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Uponor ProPEX Connections Installation Instructions

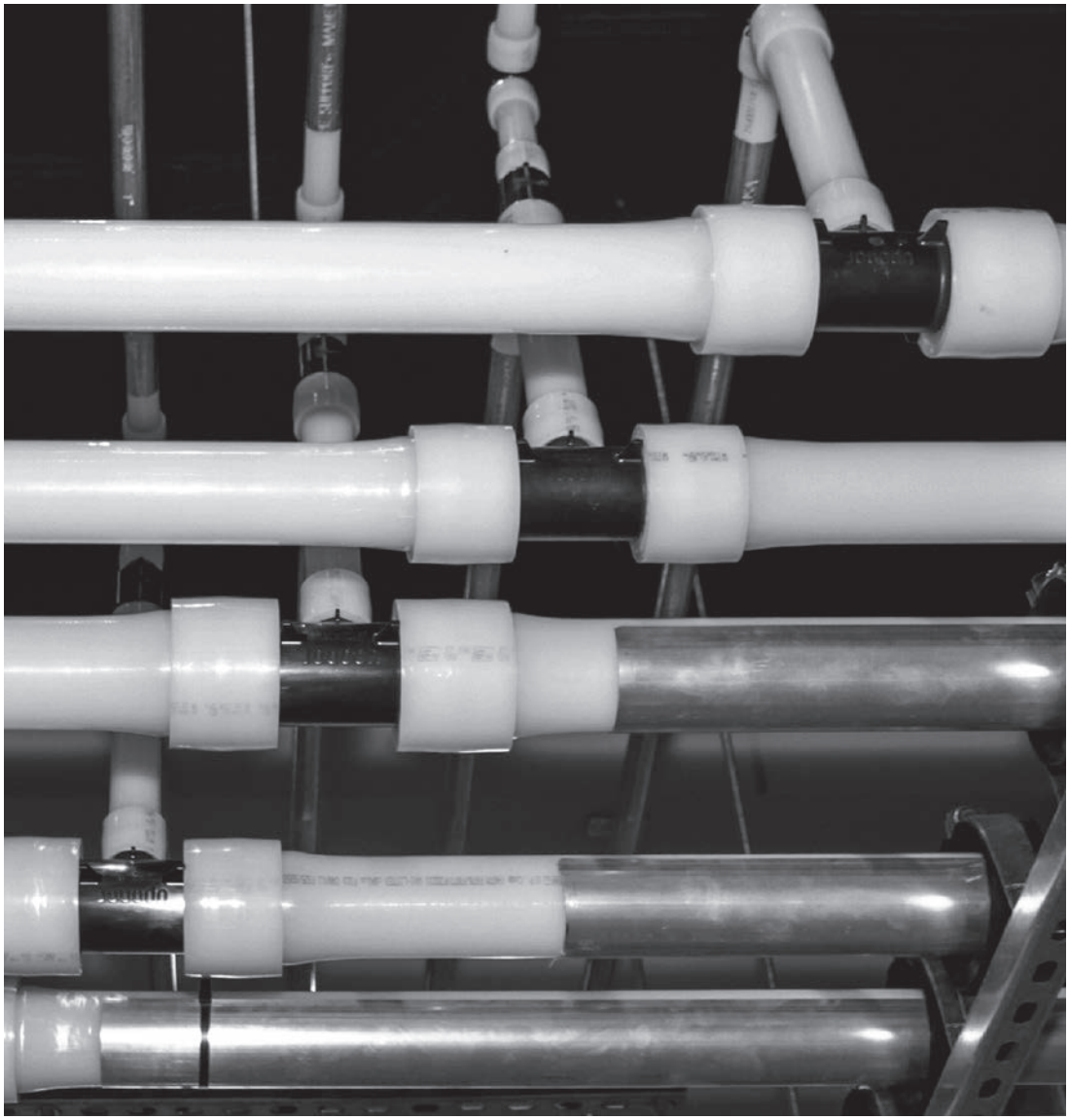
INS-UPP

Revised 02/20/24

IMPORTANT SAFETY INFORMATION

To reduce the risk of injury, read and understand this Uponor PEX Piping Systems Installation Guide before beginning work. Read all product safety warnings and operator's manuals for the Milwaukee® Tool M12™, M12 FUEL™, M18™, M18 FUEL™, and FORCE LOGIC™ ProPEX expansion tools, PEX pipe cutters, and other installation tools to operate those tools safely and correctly. Always wear safety goggles or safety glasses with side shields when performing work.

