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To protect public health, many proactive water utilities are committed to removing their lead service lines. The Lansing (Mich.) Board of Water and Light takes a trenchless approach to lead service line replacement.

BY RANDALL ROOST

GET THE LEAD OUT!

Editor's Note: *In March 2016, AWWA announced its support for replacing all lead service lines over time, stirring an ongoing discussion about how to accomplish the task. One thing is clear: Effective lead service line replacement is exceptionally complex, requiring a collaborative community-based approach as well as significant financial resources and time. To help shed light on successful lead service line management, this profile of the Lansing (Mich.) Board of Water and Light is the first of a three-part series of* Opflow *articles featuring proactive utilities and their best practices for replacing lead service lines. Look for profiles of Halifax Water (Canada) and Greater Cincinnati (Ohio) Water Works in the August and September issues, respectively. Also, be sure to sign up for AWWA's webinar* Distribution System Management: Lead Service Line Replacement—Learning From Proactive Utility Initiatives, *which will be held Oct. 26, 2016. For more information, visit www.awwa.org/lead.*

THE LANSING (MICH.) BOARD OF WATER and Light (LBWL) has been replacing its lead service lines for many years. In 2004, the utility began an accelerated program to replace all of its lead services within 10 years. Because of delays associated with other construction projects, the deadline has been extended to June 2017. As of May 2016, the system has fewer than 400 of the nearly 17,000 active lead service lines identified in 1990.

Most lead service lines are partially owned by the local water utility and partially owned by the property owner, so replacing them isn't always simple. LBWL is somewhat unique in that it owns the entire service to a customer, all the way from the main to the meter inside the house. This means LBWL is responsible for the entire length of service line, and the customer bears no fiscal responsibility for replacing the portion on private property.

PHOTOGRAPHS: LANSING BOARD OF WATER AND LIGHT

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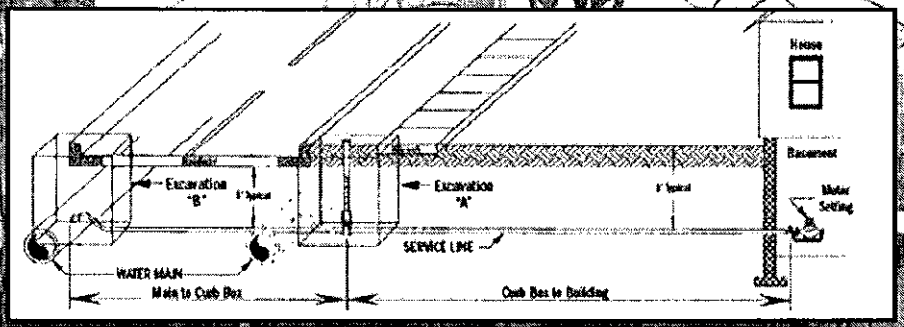


LBWL's lead service line replacement process usually requires two different excavations. Long-side services generally require an excavation at the curb stop (Excavation A) and a second excavation (Excavation B) above the water main.

FIRST STEPS

Based on LBWL service rules and regulations, the utility has the right to enter a customer's premises to repair or replace a service line. LBWL once used traditional trenching techniques for service replacement. As the years have passed, however, the utility has standardized its replacement process, minimizing excavation by pulling out the old service line and pulling in a new copper service line in the space previously occupied by the old lead line.

LBWL performs a service line replacement with the expectation the existing service line will be removed. A cone-shaped tool, sometimes called a "pulling block," locks onto the trailing end of the service pipe. The cone and the pipe are pulled from the ground by a cable that passes through the pipe and attaches to the cone. The replacement pipe is simultaneously pulled in behind the cone. However, service section lengths greater than 60 ft generally can't be replaced by this method. The method also can't be used if the service pipe is

- Looped
- So clogged the cable can't pass through
- Encased in concrete (excluding basement wall)
- Interfered with by existing utilities, preventing a straight line pull
- Buried in extremely hard, dry ground

A lot of work must be done before replacing a lead service pipe. For example, scheduling the replacement with the customer can take time. Also, LBWL coordinates the project with a locate service to identify other utility services in the excavation areas.

The process begins by shutting off the water at the curb stop to prevent any water in the system from entering the customer's premises. This step helps to prevent transfer of any lead particulates into the service or the customer's household piping during excavation at the main.

