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Water Main Replacement Work
A Field Example

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Note: Construction practices can vary significantly, and some techniques used in this example may or may not be used by other companies.

A trench is dug along the curb for the new water main.
After digging the trench the new water main is lowered in place.

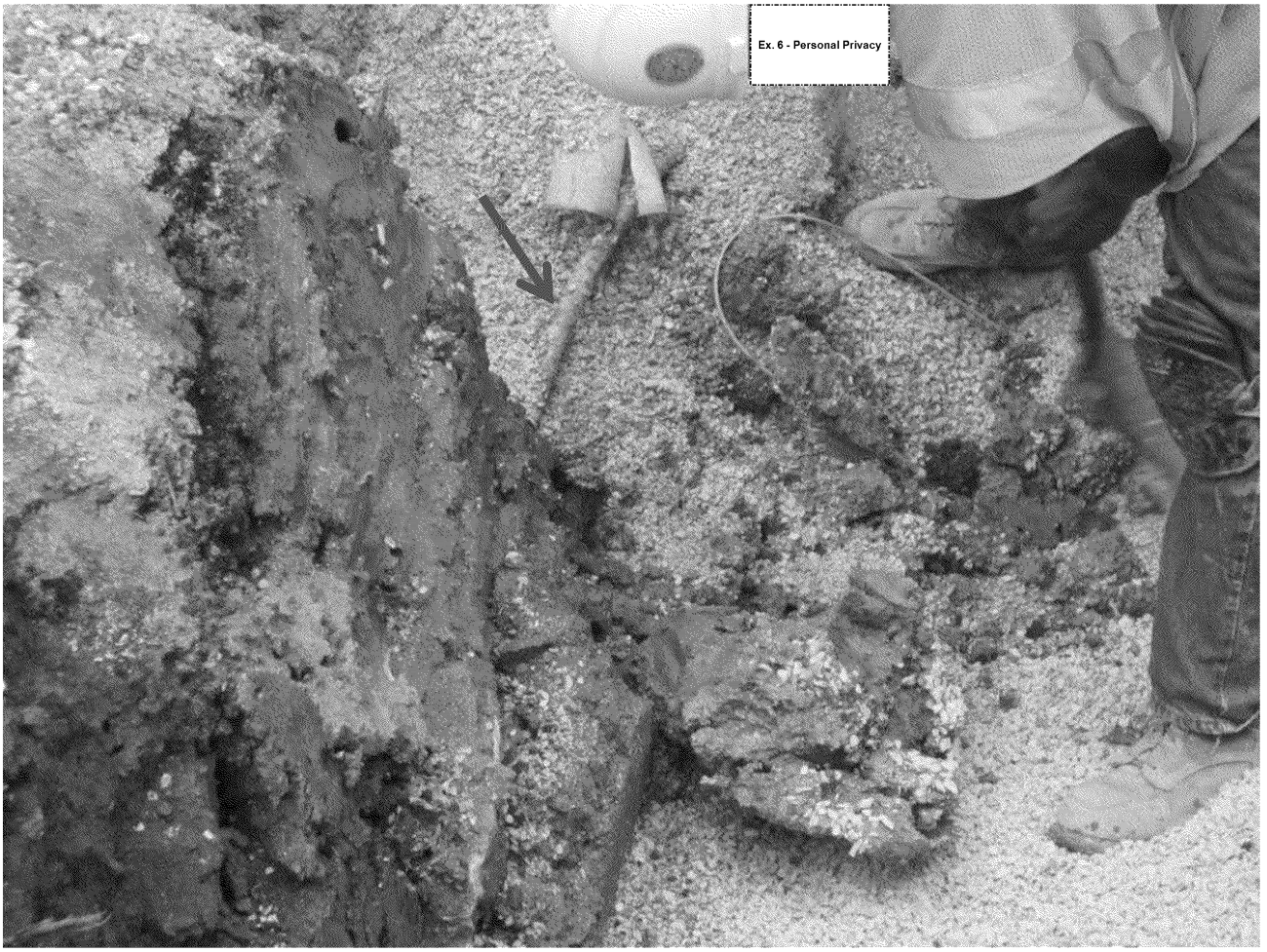
Once the new main is placed, it is connected (being done here) and the trench is buried with gravel temporarily.

After they have installed the new main along the entire block, the water in the new main is shock-chlorinated (using concentrated chlorine). Once the bacteriological tests come back clean, they start excavating again to disconnect the lead service lines from the existing main and connecting them to the new main. The old main is next to the new one so they have to break up more street to get to service connections on the opposite side of the old water main which connect across the street.

