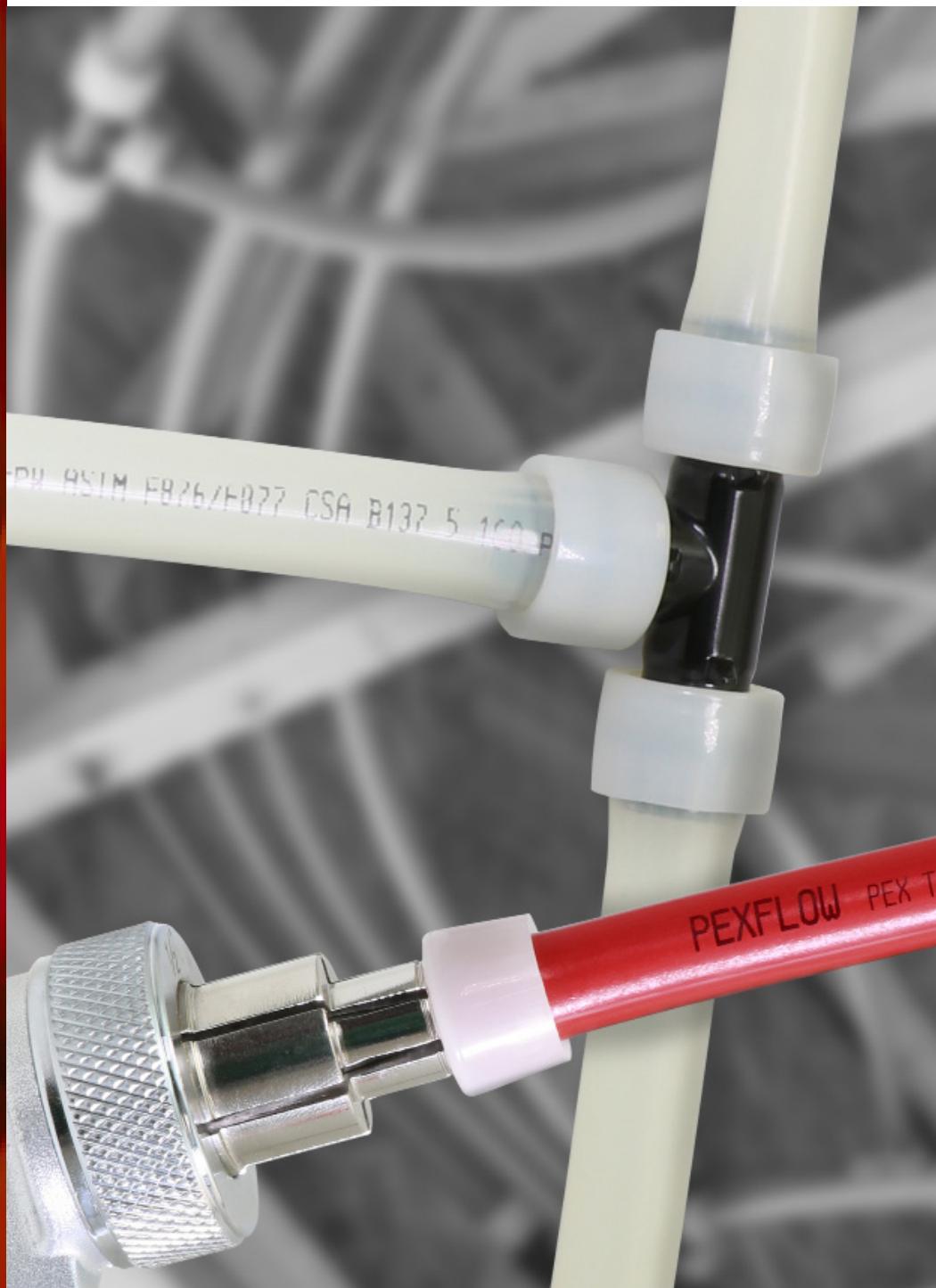




PEX-A Installation Guide





Pexflow PEX-A Expansion Pipe Installation Guide

Introduction

This installation guide is intended to assist plumbing contractors and building officials and includes general guidelines for the Installation Pexflow® Pex-A Expansion Pipe. Please check our website to ensure you have the latest version of this guide. Installations must follow all applicable local building and plumbing codes and regulations.

The Pexflow PEX-A process produces a higher degree and greater uniformity in crosslinking, resulting in product with significantly improved material properties with respect to temperature, pressure, strength and chemical resistance.

PEX-A expansion technology has been used for decades worldwide in plumbing applications.

