



by  MOSACK GROUP

F1960 PEX-a Potable Water Expansion System Installation Guide

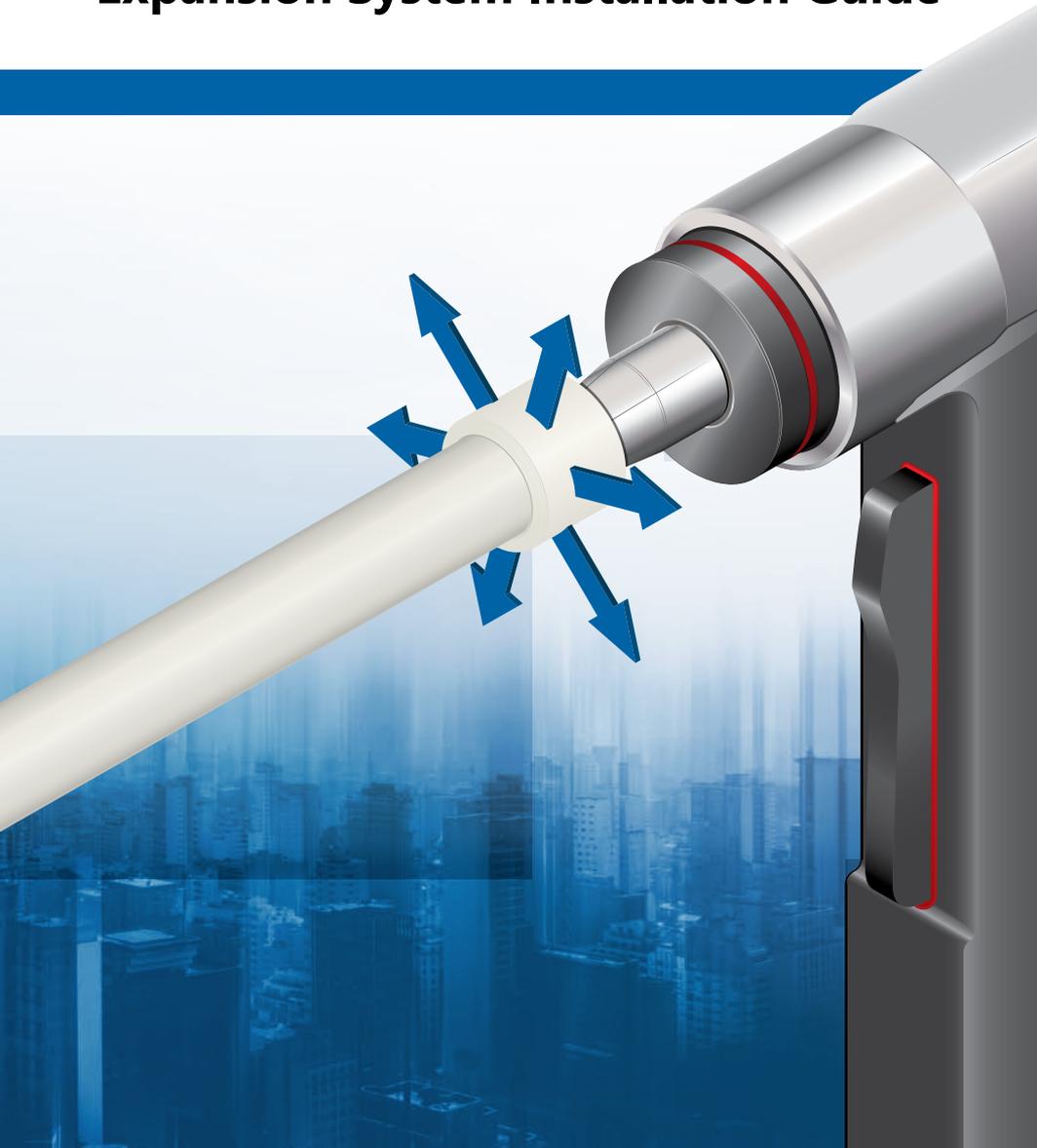


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About Us

HeatLink is a multi-system supplier of potable water and radiant hydronic heating/cooling and snow melt systems that began as a family-owned business servicing a number of industries, including HVAC.

The company grew to meet the needs of builders, contractors, and architects, and began designing and installing radiant heating systems in 1985. Since then HeatLink has grown into an industry leading manufacturer of radiant heating, cooling, and potable water systems for residential and commercial applications throughout the world.

HeatLink's radiant heating systems create a comfortable and energy efficient environment for living, while our snow melt systems create safer public and private spaces that reduce liability for property owners, reduce maintenance, and ensure accessibility. Our well engineered plumbing systems provide peace of mind for property owners through extensive warranty protection, and enable quick and efficient installations for builders and contractors.

HeatLink has developed and manufactured many industry firsts, such as the "TwistSeal" tool-less manifold in 1996. The company began manufacturing PEX-a tubing in 1998, and now supplies the highest quality PEX-a systems to customers throughout North America, and parts of Europe and Asia.

HeatLink works with a network of experienced and successful partner agencies to meet the design, system installation, and training needs of the construction industry, designers, and architects.

HeatLink was built on a strong family work ethic and value system that remains the foundation for our continuing growth and industry leadership role.

About Our Parent Company

On April 24, 1928, American Lubricator and Brass Co. and Sterling & Skinner Manufacturing Co., two established Detroit-based manufacturers of brass valves and fittings, merged and adopted a new name, Consolidated Brass Company.

The company relocated to Charlotte, NC in 1955. It expanded to Pageland, SC in 1968 and to Conway, SC in 1982. The name of the company was changed to Consolidated Valve Industries in 1975 and Conbraco Industries, Inc. on July 28, 1977.

In June 2010, Aalberts Industries, a Dutch global technology company, purchased Conbraco. Over the next 10 years the Mosacks and Aalberts worked together to expand and strengthen the Apollo Valves name.

In 2018, Glenn Mosack broke out on his own and started The Mosack Group, Inc. by acquiring the retail division of Conbraco Industries, Inc. In 2020, The Mosack Group Inc. completed construction on a 126,000 sq. ft. corporate headquarters and warehouse in Mint Hill, NC. The headquarters expanded in 2022 by adding an additional 106,000 sq. ft. of warehouse and manufacturing space. Today, The Mosack Group, Inc. is continually striving to be the premier solution for plumbing system connections.

Introduction

This installation guide is intended to assist plumbing contractors and building officials and includes general guidelines for the HeatLink® Potable Water Expansion System.

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 HeatLink® F1960 PEX-a Potable Water Expansion System features PureLink® Plus PEX-a tubing, high performance polymer (HPP) fittings and multiport tees, no lead fittings, and PEX-a expansion rings. The unique HeatLink® PEX-a process is based on a method developed during the 1970's and uses organic peroxide to chemically cross-link the polyethylene during the manufacturing process. The 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 expansion technology has been used for decades worldwide in plumbing applications.

HeatLink's superior potable water system 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.

HeatLink 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
- Labor costs are significantly reduced
- Light weight
- Discreet red/blue identification
- Chlorine resistance
- Freeze and chemical resistance
- Low friction losses
- Domestic Hot Water continuous recirculation approved (see "Recirculation" on [page 7](#))
- Connections can be checked visually
- Can't be dry fit

PEX Tubing Ratings

Plastic Pipe Institute (PPI) PEX Tubing Ratings

PPI TR-3 presents the policies and procedures used to develop recommendations of long-term strength ratings for commercial thermoplastic piping materials or pipe.

The term hydrostatic design basis (HDB) refers to the categorized long-term hydrostatic strength in the circumferential or hoop direction, for a given set of end use conditions, as established by ASTM Test Method D 2837, "Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials."

The hydrostatic design stress (HDS) is derived from the HDB and is the recommended maximum hoop stress that can be applied continuously with a high degree of certainty that failure of the pipe will not occur.

Pressure ratings (PR) are calculated from the dimension ratio of the pipe (DR), the material's hydrostatic design basis (HDB), and the overall design factor (DF).

An HDB/HDS recommended rating has been shown, through both scientific procedures and historical experience, to be a useful indicator of the relative long-term strength of a thermoplastic material.

HDB and HDS recommended ratings issued by PPI are for conditions equivalent to those under which the test data were obtained, e.g., constant pressure, temperature and specific test environment.