Once they dig out the gravel and uncover the new main again, they install a tap fitting using this machine, which drills a threaded hole into the new main, and then a threaded fitting (next pic) is installed using the same machine.

This is what the new fittings (main taps) look like.

They then excavate around the existing lead service line (shown by red arrow) using a shovel.



Next, because they can’t get to the service shut-off valve on the old water main, two 2-lb hammers are used to pound the existing lead service line shut. Some utilities excavate to the old main and shut the water off by turning the shut-off valve.

Once the lead pipe has been collapsed shut, they have to cut the lead pipe to be able to attach it to the new water main (nextpic)

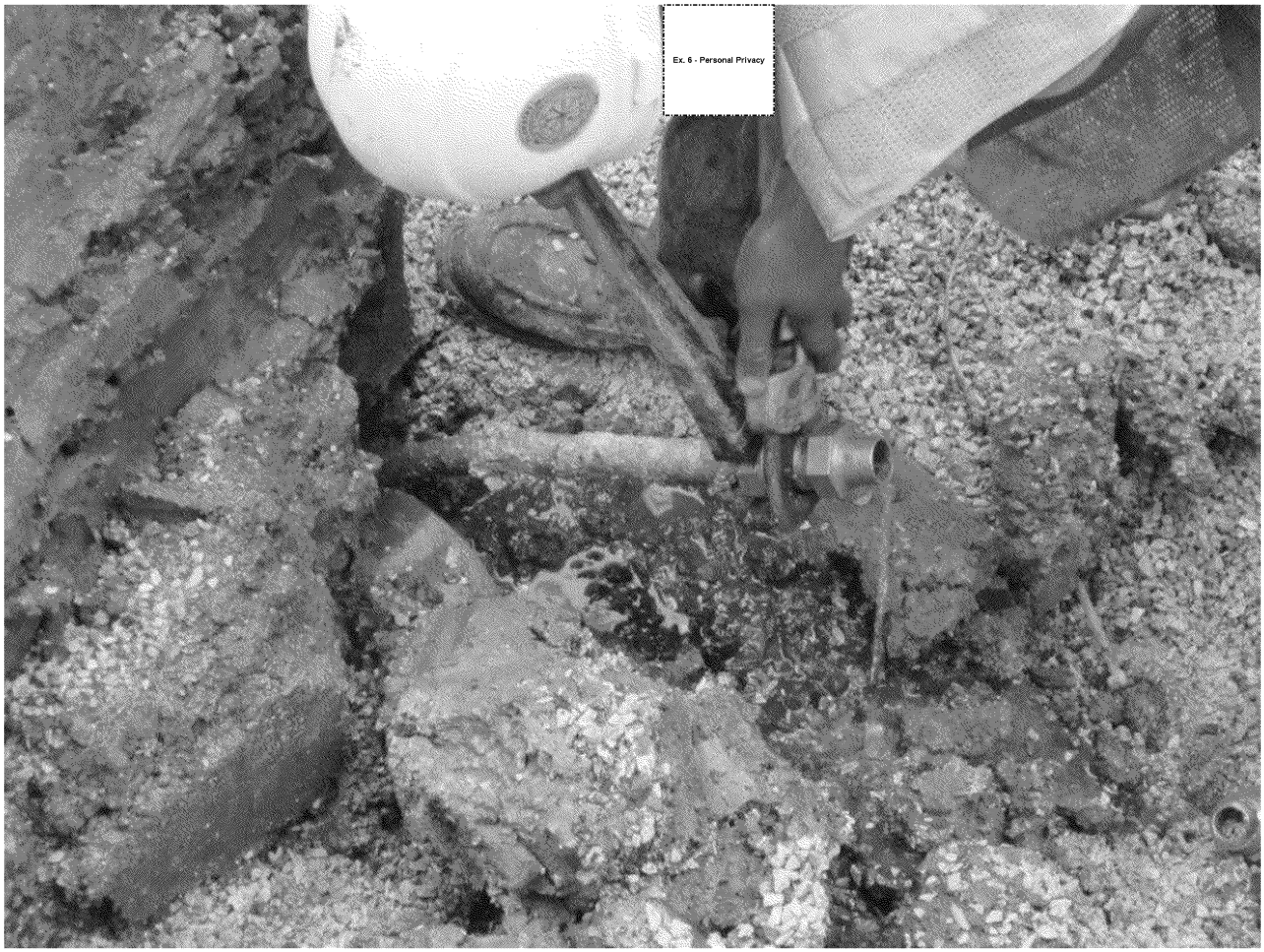
The lead service line is cut with snips. They cut partially, rotate it, cut more, rotate, etc., until they cut through it.