Pexflow Pex-A carries all necessary approvals for North American installations, and offers significant advantages and benefits when compared to copper, CPVC, and other PEX plumbing systems in use today

Pexflow F1960 PEX-A Expansion System Advantages:

- **Clean and non-toxic**
- **Flexible - easy installations**
- **Resists scaling and corrosion**
- **Fewer fittings**
- **Quiet - no water hammer noise**
- **Equalized pressure drops, minimize hot or cold surges**
- **Can easily be repaired if tubing is kinked**
- **Durable/long life**
- **Fast installations enabling reduced Labor costs**
- **Lightweight**
- **Available in Red Blue and White/Natural**
- **Chlorine resistance**
- **Freeze and chemical resistance**
- **Low friction losses**
- **Domestic Hot Water continuous recirculation approved**
- **Connections can be checked visually**

Temperature and Pressure Ratings

Pexflow maintains standard-grade ratings for its PEX pipe as shown in the table below:

Temperature	Hydrostatic Design Stress	Pressure Rating
73.4°F / 23°C	630 psi / 4340 kPa	160 psi / 1100 kPa
180°F / 82.2°C	400 psi / 2760 kPa	100 psi / 690 kPa
200°F / 93.3°C	315 psi / 2170 kPa	80 psi / 550 kPa

In accordance with ASTM F876, Standard Specification for crosslinked polyethylene (PEX) piping, the excessive temperature and pressure capability is 210°F at 150 psi. This standard requires tubing maintain its integrity for a period of 720 hours. If installed as directed, Pexflow pipe will withstand these conditions.

NOTE: Excessive temperature and pressure requirements are always subject to approval by local building codes.

The use of PEX tubing in a potable hot-water plumbing system with an operating temperature above 140°F (60°C) or system pressure above 80 psig (550 kPaG) or highly aggressive water quality or any combination thereof can significantly reduce the service life of the tubing. Pexflow requires following the guidelines described in Plastics Pipe Institute TN-53. Guide to Chlorine Resistance Ratings of PEX Pipes and Tubing for Potable Water Applications.

Plenum Rating

Pexflow Plus PEX-a tubing has been tested in accordance with CAN/ULC S102.2-2007/2010, Standard for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies and ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

CAN/ULC S102.2 - 2007/2010 (Canada)

Product	Size	Flame Spread (FS)	Smoke Development (SD)	Insulation Required	Spacing Requirements
Pexflow PEX-A	1/2" - 1"	< 25	< 50	No	Min. 8" (20 cm)
Pexflow PEX-A	1-1/4" - 2"	< 25	< 50	Yes*	None

**Requires 1/2" thick fiberglass insulation*

ASTM E84 (United States)

Product	Size	Flame Spread (FS)	Smoke Development (SD)	Insulation Required	Spacing Requirements
Pexflow PEX-A	1/2" - 3/4"	< 25	< 50	No	Min. 8" (46 cm)
Pexflow PEX-A	1" - 2"	< 25	< 50	Yes*	None

**Requires 1/2" thick fiberglass insulation*



Product Compliance

Compliance with the following codes:

2018, 2015, 2012 and 2009 International Plumbing Code® (IPC)
2018, 2015, 2012 and 2009 International Mechanical Code® (IMC)
2018, 2015, 2012 and 2009 International Residential Code® (IRC)
2018, 2015, 2012 and 2009 Uniform Plumbing Code® (UPC)*
2018, 2015, 2012 and 2009 Uniform Mechanical Code® (UMC)*
2016, 2013 and 2010 California Plumbing Code (CPC)
2016, 2013 and 2010 California Mechanical Code (CMC)
2017 City of Los Angeles Plumbing Code
2017 City of Los Angeles Mechanical Code
2017 and 2007 Code of Massachusetts Regulation 248 CMR 10.00: Uniform State Plumbing Code
2017 Massachusetts State Building Code 780 CMR Ninth Edition: Chapter 28
2015 and 2010 National Plumbing Code of Canada® (NPC**)

Compliance with the following standards:

ASTM F876-2019a, Standard Specification for Cross-linked Polyethylene (PEX) Tubing
NSF 14-2018, Plastics Piping System Components and Related Materials
NSF/ANSI/CAN 61-2019, Drinking Water System Components – Health Effects
CSA B137.5-2017 Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications

Warnings:

1. Tubing and fittings must be installed by licensed plumbing contractor. It is the sole responsibility of the installer to verify that the product meets local codes and standards.
2. When installation is in fire-resistance-rated assemblies, evidence of compliance with IBC Section 713 (penetrations), UBC Section 709 (walls and partitions) and UBC Section 710 (floor/ceiling or roof/ceiling), as applicable, must be provided to the code official for approval.
3. Like most plastic material, cross-linked polyethylene is subject to ultraviolet (UV) deterioration and must not be continuously exposed to direct or indirect sunlight, or fluorescent lights, beyond the stated limits. Storage outside is not recommended.
4. Tubing and fittings must be protected from physical damage with an oversized flexible corrugated sleeve at structural mass penetrations and when the tubing is uncovered. Annular spaces between sleeves and pipes must be filled or tightly caulked in an approved manner.
5. During placement of cover over the tubing, the tubing must be maintained at the greater of 1-1/2 times the working pressure or 100 psi (689.4 kPa).
6. To ensure system integrity and warranty remain intact do not expose PEX or fittings to unknown/untested chemicals.
7. Each installation must be pressure-tested for leaks in the presence of the code official or designated representative.
8. Clearances from heat-producing equipment must be in accordance with the applicable code.
9. Fittings used with Pexflow® PEX-A tubing must be recognized in a current ICC-ES evaluation report as complying with NSF 61 and ASTM F 1807, ASTM F 1960, ASTM F 2080, ASTM F 2098 or ASTM F 2159.
10. The use of tubing on hydronic systems is limited to applications using potable water as the transfer fluid.
11. Minimum bending radius of the tube should be eight times the outside tube diameter. The outside diameter is the nominal diameter plus 1/8 inch (3.2 mm).