Under some conditions, such as pressure cycling, higher temperature, more aggressive environment, or handling and installation quality, all of which may significantly reduce pipe durability, a more conservative design factor or design coefficient should be chosen.

PureLink® Plus PEX-a tubing is listed with a standard grade rating in PPI TR-4 as tested in accordance with PPI TR-3. PureLink Plus tubing carries the temperature and pressure ratings shown in the table below.

Temperature	PPI - Hydrostatic Design Basis	PPI - Hydrostatic Design Stress	Pressure Rating
73.4°F / 23°C	1,250 psi / 8620 kPa	630 psi / 4340 kPa	160 psi / 1100 kPa
180°F / 82.2°C	800 psi / 5520 kPa	400 psi / 2760 kPa	100 psi / 690 kPa
200°F / 93.3°C	630 psi / 4340 kPa	315 psi / 2170 kPa	80 psi / 550 kPa

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.

HeatLink 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* and HeatLink [INFO 37](#), *Domestic Hot Water Recirculation Systems plus the "Recirculation" recommendations on page 7.*

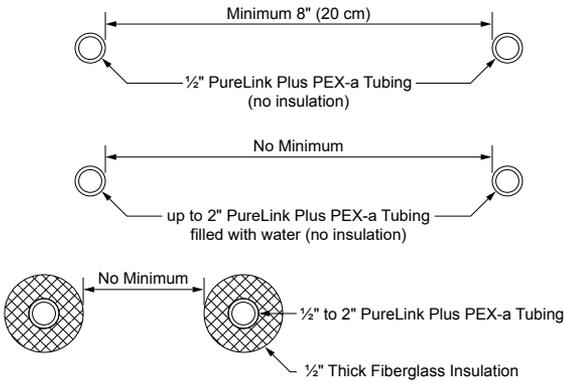
Actual service conditions (e.g. surge pressures, water quality, installation methods, localized stresses) can affect the service life of the PEX. Depending on site conditions, it may be necessary to reduce pressure, reduce temperature, condition the water, or some combination of the above to below the maximum.

Plenum Rating

PureLink Plus PEX-a tubing has been tested in accordance with CAN/ULC S102.2, *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*.

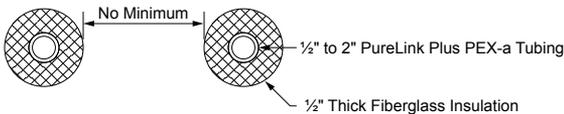
CAN/ULC S102.2 (Canada)

Product	Size	Limitations		Flame Spread Index (FSI)	Smoke Developed Index (SDI)
		Insulation Requirements*	Spacing Requirements		
PureLink® Plus	½"	None	Min. 8" (20 cm)	< 25	< 50
PureLink® Plus	up to 2"	rated ½" (13 mm)	None	≤ 25	≤ 50
PureLink® Plus	up to 2" water filled pipe	optional	None	≤ 25	≤ 50



ASTM E84 (United States)

Product	Size	Limitations		Flame Spread Index (FSI)	Smoke Developed Index (SDI)
		Insulation Requirements*	Spacing Requirements		
PureLink® Plus	up to 2"	rated ½" (13 mm)	None	≤ 25	≤ 50



* Insulation must be listed to ASTM C547 by an approved agency.

Recirculation

To ensure expected service life of the system, HeatLink requires that systems be designed at the lowest possible operating pressure and temperature, and installed as per all applicable local codes and the HeatLink installation guide.

The product standards ASTM F876 "Standard Specification for Crosslinked Polyethylene (PEX) Tubing" and CSA B137.5 "Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications" define the technical requirements for PEX.

The system should be sized according to the American Society of Plumbing Engineers (ASPE) method described in "Hot Water Circulation Systems" in *Plumbing Engineering Design Handbook – Volume 2, Chapter 6 – Domestic Water Heating Systems*.

Domestic hot water recirculation design parameters:

- Max. velocity of 2 ft/s (0.6 m/s) through PEX tubing.
- Max. operating temperature of 140°F (60°C).
- Max. operating pressure of 80 psig (550 kPa).
- Max. oxidative reduction potential (ORP) of 825 mV.

PEX Size	Velocity ft/s (m/s)	Flow US gpm (L/min)	Friction Loss @ 120°F psi/ft (kPa/m)
½"	2 (0.6)	1.1 (4.2)	0.0195 (0.4411)
¾"	2 (0.6)	2.2 (8.3)	0.0126 (0.2850)
1"	2 (0.6)	3.6 (13.6)	0.0092 (0.2081)
1¼"	2 (0.6)	5.4 (20.4)	0.0072 (0.1629)
1½"	2 (0.6)	7.5 (28.4)	0.0059 (0.1335)
2"	2 (0.6)	12.9 (48.8)	0.0042 (0.0950)

Actual service conditions (e.g. surge pressures, water quality, installation methods, localized stresses) can affect the service life of the PEX. Depending on site conditions, it may be necessary to reduce pressure, reduce temperature, condition the water, or some combination of the above to below the maximum.

HeatLink's PureLink® Plus PEX-a tubing has been third-party tested and meets the minimum end use condition of 100% of the time at 140°F (60°C) and 80 psi (550 kPa), sometimes referred to as continuous recirculation.

HeatLink recommends recirculation systems utilize the minimum duty cycle to meet the demand requirements of the system.

HeatLink is working with PPI, PPFA, and other industry professionals to develop new test methods, and improve the overall performance of PEX. It is imperative that systems be designed at the lowest possible operating pressure and temperature, installed properly, and never exceed the maximum recirculation recommendations.

For more information, see:

- Plastics Pipe Institute TN-53, *Guide to Chlorine Resistance Ratings of PEX Pipes and Tubing for Potable Water Applications*.
- IAPMO IS 31, *Installation Standard for PEX Tubing Systems for Hot- and Cold-water Distribution*.
- *Local plumbing & energy codes*
- HeatLink L2337, *Domestic Hot Water Recirculation Systems*.

Product Listings

It is the sole responsibility of the installer to verify that the product and installation meets local standards.

PureLink® Plus PEX-a tubing is approved for use with fittings that are compliant with ASTM F1807/F1960/F2080/F2098/F2159 standards. When using HeatLink tubing with fittings from other manufacturers, ensure to follow all applicable installation requirements and instructions, as well as local building codes to ensure proper connections are made.

Refer to individual product submittals for the latest information.

Product Line	Standards	Listings	
PureLink® Plus PEX-a tubing	ANSI/UL 263 ASTM F876 ASTM F877 ASTM F1807 ASTM F1960 ASTM F2023 ASTM F2080 ASTM F2098 ASTM F2159	ASTM F2657 ASTM E84 CAN/ULC S101 CAN/ULC S102.2 CSA B137.5 NSF/ANSI-14 NSF/ANSI-61 and Annex G NSF/ANSI-372 ANSI/CAN/UL 1821†	cNSFus-pw-G ICC-ES PMG 1087 IAPMO UPC PPI TR-4 CSA B137.5 Potable NSF-fs (1/2" & 3/4") cQALus P371 UL/ULC
HeatLink® expansion rings	ASTM E84 ASTM F1960 ASTM F877 CSA B137.5 NSF/ANSI 14 ULC S102.2 ANSI/CAN/UL 1821	ICC-ES PMG 1087 NSF-pw cQALus P371	
HeatLink® F1960 no lead brass fittings	ASTM E84 ASTM F877 ASTM F1960 CSA B137.5 NSF/ANSI 14 NSF/ANSI 61 and Annex G NSF/ANSI 372 ULC S102.2 ANSI/CAN/UL 1821*	ICC-ES PMG 1087 cNSFus-pw cQALus P371 U.P. Code	
HeatLink® F1960 high performance polymer (HPP) fittings	ASTM E84 ASTM F1960 ASTM F877 CSA B137.5 NSF/ANSI 14 NSF/ANSI 61 and Annex G NSF/ANSI 372 ULC S102.2 ANSI/CAN/UL 1821*	ICC-ES PMG 1087 cNSFus-pw cQALus P371 U.P. Code	
HeatLink® F1960 HPP Multiport Tees	ASTM E84 ASTM F1960 ASTM F877 CSA B137.5 NSF/ANSI 14 NSF/ANSI 61 and Annex G NSF/ANSI 372 ULC S102.2 ANSI/CAN/UL 1821*	ICC-ES PMG 1087 cNSFus-pw cQALus P371 U.P. Code	

†Excluding 1/2" tubing

*Not applicable to all fittings. See [L3245 - SureLink™ Fire Safety System Installation Guide](#) for approved fittings list.