Once the curb stop has been closed, the work is delegated to two different workgroups. The first group enters the premises and disconnects the service from the meter assembly while the second group begins excavation at the main to expose the corporation fitting.

Excavation can be accomplished with either a backhoe or a vacuum excavator. The advantage of the excavator is that it can minimize potential risk to other utility lines, which may be difficult to locate or may have been marked incorrectly.

The process usually requires two different excavations. Long-side services generally require an excavation at the curb stop (Excavation A) and a second excavation (Excavation B) above the water main. Excavating at "A" unearths the curb stop and exposes the curb stop and a minimum of 2 ft of service line in each direction. Often, if the water main is located near the curb stop, the excavated area is enlarged to include the main tap as well.

It's important to identify the material type of the existing service sections. If either service line section (main to curb box or curb box to building) is made of a nonstandard material or construction, it's replaced. Excavation control is required to keep any water or other materials from entering the main tap or the newly installed copper service lead. And of course, it's crucial to follow all trenching or excavation safety precautions.

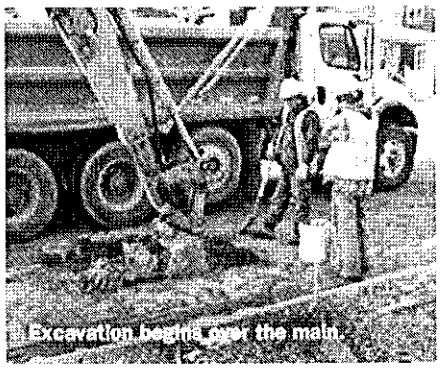
The corporation is shut off once it's exposed, and the old lead service line is cut and removed. To minimize any exposure to lead particles, LBWL field crews typically use a set of tree pruning loppers rather than a saw to cut the lead pipe. The crew then covers the exposed corporation to prevent any dirt or other foreign matter from entering the valve.

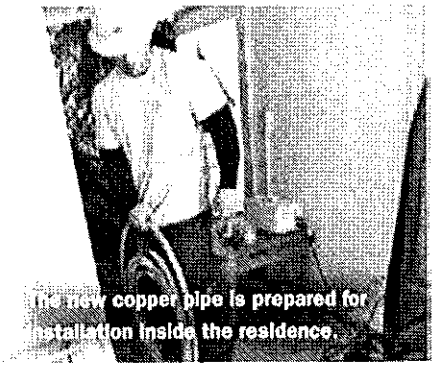
MEANWHILE INSIDE ...

As the excavation continues outside, the workgroup inside the residence begins disconnecting the lead service line and preparing the new copper line for installation. While it has property access, the group also replaces the water meter. A small battery-powered chisel is used to chip out the basement or foundation wall around the existing service line to loosen the contact and help the new copper line pull in smoothly.

The new copper line is rolled out to get ready it for installation. An important step in getting the new line ready for installation is to seal the new service line before it's pulled. Hence, the end of the copper pipe is covered with electrical tape. A pulling sock is then placed over the end of the copper pipe. Within the pulling sock is a small rubber ball that's pressed against the taped end


The project site is marked and ready for excavation.


Excavation begins over the main.


The new copper pipe is prepared for installation inside the residence.

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A standard lead service line replacement can be accomplished in 3–4 hours and at a much lower cost than traditional trenched methods.

of the pipe to further prevent any potential particulate from entering the new line during installation.

BACK OUTSIDE ...

Once the corporation is exposed, the excavation moves to the curb stop, which is removed by cutting the lead line on both sides of the curb stop. A small fiberglass line is fished through the lead line from the curb stop to the inside, and a $^3/_8$-in. steel cable is attached to the fishline and pulled back through the service line.

The copper pipe is then connected to the pulling harness, and the harness connected to the steel cable. Using a backhoe, the lead service line is pulled out of the ground from the basement to the curb stop.

Once the copper pipe is visible in the curb stop excavation, the process stops to remove the cable from the backhoe. The cable is then re-threaded through the portion of the lead service line between the curb stop and the corporation, and the backhoe pulls the copper line through to the corporation excavation. From there, the new copper service line is attached to the corporation, the copper line is cut in the curb stop excavation, and a new curb stop is installed.

