

The Differences in PEX Tubing Manufacturing

Even though all PEX tubing must meet the same performance standards, there are differences in PEX tubing. Knowing these differences can help when choosing the best option for your plumbing situation.



PEX-A, Oxygen Barrier, and PEX-B tubing are all manufactured differently, leading to differences in flexibility, thermal memory, and installation methods. Please read the information below to help you choose the correct tubing for your plumbing project.

Manufacturing/Crosslinking Method

- PEX tubing is made of modified polyethylene, usually high-density polyethylene (HDPE), that has gone through a change to its molecular structure through physical or chemical processes that cause its polymer chains to chemically link (crosslinking).
- The letters A and B refer to the manufacturing process used to crosslink the polyethylene.
 - Jones Stephens' PEX-A is manufactured using the IR (Infrared) -Extrusion method in which HDPE tubing is extruded above its melting point and passed through an infrared oven causing radicals to form, which, in turn, recombine to form crosslinking. This method results in a 70-89% or higher crosslinking density.
 - Oxygen Barrier tubing is a specifically designed PEX-A tubing with an added coating of ethylene vinyl alcohol (EVOH) to the outside to prevent oxygen from permeating the tubing and causing corrosion (oxidation) in any of the metal parts of a system.
 - Other manufacturers' PEX-A uses the Engel/peroxide method which introduces peroxides to HDPE, enabling bonding at the atomic level and resulting in a 70-89% or higher crosslinking density.
 - PEX-B is manufactured using the Silane/moisture cure method which passes the HDPE tubing through hot water or steam after extrusion in the presence of a Silane catalyst to encourage polymer crosslinking. This method results in a 65-89% crosslinking density.

Crosslink Density/Flexibility

- Crosslinking is a chemical process that links polyethylene chains into a network, making material more stable and better able to withstand pressure and temperature changes.
 - PEX-A tubing is around 70-89% crosslinked, making it highly flexible, less dense, and soft. In addition, PEX-A's high degree of crosslinking gives it a property called thermal memory which helps with kink repair and bending.
 - PEX-A's high flexibility means it can uncoil easier and bend around corners, needing less fittings and making it ideal for retrofitting.
 - Oxygen Barrier tubing is a little less flexible because of its added outer layer.
 - PEX-B tubing is around 65-89% crosslinked, making it slightly less flexible, and denser.
 - PEX-B's lower flexibility means that coils of PEX-B are more difficult to unwind, and that PEX-B requires more fittings in tight spaces.

Thermal Memory

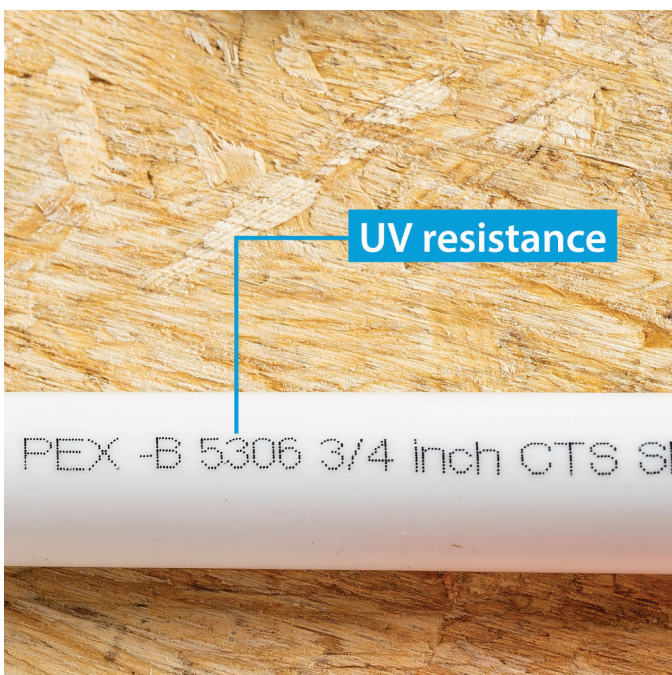
- Thermal memory in PEX-A tubing is a property formed by its manufacturing that allows the tubing to remember its original shape if it has kinked during installation. In addition, thermal memory allows PEX-A tubing to bend more easily during installation and require less fittings than PEX-B tubing.
 - A kink in PEX-A tubing can be repaired by applying heat which will cause the tubing to return to its original form.
 - A kink in PEX-B requires the kinks to be cut out and replaced.

Durability/Long-Term Performance

- PEX is durable, with a lifespan of 50 years on average. It is durable because of PEX's crosslinking property that makes PEX more resistant to temperature extremes and corrosion and stronger and more flexible than other types of piping.
 - PEX-A has a higher crosslinking ratio that provides better flexibility, impact resistance, thermal memory, chemical and stress crack resistance, and better freeze protection than PEX-B.
 - Oxygen Barrier tubing is more durable than standard PEX-A or PEX-B in oxygen-exposed environments because of its oxygen barrier layer that makes it ideal for non-potable applications.