Limitation on Pexflow Pex-A Tubing:

- Do Not expose to open flame
- Do Not expose to UV light
- Do Not use glue, or any material that affects the basic properties of cross-linked polyethylene.
- Do Not use above stated ratings.
- Do Not install within 6" (15 cm) of any gas appliance vent piping, or within 12" (30 cm) of any recessed light fixtures.
- Do Not solder pipe connections within 16" (40 cm) of any Pexflow tubing in the same water line.
- Do Not allow contact with spray foam. (Ensure PEX is sleeved, and fittings are wrapped.)
- Do Not allow contact with low molecular weight petroleum products such as fuels or solvents or oil based paints,
- Cannot Be used for LP or Natural Gas.
- Cannot Be used for an electrical ground,
- Do Not allow contact with termiticides or pesticides,
- Do Not install below fluorescent lights, unless protected,
- Do Not install in contaminated soil or environments.
- Do Not allow pests, insects, or rodents to come in contact with PEX tubing,

General Repair and Testing

Kinked Tubing Repair

One of the most important features of Pexflow PEX-A cross-linked tubing is its shape memory. As such, a kinked area can be repaired using the following procedure:

- Release system pressure.
- Straighten portion of tubing being repaired (do not squeeze with pliers),
- Using a heat gun, heat area to approximately 260°F (125°C), or until tubing appears clear. (**Do Not Use an Open Flame.**)
- Let the tubing cool undisturbed at room temperature,
- Repair is now complete.

Pressure Testing

- Once the plumbing rough-in is complete, it must be pressure tested. An appropriate test kit must be connected to the system including a pressure gauge for monitoring.
- Test requirements specified in your local building and plumbing codes must always be followed.
- Cold water or air may be used for testing. (If allowed by local codes)
- Note: Be aware of how temperature can affect air tests. Rising air temperature increases pressure, falling air temperature decreases pressure.
- Test to at least 50 psi above operating pressure, up to 120 psi.
- Pexflow recommends a test duration of 24 hours.
- When using leak detection solutions, ensure they are approved for use with PEX Tubing and fittings.

Thawing Frozen Tubing

Pexflow® PEX-a tubing can withstand freeze-thaw cycles better than most other products available for plumbing today. While not freeze proof, Pexflow® tubing is resistant to freeze damage. Should tubing become blocked due to freezing, Pexflow recommends thawing by using hot water, hot towels or gently heating with a heat gun. **Do Not Use an Open Flame!**

