



RESIDENTIAL FIRE SAFETY

AQUASAFE® LOOPED SYSTEM

INSTALLATION GUIDE



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

Uponor AQUASAFE® Looped System Installation Guide Published by Uponor, Inc. 5925 148th Street West Apple Valley, MN 55124 USA Tel: (800) 321-4739 Fax: (952) 891-1409 www.uponor-usa.com

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Uponor

This installation guide is published for architects, engineers, building officials, plumbing professionals and Authorities Having Jurisdiction (AHJ) interested in Uponor fire safety systems. This guide describes the recommendations for installing the system in one- and two-family dwellings.

The Uponor AQUASAFE® Looped System includes Wirsbo AQUAPEX® tubing and Wirsbo AQUAPEX plus tubing. Both Wirsbo AQUAPEX tubing and Wirsbo AQUAPEX plus tubing carry the NSF-pw seal for use in hot and cold potable water plumbing systems and are listed by Underwriters Laboratories Inc. in accordance with UL 1821 and ULC/ORD C199P when intended for use in an Uponor fire safety system.

Note: For readability, this document will refer to both Wirsbo AQUAPEX tubing and Wirsbo AQUAPEX plus tubing as Wirsbo AQUAPEX tubing when information applies to both.

Uponor took 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.

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

Refer to the Uponor Professional Plumbing Installation Guide or the Uponor Radiant Floor Heating Installation Guide to install Wirsbo AQUAPEX tubing in plumbing or hydronic radiant heating applications.

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 information within this installation guide may still be pending formal documentation from Underwriters Laboratories (UL).

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Section 1 AQUASAFE® Looped System

System Overview

The AQUASAFE® Looped System provides a cost-effective way to provide a home reliable and safe fire protection. Using Uponor's innovative Wirsbo AQUAPEX® tubing, the plumbing system and the fire sprinkler system are combined into one low-cost, multi-purpose water supply system. (See **Figure 1-1**.)

Heat-activated fire sprinklers are attached to Uponor's Multi-port Fittings. Flexible Wirsbo AQUAPEX tubing supplies water to each sprinkler, as well as cold-water plumbing fixtures. Because the plumbing system and the fire sprinkler system are combined, water availability is verified each time a plumbing fixture is used.

Wirsbo AQUAPEX tubing is made of crosslinked polyethylene (PEX) designed to withstand temperatures and pressures of 130 psi at 120°F/48.9°C (½" tubing only), 160 psi at 73.4°F/23°C, 100 psi at 180°F/82.2°C and 80 psi at 200°F/93.3°C. The AQUASAFE Looped System must be installed in accordance with these guidelines, National Fire Protection Association 13D (Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes) and the National Building Code of Canada (as applicable).



Figure 1-1: AQUASAFE Looped System Home-run Installation Method

Using a stainless-steel Multi-port Fitting with ProPEX® outlets, individual lines from cold-water ProPEX manifolds supply water to the residential fire sprinklers, as well as cold-water fixtures. Hot-water ProPEX manifolds supply hot water directly to necessary plumbing fixtures throughout the house in a separate system.

System Features and Benefits

- 25-year warranty on Wirsbo AQUAPEX tubing when used with ProPEX fittings*
- 25-year warranty on ProPEX fittings and Uponor Multi-port fittings when used with Wirsbo AQUAPEX tubing**
- $\boldsymbol{\cdot}$ Easily integrates into the plumbing system
- Improves water pressure at all fixtures
- Quickly installed using ProPEX fitting connections
- System verifies fresh water is available to the sprinklers each time an occupant uses a cold-water plumbing fixture
- * When installed by an Uponor-trained, licensed contractor
- ** When used with Wirsbo AQUAPEX tubing

Material Standards, Ratings and Certifications

- Wirsbo AQUAPEX tubing and fittings are Underwriters Laboratories (UL) and Canadian Underwriters Laboratories (C-UL) listed for use in multi-purpose piping systems of residential occupancies as defined in the Standard for Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes, NFPA 13D. Uponor's UL listing was issued in June 2000.
- Wirsbo AQUAPEX tubing is manufactured to ASTM F876, ASTM F877, ASTM F1960 and ASTM F2023 as certified by NSF International.
- Wirsbo AQUAPEX tubing carries the following maximum pressure and temperature ratings:
- 80 psi at 200°F/93.3°C
- 100 psi at 180°F/82.2°C
- 130 psi at 120°F/48.9°C (½" tubing only, in accordance with UL 1821 and ULC/ORD C199P)
- 160 psi at 73.4°F/23°C
- The tubing and fittings are intended for use in multi-purpose systems not equipped with a fire department connection and having a working pressure not greater than 130 psi.
- \cdot The tubing and fittings are intended for use in areas where the maximum ambient temperature does not exceed 120°F/48.9°C.
- Wirsbo AQUAPEX tubing carries a standard grade rating recommended by the Plastics Pipe Institute (PPI).

- Wirsbo AQUAPEX tubing is listed to NSF International Standard 14, which defines requirements for ingredients, materials, products, quality assurance and marking.
- Wirsbo AQUAPEX tubing and the Uponor sprinkler assembly are listed to NSF International Standard 61, which defines requirements for toxicity.
- Wirsbo AQUAPEX tubing and fittings are certified to be in compliance with the Canadian Standards Association Standard CAN/CSA B137.5M, "Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications."
- Wirsbo AQUAPEX tubing is UL-listed in accordance with UL 1821, and C-UL-listed in accordance with ULC/ORD C199P.

Model Code Approvals, Material Standards and Certifications for Wirsbo AQUAPEX Tubing and Fittings

 $\cdot ~ \text{UL} \cdot \text{NSF} \cdot \text{UPC} \cdot \text{C-UL} \cdot \text{CSA} \cdot \text{IPC}$

Note: Due to limited space on the fittings, affected Uponor fittings carry the following UL and C-UL designation: ⁽¹⁾ . Please see UL's website, www.ul.com/database, for UL documentation for the Uponor system.