WARNING: Cancer and Reproductive Harm
www.P65Warnings.ca.gov



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Testing

All carrier pipe must either be air or hydro tested per specifications prior to insulating, pouring thrust blocks, anchors or backfilling the system. Failure to comply with testing procedures will void warranty. Plastic carrier pipe must be hydro tested only, do not air test.

ROVANCO's products and processes are covered under various US patents, including, but not limited to 4,084,842 - 4,484,386 - 4,221,405 - 3,793,411.

For Leak Detection Installation Instructions, contact Rovanco for INS-RAT

Section 1: Introduction & Overview

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

- Milwaukee M12, M12 FUEL, M18, and M18 FUEL 2" ProPEX expansion tools
- Milwaukee M18 FORCE LOGIC ProPEX Expansion Tool
- ProPEX 201 Corded Expander Tool
- ProPEX Hand Expander Tool

Section 2: Distance Between Fittings

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

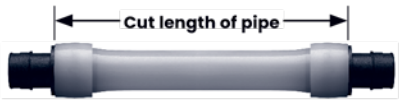

Figure 1: Distance between fittings

Table 1: Minimum distance between ProPEX fittings

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

Section 3: General ProPEX Connection Tips

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

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

- **Table 2** shows the recommended number of expansions. Experience, technique, and weather conditions influence the actual number of expansions. Fewer expansions may be necessary under certain conditions. The correct number of expansions is the amount necessary for the piping and the shoulder of the fitting to fit snugly together.
- Ensure the ProPEX ring rests snugly against the fitting shoulder. If there is more than 11⁄16" (1 mm) between the ring and the shoulder of the fitting, the connection must be replaced. Square cut the piping 2" away from the fitting for 3⁄8" to 1" pipe, 3" away for 1¼" to 2" pipe, and 5" away for 2½" and 3" pipe prior to making the new connection.
- Brass ProPEX fittings can be disconnected and reused. EP fittings must be discarded. Be sure to follow the recommended minimum distance between ProPEX fittings shown in **Table 1** above.

Table 2: Recommended number of expansions for ⅜" to 3" piping at 73.4°F (23°C)

Pipe size	Milwaukee ProPEX expansion tools					Uponor ProPEX expander tools		
	M12 with standard heads (2432)	M12 FUEL with RAPID SEAL™ heads (2532)	M18 (2632)	M18 FUEL 2" (2932)	M18 FORCE LOGIC (2633)	Manual	100/150	201
⅜"	6-7	6-10	5	5-7	—	5	7	—
½"	7-8	5-8	9	7-9	—	4	4	—
⅝"	9-10	6-10	9	8-9	—	9	9H	—
¾"	11-12	7-12	10	9-11	—	14	7H	—
1"	17-18	12-18	19	12-13 (or 7-8H)	—	—	7H	—
1¼"	—	—	9	9-10H	—	—	8H	—
1½"	—	—	10	8-9H	—	—	—	—
2"	—	—	—	9-10	4	—	—	5H
2½"	—	—	—	—	5	—	—	—
3"	—	—	—	—	7	—	—	—

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

Section 4: Making ProPEX Connections with Milwaukee M12, M12 FUEL, M18 or M18 FUEL 2" ProPEX Expansion Tools

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

Figure 2: 3/8" and ½" Milwaukee expansion heads

Figure 3: ¾" to 3" Milwaukee expansion heads

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

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

Important! Make sure you cut the pipe square and not an angle.