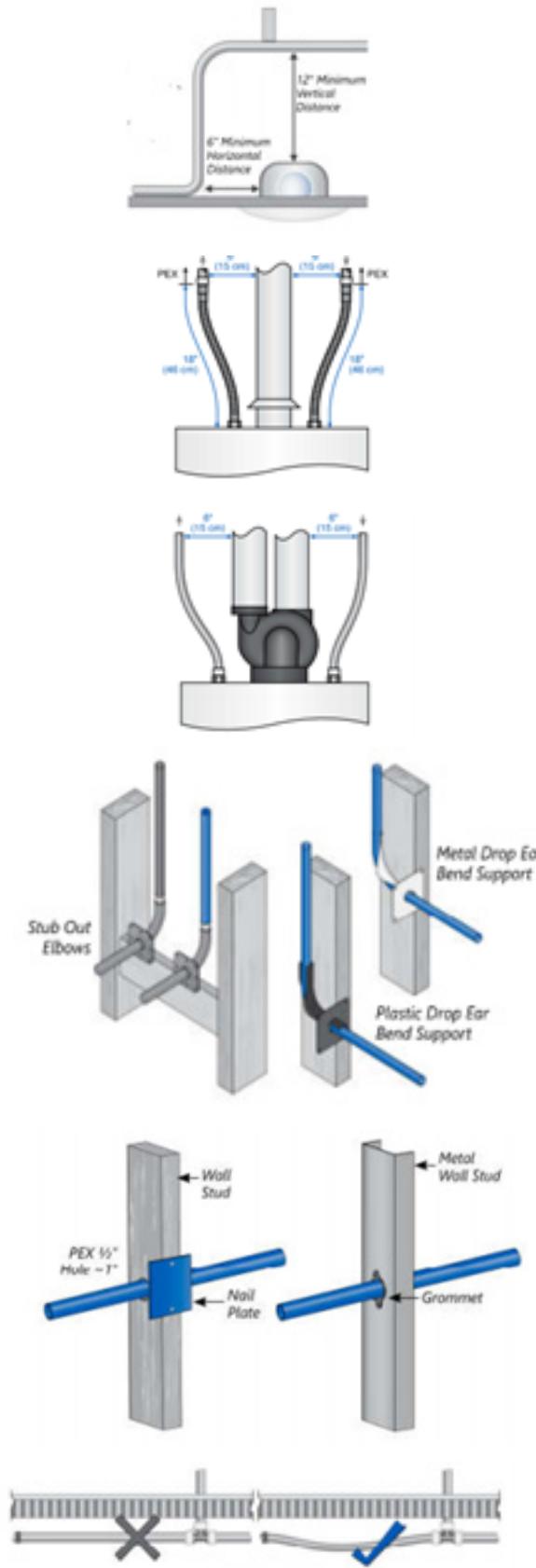
Pexflow® Installation Guidelines

General Practices

- Install Pexflow® PEX at least 12" vertically, or 6" horizontally away from heat sources such as recessed light fixtures, or gas appliance vent piping.
- For UL1598 approved Type IC thermally protected luminaires, clearance can be reduced to 1". Ensure the luminaire is fully enclosed so that no UV emissions reach the PEX.
- PEX may be used to connect directly to Power Direct Vent Water Heaters, Electric Water Heaters, or Tankless Water Heaters. Tubing must be kept at least 6" away from the exhaust vent.
- For S636 plastic or Type B double wall vent piping that clearance can be reduced to 1". The vent piping should also be used for its stated purpose and the flue gas should be no more than the temperature limit stated on the vent pipe system.
- You must use 18" (46 cm) long copper connectors on gas fired atmospheric water heaters before transitioning to Pexflow® tubing on both inlet and outlet.
- When installing threaded fittings use only PTFE tape - Do Not use other sealants. Do Not Overtighten!
- Use bend supports for 90° turns. Use drop ear bend supports or copper stub-outs for 90° turns when exiting walls.
- When installing PEX tubing through wall studs and floor joists be sure drill holes at least 1/2" (13 mm) larger than the PEX to ensure free movement of the tubing.
 - + Use protective sleeves or grommets when penetrating a hollow masonry wall or metal studs.
 - + Protect the tubing with a nail plate if it is within 2" (5 cm) of the edges of a stud, plate, or nailing surface
- Tubing bundles must be protected by heavy gauge protective sheathing at the area of abrasion.
- If Pexflow® PEX is notched or cut, the damaged section must be cut out.
- Pexflow approves the burial of PEX-a tubing in concrete.
- Pexflow recommends continuous length tubing (no fittings) when installing Pexflow® PEX tubing in or under a slab.
- When entering or exiting a concrete Slab the PEX tubing should always be protected by a conduit elbow or a tubing sleeve.
- The use of hard binding wires or tape for tying PEX tubing to rebar or wire mesh is not allowable, only soft breakable wire ties or plastic tie- straps should be used.

Expansion and Contraction

- The design and installation of every piping system shall include means to accommodate its expansion and contraction caused by temperature changes, movement of the soil, building shrinkage or structural settlement.
- Small dimension expansion can generally be accommodated with slack and expansion loops.



