

The Issue

Treated drinking water leaving a water treatment plant rarely contains appreciable concentrations of metals such as lead or copper. Water chemistry, however, can contribute to the corrosion of distribution system and household plumbing materials, causing the release of iron, lead, copper, and manganese into drinking water as it travels to the customer's tap.

The corrosion of pipe materials can impact the microbiological quality of water and can cause a variety of aesthetic issues, such as taste, odor, and discoloration. Of particular concern, lead release poses a serious health hazard for infants and children

as it is known to have long-lasting impacts on cognitive development. Corrosion can also impact distribution system operations; for example, tuberculation can increase headloss and decrease hydraulic capacity of water mains and service lines.

Many municipalities have implemented strategies to manage corrosion in their distribution system. This is usually in response to multiple objectives, including achieving compliance with regulations, the protection of public health, maintaining an acceptable level of service for customers, and protecting the investment made in the infrastructure. Changes in water quality brought about by water

source changes or treatment process modifications at the water treatment plant usually require an evaluation to identify and manage potential impacts on corrosion in the distribution system.

Further, the recent Lead and Copper Rule Revisions have new corrosion control treatment (CCT) requirements for all public water systems in the United States. These requirements include optimization or re-optimization of CCT with review of pH/alkalinity adjustment and/or corrosion control inhibitors (orthophosphate or silica). Additional CCT related requirements include pipe-loop studies for water systems with lead service lines.



Harvested lead service line



Pipe loop testing rig

Jacobs has a long history of helping municipalities manage corrosion in their distribution systems. Our experience precedes the Lead and Copper Rule in the United States and the Federal guidance and Provincial regulations for corrosion control in Canada.

Our team has partnered with municipalities, utilities, and public health agencies to earn regulatory approval for various treatment-based and non-treatment-based corrosion control strategies. We have been instrumental in helping several large cities assess their risk for corrosion, select a preferred control approach, conduct pilot testing, develop monitoring plans, plan public outreach, and implement their corrosion control strategy – and as a result introduced corrosion control protection to more than 8.2 million people in the United States and Canada. In several cases, we have provided follow-on support for corrosion control performance optimization and for achieving compliance with corrosion regulations as they evolve.

Jacobs has advised governments in support of regulatory development related to corrosion control in the United States and Canada, AWWA committees and divisions, and have been contributors and technical editors for corrosion control guidance documents, including AWWA's *M58 Internal Corrosion Control in Water Distribution Systems*.

Services Offered

Our team provides complete corrosion control solutions—from water quality assessments and corrosion control planning to full-scale implementation and water quality performance monitoring. Supported by our technical expertise and understanding of regulatory requirements in different jurisdictions, we develop tailored corrosion control solutions that meet the specific needs of the water system.

Assessing the Risk for Corrosion

Whether brought about by elevated lead measured in tap water or by a water treatment process change, corrosion assessments begin with a review of water quality at the point of entry, within the distribution system, and at the point of consumption. These desktop evaluations of water chemistry—that are often supported by corrosion control modelling, pipe scale analysis, lead source reviews, and lead profile sampling—are used to assess the potential for corrosion, the sources of metals release, and the need for corrosion control.

Developing a Corrosion Control Strategy

Once the need for corrosion control has been confirmed, the unique circumstances of the drinking water system are reviewed to identify and evaluate appropriate corrosion control alternatives. These may be treatment-based, such as pH and alkalinity adjustment or the use of a phosphate-based corrosion inhibitor, and non-treatment-based, such as lead service line replacement. A comprehensive corrosion control strategy can then be developed around the preferred corrosion control alternative—and typically includes planning for implementation, public outreach, and post-implementation monitoring.

Demonstration Studies

In many cases, a pilot or demonstration study is required to assess the potential performance benefits and confirm design parameters for a treatment-based corrosion control approach. Jacobs has designed and carried out corrosion studies for over 100 water systems. We can provide guidance on lead service line harvesting, assist with experimental design, construct and operate the pipe loop, and analyze and interpret the data.

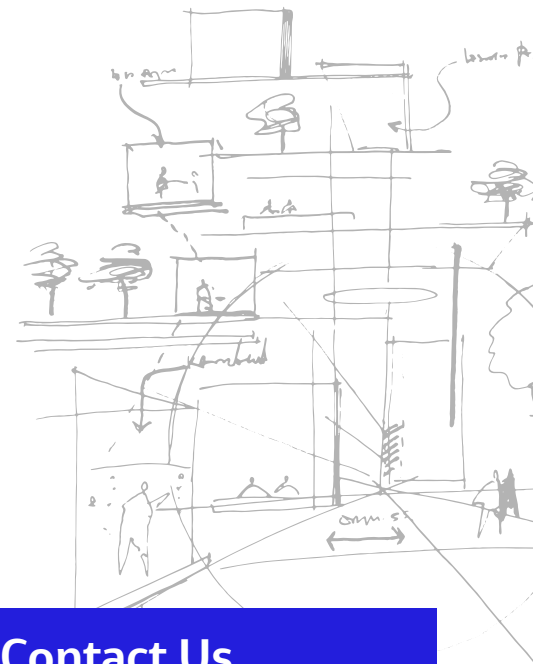
Implementation Support

Jacobs has designed and constructed chemical systems for corrosion control at a number of facilities across North America. Beyond design, construction, and commissioning, we have supported several municipalities with the implementation of their corrosion control strategy through public outreach and communications, regulatory negotiations and approvals, flushing and operating strategies to ready the distribution system for corrosion control start-up, bench-scale testing for chemical dosing optimization to manage secondary impacts from the introduction of corrosion control treatment, and lead source reduction strategies.

Post-Implementation Monitoring

We provide complete distribution system water quality monitoring solutions, including the development of monitoring plans and the design and implementation of smart water systems that provide real-time water quality assessments. These surveillance and response systems allow for performance optimization and the identification and mitigation of secondary corrosion control impacts in the distribution system.

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