2. Slide the ProPEX ring over the end of the piping until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the piping no more than 11⁄16" (1mm).

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

With auto rotation (standard Milwaukee heads)

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

Figure 4: Expansion with Milwaukee M12, M12 FUEL, M18, and M18 FUEL 2" ProPEX expansion tools

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

Without auto rotation (standard Uponor heads)

4. Press the trigger to expand the piping.

5. Release the trigger, remove the head from the piping, rotate it 1⁄8 turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expander head. See **Table 2 on Page 3** for the recommended number of expansions.

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

Figures 6a-6c: Inserting ProPEX fitting into 1/2" Uponor PEX fitting

Figures 6d-6e: Inserting ProPEX fitting into 1" Uponor PEX fitting

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

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

Figure 7: ProPEX coupling

Figure 8: ProPEX tee

Figure 9: Expansion with Milwaukee M18 ProPEX Expansion Tool

Section 5: Making ProPEX connections with Milwaukee M18 FORCE LOGIC ProPEX expansion tools

FORCE LOGIC expansion head installation

The Milwaukee FORCE LOGIC ProPEX Expansion Tool for 2", 2½", and 3" Uponor PEX pipe features an auto-rotating head with specially designed alignment cogs. This requires slightly different head installation than the M12 and M18 ProPEX expansion tools for 3⁄8" to 1½" pipe sizes.

1. Remove the battery pack and place the FORCE LOGIC tool in the upright position (cone up).
2. Verify the expansion cone is fully retracted.
3. Screw the head onto the tool (clockwise). Hand-tighten securely. Do not over tighten. Ensure the expansion head fits flush against the tool.
4. Check the installation.
   a. Ensure the head segments do not “flower”
   b. If the head flowers, correct the installation by loosening the head slightly and rotating the segments until they engage in the cogs. Re-tighten the head.
   c. Rotate the six expansion segments in the clockwise direction. They will rotate freely. They should not rotate counter clockwise.
   d. The expansion head collar will fit flush against the tool.

Figure 10: FORCE LOGIC expansion head installation

Figure 11: FORCE LOGIC expansion head auto-rotate teeth

Figure 12: Incorrect expansion head “flowering”

Figure 13: Correct expansion head alignment

Section 6: Making ProPEX Connection

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

Important! Make sure you cut the pipe square and not an an angle.

2. Slide the ProPEX ring over the end of the piping until it reaches the stop edge.
3. The tool features auto rotation so the head will automatically rotate to ensure the piping is evenly expanded

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

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

Important! Do not force the pipe and ring on the head during any expansion.

5. After the tool has retracted, the green indicator light blinks three times. Press the trigger and repeat the expansion process.
6. Repeat the process until the pipe and ring are snug against the shoulder of the expansion head. Repeat the expansion one or two more times depending on the ambient temperature.

Note: Colder temperatures require fewer expansions.

7. After final expansion, immediately remove the tool and insert the fitting.

Figure 14: Cut pipe

Figure 15: Add ring

Figure 16: Ensure ring reaches stop edge

Figure 17: Begin expanding

Figure 18: Expand to shoulder

Figure 19: Insert fitting

Section 7: Making ProPEX connections with ProPEX 201 corded expander tools

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

Figure 20: Cut pipe

Figure 21: Add ring

2. Slide the ProPEX ring over the end of the piping until it reaches the stop edge. If using a ProPEX ring without a stop edge, extend the ring over the end of the piping no more than 11⁄16" (1 mm).
3. Slide the expander head into the piping until it stops. Full expansions are necessary to make a proper connection.
4. Press the trigger to expand the piping.
5. Release the trigger, remove the head from the piping, rotate it 1⁄8 turn and slide the head back into the piping. Continue expanding and rotating until the piping and ring are snug against the shoulder on the expander head. See **Table 2 on Page 3** for recommended number of expansions.

