Copper Development Association Inc.

Optimizing Lead Service Line Replacement Through Strategic Material Selection and Community Engagement

Denver Water replaces 60,000 lead pipes by 2037 sustainably

Problem

Ensuring safe drinking water remains a top priority for municipalities and water utilities across the country. With the new Lead and Copper Rule Improvements (LCRI), utilities now face stricter regulations and an urgent mandate to fully replace all lead service lines. This rule represents a significant shift from previous approaches, requiring a system-wide replacement rather than relying solely on corrosion control measures. As a result, utilities must navigate logistical, financial, and operational challenges to meet compliance deadlines.

Denver Water, Colorado's oldest and largest water utility, serves approximately a quarter of the state's population, providing water to around 320,000 taps. The utility relies primarily on mountain snowmelt for its supply, with an estimated 20–28% of its service lines made of lead. Lead was commonly used in service lines until the early 1950s, and although its use was banned in 1972, the responsibility for the service lines from the main tap to the first fitting remains with the customer.

Denver Water faced a critical challenge: replacing an estimated 60,000 lead service lines (LSLs) to comply with federal regulations under the updated LCRI, with a full replacement deadline set for 2037. This effort was driven by the need to protect public health, ensure regulatory compliance, and improve drinking water safety.

The scale of this project demanded a comprehensive approach, requiring careful planning, strong leadership, and effective community engagement. Denver Water also needed to address cost considerations, environmental impacts, and system compatibility to meet the EPA mandate and achieve long-term success.

Solution

Denver Water's decision to use copper exclusively for LSL replacements was rooted in decades of proven performance. Since 1978, copper has been the specified material for service lines of two inches or smaller in Denver Water's system. This long history provided confidence in the material's durability, compatibility with water chemistry, and market availability.

Katie Ross, an engineering manager at Denver Water, highlighted several factors behind this choice to maintain copper as the standard material for Denver's residences for over 45 years:

1. Known entity: Copper has a well-documented life cycle and performance history. Its use in Denver Water's system dates back to 1959, providing crews and contractors with extensive experience handling and installing it. The engineering standards governing Denver Water's materials and processes were developed around copper's unique properties, making it the clear choice for this large-scale project.

2. No need for testing: Because of its established reliability and compatibility, there was no requirement for extensive testing or evaluation of alternative materials. This streamlined the decision-making process and allowed Denver Water to focus on program execution rather than material experimentation. Ross explains: "We know copper works. It's been part of our system for over 50 years, and our crews know how to install and maintain it effectively."

3. Supply chain reliability: The broad availability of U.S.-made copper ensured the program could meet its commitments without material shortages or delays. Ross notes that copper's non-proprietary nature was a significant advantage. "It's not tied to a single manufacturer," she says. "This gives us flexibility and stability in sourcing the materials we need." By selecting a widely used material, Denver Water mitigated the risk of supply chain disruptions and ensured consistent progress.

4. Simplicity in standards: Denver Water's engineering standards prioritize materials that align with both current practices and future workforce training. The organization deliberately avoided the complexity of transitioning to unfamiliar materials, which would have required additional training for contractors and staff and adjustments to plumbing codes and inspection processes. Ross emphasizes: "With copper, we're not reinventing the wheel. It's a material that everyone in the industry is familiar with, from our contractors to the homeowners who see it at their local hardware stores."

5. Water chemistry compatibility: Denver Water's Lead Reduction Program (LRP) requires strict pH level controls to prevent lead from leaching into drinking water. Copper's compatibility with existing water chemistry was another decisive factor. Alternative materials might have introduced unknown variables, potentially complicating Denver Water's efforts to maintain water quality. "We didn't want to introduce anything that could compromise the progress we've made in water treatment and corrosion control," Ross adds.

Execution

Denver Water launched the LRP with a focus on efficiency and community collaboration. To achieve its goals, the organization relied on a network of trained contractors who adhered to Denver Water's strict engineering standards. Inspectors worked closely with contractors to ensure quality control, while public affairs teams engaged with communities to build trust and encourage participation.

Key elements of the execution strategy included:

- Contractor training: Denver Water partnered with contractors across its 18-city service area to perform LSL replacements. Contractors received specialized training to ensure they met the program's high standards. Denver Water also coordinated with local plumbing departments to maintain continuity between service line installations and building infrastructure.

- Customer outreach: Public communication was critical to the program's success. Denver Water provided residents with detailed information about the replacement process, emphasizing the benefits of copper pipes and addressing any concerns about disruptions or costs. This transparency helped foster community support.

- Inspection and quality assurance: Denver Water implemented a rigorous inspection process to ensure the integrity of every installation. Field inspectors monitored the work to verify that materials and methods met established standards. At the same time, the cathodic protection team provided expertise to address corrosion risks in challenging locations, such as near light rail lines or other infrastructure. Ross notes: "If something is next to a light rail line or similar infrastructure, we have additional in-house engineers who can recommend extra safeguards with different installation techniques for copper, though the material remains consistent."

- Resource management: By leveraging copper's availability and non-proprietary status, Denver Water avoided the delays and cost increases that can arise from supply chain issues. This proactive approach ensured that the program remained on schedule and within budget.

While Denver Water's Lead Reduction Program (LRP) has seen significant progress, it has also faced challenges, including property access, customer consent, and coordination with multiple jurisdictions.

Maintaining a consistent workforce of trained contractors and inspectors has been critical to achieving program milestones. Denver Water's experience highlights key lessons for other utilities: plan for the long term by selecting durable, reliable materials; build trust through clear communication and transparency; ensure supply chain resilience by using non-proprietary joining methods and widely available US-manufactured materials; and invest in training to maintain quality and consistency throughout the program.

Results

As of the publication of this case study, Denver Water has successfully replaced approximately 30,000 lead service lines—50% of the total—with copper tube, demonstrating their commitment to maintaining high standards and prioritizing public health. This achievement underscores the importance of selecting materials that align with long-term goals and operational expertise.

Denver Water's decision to rely on copper exemplifies how utilities can successfully address public health challenges while leveraging materials with a long history of reliability. Copper's established history eliminated the risks associated with newer, less-tested alternatives, while its broad availability ensured supply chain stability. Its compatibility with existing standards and water chemistry further simplified implementation. By prioritizing these factors, Denver Water has made significant strides in safeguarding its water system and protecting public health.

The program's emphasis on consistency, transparency, and quality control has positioned it as a model for other organizations facing similar challenges. Transparent communication and consistent results have bolstered public confidence in the program. Residents value the use of a familiar material like copper, which is widely recognized for its reliability and safety.

By choosing copper, Denver Water has ensured that this lead replacement initiative will not need to be repeated. As Ross explains: "This is a one-time effort. None of us want to go through this more than once. By choosing copper, we're ensuring that Denver Water's infrastructure will stand the test of time, providing safe and reliable water for generations to come."