Limitations

Limitations on PureLink® PEX Tubing

- **Do Not** expose to open flame.
- **Do Not** permanently expose to UV light.
- **Do Not** use glue, or any material that affects the basic properties of crosslinked polyethylene.
- **Do Not** use above ratings.
- **Do Not** install within 6" (15 cm) of any gas appliance vent piping, or within 12" (30 cm) of any recessed light fixtures. See exceptions on [page 10](#).
- **Do Not** solder pipe connections within 16" (40 cm) of any PureLink® tubing in the same water line.
- **Do Not** allow to come into contact with spray foam. (Ensure PEX is sleeved, or use Pipe-in-Pipe tubing, 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.
- **Do Not** allow pests, insects, or rodents to come in contact with PEX tubing.
- **Do Not** install in contaminated environments.
- **Do Not** exceed recirculation limitations (see "Recirculation" on page 7).

Limitations on HPP Fittings & Multiport Tees

- **Do Not** expose to open flame.
- **Do Not** use above ratings.
- **Do Not** reuse fittings.
- **Do Not** expose to excessive stress due to PEX expansion/contraction or bending force.
- **Do not** solder pipe connections within 16" (40 cm) of any HPP fitting or multiport tee in the same water line.
- **Do Not** allow contact with solder flux, pipe dope, PVC glue, strong acids, strong bases, oil based paints, solvents, or spray foams. See also INFO 24 - Material Properties of Polysulfone ([L2324](#)). Use only Teflon Tape for threaded fittings.
- **Do Not** allow contact with termiticides or pesticides.
- **Do Not** install in contaminated environments.

Limitations on NL Brass Fittings

- **Do Not** install in corrosive environments (for more information consult the Copper Development Association).

Important Notice!

HeatLink products are intended for installation by a licensed plumbing contractor. It is the sole responsibility of the installer to verify that the product meets local codes and standards.

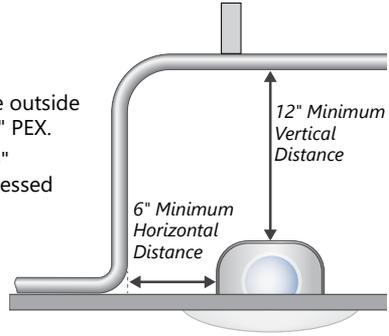
Like most plastic material, crosslinked polyethylene is subject to ultraviolet (UV) deterioration and must not be continuously exposed to direct or indirect sunlight, or fluorescent lights, beyond the stated limits. Storage outside is not recommended.

To ensure system integrity and warranty remain intact do not expose PEX or fittings to unknown/untested chemicals.

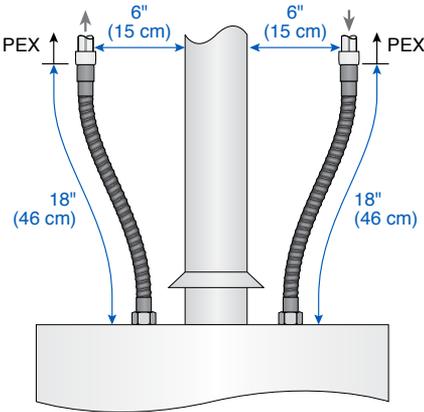
PureLink® Installation Guidelines

General Practices

- The minimum bend radius for PEX is 6 times the outside diameter. For example, 3" (77 mm) radius for ½" PEX.
- Install PureLink® 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.

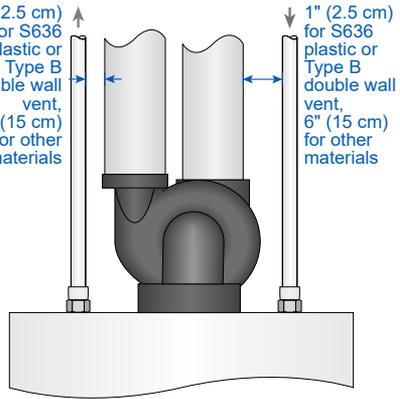


- PEX may be used to connect directly to Power Direct Vent Water Heaters, Electric Water Heaters, or Tankless Water Heaters. Tubing must be kept at least 6" away from the exhaust vent.
- For S636 plastic or Type B double wall vent piping that clearance can be reduced to 1". The vent piping should also 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 PureLink® on both inlet and outlet.

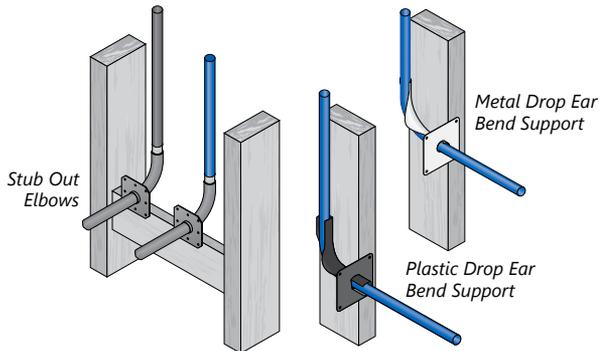


1" (2.5 cm) for S636 plastic or Type B double wall vent, 6" (15 cm) for other materials

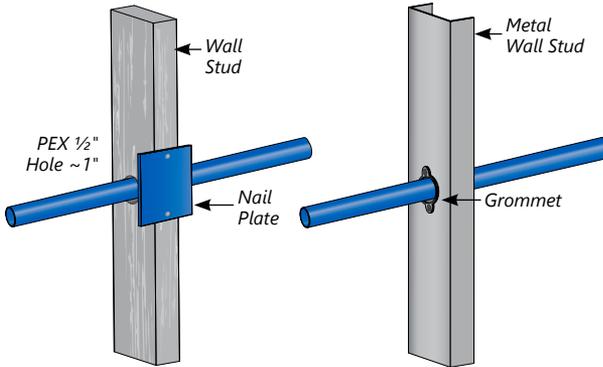
1" (2.5 cm) for S636 plastic or Type B double wall vent, 6" (15 cm) for other materials



- When installing HPP threaded fittings use only Teflon 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 are at least ½" (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 PureLink® PEX is notched or cut, the damaged section must be cut out.
- HeatLink approves the burial of PureLink® Plus PEX-a tubing in concrete. Use of Pipe-in-Pipe (pre-sleeved tubing) is strongly recommended.
- HeatLink recommends continuous length tubing (no fittings) when installing PureLink® PEX tubing in or under a slab. Use of Pipe-in-Pipe (pre-sleeved tubing) is strongly recommended.
- When entering or exiting a concrete slab the PEX tubing should always be protected by a conduit elbow (86000 series) or a tubing sleeve.
- HeatLink NL fittings are suitable for direct, unprotected burial in clean, non corrosive environments.
- 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.

Heat Trace

Trace heating may be required for freeze protection or maintaining hot water temperatures.

HeatLink approves the use of self regulating (self limiting) heat trace cables (aka heat tape) with HeatLink PEX tubing provided the temperature does not exceed the maximum temperature rating of the PEX tubing (200°F / 93.3°C).

- Secure the heat trace cable to the PEX tubing with plastic tie straps (not tape) appropriate to the application temperatures.
- Insulate with fiberglass or closed cell foam pipe insulation.

Self regulating heat trace cable manufacturers include, but are not limited to:

- 3M
- Emerson Electric
- BriskHeat
- Raychem

PEX Tubing Support Requirements

HeatLink PEX-a tubing can be supported using the same methods as metallic pipe. HeatLink 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.

Firestop systems generally require tubing to be rigidly supported on both sides of floor or wall assembly. Refer to the applicable firestop design.