UV Resistance

- PEX tubing can be damaged by ultraviolet (UV) radiation from sunlight and is not designed for outdoor use. If used outdoors, installers should sleeve PEX tubing. In addition, if PEX tubing is used in chlorinated hot-water systems after UV exposure, it may be more prone to oxidative failure.
- All PEX has a four-digit code printed on the tubing. The second number of the code represents UV resistance. The UV-Resistance testing method for PEX follows ASTM standard F2657.
 - 0 = has not been tested or does not meet the ASTM F2657 standard.
 - 1 = meets the standard for minimum UV resistance of one month.
 - 2 = meets the standard for minimum UV resistance of three months.
 - 3 = meets the standard for minimum UV resistance of six months.



Temperature/Burst/Pressure Rating

- All PEX meets the same U.S. ASTM F876 standard, and, therefore has the same burst pressure and temperature ratings.
 - PEX Maximum Working Pressure: 160psi @ 73°F (11 bar @ 23°C)
 - PEX Temperature Ratings:
 - 160psi @ 73°F (11 bar @ 23°C)
 - 100psi @ 180°F (6.9 bar @ 82°C)
 - 79psi @ 200 °F (5.4 bar @ 93°C)

Installation Method (Expansion vs. Crimp)

- PEX tubing does not require glue or cement for connection and instead relies upon expansion, crimp, and clamp fittings and their specific tools.
 - PEX-A installs with expansion fittings, F1960, which leave the inner diameter (I.D.) and flow velocity unchanged.
 - Oxygen Barrier installs same as PEX-A.
 - PEX-B installs with crimp and clamp fittings (F1807 and F2159).



PEX Tubing Comparison

	PEX-A	Oxygen Barrier	PEX-B
Manufacturing Method	IR (Infrared) Engel/Peroxide	IR or Engel/Peroxide with a layer of ethylene vinyl alcohol (EVOH) applied to the outside of the tubing	Silane/Moisture-Cure
Crosslink Density	70-89% crosslinked	70-89% crosslinked	65-89% crosslinked
Flexibility	Highly flexible	Highly flexible, but the added layer makes it a little less flexible than PEX-A	Moderately flexible
Thermal Memory	High degree of thermal memory	High degree of thermal memory, but slightly less than PEX-A	No thermal memory
Durability	All PEX is durable		
	Higher crosslinking ratio than PEX-B provides slightly better: Flexibility, impact resistance, and thermal memory	Oxygen Barrier tubing is more durable than potable PEX-A or PEX-B in oxygen- exposed environments, because of its oxygen barrier layer	PEX-B offers a lessened degree of crosslinking than PEX-A, and therefore, slightly less: Flexibility, impact resistance, and thermal memory
	Chemical and stress crack resistance and freeze protection		Chemical and stress crack resistance and freeze protection
Long-Performance	Average lifespan of 50 years		
UV Resistance	Moderate: Can withstand up to 1, 3, or 6 months of UV exposure, based on number rating		
Temperature/Burst/ Pressure Rating	160psi @ 73°F (11 bar @ 23°C) 100psi @ 180°F (6.9 bar @ 82°C) 79psi @ 200 °F (5.4 bar @ 93°C)		
Installation Method	Expansion tool and fittings Crimp/clamp tool and fittings	Expansion tool and fittings Crimp/clamp tool and fittings	Crimp/clamp tool and fittings



Water System Comparison

	PEX-A	PEX-B	Rigid Copper	CPVC	PE-RT	Rigid Sch. 40 PVC
Manufacturing Method	IR (Infrared) method Engel/Peroxide method *Oxygen Barrier tubing is PEX-A tubing with a layer of ethylene vinyl alcohol (EVOH) applied to the outside of the tubing	Silane/Moisture-Cure method	Cast, drawn, or extruded	Injection molding	Extruded	Injection molding
Material	Crosslinked polyethylene	Crosslinked polyethylene	99% pure copper	Chlorinated Polyvinyl Chloride	Polyethylene of Raised Temperature Resistance	Unplasticized Polyvinyl Chloride
Flexibility	High	High (slightly less flexible than PEX-A)	Low	Low	Moderate	Low
Best For	Water supply; new construction; retrofits *PEX-A Oxygen Barrier is good for radiant (hydronic) heating	Water supply; new construction; retrofits	Water supply; Radiant (hydronic) heating	Water supply; High-chlorine environments where water disinfection is a concern	Water supply; Radiant (hydronic) heating	Water supply; Drain, Waste, Vent
Cold Water	Yes	Yes	Yes	Yes	Yes	Yes
Hot Water	Yes	Yes	Yes	Yes	Yes	No
Durability*	High	High	Highest	High	High	High
Long-Performance	50 years	50 years	70-80 years	50-75 years	40-50 years	50-75 years
Freeze Resistance	High	Moderate	Low	Low	Moderate	Low
Corrosion	Resistant	Resistant	Resistant unless used with noble metals	Resistant	Resistant	Resistant
Quiet Operation	High	High	Low	Moderate	High	Moderate
UV Resistance	Moderate	Moderate	High	Moderate	Moderate	Moderate
Bacterial Resistance	Moderate	Moderate	Highest	High	Moderate	High
Installation Method	Expansion/Insert/Crimp/Clamp	Insert/Crimp/Clamp	Solder/Compression fittings	CPVC Solvent Cement	Insert/Crimp/Clamp	Solvent cement
Installation	Easiest	Easiest	Most difficult	More difficult	Easiest	More difficult
Cost	Lowest	Lowest	Highest	Moderate	Lower	Lower

* in normal operating conditions