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

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

Figure 22: Slide head into piping

Figure 23: Begin expanding

Figure 24: Rotate head

Figure 25: Expand to shoulder

Figure 26: Insert fitting

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

Figure 28: ProPEX EP tee connected to pipe

Figure 29: ProPEX brass fitting connected to pipe

Section 8: Making 3/8" ProPEX Connections

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

1. Square cut the PEX piping perpendicular to the length of the piping. Remove all excess material or burrs that might affect the fitting connection.
2. Expand each side of the ring once.
3. Slide the expanded ring over the end of the piping. Extend the end of the ring over the end of the piping no more than 11⁄16" (1 mm).

Figure 30: E6081128 pipe cutter (plastic)

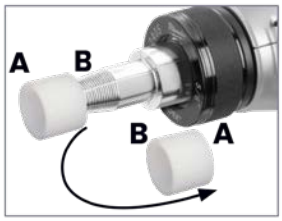

Figure 31: Expand each side of the ring

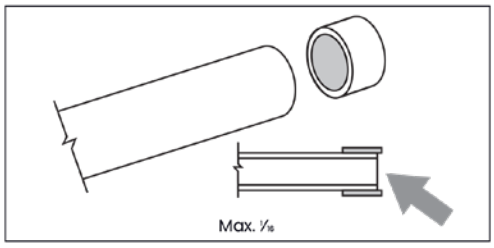

Figure 32: Slide the expanded ring over the end of the piping

4. After ring is on the piping, continue with regular steps for making a proper connection with your specific tool.

Important tips for a proper 3/8" ProPEX connection

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

Section 9: Proper Expander Tool & Head Maintenance

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

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

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

Section 10: Cutting Large Diameter PEX Pipe

Caution! Read and thoroughly understand all safety instructions in the pipe cutter operator's manuals before performing work.

Caution! Be sure to wear safety gloves and proper eye protection prior to cutting pipe. Failure to do so could result in personal injury.

Use a swing or ratchet-type cutter to create smooth, clean cuts.

Figure 33: Uponor swing-style pipe cutter for up to 4" pipe (E6084000)

Figure 34: Uponor ratchet-style pipe cutter for up to 3" pipe (E6083000)

Section 11: Troubleshooting ProPEX Connections

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

Fittings Won't Seal

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

Expansion is difficult

- Make sure the internal cone is properly greased.

Expansion head slips out of piping when making expansions

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

ProPEX ring slides down piping during expansion

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

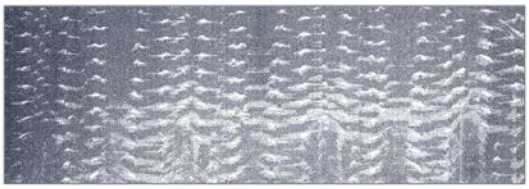

Figure 35: Expansion with proper rotation

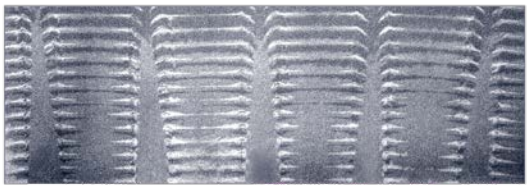

Figure 36: Expansion without proper rotation

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

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

Cold-weather expansions

- Uponor recommends the use of the Milwaukee M12 FUEL ProPEX expansion tool with RAPID SEAL™ heads for cold-weather installation of 3/8" to 1" Uponor piping systems.
- Temperatures affect the time required for the piping and ring to shrink onto the fitting. The colder the temperature, the slower the contraction time.
- Warming ProPEX fittings and ProPEX rings reduces contraction time. Put fittings and rings in your pockets prior to installation to keep them warm.
- Fewer expansions are necessary in temperatures below 40ºF (4.4ºC).

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

Figure 37: Milwaukee RAPID SEAL 1" head

Section 12: Verifying ProPEX Connections

Make sure the ProPEX ring is tight against the fitting shoulder.

