Copper Development Association Inc.
Copper Alliance

The False Initial Cost Economy

Water utilities and systems are entrusted with and regulated to provide the highest quality water while exercising financial responsibility in using ratepayer and public funds. When looking to replace lead service lines, the low cost of plastic piping is alluring, but it is in the utilities interest, as well as the interests of their customers, to make wise financial decisions for the life cycle of the infrastructure.

How Significant is the First Cost?

On average, lead service line replacements across the country can range from just a few thousand dollars to upwards of $10,000. For estimates sake, it is common to use $5,000 as an average cost for the material and installation of a 65-foot long service line. The average service line price for copper is $286 and $46 for plastic; a difference of $240 per service line.

This initial cost savings of plastic represents less than 5 percent of the total cost of the service line replacement. For a utility looking to change thousands of service lines, this adds up, but it is a false economy. Utility experience suggests that problems with plastic service lines can require significant replacements in 10 - 20 years, much shorter than the typical 75-100 year life cycle of copper[1]. The full life cycle cost of material choices can become quite expensive over the expected life of the service line, especially considering the high cost of repair or replacement.

The Plastic Problem

Many municipalities trying to keep pace with the construction boom in the late 1980s and 1990s turned to various plastic piping systems for their water service line installations. However, as the building boom continued through the early 2000s, utilities and municipalities began to struggle with leaks and loss of water in plastic service lines, and began turning back to copper.

Life Cycle Cost and Total Cost of Ownership: Reliability Trumps First Cost

When selecting a service line material, it is wise to assess the full life-cycle costs that can be expected over the life of the service line and any salvage value left at the end of the service life. Since the beginning of its use in the 1930s as a service line material, copper has proven to deliver a 75 – 100 year lifetime of use. On the other hand, plastics have shown a lifetime of approximately 25 years. Over the course of 75 years, the copper system would only have to be installed once, while the plastic system would need to be installed and then replaced twice, at years 25 and 50. Furthermore the copper service line can be sold for scrap at the end of its life, typically at 80 – 90 percent of the value of new copper (based on the weight of the copper).

[1] Irwin P. Sharpe & Associates. "Underground Water Service Lines – Material Usage Trends 1965-2009." Copper Development Association (July 2010): 5-6.

The following table shows a life cycle cost comparison of copper versus two plastic service line materials over the course of a planned 75-year service term.

Table 1a

Life Cycle Cost: Constant Dollars (Present Value)

	Copper			HDPE			PEX		
Year	Install	Material	Total	Install	Material	Total	Install	Material	Total
0	$5,000	$286	$5,286	$5,000	$33	$5,033	$5,000	$46	$5,046
25	$0	$0	$0	$2,388	$16	$2,404	$2,388	$22	$2,410
50	$0	$0	$0	$1,141	$7	$1,148	$1,141	$10	$1,151
75	$0	$-8	$-8	$0	$0	$0	$0	$0	$0
Life Cycle Cost (Constant Dollars)			$5,278			$8,584			$8,606

Table 1b

Total Cost of Ownership: Current Dollars Analysis

	Copper			HDPE			PEX		
Year	Install	Material	Total	Install	Material	Total	Install	Material	Total
0	$5,000	$286	$5,286	$5,000	$33	$5,033	$5,000	$46	$5,046
25	$0	$0	$0	$10,469	$68	$10,537	$10,469	$95	$10,564
50	$0	$0	$0	$21,920	$142	$22,062	$21,920	$199	$22,119
75	$0	$-642	$-642	$0	$0	$0	$0	$0	$0
Total Cost of Ownership (Current Dollars)			$4,644			$37,631			$37,729

This Analysis Uses the Common Assumption:

- Installation cost: $5,000 (estimate based on average service line cost)
- Pipe size: ¾-inch
- Service line length: 65 feet
- Pipe material costs per foot of pipe:
  - o Copper (Type K): $4.40
  - o HDPE: $0.50
  - o PEX: $0.70
- Inflation rate: 3%

The life cycle cost and total cost of ownership of the material options are compared in two ways. First, in Table 1a, inflation is neglected and all anticipated costs and returns (in the case of the scrap value of the copper at the end of life) are calculated as their present value in year zero to determine the life cycle cost. For the plastics, the material and installation costs for replacement are taken as the same amount as the initial cost - $5,000 for installation plus the material cost, and calculated back to the present value to show how much you would have to invest initially based on the 3 percent inflation rate to cover those costs in year 25 and year 50. In the same manner, the value of the copper as scrap in year 75 is taken as 80 percent of the current cost of copper ($2.10 per pound) times the weight of the copper, brought back to the present value. This is a common engineering economics method for assessing life cycle costs of various options (ref. ASTM E915).

In Table 1b, the same comparison is made but the rate of inflation is used to estimate the anticipated costs and return across the range of options, or the total cost of ownership. This total reflects the amount spent over the lifetime of the service for each material.

The Choice is Clear

Any way you look at it, the choice is clear. Copper offers a significant cost advantage over plastics over the lifetime of a service line.

Table 1 shows that **copper offers a nearly $3,300 savings per service line in constant dollars (present value), and nearly $32,000 in savings over the lifetime of the service in current dollars spent.** Even if the cost of both of the plastic materials is zero, copper still is the most cost effective. In fact, **copper would have to increase 12.5 times in cost before the plastics became equally as attractive on a life cycle cost basis.** Even at that point, copper still offers the clear cost advantage in total dollars spent over the life of the service line.

The decisions made on purchasing and installing underground water infrastructure today are borne out in service for decades in the future. Make a bad decision now and the cost to rectify it can multiply drastically when you have to dig up streets and lawns, shut off water service and disrupt customers' lives.

More Information

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

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For information about copper, contact CDA at 800-232-3282, or visit www.copper.org
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