UL and C-UL Listing Requirements and Handling Guidelines

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 manufacturer's installation instructions. Failure to follow the instructions and installation guidelines in the installation guide can result in the failure of Uponor systems.
- Do not store sprinkler assemblies or cover plates in areas subject to extreme temperatures (over 100°F/37.7°C).
- Do not use Uponor PEX where temperatures and pressures exceed ratings. Uponor PEX used in Uponor fire safety systems must not exceed 130 psi at 120°F/48.9°C.
- Ensure the ambient temperature where Uponor PEX is installed does not exceed 120°F/48.9°C.
- In accordance with the UL and C-UL-listings, do not use or store Wirsbo AQUAPEX tubing where it will be exposed to direct sunlight for more than 15 days.

Handling Guidelines, (cont.)

- Do not weld, glue or use adhesives or adhesive tape with Wirsbo AQUAPEX tubing.
- · Do not apply open flame to Wirsbo AQUAPEX tubing.
- Do not install Wirsbo AQUAPEX tubing within six inches of any gas appliance vents, with the exception of B vents.
- Do not install Wirsbo AQUAPEX tubing within 12 inches of any recessed light fixtures, unless the PEX line is insulated.
- Do not solder within 18 inches of Wirsbo AQUAPEX tubing in the same water line. Make sweat connections prior to making the ProPEX connection.
- · Do not use Wirsbo AQUAPEX tubing to convey natural gas.
- · Do not use Wirsbo AQUAPEX tubing for an electrical ground.
- Do not spray on or allow organic chemicals, strong acids or strong bases to come into contact with Wirsbo AQUAPEX tubing. Verify firestop compatibility with firestop manufacturing.
- · Do not install tubing or fitting outdoors.
- Do not use petroleum or solvent-based paints on Wirsbo AQUAPEX tubing.
- Use only approved and appropriate firestop materials with Wirsbo AQUAPEX tubing. Verify firestop compatibility with the firestop manufacturer.
- Do not allow rodents, insects or other pests to come into contact with Uponor PEX tubing.
- Do not subject Wirsbo AQUAPEX tubing to impact.
- Do not install Wirsbo AQUAPEX tubing in plenums or within 24 inches of air return grills or other openings in the ceiling.
- During remodeling or ceiling repair, implement appropriate precautions to protect the tubing and sprinklers from damage.
- Wirsbo AQUAPEX tubing and ProPEX fittings are intended for use in hydronic pipe systems only.

Necessary Parts and Tools

In addition to Uponor parts, use the following tools for the installation:

- Two $\frac{1}{2}$ " right-angle drills
- Two ³/₄" electrician drill bits
- \cdot #10 x 1¼" coarse thread screws (or similar fasteners) and washer
- \cdot Two $^{\prime\prime}\!\!\!/_8"$ cordless drills (90-degree drills work best)
- Ladders
- Hammers
- Teflon[®] tape

Tubing Identification

The labeling (print line) on Wirsbo AQUAPEX tubing reads as follows: WIRSBO AQUAPEX® PEX 1006 1/2IN SDR9/ B137.5 POTABLE / B137.5 POTABLE / B130PSI 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 WIRSBO-PEX-a TUBING *UN04950127 **xxxxx

*USA, Material Type, Extruder No., Year, Month, Day **Footage marking in increments of three

System Design Program

All Uponor fire safety systems are designed using custom design software. Uponor designers use the program to create systems that provide reliable fire sprinkler protection. The program specifies the proper location for sprinklers, as well as necessary flow rates. The program is designed to comply with national fire codes and standards and meets the requirements of NFPA 13D Standard and the National Building Code of Canada (as applicable). For more information about Uponor's design capabilities, contact your local manufacturer representative.

Note: Uponor supplies all fire safety system designs.

Section 2 Working With Wirsbo AQUAPEX Tubing

Wirsbo AQUAPEX tubing is a workable and installation-friendly construction material. Its flexibility eliminates many of the joints necessary with a rigid piping system. The following procedures are recommended to simplify installation:

Reforming Kinked Tubing

If the tubing kinks and hinders flow, repairs can be made easily by performing the following:

- 1. Straighten the kinked portion of the tubing.
- 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: Heat the Wirsbo AQUAPEX tubing just 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 Wirsbo AQUAPEX tubing cool undisturbed to room temperature. When the tubing returns to its original appearance, the repair is complete.



Caution: The tubing's surface temperature must not exceed 338°F/170°C. Do not apply direct flame to Wirsbo AQUAPEX tubing.

Wirsbo AQUAPEX tubing repaired according to these recommendations will return to its original shape and strength. If Wirsbo 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. PEX cannot be welded or repaired 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 sprinkler's glass bulb to burst, activating discharge.

Storing and Handling PEX

Store Wirsbo AQUAPEX tubing in its carton and under cover to avoid dirt accumulation and extended 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. It is recommended to follow these storage and handling guidelines for all Uponor PEX tubing.

Bending PEX

The minimum bend radius of ½" Wirsbo AQUAPEX tubing is listed in **Table 2-1**. If making bends less than 12 inches in diameter, make the bends slowly and carefully to avoid over-bending or kinking the tubing.

See **Reforming Kinked Tubing** on **page 7** for information about how to reform tubing. Bend supports are available for Wirsbo AQUAPEX tubing and may be used to facilitate 90-degree rigid bends.

Tubing Size	Bend Radius	
1/2"	4"	
³ /4"	5"	
1"	6"	

Table 2-1: Wirsbo AQUAPEX Tubing Bend Radius

Uncoiling PEX

Purchase an Uponor Select Uncoiler, Uponor Compact Select Uncoiler or Uponor Tube Uncoiler to facilitate convenient uncoiling.



Uponor Tube Uncoiler

Section 3 Sprinkler Options

Only National Sanitation Foundation (NSF)-listed residential fire sprinklers are compatible with the AQUASAFE Looped System.