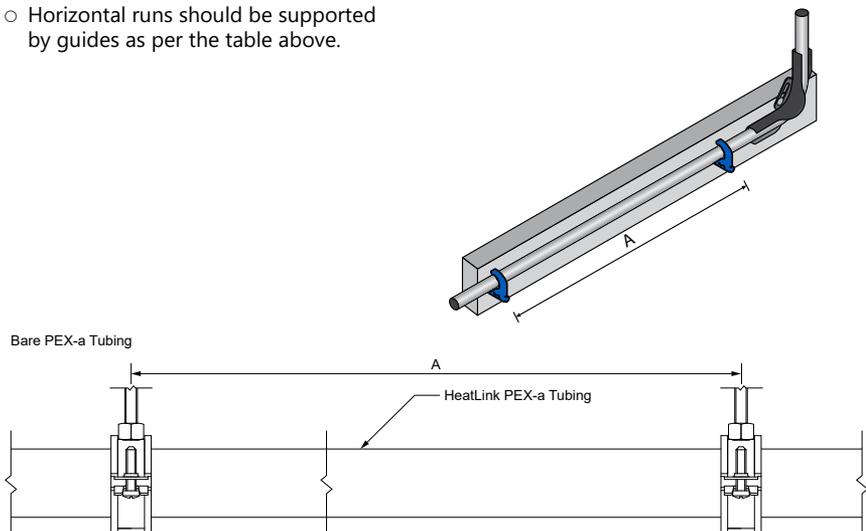
Pipe support manufacturers include, but are not limited to:

- Eaton B-Line
- Hydra-Zorb Corp.
- Walraven, Inc.
- HoldRite, Inc.
- Pentair (Erico) CADDY

Horizontal Support Requirements

Nominal PEX-a Size	Max. Support Spacing (A)			Max. Support Spacing with PEX Supports (B)
	International Plumbing Code	Uniform Plumbing Code	National Plumbing Code of Canada	
1/2"	32" (0.8 m)	32" (0.8 m)	0.8 m (32")	5 ft (1.5 m)
3/4"	32" (0.8 m)	32" (0.8 m)	0.8 m (32")	5 ft (1.5 m)
1"	32" (0.8 m)	32" (0.8 m)	0.8 m (32")	6 ft (1.8 m)
1 1/4"	48" (1.2 m)	48" (1.2 m)	0.8 m (32")	7 ft (2.1 m)
1 1/2"	48" (1.2 m)	48" (1.2 m)	0.8 m (32")	8 ft (2.4 m)
2"	48" (1.2 m)	48" (1.2 m)	0.8 m (32")	8 ft (2.4 m)

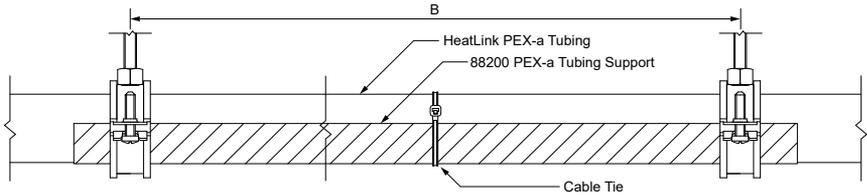
- Horizontal runs should be supported by guides as per the table above.



88200 Series PEX-a Tubing Support Requirements

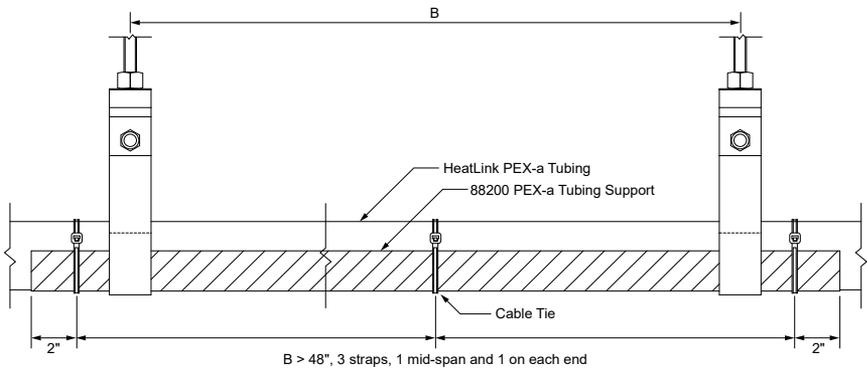
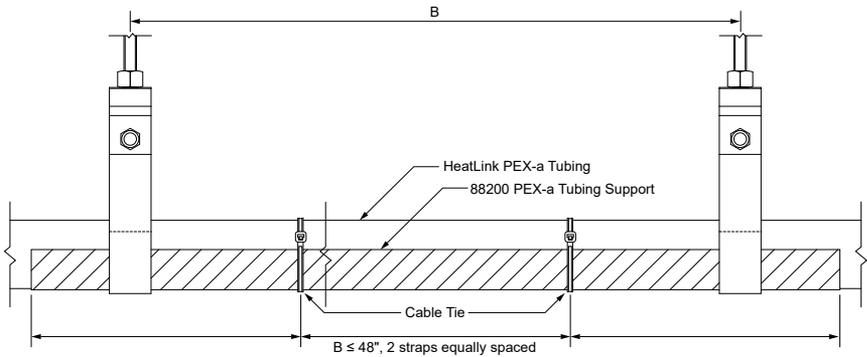
HeatLink® 88200 PEX-a tubing supports are self-gripping galvanized steel, and are ideal for all commercial potable and hydronic installations, maintaining alignment of tubing in *suspended applications*. The supports control the direction of expansion and prevent snaking, while allowing for more space between hanger placements.

PEX Support with Clamps



If the distance between clamps (B) is greater than 48" inches, the PEX Support must be strapped mid-span to the PEX-a tubing with a cable tie or other strap suitable for use with PEX.

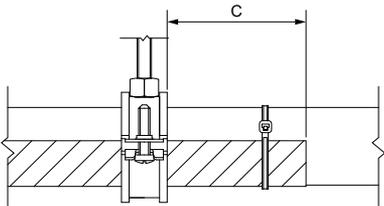
PEX Support with Hangers - Clevis or Loop style



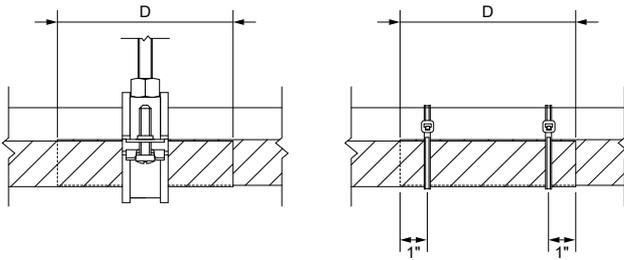
Overlap, cantilever, and minimum distance guidelines for hanger placement and tie straps on HeatLink® 88200 PEX-a tubing supports.

Nominal PEX-a Size	Max. Cantilever (C)	Min. Overlap (D)	Min. Overhang (E)	Min. Distance to Fitting (F)
1/2"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	1 1/4" (30 mm)
3/4"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	1 3/4" (45 mm)
1"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	2 1/4" (60 mm)
1 1/4"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	2 3/4" (70 mm)
1 1/2"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	3" (75 mm)
2"	18" (0.5 m)	6" (0.15 m)	1" (25 mm)	4" (100 mm)