PEX Tubing Supports

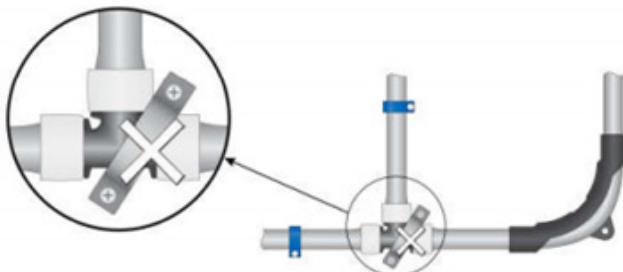
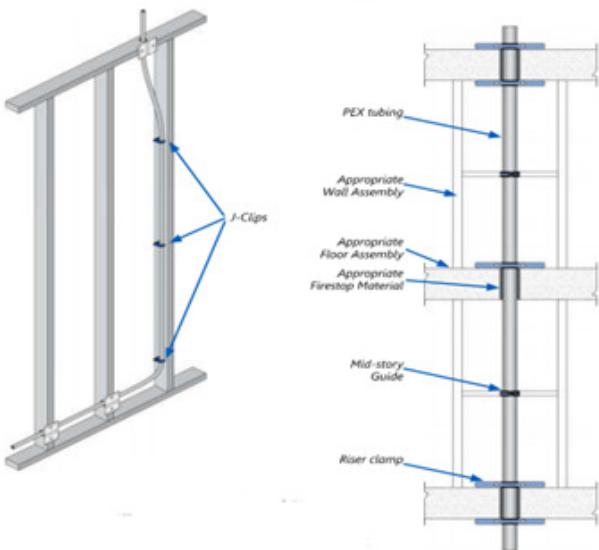
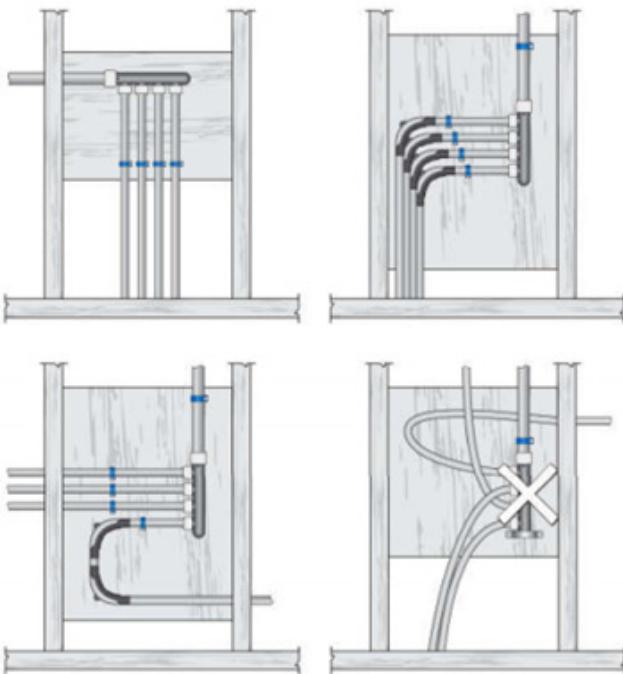
Pexflow PEX-a tubing can be supported using the same methods as metallic pipe. Pexflow recommends using copper tube size (CTS) hangers and supports designed for use with plastic pipe, e.g., plastic, coated, rubber, or foam lined, etc. Supports shall not compress, cut or abrade the tubing. Guides should be installed to allow the free movement of the tubing.

- Horizontal runs should be supported by guides every 32" (80 cm)



- Vertical runs should be supported by guides at every floor level and midpoint between.
- Vertical risers should be supported at the base of each floor and have mid-story guides. Hot water risers should have a support at the top of every other floor. Cold water risers should have a support at the top of every fourth floor.

- To minimize stress on fittings, manifolds, and multiport tees, PEX should be supported as shown in the diagrams below.



Expansion & Contraction

PEX has a high rate of thermal expansion. The design and installation of every piping system shall include means to accommodate its expansion and contraction caused by temperature changes, movement of the soil, building shrinkage or structural settlement.

For systems using PEX 1" and smaller the tubing will generally flex enough to eliminate the need for expansion offsets so long as tubing is installed as per the guidelines in this manual. However, for systems using PEX larger than 1", installation must allow for expansion and contraction using appropriate offsets.

Calculate the expansion offset (D) using the formula:

$$D = C \times \sqrt{(\bar{O} + 0.125) \times \Delta L}$$

C = 12 (PEX material specific constant)

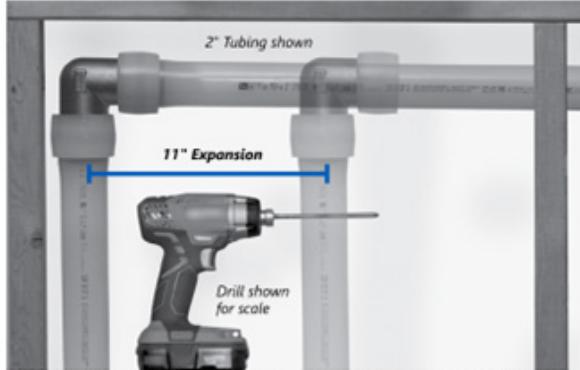
\bar{O} = PEX outside diameter (nominal size + $\frac{1}{16}$ ")

ΔL = Expansion of L (Length of Run)

$$\Delta L = \alpha \times \Delta T \times L$$

α = coefficient of expansion = $1.1^{\circ}/10^{\circ}\text{F}/100\text{ft}$

ΔT = change in temperature of PEX



On 100ft of 2" PEX with a temperature change of 100°F the expansion is **11 inches**. (Coefficient of expansion is the same for all PEX sizes)

$$\Delta L = \alpha \times \Delta T \times L$$

$$\Delta L = (1.1^{\circ}/10^{\circ}\text{F}/100\text{ft}) \times 100^{\circ}\text{F} \times 100\text{ft}$$

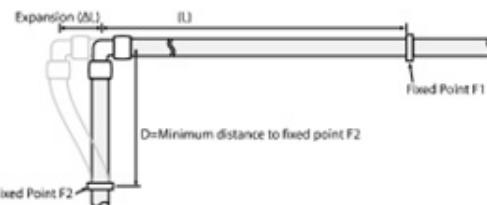
$$\Delta L = 11^{\circ}$$

A **fixed point** does not allow the PEX to move (such as at a fire stop or tubing anchor).