Note: Ensure 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.

Concealed Sprinklers

The Concealed Sprinkler is not visible in the ceiling because it is covered by a special plate. This plate drops away from the sprinkler at 135°F/57.2°C. The sprinkler is designed to activate when it senses temperatures greater than 165°F/73.9°C. Proper flow rates are verified by Uponor's computer design program.







representative for information.

Note: Concealed Sprinkler model RFC43 (SIN RA0612), 165°F/73.9°C, 4.3k factor, for minimum densities of 0.05 gpm per square foot, is compliant with all editions



Figure 3-2: Uponor Concealed Sprinkler Flat Cover Plate

of NFPA 13D Standard. Do not store sprinklers in areas that may experience excessive heat (over 100°F/37.3°C).

Recessed Pendent Sprinklers

A Recessed Pendent Sprinkler is visible in the ceiling and does not use a cover plate. Like the Flat Plate Concealed Sprinkler, these sprinklers activate when they sense temperatures greater than 155°F/68.3°C. Proper flow rates are verified by Uponor's computer design program.



Figure 3-3: Uponor Recessed Pendent Sprinkler

Note: Recessed Pendent Sprinkler model F1/RES 49 (SIN R3516) 155°F/68.3°C, 4.9k factor, for minimum densities of 0.05 gpm per square foot, is 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).

Recessed Horizontal Sidewall Sprinklers

The Recessed Horizontal Sidewall Sprinkler is mounted through the sidewall of the room, typically between four and six inches below the ceiling. The sprinkler is designed to activate when it senses temperatures greater than 155°F/68.3°C. Proper flow rates are verified by Uponor's computer design program.

Note: Recessed Horizontal Sidewall Sprinkler model F1/RES 40/HSW (SIN R3538) 155°F/68.3°C, 4.0k factor, is 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 3-4: Recessed Horizontal Sidewall Sprinklers

Section 4 The Uponor Sprinkler Adapter Fitting

Uponor's stainless-steel Sprinkler Adapter Fittings are designed specifically for use with the AQUASAFE Looped System. They attach to the fire sprinklers using a standard ½" NPT connection. The fitting uses ProPEX outlets for easy connections to Wirsbo AQUAPEX tubing.

Installing the Fitting

- Look at the design printout to determine the type of sprinkler to use (See Appendix A.) Flow and pressure requirements and consumer preference dictate sprinkler selection.
- 2. Using the sprinkler layout on the computer design printout, determine the proper location to install the sprinkler assemblies.
- Note: Sprinkler selection is found on the design printout. The number after the dash indicates proper sprinkler spacing. Example: R49 - 16 = a recessed 4.9k sprinkler, designed to cover a 16' x 16' area.



Caution: When mounting sprinkler assemblies, avoid obstructions that may interfere with sprinkler discharge. Properly anticipate the use of fans, surface-mounted lights, beams and slopes. Refer to NFPA 13D Standard for specific clearance requirements. Vaulted ceilings and beams added after the system design is completed can interfere with proper sprinkler operation. If ceiling vaults change or beams are added, contact your Uponor representative.

Sprinkler placement and spacing are dictated by the design printout. 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 18 feet apart, do not place farther than nine feet off the wall. 3. Attach the sprinkler assembly to the structure using the sprinkler mounting bracket. The bracket is designed to hold the sprinkler assembly with #10 x 1/4" coarse thread screws (or similar fasteners) and washer.





Figure 4-2: Concealed Assembly Mount Sprinkler Placement and Spacing

- Using proper ProPEX connection procedures, attach the Wirsbo AQUAPEX tubing to the Multi-port Fitting. (See Section 5 for ProPEX connection procedures.)
- To feed plumbing fixtures, install a ProPEX Brass Tee in the AQUASAFE Looped System. From this tee, Wirsbo AQUAPEX tubing can be fed into a Multi-Port Tee to feed multiple fixtures, or a dedicated feed may be installed to serve an individual fixture.



Figure 4-3: AQUASAFE Looped Residential Fire Safety System Installation



Section 5 Making the ProPEX Fitting

Uponor ProPEX Fittings, manufactured to ASTM F1960, are designed for use with Wirsbo AQUAPEX ASTM F876 and F877 tubing. Make connections 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 because of the unique shape memory of Wirsbo AQUAPEX tubing.

Uponor offers ProPEX Fittings made from engineered plastic (EP) or brass. Both are NSF-61 certified.

Making ProPEX Connections

Make strong, reliable connections using one of Uponor's expander tools

(battery, air or hand). The steps are virtually the same for all three tools — with a slight variation in step 3. (See **page 18** for ProPEX Auto Rotation Adapter instructions.)

- Square-cut the PEX tubing perpendicular to the length of the tubing. Remove all excess material or burrs that might affect the fitting connection.
- 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 χ_6 inch (1.6mm).



Figure 5-1: Cutting PEX Tubing



Figure 5-2: Placement of the ProPEX Ring

3. 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 5-3 through 5-5 on page 16.) 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.

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.



Important: Rotate the tool

one-eighth turn in either direction after each expansion to provide smooth and even expansion of the tubing. If the head is not repositioned after each expansion, the segments on the tool head may cause deep grooves in the tubing. These grooves can result in potential leak paths.

- **Note:** It is not necessary to rotate the tool in only one direction. Alternating the turning direction will ease expansion in confined spaces. Figures 5-6 and 5-7 show enlarged views inside expanded tubing.
- 4. Repeat the expansion process until the tubing and ring are snug against the shoulder on the expander head. See Table 5-1 for the recommended number of expansions for each tubing size.
- Note: The "H" in the chart refers to the H-series expander heads, which are only used with the ProPEX Battery Expander Tools. Only use the 2" H-series Expander Head on

the ProPEX 200 Battery Expander Tool.