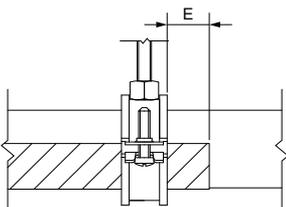
Max. Cantilever



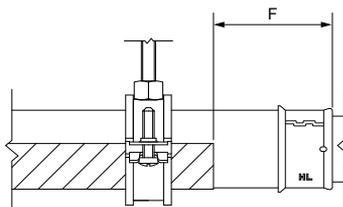
Min. Overlap



Min. Overhang

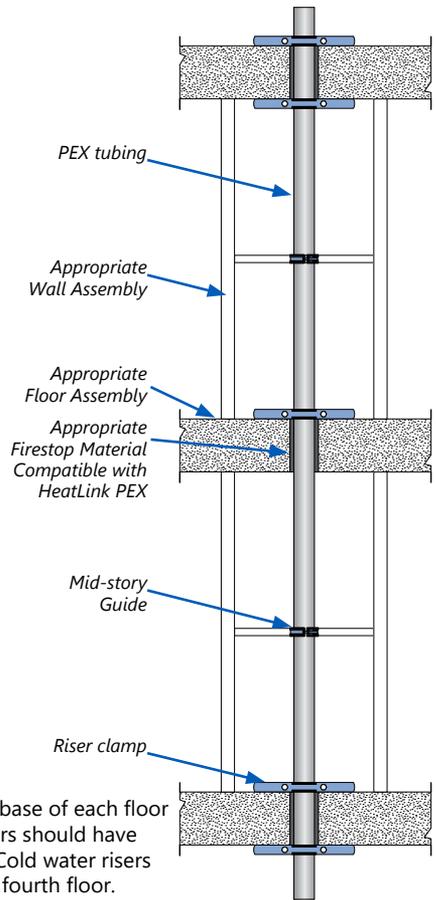
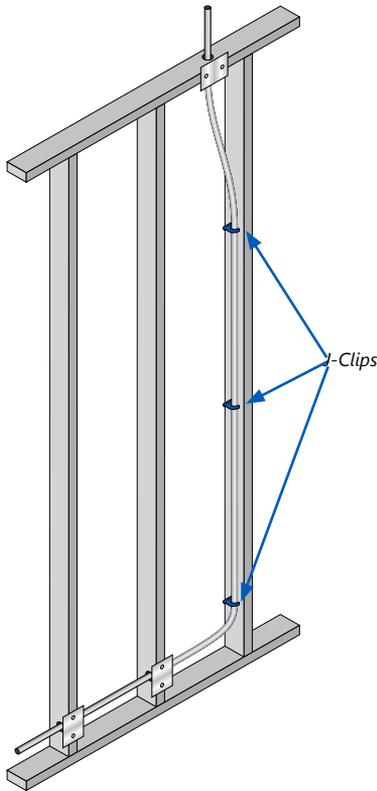


Min. Distance to Fitting



Vertical Support Requirements

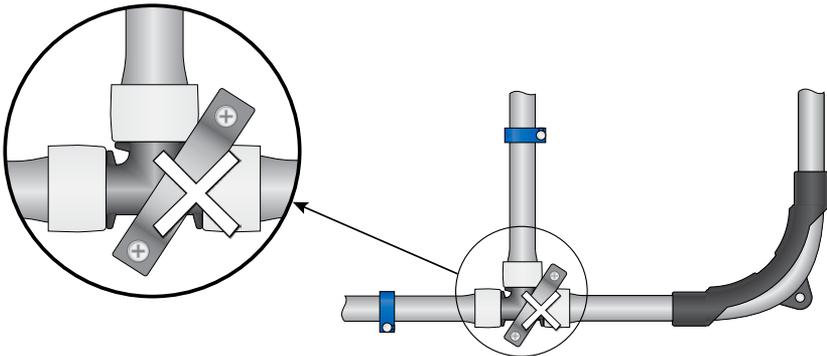
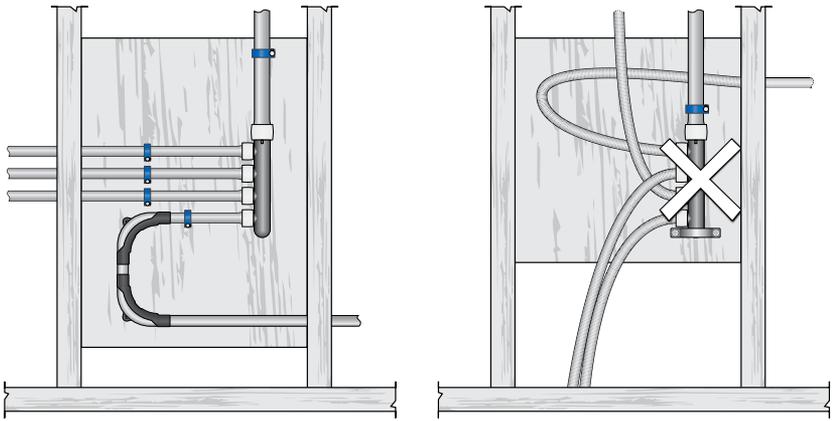
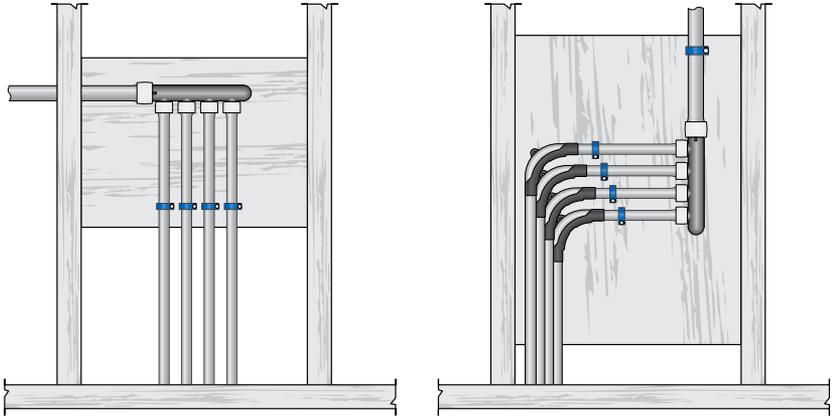
- Vertical runs should be supported by guides at every floor level and midpoint between.



- 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.

Other Support Requirements

- To minimize stress on fittings, manifolds, and multiport tees, PEX should be supported as shown in the diagrams below.
- Manifolds and multiport tees should be installed at least 24" (60 cm) above the floor.



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. Small dimension expansion can generally be accommodated with slack and expansion loops.

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:

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

C = 12 (PEX material specific constant)

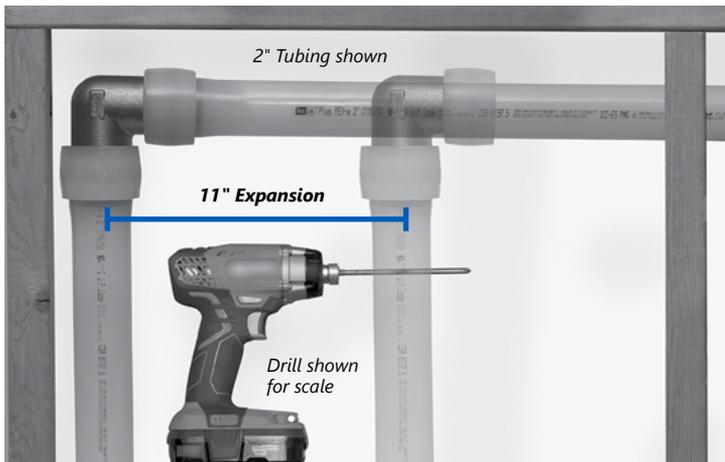
\varnothing = PEX outside diameter (nominal size + 1/8")

ΔL = Expansion of L (Length of Run)

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

α = coefficient of expansion = 1.1"/10°F/100ft

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)

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

$$\Delta L = (1.1"/10°F/100ft) \times 100°F \times 100ft$$

$$\Delta L = 11"$$

Without a proper offset (see [page 18](#)) this can easily damage fittings and the installation location.

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

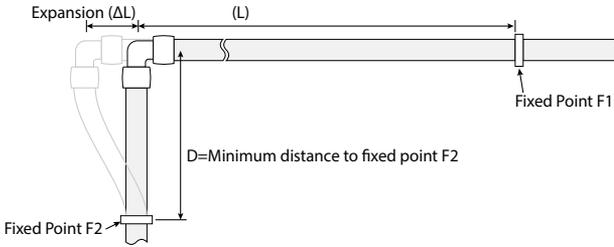
A **guide** allows the PEX to slide during expansion and contraction.

Corner Offset

Example 1: A 50ft straight run of 1¼" 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 1¼" PEX and temperature from 70°F to 150°F:

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

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

$$D = 12 \times \sqrt{1.375'' \times 4.4''}$$

$$D = 29.5''$$

Quick Reference Table - Corner Offset

Length of D for 50ft of PEX

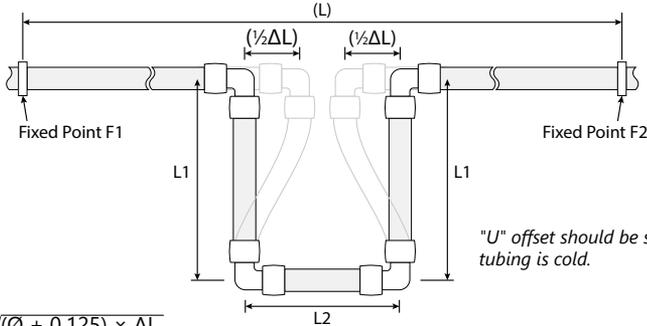
ΔT (°F)	PEX Size					
	½"	¾"	1"	1¼"	1½"	2"
20	9.9"	11.8"	13.3"	14.8"	16.0"	18.3"
40	14.1"	16.6"	18.9"	20.9"	22.7"	25.9"
60	17.2"	20.4"	23.1"	25.6"	27.8"	31.8"
80	19.9"	23.5"	26.7"	29.5"	32.1"	36.7"
100	22.2"	26.3"	29.8"	33.0"	35.9"	41.0"
120	24.4"	28.8"	32.7"	36.1"	39.3"	44.9"
140	26.3"	31.1"	35.3"	39.0"	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.