Figure 38: Coupling shoulder

Figure 39: Tee shoulder

Section 13: PEX Bending Radius

Pipe size	Pipe O.D.	Min. bend radius	2 x O.D.
½"	0.625"	3¾" (95mm)	1¼" (32mm)
¾"	0.875"	5¼" (133mm)	1¾" (44mm)
1"	1.125"	6¾" (171mm)	2¼" (57mm)

The minimum bend radius of Uponor AquaPEX pipe is six times the outside diameter. Bend supports are available for 33/88", ½", ¾", and 1" piping and may be used to facilitate 45-degree or 90-degree bends.

Use large-diameter PVC conduit to facilitate 90-degree bends in larger-diameter Uponor PEX piping.

To alleviate stress on ProPEX connections and fittings, do not change direction immediately after a ProPEX connection.

Uponor recommends a minimum of two times the outside diameter (O.D.) of the pipe as the minimum distance before changing direction; however, it is up to the installer to use best judgment. **See Figures 40, 41 & 42** for guidance.

Note: When a proper bend is not possible, use a ProPEX elbow.

Note: Uponor recommends the use of elbows in sizes 1¼" and larger for directional changes unless adequate space is available for a proper bend.

Figure 40: Bend radius

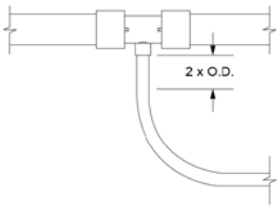

Figure 41: Correct Bending

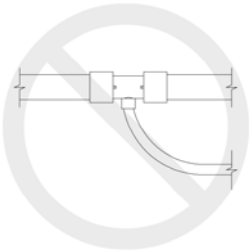

Figure 42: Incorrect Bending

Section 14: Reforming Kinked Piping

If the piping is kinked and hinders flow, easily make repairs following the steps below.

1. Make sure the system is not pressurized.
2. Straighten the kinked portion of the piping.
3. Heat the kinked area to approximately 265ºF/129.4ºC with an electric heat gun (approximately 450 watts of power). Apply the heat evenly until the piping returns to its original size and shape. Do not use an open flame **(see Figure 43).**
4. Allow the repaired piping to cool undisturbed to room temperature. When the piping returns to its opaque appearance, the repair is complete.

Caution: The piping surface temperature must not exceed 338ºF/170ºC. Do not apply direct flame to Uponor PEX piping. Uponor PEX piping repaired according to these recommendations will return to its original shape and strength. If the piping is sliced, punctured or otherwise damaged beyond the capacity of the crosslinked memory, install a ProPEX coupling. Uponor PEX piping cannot be welded or repaired with adhesives.

Figure 43: Reforming Kinked Piping

Section 15: Thawing Frozen Piping

Uponor PEX can withstand extreme freeze-thaw cycles better than other piping materials. In 2015, Uponor worked in partnership with standards developing organizations (SDOs) to establish a test method for performance under freeze/thaw conditions and subsequently developed a new standard for PEX piping applications. The test methodology included Uponor PEX pipe, ProPEX rings and ProPEX fitting assemblies and subjected them to repeated freeze/thaw cycles. The assemblies were then evaluated for leaks under pressure after every cycle. Based on the samples provided and the testing performed, Uponor ½" PEX pipe, ProPEX rings, and ProPEX EP couplings passed the freeze/thaw cycling and subsequent burst tests without failure in accordance with the test method.

If freezing occurs, the installer should advise the end user to correct the lack of insulation or heat to eliminate the problem from reoccurring. Should Uponor PEX piping experience an ice blockage, thaw the piping using one or more of the following methods.

- Pour hot water over the affected portion of piping.
- Wrap hot towels around the affected portion of piping.
- Place a small portable heating unit in the area to heat the space and thaw the ice blockage from the piping.
- Slowly heat the affected area with a hair dryer. Rub a hand over the area while heating to ensure the piping does not get too hot.