Figure 5-3: ProPEX Fitting Placement



Figure 5-4: Slide the Tool Head Into the Tubing



Figure 5-5: Rotate and Expand Again

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Figure 5-7: Expansion With Proper Rotation

5. 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 over-expanded and may require additional time to fully shrink over the fitting. The tubing and ProPEX Ring should seat against the shoulder of the fitting for a proper connection.

Important Tips for

a Proper ProPEX

Connection



Figure 5-8: Slide Tubing Over the Fitting



Figure 5-9: ProPEX Ring and Fitting

- If the fitting does not slide into the tubing all the way to the stop, immediately remove it from the tubing and expand the tubing one final time.
- Note: To avoid over-expanding the tubing, do not hold the tubing in the expanded position.
- The recommended number of expansions is listed in **Table 5-1**. 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 1/16 inch between the ring and the shoulder of the fitting, square-cut the tubing two inches away from the fitting and make another connection using a new ProPEX Ring.

Tubing	Ring	H	ead Ma	rking	Number of Expansions			
Size	Marking	Manual	Air Exp	Battery Exp	Manual	Air Exp	Battery Exp	
³ /8"	3/8"	3/8"	3/8"	-	4-5	4-5	6-7	
1/2"	1⁄2"	1/2"	1/2"	1⁄2"H	3-4	3-4	3-4	
³ /4"	³ /4"	3/4"	3/4"	³⁄4"H	7-9	7-9	6-7H	
1"	1"	1"	1"	1"H	12-14	12-14	6-7H	
1¼"	11⁄4"	—	—	1¼"H	—	—	6-7H	
1½"	1½"	—	—	1½"H	—	—	7-8H	
2"	2"	—	—	2"H	—	—	4-5H	

Table 5-1: Recommended Number of Expansions



Making ³/⁴ ProPEX Connections

The ³/₈" ProPEX Ring is smaller and thicker than the ProPEX Rings used for other tubing sizes. The ³/₈" ProPEX Ring must be expanded once on each side to properly fit over the tubing. Expansion of the ProPEX Ring is only necessary for ³/₄" Wirsbo AQUAPEX[®] tubing.

- 1. Square-cut the ³/₄" Wirsbo AQUAPEX tubing perpendicular to the length of the tubing.
- 2. Expand each side of ³/₈" ProPEX Ring with the ProPEX[®] Expander Tool once.
- 3. Slide the expanded ³/₈" ring over the end of the tubing. Make sure the end of the ring extends over the end of the tubing no more than $\frac{1}{16}$ inch (1.6mm). Once the $\frac{3}{6}$ " ProPEX Ring is properly expanded on the tubing, refer to Steps 3 to 5 (pages 15 to 17) for further instruction.
- 4. When the temperature is above 40°F/4.4°C, ProPEX connections to ³/⁴" Wirsbo AQUAPEX tubing require four to five expansions. When the temperature is below 40°F/4.4°C, only four expansions are necessary.
- 5. The thicker ProPEX Ring used for ³/₄" ProPEX connections shrinks over the fitting faster than other size rings.

Using the ProPEX Auto Rotation Adapter

- 1. Lightly grease the cone of a standard ProPEX Expander Tool (manual, air or battery). See Figure 5-10 for further details
- 2. Thread the ProPEX Auto Rotation Adapter onto the tool. Remove excess oil from adapter cone, then lightly grease cone. (See **Figure 5-11**.)
- 3. Select a standard expander head only. (H-heads are not compatible.)
- 4. Thread the standard expander head onto the ProPEX Auto Rotation Adapter. (See Figure 5-12.)
- 5. Next, square-cut the PEX tubing perpendicular to the length of the tubing. (See Figure 5-13.)
- 6. Slide the ProPEX Ring over the tubing's end. Extend the ring's end over the tubing's end no more than ¹/₁₆ inch. (See **Figure 5-14**.)
- 7. Gently slide the expander head into the tubing until it stops. Do not force the expander head into the tubing. (See Figure 5-15.)
- 8. Perform the expansion and repeat. (See Table 5-2 for recommended number of expansions.) After each expansion, remove expander tool from tubing to allow rotation. Reinsert tool into tubing for the next expansion. (See Figure 5-16.)

	Tubing	Ring	Number of Expansions				
	Size	Marking	Manual	Air Exp	Bat Exp		
	3⁄8"	3/8"	4-5	4-5	4-5		
5-2	1/2"	Х"	3-4	3-4	3-4		
	5/8"	5⁄8"	6-7	6-7	6-7		
	3/4"	3⁄4"	7-9	7-9	7-9		
	1"	1"	12-14	12-14	12-14		

- 9. Expansion is complete when the tubing and ring are snug against the shoulder on the expander head. (See Figure 5-17.)
- 10. Immediately remove the ProPEX Expander Tool. You should feel resistance as you insert the fitting. (See Figure 5-18.)
- **Note:** You do not need to rotate the tubing or the expander tool. • Expander head may not rotate after each expansion on 1" tubing. This will not impact the quality of the connection.









Figure 5-11



















18 **UDONO**

Disconnecting a ProPEX Brass Fitting

ProPEX Brass Fittings are manufactured connections and can be concealed in walls, ceilings and floors. However, when necessary, ProPEX Brass Fittings can be disconnected. (EP fittings cannot be reclaimed or reused.)

To Disconnect a ProPEX Brass Fitting:

- 1. Make sure the system is not pressurized.
- 2. Use a heat gun to heat one side of the ProPEX Ring. When the ring is clear, use a utility knife to carefully cut through the ring. Care should be taken to cut only the ring and not the tubing. This will protect the fitting from being gouged by the knife. Remove the ProPEX Ring from the tubing with pliers or another tool to avoid touching the hot ring.

Note: Do not gouge the fitting when cutting the ProPEX Ring. Nicks and gouges in the fitting may result in leaks. If gouged, discard the fitting.