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

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

$$D = 58''$$

$$L1 = \frac{2}{5} \times D$$

$$L2 = \frac{1}{5} \times D$$

$$L1 = 23.2''$$

$$L2 = 11.6''$$

Quick Reference Table - "U" Offset

Length of L1 & L2 for 50ft of PEX

ΔT (°F)		PEX Size					
		1/2"	3/4"	1"	1 1/4"	1 1/2"	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

General Repair and Testing

Kinked Tubing Repair

One of the most important features of PureLink® PEX-a crosslinked 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. HeatLink® ½", ¾", 1", 1¼", 1½", and 2" plugs are available.
- 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.
- HeatLink recommends a test duration of 24 hours.
- When using leak detection solutions, ensure they are approved for use with PEX and HPP fittings.

Damaged Tubing Repair

If the PEX tubing is notched or cut, the damaged section must be replaced using the following procedure:

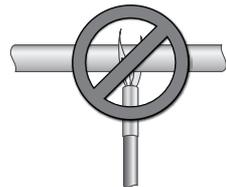
- Release system pressure.
- Cut out the damaged section, ensuring the cuts are square.
- Use an appropriate sized coupling assembly to reconnect the ends.
- Repairs in concrete require the fitting assembly to be wrapped with heat or cold shrink tube to protect assembly from concrete; HPP couplings are recommended for concrete repairs.
- HeatLink NL brass fittings, HPP fittings, and PEX-a expansion rings are suitable for direct, unprotected burial in clean, non corrosive environments (e.g. soil).
- Repair is now complete.

Thawing Frozen Tubing

PureLink® PEX-a tubing can withstand freeze-thaw cycles better than most other products available for plumbing today. While not freeze proof, PureLink® tubing is resistant to freeze damage.

Should tubing become blocked due to freezing, HeatLink recommends thawing by using hot water, hot towels or gently heating with a heat gun.

Do Not Use an Open Flame!



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.

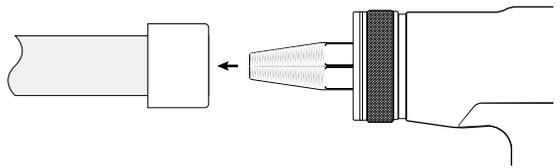
2. Cut the PEX tubing to length, ensuring a square cut - an irregular cut may result in a failed connection. For larger diameter PEX an ABS cutter is recommended.



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.

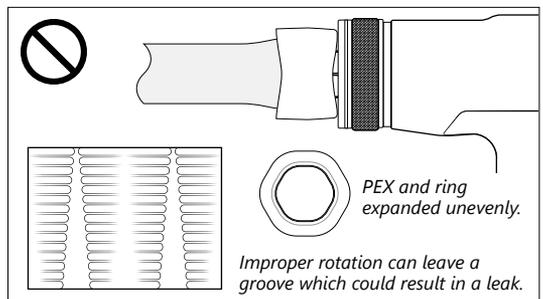
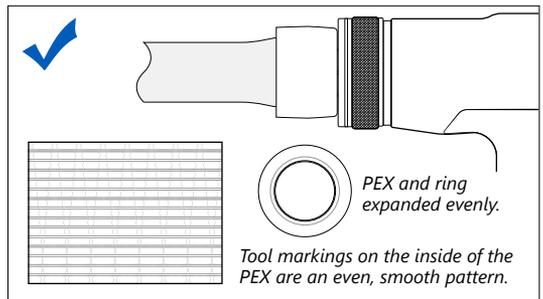


- Ensure the tool is rotated $\frac{1}{8}$ turn between expansions.

- 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 $\frac{1}{2}$ " 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

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

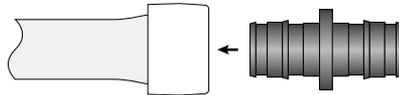
- DeWalt DCE400
- Milwaukee M12 (2432)
- Milwaukee M18 (2632)
- Milwaukee M18 (2633)
- Milwaukee M18 (2932)

PEX Size	Number of Expansions with Ring*				
	DeWalt DCE400	Milwaukee M12 (2432)	Milwaukee M18 (2632)	Milwaukee M18 (2633)	Milwaukee M18 (2932)
½"	7-8	7-8	9	–	7-9
¾"	11-12	11-12	10	–	9-11
1"	17-18	17-18	19	–	12-13 or 7-8 (H)
1 ¼"	–	–	9	–	9-10
1 ½"	–	–	10	–	8-9
2"	–	–	–	5	9-10

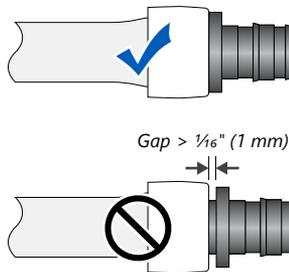
* The number of expansions recommended by the tool manufacturer is to be used as a guide. This number may vary with installation temperature and operator technique.

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.

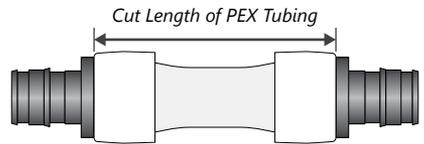


Gap > 1/16" (1 mm)

Fitting Spacing

HeatLink 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.

PEX Size	Minimum Cut Length of PEX Tubing
½"	2" (5 cm)
¾"	3" (7.5 cm)
1"	3 ½" (9 cm)
1 ¼"	4 ½" (11.5 cm)
1 ½"	4 ½" (11.5 cm)
2"	6" (15 cm)



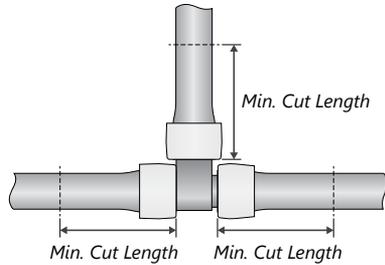
Cold Weather Connections

- 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.

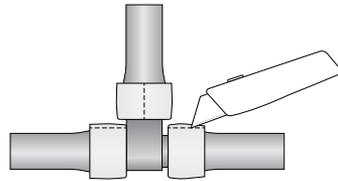
PEX Size	Minimum Cut Length
1/2" – 1"	2" (5 cm)
1 1/4" – 2"	3" (7.5 cm)



- **Do not** reuse expansion rings.
- **Do not** reuse HPP fittings or multiport tees.
- No Lead 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.

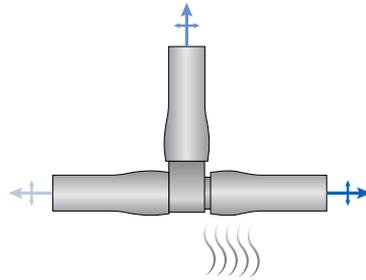


2. For each connection, slowly heat the PEX tubing around it with a heat gun.

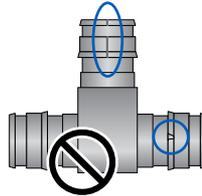
Do not use an open flame.

Work the tubing back and forth while pulling away from the fitting until it is removed.

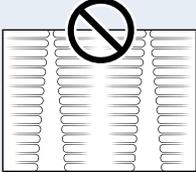
Protect the fitting barbs from damage if gripping tools are used.