To complete the installation, the work group first opens the corporation with the curb stop closed to check for leaks between the main and the curb stop. If any are found, necessary repairs are made before the line is repressurized to ensure the system is tight. The curb stop is opened, with the valve on the inlet side of the meter closed, to permit checking whether there are leaks in the system between the curb stop and the meter. Again, repairs are made as needed.

When the system has passed the leak test, the new service is flushed for 5–7 minutes to eliminate any foreign matter that may have been in the line. Next, local codes require a local plumber to reconnect the line after the meter to the customer's household plumbing.

As for the outside excavation, it's filled at the curb stop, and a field crew is sent back a few days later after the area has settled to do a final grade with topsoil and seed. The street excavation is filled to just below grade with sand, and then a few inches of gravel are added with some road fill until the city can make a proper pavement repair.

A FINAL FLUSH

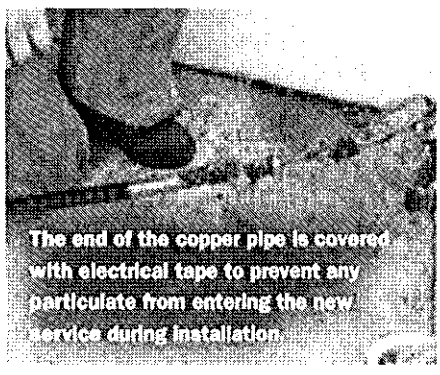
Once the household plumbing is reconnected, LBWL advises the customer to flush the entire household system as follows:

1. Remove faucet aerators from all cold water taps in the home.
2. Beginning at the faucet nearest to the meter, fully open the cold water tap, flush for 5 minutes, and shut off before moving to the next faucet.
3. Repeat this procedure at the remaining faucets throughout the home from the lowest level to the last faucet on the top floor. It's important to run water in bathtubs and showers as well as sink faucets.
4. Until flushing is complete, customers shouldn't consume tap water, open hot water faucets, or use an icemaker or filtered water dispenser.
5. Clean the inside of the aerators before reinstalling them on the faucet.

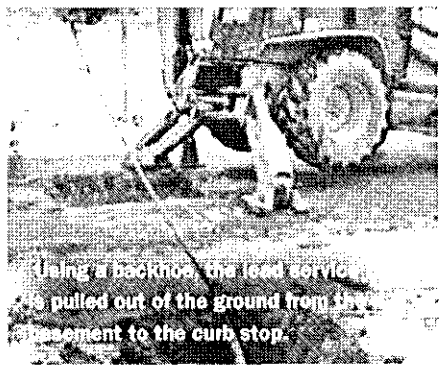
These flushing instructions are an additional method to ensure lead is removed from a home's water supply. As a final precaution, LBWL also offers its customers a free home filter to use for three months at faucets used for tapping drinking and cooking water, particularly if sensitive individuals are residents, such as pregnant women or children under age six.

In total, a standard lead service line replacement can be accomplished in 3–4 hours and at a much lower cost than traditional trenched methods. Since 2004, LBWL has replaced nearly 13,500 lead services at a total cost of $42 million dollars, or about $3,100 per service. The utility also has coordinated with the city of Lansing on a sewer separation project by replacing lead service lines in those areas in conjunction with the rest of the work to eliminate pavement restoration costs.

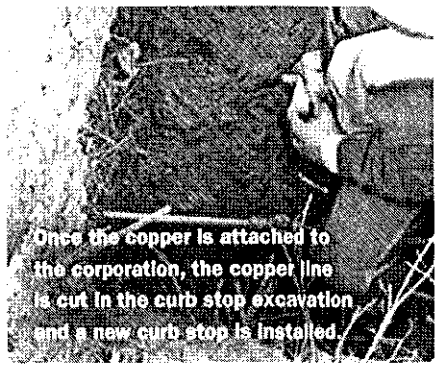
Although the method described here works in most circumstances, there are always exceptions when a service replacement doesn't go as planned. In these instances, having highly trained workers who can remediate any issues that arise is important to program success. LBWL has hosted many representatives from utilities across the country to demonstrate its process, and the communities represented are benefiting from successful replacement projects.



The end of the copper pipe is covered with electrical tape to prevent any particulate from entering the new service during installation.



Using a backhoe, the lead service is pulled out of the ground from the basement to the curb stop.



Once the copper is attached to the corporation, the copper line is cut in the curb stop excavation and a new curb stop is installed.

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