- 3. When the ProPEX Ring is removed, apply heat directly around the fitting and tubing connection. Gently work the tubing back and forth while pulling slightly away from the fitting until the tubing separates from the fitting.
- 4. When the tubing is removed from the fitting, square-cut the tubing two inches (minimum) from the end of the tubing.
- 5. Use a new ProPEX Ring and follow the steps to make a new ProPEX connection.
- **Note:** Allow the fitting to cool before attempting to make another connection.

Troubleshooting ProPEX Connections

Trouble-free ProPEX installations begin with a ProPEX Expander Tool that is maintained in proper working condition. If the tool's conical or segment fingers are damaged, it is very difficult to make a proper connection. The following troubleshooting suggestions are designed to assist with problems in the field.

For Fittings That Will Not Seal:

- Make sure the expander head is securely screwed onto the tool (hand-tightened).
- Make sure the expander head segment fingers are not bent. If the head does not completely close when the battery tool's 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 conical or expander head segment fingers. Remove excess grease prior to making ProPEX connections.

- Examine the fitting for any damage. Sharp nicks and gouges on the fitting 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. The longer the tubing and ProPEX Ring are held in the expanded position, the greater the chance for a leak (due to over-expansion).
- $\boldsymbol{\cdot}$ Be sure to rotate the tool one-eighth turn after each expansion.

If Expansion is Difficult:

· Make sure the internal cone is properly greased.

If the Expansion Head Slips out of the Tubing When Making Expansions:

- Ensure the tubing and ProPEX Ring are dry.
- Make sure that grease is not getting into the tubing.
- Examine the expander head segment fingers to make sure that none are bent.

If the ProPEX Ring Slides Down the 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 may possibly slide 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 Than the Recommended Number of Expansions are Needed to Make a Connection:

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

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.
- ProPEX connections must be made at temperatures above 5°F/-15°C.
- Fewer expansions are necessary in temperatures below 40°F/4.4°C.

Proper Expander Tool and Head Maintenance

The ProPEX Expander Tools are sturdy, but must be handled with care to prevent possible damage to the cone and the expander heads.

- Remove and clean the segment fingers as needed.
- Remove the segments from the attachment ring by pushing the segment finger down toward the opening in the ring. Once the first segment is removed, the rest follow easily.
- Place the segments on a flat surface with the ridges facing up. The fingers should lay flat without any curve in the middle. If the segments are bent, replace the head immediately.
- To reassemble, replace the segment fingers one at a time to the attachment ring by sliding the grooved portion of the segment fingers over the spring in the attachment ring. The narrow end of the segment fingers point away from the solid side of the attachment ring. Hold these segment fingers in place with your thumb as the remaining segment fingers are inserted.
- Once the expander head is cleaned and reassembled, use a lint-free cloth to apply a light coat of lubricant to the cone prior to making any ProPEX connections.
- Apply the lubricant daily if used regularly.
- Keep all other parts of the tool free from lubricant.
- The Hand Expander Tool handles will open and close smoothly if the tool is properly lubricated.
- Failure to properly lubricate the tool 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.

- 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.
- Store the tool and expander heads in the case. Store the tool with an expansion head in place to protect the cone.
- Store the tool in a dry location to prevent rust.

Handling Guidelines for Engineered Plastic (EP) Fittings

Although not comprehensive, the following highlights the most common EP fitting guidelines:

- Do not solder within 18 inches of any EP fittings in the same water line. Sweat connections must be made prior to making the ProPEX connection.
- Do not subject EP fittings to impact.
- $\boldsymbol{\cdot}$ Do not use adhesives or adhesive tape with Uponor EP fittings.1
- Do not expose EP fittings to open flame.
- Do not allow solder, flux, pipe dope, solvents or urethane foams to come in contact with EP fittings as immediate damage may result.
- Never pull or drag tubing by the installed EP fittings.
- Do not expose EP fittings to excessive bending loads (greater than 100 pounds).
- Do not use EP fittings where temperatures and pressures exceed ratings.
- Do not spray on or allow organic chemicals, strong acids or strong bases to come into contact with EP fittings.
- Do not use petroleum or solvent-based paints on EP fittings.
- Do not allow rodents, insects or other pests to come into contact with EP fittings.
- **Note:** EP Fittings are not listed to UL 1821 and may not be installed into portions of the AQUASAFE Looped System. EP fittings are permitted to be installed to facilitate connections to cold-water potable plumbing fixtures as described in **Sections 1** and **4** of this guide.

You may temporarily affix adhesive tape to EP fittings 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.

Section 6 Extreme Temperature Instructions

Cold-weather Expansions

- Cold temperatures affect the time it takes for the tubing and ProPEX Ring to shrink onto the fitting. The colder the temperature, the slower the contraction time.
- Warming up ProPEX fittings and rings speed up contraction time. Putting fittings and rings in your pockets prior to installation is a simple way to keep them warm.
- In temperatures below 40°F/4.4°C, do not hold the tubing in the expanded position.
- Fewer expansions may be necessary in cold weather.
- The correct number of expansions is the number it takes to get the tubing and the shoulder of the fitting snug against each other.
- Rotate the tool after each expansion.
- **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 to gently warm up connections all the way around the circumference of the tubing for about 15 seconds so that the tubing becomes warm to the touch. Do not let the tubing get hot enough so that it damages the outer polyethylene layer. 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 sprinkler's glass bulb to burst, activating discharge.

Hot- and Cold-weather Installation Instructions

Because the Wirsbo AQUAPEX tubing used in the AQUASAFE Looped Residential Fire Safety System may be installed in the ceiling or other areas exposed to temperature extremes of heat and/or cold, follow the recommended extreme weather installation instructions to isolate the system components from extreme temperatures.