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

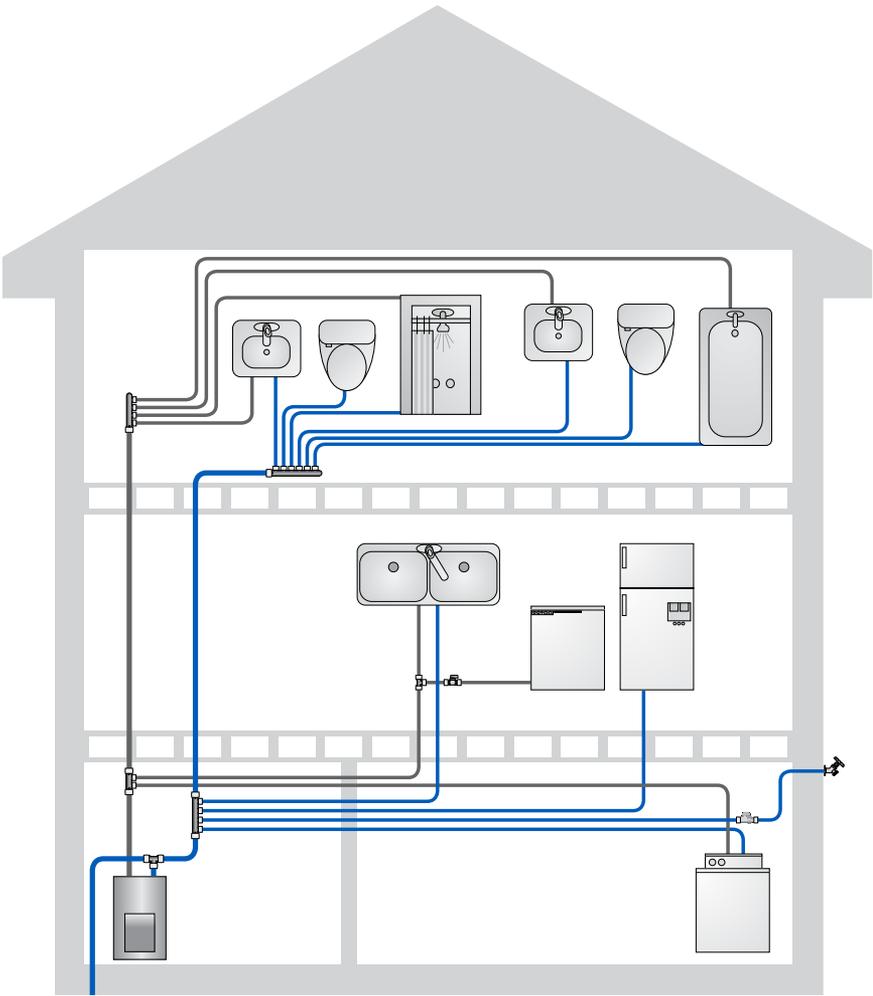


Common Installation Issues

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="display: flex; justify-content: space-around; align-items: center;">   </div> <p>• Avoid removing the PEX tubing from the tool while the expansion tool is in the expanded position.</p>
Fittings	
Cracked	Cut out fitting, and replace with new rings and fitting.
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. See page 20 for details.
Frozen	Can be thawed using hot water, hot towels, or gently heating with a heat gun. Do Not Use Open Flame!

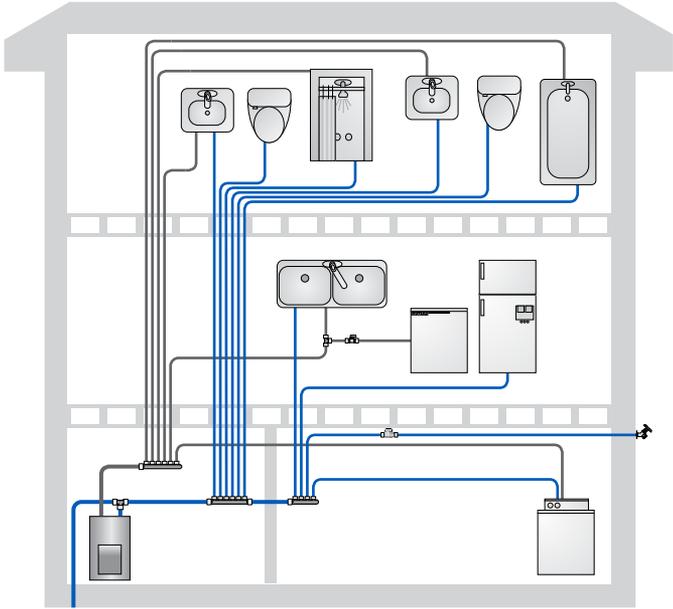
Piping Methods

Modified Home Run Piping Method (Recommended)

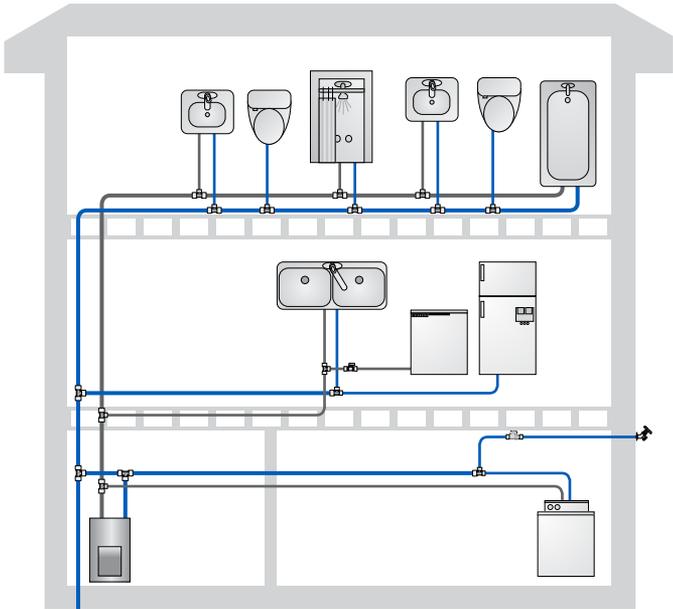


1. Remote headers require less than half of the connections of the branch method.
2. Less PEX tubing compared to home run method.

Home Run Piping Method



Branch and Tee Piping Method



Demand Load of Fixtures

Demand load of fixtures					
Fixture	Occupancy	Type of Supply Control	Fixture Units		
			Cold	Hot	Total
WC	Public	Flush valve	10.00		10.00
WC	Public	Flush tank	5.00		5.00
Urinal	Public	1" flush valve	10.00		10.00
Urinal	Public	¾" flush valve	5.00		5.00
Urinal	Public	Flush tank	3.00		3.00
Lavatory	Public	Faucet	1.50	1.50	2.00
Bath	Public	Faucet	3.00	3.00	4.00
Shower	Public	Mixing valve	3.00	3.00	4.00
Basin	Office	Faucet	2.25	2.25	3.00
Kitchen sink	Hotel, restaurant	Faucet	3.00	3.00	4.00
Drinking fountain	Office	¾" valve	0.25		0.25
WC	Private	Flush valve	6.00		6.00
WC	Private	Flush tank	3.00		3.00
Basin	Private	Faucet	1.00	1.00	1.50
Bath	Private	Faucet	1.50	1.50	2.00
Shower	Private	Mixing valve	1.50	1.50	2.00
Kitchen sink	Private	Faucet	1.50	1.50	2.00
Laundry tray	Private	Faucet	2.25	2.25	3.00
Dishwasher	Private	Faucet		1.00	1.00
Washing machine 8lbs	Private	Automatic	1.50	1.50	2.00
Washing machine 8lbs	Public or general	Automatic	2.25	2.25	3.00
Washing machine 16lbs	Public or general	Automatic	3.00	3.00	4.00

Definition of Terms

Fixture Unit: The demand imposed by a number of fixtures used intermittently cannot be determined exactly, so each fixture is given a factor known as a fixture unit which corresponds to a demand in GPM. Note: for the purposes of this book the fixture unit is used only to determine the size of distribution pipe required; it is not necessary to know the corresponding GPM.

Note: *fixture unit information supplied from general code book info.*

Please check with your local codes to confirm.