A **guide** allows the PEX to slide during expansion and contraction.

Corner Offset

Example 1: A 50ft straight run of 1 1/4" PEX is anchored at one end, and an elbow is installed at the other end. It is a DHW supply pipe with an operating temperature of 150°F , but was originally installed at 70°F , giving us a difference of 80°F , which equals 4.4° of expansion. In this case a corner offset is the best solution. L is the PEX length from the fixed (anchor) point (F1) to the elbow. D is the minimum distance, measured from the elbow, to fixed point F2.



Calculation for a 50 ft run of 1 1/4" PEX and temperature from 70°F to 150°F :

$$D = 12 \times \sqrt{(1.25^{\circ} + 0.125^{\circ}) \times (50 \text{ ft} \times 1.1^{\circ}/10^{\circ}\text{F}/100\text{ft} \times (150^{\circ}\text{F} - 70^{\circ}\text{F}))}$$

$$D = 12 \times \sqrt{1.375^{\circ} \times (50 \text{ ft} \times 1.1^{\circ}/10^{\circ}\text{F}/100\text{ft} \times 80^{\circ}\text{F})}$$

$$D = 12 \times \sqrt{1.375^{\circ} \times 4.4^{\circ}}$$

$$D = 29.5^{\circ}$$

Quick Reference Table - Corner Offset

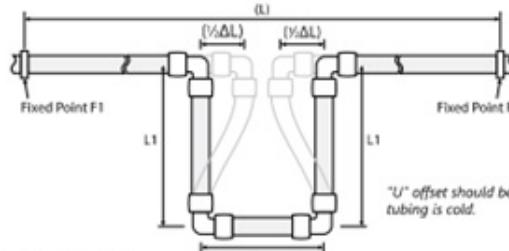
Length of D for 50ft of PEX

ΔT ($^{\circ}\text{F}$)	PEX Size					
	$\frac{1}{2}^{\text{in}}$	$\frac{3}{4}^{\text{in}}$	1"	$1\frac{1}{4}^{\text{in}}$	$1\frac{1}{2}^{\text{in}}$	2"
20	9.9"	11.8"	13.3"	14.8"	16.0"	18.3"
40	14.1"	16.6"	18.9"	20.9"	22.7"	25.9"
60	17.2"	20.4"	23.1"	25.6"	27.8"	31.8"
80	19.9"	23.5"	26.7"	29.5"	32.1"	36.7"
100	22.2"	26.3"	29.8"	33.0"	35.9"	41.0"
120	24.4"	28.8"	32.7"	36.1"	39.3"	44.9"
140	26.3"	31.1"	35.3"	39.0"	42.4"	48.5"
160	28.1"	33.3"	37.8"	41.7"	45.4"	51.9"
180	29.8"	35.3"	40.0"	44.3"	48.1"	55.0"
200	31.5"	37.2"	42.2"	46.7"	50.7"	58.0"

Common ΔT Range

Expansion U Offset

Example 2: There is a 100ft straight run of 2" PEX tubing on a tray in a ceiling space for DHW. Again we need to allow for 100°F of temperature difference. In this case a U offset will work best. The equation on the previous page also applies to an expansion "U", but the arm length (D) is divided into three sections.



$$D = C \times \sqrt{(\bar{O} + 0.125) \times \Delta L}$$

$$D = 12 \times \sqrt{(2 + 0.125) \times 100\text{ft} \times 1.1^{\circ}/10^{\circ}\text{F}/100\text{ft} \times (160 - 60)}$$

$$D = 58"$$

$$L1 = \frac{1}{2} \times D$$

$$L2 = \frac{1}{2} \times D$$

$$L1 = 23.2"$$

$$L2 = 11.6"$$

Quick Reference Table - "U" Offset

Length of L1 & L2 for 50ft of PEX

ΔT ($^{\circ}\text{F}$)	PEX Size					
	$\frac{1}{2}^{\text{in}}$	$\frac{3}{4}^{\text{in}}$	1"	$1\frac{1}{4}^{\text{in}}$	$1\frac{1}{2}^{\text{in}}$	2"
20	L1 4.0"	4.7"	5.3"	5.9"	6.4"	7.3"
	L2 2.0"	2.4"	2.7"	3.0"	3.2"	3.7"
40	L1 5.6"	6.7"	7.6"	8.3"	9.1"	10.4"
	L2 2.8"	3.3"	3.8"	4.2"	4.5"	5.2"
60	L1 6.9"	8.2"	9.2"	10.2"	11.1"	12.7"
	L2 3.4"	4.1"	4.6"	5.1"	5.6"	6.4"
80	L1 8.0"	9.4"	10.7"	11.8"	12.8"	14.7"
	L2 4.0"	4.7"	5.3"	5.9"	6.4"	7.3"
100	L1 8.9"	10.5"	11.9"	13.2"	14.3"	16.4"
	L2 4.4"	5.3"	6.0"	6.6"	7.2"	8.2"
120	L1 9.7"	11.5"	13.1"	14.5"	15.7"	18.0"
	L2 4.9"	5.8"	6.5"	7.2"	7.9"	9.0"
140	L1 10.5"	12.5"	14.1"	15.6"	17.0"	19.4"
	L2 5.3"	6.2"	7.1"	7.8"	8.5"	9.7"
160	L1 11.3"	13.3"	15.1"	16.7"	18.2"	20.8"
	L2 5.6"	6.7"	7.6"	8.3"	9.1"	10.4"
180	L1 11.9"	14.1"	16.0"	17.7"	19.3"	22.0"
	L2 6.0"	7.1"	8.0"	8.9"	9.6"	11.0"
200	L1 12.6"	14.9"	16.9"	18.7"	20.3"	23.2"
	L2 6.3"	7.4"	8.4"	9.3"	10.1"	11.6"