Installation methods which may be employed include, but are not limited to:

- $\boldsymbol{\cdot}$ Tenting over the fire sprinkler piping
- · Additional layers of batt insulation
- · Increased depth of blown-in insulation

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

Section 7 Tubing Supports and Fittings

Tubing Support Guidelines

 Plastic tubing supports are recommended. Metal tubing supports designed for use with plastic tubing are suitable. Attach metal tubing supports with #10 x 1¹/₄" coarse thread screws (or similar fasteners) and washer. (See Figure 7-1.)



- Figure 7-1: Metal Tubing Supports
- 2. Do not use supports that will damage the tubing. Inspect metal supports for sharp edges.
- The linear expansion rate for Wirsbo AQUAPEX tubing is approximately 1.1 inches per 10°F/12.2°C temperature change for every 100 feet of tubing.
- 4. When installing runs of tubing, allow $\frac{1}{6}$ " to $\frac{3}{6}$ " longitudinal clearance per foot of run to accommodate thermal expansion. Allow tubing to dip between supports.

Note: Do not pull tubing tight during installation.

- 5. Do not rigidly anchor Wirsbo AQUAPEX tubing with supports (e.g., tube talons), but instead allow freedom of movement to expand and contract. (See **Figure 7-2**.)
- 6. Allow adequate clearance between PEX tubing and the structure (bored holes or sleeves) to allow freedom of movement due to thermal expansion and contraction.



Figure 7-2: Correct Positioning of Tube Talon

Tubing Support Spacing

Anchor Wirsbo 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 inches. If horizontal runs are continuously supported, place tubing supports at six-foot intervals.



2. Along vertical runs, install supports every four to five feet, at each floor and at a mid-story guide.



- **Note:** In accordance with UL and C-UL listings, ensure protection is provided for the tubing and fittings. The minimum protection should consist of either:
 - One layer of 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
 - ・½" (13mm) plywood soffits
 - One layer of ½" (13mm) plywood

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

ProPEX Fittings

Please refer to the Uponor Product Catalog for a current listing of ProPEX Brass Couplings, Brass Elbows, Brass Tees, Brass Reducing Tees, Brass Male Threaded Adapters, Brass Female Threaded Adapters and Brass Sweat Adapters.

Section 8 Pressure Testing

Pressure Testing Uponor AQUASAFE Looped Systems

Pressure-test Uponor AQUASAFE Looped System in accordance with NFPA 13D Standard, which specifies testing at normal operating water pressure. If local plumbing code requirements are more stringent, follow local code. Wait 30 minutes after making all ProPEX connections before pressure testing.

If leaky connections are found during pressure tests in cold weather, use a heat gun to gently warm up connections around the circumference of the tubing for 15 seconds. 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 sprinkler's glass bulb to burst, activating discharge.



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



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 it is 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.

Uponor Concealed

Sprinkler Flat Cover Plates



Figure 8-2: Pressure Testing





Figure 8-4: Uponor Recessed Escutcheons



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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.

Note: The Uponor AQUASAFE warranty packet contains complete system and warranty information, along with a red label describing the system pressure and flow requirements. Leave the warranty in the home and attach the label to the primary shut-off valve.

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. System design can easily be modified to accommodate any flow-restricting devices. Consult the manufacturer for bypass instructions.

Backflow Prevention Requirements

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

Section 9 Flow Verification Featuring Flow Meter

Flow-verification Kit

To ensure the system provides enough water for proper fire sprinkler performance, you must conduct a flow-verification test. Trained installers who complete a flow-verification test may offer their customers a warranty on Wirsbo AQUAPEX tubing. (Uponor offers a limited warranty of up to 25 years on its Wirsbo AQUASAFE tubing. For full details, go to www.uponor-usa.com.)

- **Note:** Flow verification is not required by the NFPA 13D Installation Standard.
- Note: Before performing a flow-verification test, confirm the water pressures by contacting the local city water and sewer department. Be sure the available water pressure matches the pressure used in the system design.



The Flow Verification Kit attaches to the Multi-port Fitting for proper flow measurement. The kit contains the following items:

- Flow-control valve
- Uponor Flow Meter
- Four test orifices
- ¾" PEX x ½" FNPT
- One ³/₄" PEX x ¹/₂" MNPT
- Two ¾" PEX x 1" NPT

Performing a Flow-verification Test

The flow-verification test must be performed with all flow-restricting devices (water softener, etc.) in place.

- 1. Be sure the water is turned off. Carefully unscrew the sprinkler from the Multi-port Fitting. Place the sprinkler in a safe place to avoid any damage.
- 2. Assemble the PEX pieces using the threaded fittings. Be sure the Flow Meter is installed closest to the sprinkler.



- 3. 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.
- Attach the Flow Verification Kit to the Multi-port Fitting's ¹/₂" NPT connection. Be sure 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.
- Check to make sure the proper sprinkler orifice adapter is installed to the bottom of the Flow Verification Kit.
- 6. Pressurize the system to its working pressure.
- 7. Open the valve and bleed air from the system.
- 8. Close the valve completely.

9. Record the static pressure reading on the gauge near the manifold.

- 10. 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.
- 11. Compare the results with the gallons per minute required on the sprinkler data sheet. Test results must equal or exceed required flow for proper operation and warranty coverage.
- **Note:** If a two-sprinkler flow is required by the Authorities Having Jurisdiction (AHJ), two Flow Verification Kits are necessary.
- 12. Pull all Teflon[®] tape off detached sprinkler.
- Apply new Teflon tape to the threads of the sprinkler (two to three wraps).
- 14. Screw the sprinkler back into the Multi-port Fitting using the appropriate sprinkler wrench. Approximately 10- to 25-foot pounds are required to secure the sprinkler in the fitting.
- **Note:** The hydraulically most remote sprinkler or pair of sprinklers is indicated on the design printout in **Appendix A**. For test requirements on other sprinklers, consult 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.

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, check the following:

- 1. Verify the available water pressure.
- 2. Ensure the system is piped according to the design.
- 3. Verify that the proper test orifice was used for the flow test.
- 4. Check to see that all supply valves in the system are open.
- 5. Check to ensure that flow-restricting devices were not added after the design was complete.
- 6. Ensure that the water meter is sized in accordance with the drawing.

