



Copper: the Right Choice for Water Service Lines

The Aging Water Infrastructure

Lead was once the preferred piping material for water service line installations. Copper and other materials have since taken its place in new construction, as well as in routine replacement and repairs, but many cities have yet to remove old lead service lines buried underground. A risk that with one change of the water supply or water treatment, can expose residents to unsafe levels of lead. The only way to eliminate the risk is to remove all lead service lines from our infrastructure. When it comes to conveying water safely, copper is the superior choice – it has 2,500 years of successful use to prove it, and it has been safely and reliably used for water service lines in the U.S. since the 1930s.

New Materials Come and Go

1700s – 1920

Lead pipes once favored for their durability and ductility were the go-to material for service lines, but are now known to pose potential health effects even at the very lowest levels of exposure to the drinking water they convey.

1800s – 1960

Unlined iron, steel and galvanized steel pipes are robust but hard to install without multiple joints, which can leak and are easily clogged with mineral deposits in many waters.

1960s – 1980s

Early PVC plastic pipes became brittle when left exposed to UV light or chlorine in the water system and were found to leach vinyl chloride monomer, a known human carcinogen.

1978 – 1995

Polybutylene plastic pipes experienced wholesale failures due to embrittlement and stress fractures.

1990s – Present

Polyethylene service lines are being removed by the thousands due to oxidative damage from chlorine and other disinfectants in drinking water. And polyethylene and PEX plastic systems have also been shown to leach various chemicals to drinking water with unknown health effects, resulting in taste and odor issues.



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Longevity and Proven Reliability

Copper is the most widely used plumbing material in the developed world. For the past 50 years, copper tubing has endured as the mainstay water service material from the utility main to the residential property line. It is available in several types (wall thicknesses) to accommodate different system requirements. For underground water service lines, Type K (thickest) and Type L are commonly used. Both are available in long coils, to eliminate unnecessary joints, or in hard straight lengths. Copper's extensive use has allowed it to be studied and tested over time in order to ensure long-term system reliability and safety.

- **Performance:** Copper tube has long been preferred for drinking water lines because of its reliability, ease of installation and join-ability. It can be joined using multiple, leak-free joining methods. In underground water service applications, flared or mechanical compression joints are the most common. However, copper can also be brazed using standard fittings.



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- **Impermeable:** Copper service lines are completely impermeable, preventing outside chemicals, such as petroleum products that may be spilled on nearby streets or insecticides and fertilizers that are intentionally spread on yards, from contaminating the water system. While plastic pipes such as those manufactured of polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), polyethylene (PE), polybutylene (PB) and acrylonitrile-butadiene-styrene (ABS) are used widely in the water industry because of its corrosion resistance, it has been found that the water in some plastic and gasketed piping systems has been contaminated by hydrocarbons and organic chemicals. This occurs through 1. leakage, 2. leaching and 3. permeation.¹
- **Safe:** Copper is an essential micronutrient for good health and exists naturally in most water supplies. Copper tubing has positive health benefits. In addition to supplying dietary copper, it kills pathogenic microbes and does not leach potentially harmful chemicals or organic substances that can provide a food source for the growth of microbes in the piping systems. On the other hand, plastic pipes are known to leach a number of volatile organic compounds (VOCs) that can affect the taste and odor of the water and may cause health effects. Some of these are known, like the risk of vinyl chloride as a carcinogen, however many are unknown since the chemicals that leach are difficult to identify and their potential health effects have yet to be studied or determined.

- **Reliable:** Copper is highly corrosion-resistant in most underground environments. Because of its superior strength, this durable and malleable metal can also withstand high pressures and stresses without failures, while other materials crack, rupture and leak, such as in underground applications where freezing and thawing and other natural occurrences cause the ground to settle and move.

Copper can be exposed to UV rays and oxidizing disinfectants (chlorine, chloramines, chlorine dioxide, etc.) without risk of cracking or failure. Meanwhile, plastic pipe has exhibited an above average risk of premature failure due to oxidative degradation in underground potable water systems treated with an oxidizing disinfectant, like chlorine.²

Copper service lines can be easily located in case of future utility or underground work, without the need to install a separate tracer wire. And, if copper service lines become frozen, they can be easily thawed without damaging the water system.

- **Sustainable:** A properly designed and installed copper water tube assembly is built to last, but when it's time to replace the line, copper can be recycled into another pipe or product without any loss to its beneficial properties. Its long life cycle, combined with its ease of recyclability back to the same metal purity (not downcycled to a lower purity or lesser use), makes copper a truly sustainable piping material. In addition, no matter how long it has been buried or in service, copper maintains its value – returning 80–90 percent or more of its original cost when it is reclaimed and sold for recycling.

Copper tube and fittings are the original lead-free piping materials. Today, with no-lead brass valves, fittings and components, lead-free solders and flameless, solderless joining systems, copper piping systems represent the best option in reliable, long-lasting, lead-free service line installations. The choice is obvious when installing or replacing water service lines: Copper.

More Information

Visit www.CopperServiceLines.org to learn more about why copper is the preferred material for water service lines.

¹ Thomas M. Hosen, Jae Kwang Park, David Jenkins and Robert E. Selleck. "Contamination of Potable Water by Permeation of Plastic Pipe." Journal AWWA, Management and Operations (August 1991): 53–56.

² Duvall, D. E.; Edwards, D. B.; Oxidative Degradation of High Density Polyethylene Pipes from Exposure to Drinking Water Disinfectants; Engineering Systems Inc. File No. 29261A; 2009