Equivalent Tubing Lengths

Elbows

Part #	Description	Equivalent Length (ft)
EX18022	¾" × ¾" PEX F1960 HPP Elbow	6.75
EX18028	1" × 1" PEX F1960 HPP Elbow	7.86
EX18035	1¼" × 1¼" PEX F1960 HPP Elbow	9.16
EX18041	1½" × 1½" PEX F1960 HPP Elbow	11.87
EX18054	2" × 2" PEX F1960 HPP Elbow	11.98

Tees

Part #	Description	Equivalent Length (ft)	
		Through	Branch
EX16222	¾" × ¾" × ¾" PEX F1960 HPP Tee	1.80	6.60
EX16332	1¼" × 1¼" × ¾" PEX F1960 HPP Tee	2.72	3.38
EX16333	1¼" × 1¼" × 1¼" PEX F1960 HPP Tee	2.67	8.69
EX16338	1¼" × 1¼" × 1" PEX F1960 HPP Tee	3.02	7.21
EX16382	1¼" × 1" × ¾" PEX F1960 HPP Tee	4.98	3.35
EX16388	1¼" × 1" × 1" PEX F1960 HPP Tee	1.17	8.24
EX16432	1½" × 1¼" × ¾" PEX F1960 HPP Tee	4.87	7.76
EX16433	1½" × 1¼" × 1¼" PEX F1960 HPP Tee	6.25	11.50
EX16438	1½" × 1¼" × 1" PEX F1960 HPP Tee	6.18	9.20
EX16442	1½" × 1½" × ¾" PEX F1960 HPP Tee	2.18	8.59
EX16443	1½" × 1½" × 1¼" PEX F1960 HPP Tee	1.81	9.29
EX16444	1½" × 1½" × 1½" PEX F1960 HPP Tee	2.38	11.76
EX16448	1½" × 1½" × 1" PEX F1960 HPP Tee	2.77	7.50
EX16488	1½" × 1" × 1" PEX F1960 HPP Tee	4.87	7.78
EX16642	2" × 1½" × ¾" PEX F1960 HPP Tee	8.46	7.57
EX16643	2" × 1½" × 1¼" PEX F1960 HPP Tee	5.81	10.33
EX16644	2" × 1½" × 1½" PEX F1960 HPP Tee	6.03	10.59
EX16648	2" × 1½" × 1" PEX F1960 HPP Tee	5.44	6.52
EX16662	2" × 2" × ¾" PEX F1960 HPP Tee	1.17	7.58
EX16663	2" × 2" × 1¼" PEX F1960 HPP Tee	1.75	10.42
EX16664	2" × 2" × 1½" PEX F1960 HPP Tee	1.84	10.60
EX16666	2" × 2" × 2" PEX F1960 HPP Tee	2.99	12.44
EX16668	2" × 2" × 1" PEX F1960 HPP Tee	2.71	8.02
EX16828	1" × ¾" × 1" PEX F1960 HPP Tee	3.77	7.69
EX16822	1" × ¾" × ¾" PEX F1960 HPP Tee	3.77	6.80
EX16882	1" × 1" × ¾" PEX F1960 HPP Tee	1.27	6.71
EX16888	1" × 1" × 1" PEX F1960 HPP Tee	3.57	7.86

Couplings

Part #	Description	Equivalent Length (ft)
EX19022	¾" × ¾" PEX F1960 HPP Coupling	1.75
EX19028	1" × 1" PEX F1960 HPP Coupling	3.61
EX19035	1¼" × 1¼" PEX F1960 HPP Coupling	2.60
EX19041	1½" × 1½" PEX F1960 HPP Coupling	3.10
EX19054	2" × 2" PEX F1960 HPP Coupling	1.19
EX19238	1¼" × 1" PEX F1960 HPP Coupling	3.21
EX19243	1½" × 1¼" PEX F1960 HPP Coupling	5.61
EX19248	1½" × 1" PEX F1960 HPP Coupling	5.00
EX19264	2" × 1½" PEX F1960 HPP Coupling	5.38
EX19282	1" × ¾" PEX F1960 HPP Coupling	3.45

Adapters

Part #	Description	Equivalent Length (ft)
EX27122NL	¾" PEX F1960 × ¾" M/Sweat No Lead Brass Adapter	5.02
EX27128NL	1" PEX F1960 × 1" M/Sweat No Lead Brass Adapter	3.43
EX27135NL	1¼" PEX F1960 × 1¼" M/Sweat No Lead Brass Adapter	4.40
EX27141NL	1½" PEX F1960 × 1½" M/Sweat No Lead Brass Adapter	4.29
EX27154NL	2" PEX F1960 × 2" M/Sweat No Lead Brass Adapter	4.78
EX27222NL	¾" PEX F1960 × ¾" F/Sweat No Lead Brass Adapter	4.98
EX27228NL	1" PEX F1960 × 1" F/Sweat No Lead Brass Adapter	3.04
EX27235NL	1¼" PEX F1960 × 1¼" F/Sweat No Lead Brass Adapter	4.44
EX27241NL	1½" PEX F1960 × 1½" F/Sweat No Lead Brass Adapter	4.11
EX27254NL	2" PEX F1960 × 2" F/Sweat No Lead Brass Adapter	5.34
EX27522NL	¾" PEX F1960 × ¾" MNPT No Lead Brass Adapter	5.03
EX27528NL	1" PEX F1960 × 1" MNPT No Lead Brass Adapter	3.65
EX27535NL	1¼" PEX F1960 × 1¼" MNPT No Lead Brass Adapter	7.53
EX27541NL	1½" PEX F1960 × 1½" MNPT No Lead Brass Adapter	6.74
EX27554NL	2" PEX F1960 × 2" MNPT No Lead Brass Adapter	1.17
EX27622NL	¾" PEX F1960 × ¾" FNPT No Lead Brass Adapter	3.77
EX27628NL	1" PEX F1960 × 1" FNPT No Lead Brass Adapter	3.57
EX27635NL	1¼" PEX F1960 × 1¼" FNPT No Lead Brass Adapter	7.63
EX27641NL	1½" PEX F1960 × 1½" FNPT No Lead Brass Adapter	6.63

PEX Tubing Pressure Drop Graph

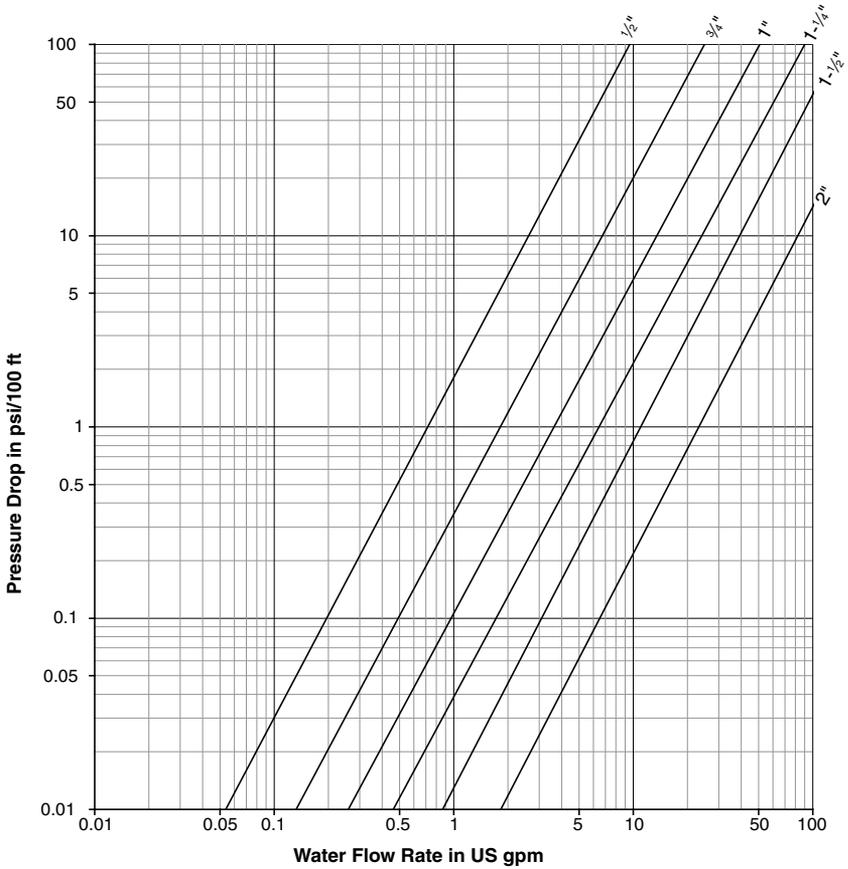


Chart settings at 120°F

PEX Tubing Water Volume

Dimension and Volume		
Size	Volume (US gallons/ft)	Volume (L/m)
1/2"	0.0092	0.114
3/4"	0.0184	0.228
1"	0.0303	0.376
1 1/4"	0.0453	0.563
1 1/2"	0.0631	0.785
2"	0.1083	1.344

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