Figure 10-2: Uponor Flow Meter

- 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.

60°F Water Inlet Pressure: 60 3/4" PEX Tube Length (feet) 25 50 100 150 200 225 250 275 300 325 ft/sec 56.8 55.3 53.4 57.7 57.4 57.1 56.5 56.2 1.81 $\begin{array}{c} 2.0\\ 2.5\\ 3.0\\ 4.5\\ 5.0\\ 5.5\\ 6.0\\ 7.0\\ 7.5\\ 8.0\\ 9.5\\ 10.0\\ 11.5\\ 12.0\\ 11.5\\ 12.0\\ 13.5\end{array}$ 59.7 59.4 58.8 58.3 54.8 52.8 50.6 48.0 54.4 52.2 2.27 59.6 59.4 59.2 59.0 58.5 58.2 57.9 57.6 57.3 56.9 56.1 55.7 55.3 54.8 54.3 53.3 59.1 58.3 57.6 57.4 56.6 56.1 55.7 58.8 56.4 55.2 54.6 54.0 58.4 58.0 56.9 56.0 55.3 54.0 52.9 51.0 52.1 50.0 51.3 49.0 49.8 3.18 3.63 53.7 52.0 47.0 57.5 57.0 56.5 55.9 55.1 54.0 52.9 51.7 52.6 50.1 48.9 47.7 46.4 45.2 43.9 4.08 51.0 48 1 46.6 45.1 43.6 42.1 40.6 4.54 49.4 47.6 44.0 42.3 39.3 40.5 37.2 38.7 35.1 37.0 33.1 4.99 45.8 43.4 41.3 5.44 55.2 54.5 53.8 53.1 50.4 49.1 38.5 35.4 31.3 27.2 5.90 6.35 45.6 40.9 36.1 32.7 33.7 28.9 43.6 38.1 29.9 24.5 47.6 41.4 35.3 32.2 32.2 28.7 29.1 25.3 26.0 21.8 22.9 18.3 19.8 6.81 46.1 39.2 14.9 7.26 52.3 51.4 50.5 49.6 36.8 34.2 31.6 28.9 29.0 25.7 22.2 18.5 25.1 21.4 17.4 13.3 23.3 21.3 17.1 12.7 8.1 3.4 21.8 17.4 12.8 8.0 2.9 13.5 8.5 3.2 44.5 9.7 7.71 42.8 41.1 39.3 4.2 8.17 8.62 9.07 37.3 35.4 33.3 26.0 23.0 20.0 9.53 9.98 10.44 48.7 47.7 14.7 9.0 10.7 6.6 4.6 46.7 52.8 52.2 31.2 2.4 10.89 45.6 16.8 44.5 29.0 13.5 11.34 51.7 51.1 43.4 42.2 26.7 24.4 10.1 6.6 11.80

60°F Water

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

Inlet Pre	eeuro.	60				, and					
meeric				1" PE	X Tube I	enath (feet)				
gpm	25	50	100	150	200	250	275	300	325	350	ft/sec
3.0	59.8	59.6	59.3	58.9	58.6	58.2	58.0	57.8	57.7	57.5	1.65
3.5	59.8	59.5	59.1	58.6	58.1	57.6	57.4	57.2	56.9	56.7	1.92
4.0	59.7	59.4	58.8	58.2	57.6	57.0	56.7	56.4	56.1	55.8	2.20
4.5	59.6	59.3	58.5	57.8	57.0	56.3	55.9	55.5	55.2	54.8	2.47
5.0	59.6	59.1	58.2	57.3	56.4	55.5	55.1	54.6	54.2	53.7	2.75
5.5	59.5	58.9	57.9	56.8	55.7	54.7	54.1	53.6	53.1	52.5	3.02
6.0	59.4	58.8	57.5	56.3	55.0	53.8	53.2	52.5	51.9	51.3	3.30
6.5	59.3	58.6	57.1	55.7	54.2	52.8	52.1	51.4	50.6	49.9	3.57
7.0	59.2	58.4	56.7	55.1	53.4	51.8	51.0	50.1	49.3	48.5	3.85
7.5	59.1	58.1	56.3	54.4	52.6	50.7	49.8	48.8	47.9	47.0	4.12
8.0	59.0	57.9	55.8	53.7	51.6	49.6	48.5	47.5	46.4	45.4	4.40
8.5	58.8	57.7	55.3	53.0	50.7	48.4	47.2	46.0	44.9	43.7	4.67
9.0	58.7	57.4	54.8	52.3	49.7	47.1	45.8	44.5	43.2	41.9	4.95
9.5	58.6	57.2	54.3	51.5	48.6	45.8	44.4	42.9	41.5	40.1	5.22
10.0	58.4	56.9	53.8	50.6	47.5	44.4	42.8	41.3	39.7	38.2	5.50
10.5	58.3	56.6	53.2	49.8	46.4	43.0	41.3	39.6	37.9	36.2	5.77
11.0	58.2	56.3	52.6	48.9	45.2	41.5	39.7	37.8	36.0	34.1	6.05
11.5	58.0	56.0	52.0	48.0	44.0	40.0	37.9	35.9	33.9	31.9	6.32
12.0	57.8	55.7	51.3	47.0	42.7	38.4	36.2	34.0	31.9	29.7	6.60
12.5	57.7	55.3	50.7	46.0	41.4	36.7	34.4	32.0	29.7	27.4	6.87
13.0	57.5	55.0	50.0	45.0	40.0	35.0	32.5	30.0	27.5	25.0	7.15
13.5	57.3	54.7	49.3	44.0	38.6	33.3	30.6	27.9	25.2	22.6	7.42
14.0	57.1	54.3	48.6	42.9	37.1	31.4	28.6	25.7	22.9	20.0	7.70
14.5	57.0	53.9	47.8	41.7	35.7	29.6	26.5	23.5	20.4	17.4	7.97
15.0	56.8	53.5	47.1	40.6	34.1	27.7	24.4	21.2	17.9	14.7	8.25
15.5	56.6	53.1	46.3	39.4	32.5	25.7	22.2	18.8	15.4	11.9	8.52
10.0	50.4	52.7	45.5	38.2	30.9	23.7	20.0	10.4	12.8	9.1	0.00
10.5	50.2	52.3	44.0	37.0	29.3	21.0	17.0	13.9	7.0	0.2	9.07
17.0	55.9	51.9	43.8	35.7	27.0	19.5	15.4	11.4	1.3	3.3	9.35
17.5	55.7	51.5	42.9	34.4	25.8	17.3	13.0	0.0	4.5	0.2	9.62
10.0	55.5	51.0	42.0	33.0	24.1	10.1	10.6	0.1	1.0	-	9.90
10.0	55.0	50.0	41.1	30.3	22.2	12.0	0.1	0.6	-	-	10.17
10.5	54.8	10.6	30.2	28.0	19.5	Q 1	2.0	0.0	-		10.43
20.0	54.0	43.0	39.2	20.9	16.6	5.7	2.9	-	-	-	11 00
20.0	54.0	49.1	37.3	26.0	14.6	3.7	0.5	-	-	-	11.00
20.3	54.1	40.0	36.3	20.0	12.6	0.7	-	-	-		11.27
21.0	53.9	40.1	35.3	24.4	10.5	0.7	-	-	-	-	11.00
21.0	53.6	47.0	34.2	22.9	8.4	-	-	-	-		12.10
	0.0		04.2	21.0	0.4		2			1	12.10

