

**Differences Between
PEX and PB Piping Systems
for Potable Water Applications**

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FOREWORD

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Just as various metals (eg. steel, copper, lead) have different properties, various plastics have different properties. Not all metal pipes are the same, and clearly, not all plastic pipes perform the same.

Thanks to modern polymer technology, cross-linked polyethylene (PEX) piping systems perform in ways that provide superior reliability and safety when compared to polybutylene (PB) piping systems.

Cross-linked polyethylene (PEX) is a high-temperature, flexible plastic (polymer) pipe. PEX pipe is approved for potable hot- and cold-water plumbing systems and hot-water (hydronic) heating systems in all model plumbing and mechanical codes across the USA and Canada. PEX piping systems are durable, provide security of safe drinking water, and use reliable connection systems.

PEX piping systems have been used for more than 30 years in Europe and for more than 10 years in North America. Today, the North American PEX piping industry is thriving in both residential and commercial new-home construction. There are at least ten domestic producers of quality PEX pipes today.

The PEX piping industry is highly-regulated. Standards, specifications and code requirements developed over the past ten years define tight material and production controls, require continuous-use temperature ratings as high as 200°F (93°C), and mandate standardized chlorine resistance testing. Third-party certification agencies require strenuous quality control testing for PEX pipes, including frequent unannounced inspections of plants and annual monitoring testing.

The testing requirements for PEX pipes are more stringent than for PB pipes, the gray plastic pipes used in plumbing applications up until the mid-1990's.

Specifically:

- **PEX is a cross-linked material.** The molecules of the high-density polyethylene (HDPE) base material are permanently linked to each other by a process known as cross-linking. Cross-linking makes PEX pipes a “thermoset” polymer. PB pipes were not cross-linked, making them “thermoplastic” polymer materials, with lower melting temperatures. Cross-linking gives PEX pipes greater long-term stability against internal pressure, and reduced creep (material flow) under compression at fittings.
- **PEX pipes are thicker than PB pipes.** As written into PEX pipe standards ASTM F 876, ASTM F 877 and CSA B 137.5, PEX pipes have a wall thickness that is at least 22% thicker than the wall thickness of PB pipes.

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- **PEX pipes are proven to be chlorine resistant.** Mandatory chlorine resistance testing, following standard test method ASTM F 2023, requires that all PEX pipes used for plumbing applications are tested to show a minimum extrapolated lifetime of at least 50 years, with extremely aggressive water conditions.
- **PEX piping systems do not use polyacetyl fittings.** PEX piping systems use fittings that, according to ASTM standards, are made from brass, copper, or high-temperature polymers engineered to be chlorine-resistant. These fittings are tested to the same standards as PEX pipes, and must also be certified by the same third-party testing agencies. *Consult with the PEX pipe manufacturer for recommended fitting(s).*
- **PEX piping systems have long-term performance requirements at 200°F (93°C),** whereas the highest-temperature testing required for PB was 180°F (82°C). Long-term hydrostatic testing required by PEX piping system standards, such as ASTM F 876, ASTM F 877 and CSA B 137.5, and certified to stringent requirements as established in PPI TR-3, are used to demonstrate the following extrapolated continuous-use temperature/pressure ratings:
 - 80 psi @ 200°F
 - 100 psi @ 180°F
 - 160 psi @ 73.4°F

For more information on PEX pipes and PPI hydrostatic requirements, please refer to PPI Technical Report **TR-3 “Policies and Procedures for Developing HDB, PDB, SDB and MRS Ratings for Thermoplastic Materials or Pipe”** and Technical Note **TN-17 “Crosslinked Polyethylene (PEX) Tubing”**, or visit the website at www.plasticpipe.org.