Common ΔT Range



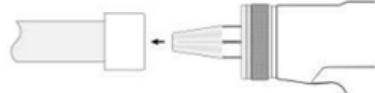
Expansion Connection Instructions

1. Inspect all components for debris, obstructions, and/or damage prior to installation. Ensure the expansion tool and head is in proper working order.
2. Cut the PEX tubing to length, ensuring a square cut - an irregular cut may result in a failed connection. For larger diameter PEX an ABS cutter is recommended.



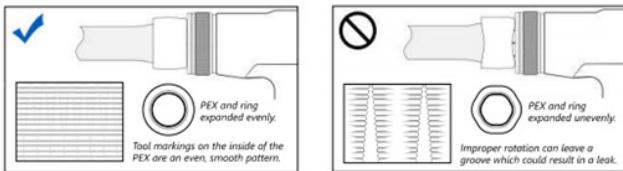
3. Slide the expansion ring over the tubing until it is properly seated.
4. Using a recommended F1960 expansion tool with appropriate size expansion head, expand the PEX and ring. Follow the tool manufacturer's instructions.

- Ensure the tool is rotated $1/8$ " turn between expansions. Hold the ring and PEX so they don't rotate with the head.



- To avoid over expansion, only expand the PEX enough to insert the fitting with some resistance and don't hold the PEX in the expanded position
- If there is any indication of uneven expansion or improper rotation, do not complete the connection.

Cut back the tubing 2" for $1/2$ " to 1" PEX or 3" for $1\frac{1}{4}$ " to 2" PEX, and replace the ring before restarting the process.



Recommended F1960 Expansion Tools

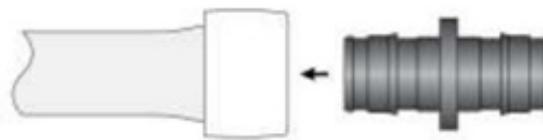
Pexflow recommends the use of power tools for consistency in expansion.

- DeWalt DCE400
- Milwaukee M12 (2432)
- Milwaukee M18 (2632)
- Milwaukee M18 (2633)

PEX Size	DeWalt DCE400	Milwaukee M12 (2432)	Milwaukee M18 (2632)	Milwaukee M18 (2633)
$1/2$ "	7-8	7-8	9	-
$3/4$ "	11-12	11-12	10	-
1"	17-18	17-18	19	-
$1\frac{1}{4}$ "	-	-	9	-
$1\frac{1}{2}$ "	-	-	10	-
2"	-	-	-	5

* The number of expansions recommended by the tool manufacturer is to be used as a guide. This number may vary with installation temperature and operator technique.

5. Remove the PEX when the expansion cone segments are retracted and release the trigger.
6. Quickly wipe any grease from inside the PEX tubing.
7. Insert the fitting into the expanded PEX so that the fitting shoulder or stop is flush with the ring. If the PEX doesn't reach the shoulder or stop, quickly remove the fitting and expand the PEX one more time.

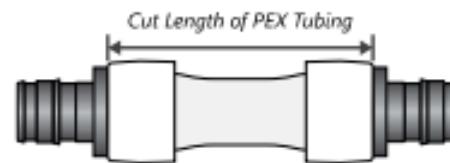


8. Hold the fitting in place until the PEX contracts around the fitting. If there is a gap between the fitting shoulder and ring greater than $1/16$ " (1 mm), the fitting must be cut out and replaced.



Fitting Spacing

- Pexflow requires a minimum spacing distance between F1960 fittings, as measured by the cut length of PEX tubing. This distance ensures the expansion head can be fully inserted and expanded without damaging the fitting.