In this case the lead pipe was not completely collapsed, so water sprays from the pipe which is still connected to the old water main.

The lead pipe is pounded more to stop the water flow. Since the part of the lead pipe being pounded is connected to the old main, it is just pounded shut and left in place.

This is the remaining portion of the lead service line to the home, so they will attach this to the new main. Although the cut is clean, there is significant bending of the lead pipe to bring the edge out and also when connecting to the copper pipe. Lead is more flexible than copper, so they typically bend the lead pipe to make the connection.

This is a bronze compression fitting being put on the LSL end.



Segments of copper pipe are cut, and a coupling is slipped over the end of the pipe. A metal flaring tool is inserted to flare the end of the copper tube (next pic) so it does not slip out of the coupling.

This is what the flared end of the copper tube looks like.

The copper pipe is ready to connect. The flaring tool is shown above. The other end of the copper tube will be flared in the trench.

The valve on the new main is opened slightly to allow the water to run to clear any debris.

A thread sealer is applied while the water runs.

The copper pipe is too long to make the connection to the lead pipe and must be cut.

The copper pipe is cut using a rotary cutter.

The final cut copper pipe.

The bronze connector is slid onto the copper pipe and the end of the copper pipe is flared.

The lead and copper pipe are connected. In this case a dielectric fitting was not used, potentially increasing the risk of galvanic corrosion of the lead pipe.

Once the pipes are joined, the valve is opened to check for leaks.

The new connection to the main was not sufficiently tightened, so water sprays out once the valve is opened.

Tightening the connection stops the leak.

Once all is tightened and there are no leaks, the work here is done.

View of final connection from the sidewalk level

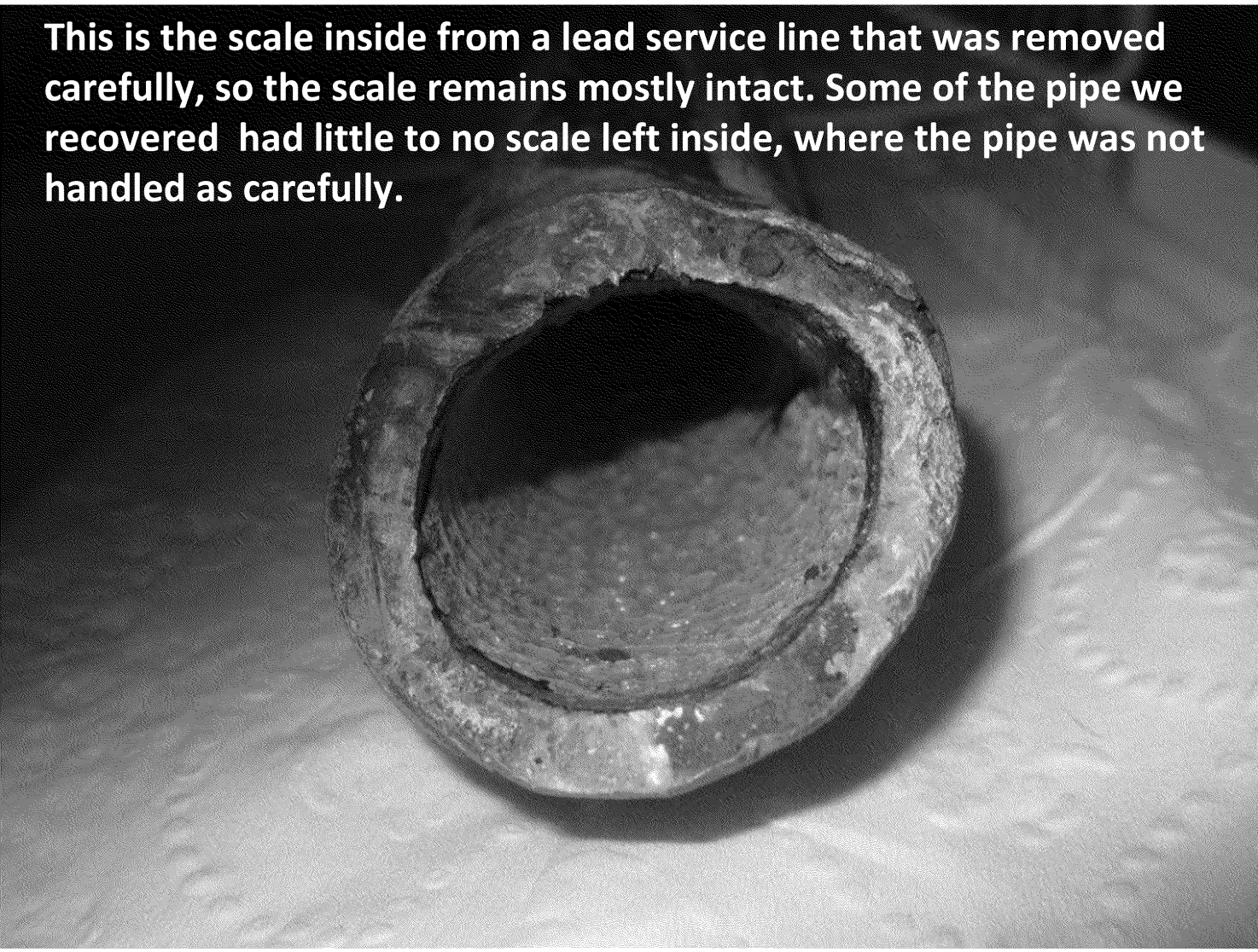
Once the connection is made and there are no leaks, the trench is filled with gravel