Appendix A The Uponor Design Printout

Reading Flow Charts

Flow charts provide 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

Sprinkler Spacing

The possible maximum spacing between the sprinklers (determined by the designer)

Maximum Distance to Wall

The maximum distance the sprinkler may be placed from the wall at the selected spacing

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

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

							Mini	mum Requi	ired Sprinkle	r Discharge
	Orifice	Temp.	Temp.		Maximum Sprinkler	Distance	Single	Sprinkler	Two or Mo	ore Sprinklers
Model	Size (Inches)	Rating (°F)	Rating (°C)	k Factor	Spacing (Feet)	to Wall (Feet)	Flow (gpm)	Pressure (psi)	Flow Each (gpm)	Pressure Each (psi)
F1 RES 49	1/2"	155/175	68.3/79.4	4.9	16 x 16	8	13	7.0	13	7.0
(SIN R3516)	7"	155/175	68.3/79.4	4.9	18 x 18	6	17	12.0	17	12.0
	1/2"	155/175	68.3/79.4	4.9	20 x 20	10	20	16.6	20	16.6
RFC43	1 ₇₂ "	165	73.9	4.3	12 x 12	9	12	7.8	12	7.8
(SIN RA0612)	7"	165	73.9	4.3	14 × 14	7	13	9.1	13	9.1
	μ"	165	73.9	4.3	16 × 16	8	13	9.1	13	9.1
	μ"	165	73.9	4.3	18 x 18	6	18	17.5	18	17.5
	1/2"	165	73.9	4.3	20 x 20	10	21	23.8	21	23.8
F1 RES44 HSW	3%"	155/175	68.3/79.4	4.4	12 x 12	9	12	7.5	12	7.5
(SIN R3531)	3%"	155/175	68.3/79.4	4.4	14 × 14	7	14	10.2	14	10.2
Installed	3%"	155/175	68.3/79.4	4.4	16 × 16	8	16	13.3	16	13.3
4" - 6"	3%"	155/175	68.3/79.4	4.4	16 x 18	8	18	16.8	18	16.8
Below Ceiling	3%"	155/175	68.3/79.4	4.4	18 x 18	6	19	18.7	19	18.7
	3/8"	155/175	68.3/79.4	4.4	16 x 20	8	23	27.4	23	27.4
Table A-1: Flow Che	art Example									

Design Example

Uponor's design provides the following information:

Sprinkler node number Type of sprinkler and its maximum spacing Sun Room (H.14 R49-16 H.23 R49-16 H.23 R49-16 H.23 R49-16 H.23 R49-16 H.23 R49-16 H.23 R49-16 H.23 R49-16 H.24 R49-16 H.23 R49-16 H.23 R49-16 H.24 R49-16 H.23 R49-16 H.24 R49-16 H.24 R49-16 H.23 R49-16 H.23 R49-16 H.24 R49-16 H.23 R49-16 H.24 R	H.#	Sprinkler ID	
Dining Room H.14 R49-16 H.12 R49-16 H.3 Supply up to 2nd Floor H.3 R49-16 H.2 R49-16 H.2 R49-16 H.2 R49-16 H.3 @ H.18 R49-16 Garage (No A.S.) @ H.18 R49-16 H.18 R49-16 H.18 R49-16 Garage (No A.S.)	Sprinkler node number	Type of sprinkler and its maximum spacing	
Colonial 1st Floor	Dining Room Ki R49-16 H.3 Supply up t R49-16 H.2 R49-16 H.4 R49-16 H.1 C	Sun Room H.14 R49-16 H.12 Dana Floor H.13 R49-16 H.13 R49-16 H.18 R49-16 H.18 R49-16 H.18 R49-16 Open to Aboye Study	Family Room H.24 R49-16 () Garage (No A.S.)

Note: This home is using residential 4.9k sprinklers spaced at 16-foot x 16-foot.

Basic Sprinkler Spacing Guidelines

- Do not space sprinklers closer together than eight feet, per NFPA 13D Standard.
- Do not space sprinklers farther apart than the distance shown on the design printout. Spacing varies depending on pressure and flow requirements. Residential sprinklers are often spaced at less than their maximum allowable spacing.
- Maximum distance off the wall is always half the maximum spacing distance.

Notes

Notes