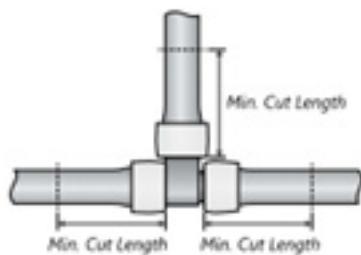


Cold Weather Connections

- Temperatures below 40°F (4°C) increase the amount of time for the PEX and ring to contract onto the fitting.
- Do not make expansion connections in temperatures below 5°F (-15°C).
- Keep rings and fittings at 55°F (13°C) or warmer to reduce contraction time and ensure even expansion.
- Slowly expand the PEX and ring only enough to insert the fitting. Fewer expansions are required.
- Do not use a heat gun on HPP fittings or multiport tees to speed up contraction.

Replacing Fittings

- Make sure that the system is not under pressure.
- When cutting out the old fitting, the PEX tubing must be square cut back a minimum length before a new fitting is installed.

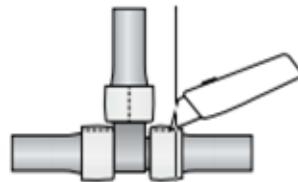


PEX Size	Minimum Cut Length
½" – 1"	2" (5 cm)
1¼" – 2"	3" (7.5 cm)

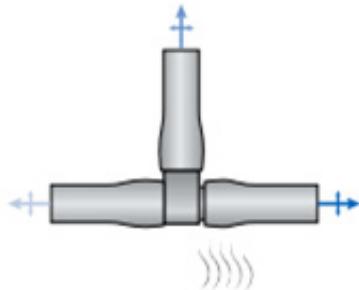
- Do not reuse expansion rings.
- Do not reuse plastic fittings or multiport tees.
- Brass fittings may be reused if the barbs are not damaged.

Recovering Brass Fittings for Reuse

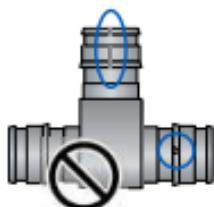
1. Cut off the expansion rings with a utility knife. Avoid damaging the fitting.



2. For each connection, slowly heat the PEX tubing around it with a heat gun. Do not use an open flame. Work the tubing back and forth while pulling away from the fitting until it is removed. Protect the fitting barbs from damage if gripping tools are used.



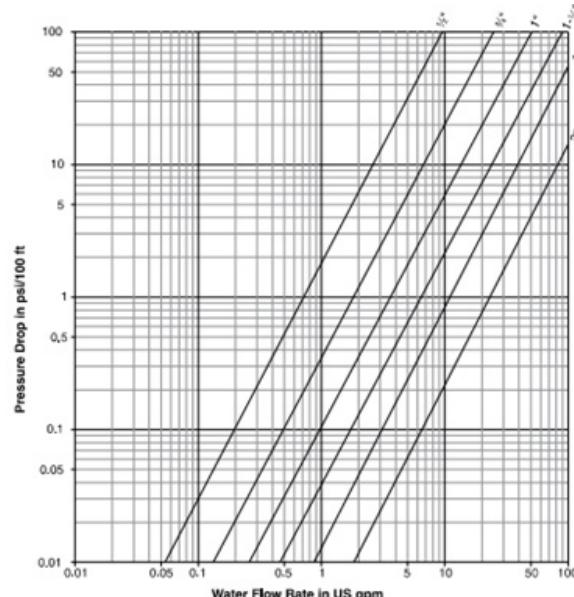
3. Allow the fitting to cool.
4. Inspect the fitting for damage before reuse. If any barbs are damaged, the fitting cannot be reused.



Common Installation Issues

Issue	Resolution
Connections	
Tubing not seated all the way onto fitting	Cut out fitting, and replace with new rings and fitting
Tubing not cut straight	Cut out fitting, and replace with new rings and fitting.
Connection not sealing	<p>Allow enough time for the PEX to contract onto the fitting. If it doesn't seal, cut out fitting. Replace with new rings and fitting after checking the following:</p> <ul style="list-style-type: none"> • Ensure the expander cone is not bent or damaged, and is properly lubricated. • Ensure the expander head segments are not bent or misaligned, and are clean and properly lubricated. • Ensure the expander head is screwed on tightly. • Inspect the fitting for damage. • Make sure the tool is rotating between expansions. The tool leaves expansion markings on the inside of the PEX tubing. The markings should be an even, smooth pattern. If not, the tool may not have rotated properly or the tubing rotated with the head. Improper rotation can leave a groove which could result in a leak. <div style="text-align: center; margin-top: 10px;">  </div> <ul style="list-style-type: none"> • Avoid removing the PEX tubing from the tool while the expansion tool is in the expanded position.
Fittings	
Cracked	Cut out fitting, and replace with new rings and fitting.
Barbs are Damaged	Cut out fitting, and replace with new rings and fitting.
PEX Tubing	
Notched or Cut	Cut out section of tubing and use appropriately sized coupling. Repairs in concrete must be wrapped. HPP fittings are recommended for concrete repairs.
Kinked	Kinked tubing can be repaired using a heat gun.
Frozen	Can be thawed using hot water, hot towels, or gently heating with a heat gun. Do Not Use Open Flame!

PEX Tubing Pressure Drop Graph





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