The previous pictures were a connection to the near side home. This copper connection is longer, going across the trench since the home is on the other side of the street.

The excavation work in the street caused a leak in the existing lead service line, so a lateral trench was dug along the lead line to reach the leak. An additional length of the lead line was removed and replaced with copper pipe and a new shut-off valve was installed.

In this picture the lead line was replaced with copper pipe from the main to the edge of the sidewalk at the right.

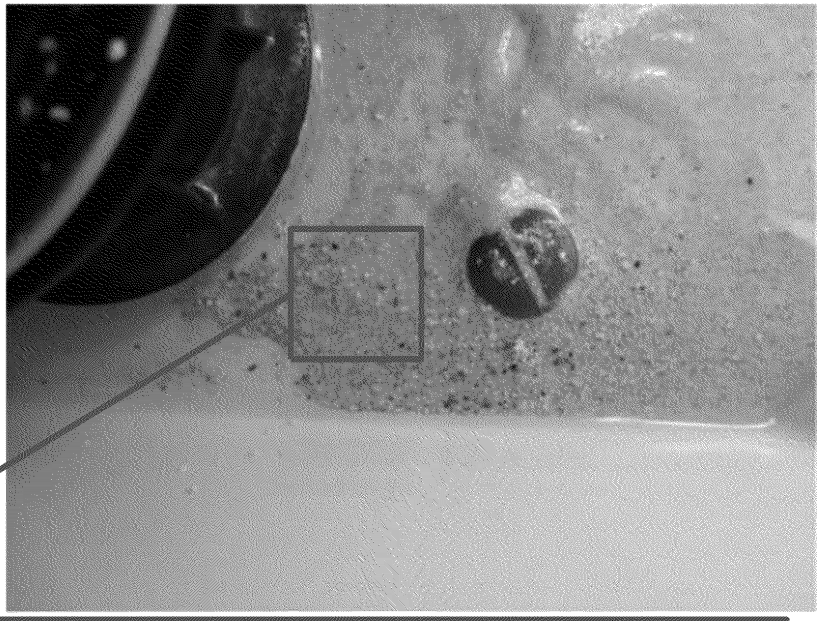
This is the same location as the last slide. Another (shorter) segment of copper pipe is connected to the lead line serving the home across the street.

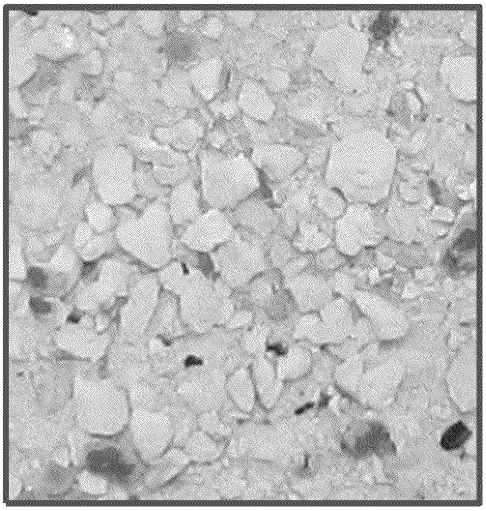

This is the scale inside from a lead service line that was removed carefully, so the scale remains mostly intact. Some of the pipe we recovered had little to no scale left inside, where the pipe was not handled as carefully.

This section of lead pipe which was extracted has only residual scale left inside.

The scale and sediment released following the physical disturbance and partial replacement of a lead service line was collected and the lead levels in the scale and sediment were measured.

The scale and sediment contained extremely high lead concentrations.





Sediment/Scale → Primarily Aluminum, Phosphorous & Calcium

- 330,000 ug/L Pb in particulate sample
- 125,000 ug/L Pb in suspended sample