

Note: If the AHJ requires a multiple head test, additional flow test assemblies and buckets are necessary.

13. Pull all Teflon tape off detached sprinkler.
14. Apply new Teflon tape to the threads of the sprinkler (three wraps).
15. Using the appropriate sprinkler wrench and following the sprinkler installation instructions, carefully tighten the sprinkler head into the sprinkler adapter. You should obtain a leak-tight connection with a maximum torque of 14 ft.-lbs. to 21 ft.-lbs. (approximately 2 turns past hand tight). Do not over-tighten.
16. Once you have verified the proper flow rate, fill out the Flow Test Verification form and fax to the Uponor Technical Services Department at 952.997.1731. Keep a copy for your own records. The AHJ may also require a copy.

Troubleshooting Flow Problems

If the number of gallons that flow out of the sprinkler during a flow test is less than the number required by the manufacturer, perform the following checks.

1. Verify the available water pressure.
2. Ensure that you have piped the system according to the design.
3. Verify that you have used the proper test orifice for the flow test.
4. Check to see that all supply valves in the system are open.
5. Ensure that no flow-restricting devices were added after the design was complete.
6. Ensure that you have the properly sized water meter, according to the drawing.
7. Ensure that the water service pipe (i.e., diameter and length) is in accordance with the design.
8. Ensure that the elevations are in accordance with the design. If all of the above are in accordance with the design, contact your Uponor representative.

9. Refer to the following pressure charts for PEX tubing:

Residual Pressure Charts for PEX Tubing

60°F Water										
Inlet Pressure: 60			¾" PEX Tube Length (feet)							
gpm	25	50	100	150	200	225	275	300	325	ft/s
2.0	59.7	59.5	58.9	58.4	57.9	57.6	57.1	56.8	56.5	1.81
2.5	59.6	59.2	58.4	57.6	56.8	56.4	55.5	55.1	54.7	2.27
3.0	59.4	58.9	57.7	56.6	55.5	54.9	53.8	53.2	52.6	2.72
3.5	59.2	58.5	57.0	55.5	54.0	53.2	51.7	50.9	50.2	3.18
4.0	59.0	58.1	56.1	54.2	52.3	51.3	49.4	48.4	47.4	3.63
4.5	58.8	57.6	55.2	52.8	50.4	49.2	46.8	45.6	44.4	4.08
5.0	58.5	57.1	54.2	51.2	48.3	46.9	43.9	42.5	41.0	4.54
5.5	58.3	56.5	53.0	49.6	46.1	44.3	40.8	39.1	37.4	4.99
6.0	58.0	55.9	51.8	47.7	43.6	41.6	37.5	35.5	33.4	5.44
6.5	57.6	55.3	50.5	45.8	41.0	38.7	33.9	31.5	29.2	5.90
7.0	57.3	54.6	49.1	43.7	38.2	35.5	30.1	27.4	24.6	6.35
7.5	56.9	53.8	47.6	41.5	35.3	32.2	26.0	22.9	19.8	6.80
8.0	56.5	53.0	46.1	39.1	32.1	28.7	21.7	18.2	14.7	7.26
8.5	56.1	52.2	44.4	36.6	28.8	24.9	17.1	13.3	9.4	7.71
9.0	55.7	51.3	42.7	34.0	25.4	21.0	12.4	8.0	3.7	8.17
9.5	55.2	50.4	40.9	31.3	21.7	16.9	7.4	2.6	-	8.62
10.0	54.7	49.5	39.0	28.4	17.9	12.6	2.1	-	-	9.07
10.5	54.2	48.5	37.0	25.4	13.9	8.2	-	-	-	9.53
11.0	53.7	47.4	34.9	22.3	9.8	3.5	-	-	-	9.98
11.5	53.2	46.4	32.7	19.1	5.5	-	-	-	-	10.43
12.0	52.6	45.3	30.5	15.8	1.0	-	-	-	-	10.89
12.5	52.0	44.1	28.2	12.3	-	-	-	-	-	11.34
13.0	51.4	42.9	25.8	8.7	-	-	-	-	-	11.79
13.5	50.8	41.7	23.3	5.0	-	-	-	-	-	12.25

Table 9-1: Residual Pressure (psi) for ASTM F877 ¾" PEX Tubing

60°F Water										
Inlet Pressure: 60			1" PEX Tube Length (feet)							
gpm	25	50	100	150	200	225	275	300	325	ft/s
3.0	59.8	59.7	59.3	59.0	58.7	58.5	58.2	58.0	57.8	1.65
3.5	59.8	59.6	59.1	58.7	58.2	58.0	57.5	57.3	57.1	1.92
4.0	59.7	59.4	58.9	58.3	57.7	57.4	56.9	56.6	56.3	2.20
4.5	59.6	59.3	58.6	57.9	57.2	56.8	56.1	55.7	55.4	2.47
5.0	59.6	59.1	58.3	57.4	56.6	56.1	55.3	54.8	54.4	2.75
5.5	59.5	59.0	57.9	56.9	55.9	55.4	54.3	53.8	53.3	3.02
6.0	59.4	58.8	57.6	56.4	55.2	54.6	53.4	52.8	52.1	3.30
6.5	59.3	58.6	57.2	55.8	54.4	53.7	52.3	51.6	50.9	3.57
7.0	59.2	58.4	56.8	55.2	53.6	52.8	51.2	50.4	49.6	3.85
7.5	59.1	58.2	56.3	54.5	52.7	51.8	50.0	49.0	48.1	4.12
8.0	59.0	57.9	55.9	53.8	51.8	50.7	48.7	47.7	46.6	4.40
8.5	58.8	57.7	55.4	53.1	50.8	49.6	47.3	46.2	45.0	4.67
9.0	58.7	57.4	54.9	52.3	49.8	48.5	45.9	44.7	43.4	4.95
9.5	58.6	57.2	54.3	51.5	48.7	47.3	44.5	43.0	41.6	5.22
10.0	58.4	56.9	53.8	50.7	47.6	46.0	42.9	41.4	39.8	5.50
10.5	58.3	56.6	53.2	49.8	46.4	44.7	41.3	39.6	37.9	5.77
11.0	58.1	56.3	52.6	48.9	45.2	43.3	39.6	37.8	35.9	6.05
11.5	58.0	56.0	52.0	47.9	43.9	41.9	37.9	35.9	33.8	6.32
12.0	57.8	55.6	51.3	46.9	42.6	40.4	36.1	33.9	31.7	6.60
12.5	57.7	55.3	50.6	45.9	41.2	38.9	34.2	31.8	29.5	6.87
13.0	57.5	55.0	49.9	44.9	39.8	37.3	32.2	29.7	27.2	7.15
13.5	57.3	54.6	49.2	43.8	38.3	35.6	30.2	27.5	24.8	7.42
14.0	57.1	54.2	48.4	42.6	36.8	33.9	28.1	25.3	22.4	7.70
14.5	56.9	53.8	47.6	41.5	35.3	32.2	26.0	22.9	19.8	7.97
15.0	56.7	53.4	46.8	40.3	33.7	30.4	23.8	20.5	17.2	8.25
15.5	56.5	53.0	46.0	39.0	32.0	28.5	21.6	18.1	14.6	8.52
16.0	56.3	52.6	45.2	37.8	30.3	26.6	19.2	15.5	11.8	8.80
16.5	56.1	52.2	44.3	36.5	28.6	24.7	16.8	12.9	9.0	9.07
17.0	55.9	51.7	43.4	35.1	26.8	22.7	14.4	10.2	6.1	9.35
17.5	55.6	51.2	42.5	33.7	25.0	20.6	11.9	7.5	3.1	9.62
18.0	55.4	50.8	41.6	32.3	23.1	18.5	9.3	4.7	0.1	9.90
18.5	55.2	50.3	40.6	30.9	21.2	16.4	6.7	1.8	-	10.17
19.0	54.9	49.8	39.6	29.4	19.2	14.2	4.0	-	-	10.45
19.5	54.7	49.3	38.6	27.9	17.2	11.9	1.2	-	-	10.72
20.0	54.4	48.8	37.6	26.4	15.2	9.6	-	-	-	11.00
20.5	54.1	48.3	36.6	24.8	13.1	7.2	-	-	-	11.27
21.0	53.9	47.7	35.5	23.2	11.0	4.8	-	-	-	11.55
21.5	53.6	47.2	34.4	21.6	8.8	2.4	-	-	-	11.82
22.0	53.3	46.6	33.3	19.9	6.5	-	-	-	-	12.09

Table 9-2: Residual Pressure (psi) for ASTM F877 1" PEX Tubing

Bypass Instructions

Flow-restricting devices can have a negative effect on the operation of this system. If any potential flow-restricting devices (such as water softeners, water conditioners, etc.) are part of the plumbing system, notify the system designer prior to initial system design. You can easily modify the system design to accommodate any flow-restricting devices. Refer to the Uponor Domestic Water Bypass Instruction Sheet for more information.

Backflow Prevention Requirements


Because this is a non-stagnant multipurpose fire sprinkler and plumbing system, backflow prevention devices are not required. Check local code for any additional backflow requirements.

Section 10

Homeowner Information

Sprinkler Cabinet

Uponor recommends installing an Uponor Sprinkler Cabinet near the main water shut-off 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 experience excessive heat (over 100°F/37.3°C).

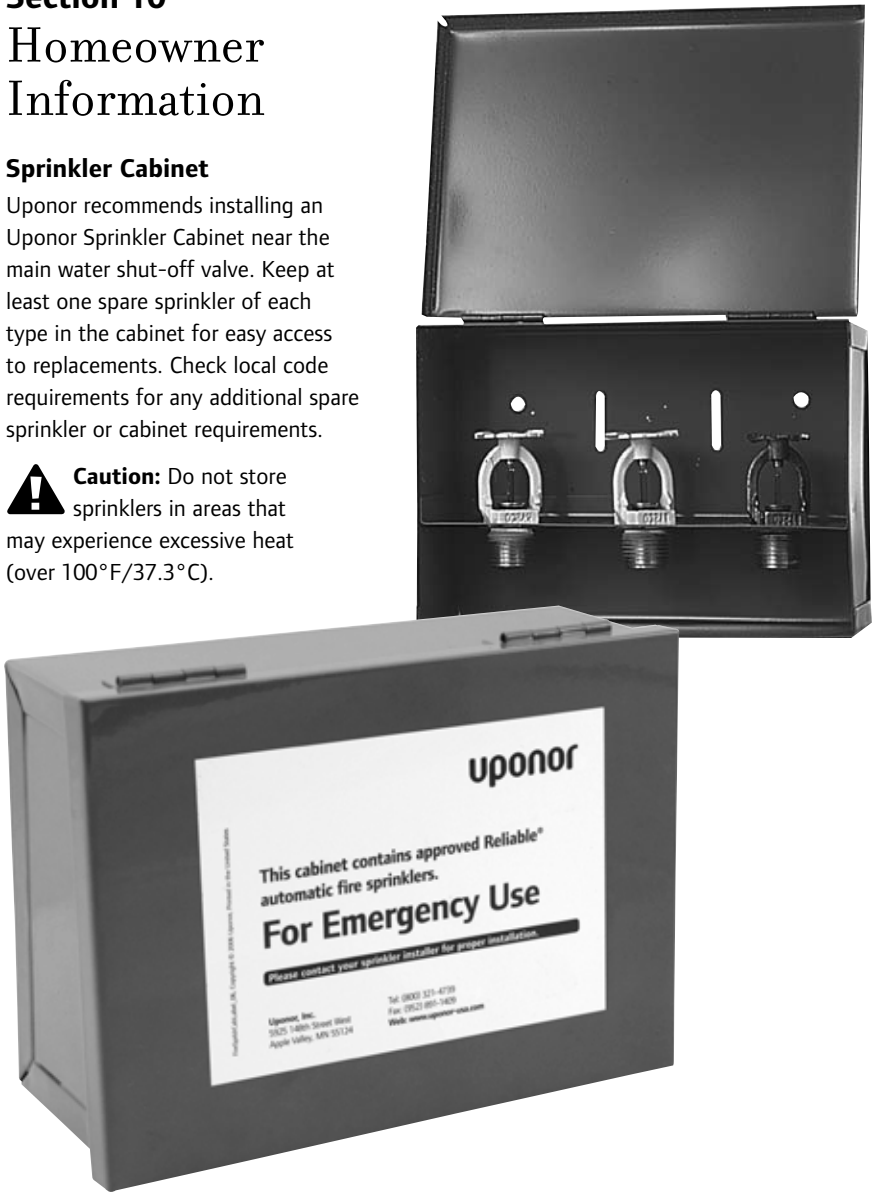



Figure 10-1: Sprinkler Cabinet

Warning Sign

The Uponor AquaSAFE Homeowner Handbook and a red warning sign are provided with the sprinkler design. The red warning label advises the homeowner that modifications to the system should not be made without consulting a fire protection specialist. Leave the homeowner handbook in the home and 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, please contact the Uponor Design Department at 888.594.7726.

Warranty Information

For warranty information, go to www.uponor-usa.com/warranties or www.uponor.ca/warranties.

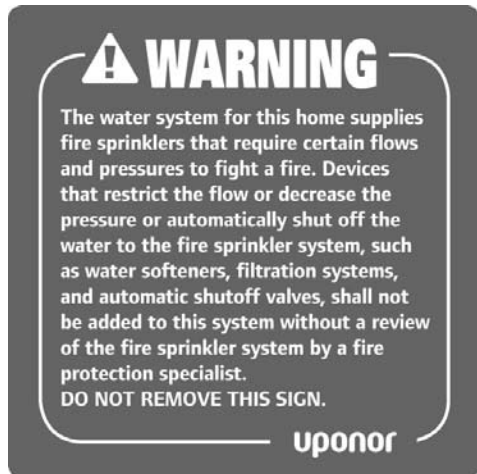


Figure 10-2: Warning Sign



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