North American Society for Trenchless Technology (NASTT)

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EXTRACT from Paper MA-T1-02 ***"Using In-Pipe Condition Assessment to Optimize Small Water Main Renewal",*** by Dan Ellison, HDR, Ventura, California; Jonathan Leung, Los Angeles Department of Water and Power, Los Angeles, California; Sam Ariaratnam, Arizona State University, Tempe, Arizona; Andy Romer, AECOM, Orange, California; and Roy Brander, City of Calgary.

BACKGROUND: In May 2013 the Los Angeles Department of Water and Power (LADWP) conducted a series of side-by-side tests of a number of non-destructive evaluation (NDE) technologies as part of a research project of the Water Research Foundation. Because keyhole excavation techniques were needed for some of these tests, a field demonstration of these techniques was conducted during the tests. This extract is a Report of that demonstration that used keyhole techniques to attach an anode to a steel pipe for cathodic protection.

Keyhole Excavation and Anode Attachment Demonstration by Utilicor

Utilicor is not an NDE company, but offered services to this project at no cost, at the request of Rock Solid. Utilicor has developed a technique, equipment, and materials that enable a small excavation to be made in pavement, then quickly restored after work within the excavation is completed. The method has existed for two decades and is described in the captioned pictures below. Common applications include "potholing" for determining the depth, location and size of buried utilities, anode attachment, pipe joint bonding, and similar construction and maintenance operations where long-handled ("keyhole") tools can be used.

According to Utilicor, this coring and pavement restoration method has been used on more than 100,000 excavations without a single pavement failure. Research reports by the University of Illinois and various third-parties show the strength of the paving is fully restored within a few hours with no long-term detriments.
Rock Solid advocated that the use of the Utilicor method would be a critical component of their "KIS" demonstration. They wanted to show that NDE could be accomplished using small, cored, easily restored excavations. Rock Solid's keyhole NDE method, described later in this report, scans the pipe from the outside using a device that can be lowered into a small, vacuum-excavated hole.

As part of an agreement to utilize this method for three of the excavations along Valleyheart Steet, a fourth excavation was performed, wherein the attachment of a cathodic protection anode was demonstrated for the benefit of LADWP staff. The work was accomplished using long-handled tools that are commerically available. For this demonstation, an 18-inch diameter hole was cored in the pavement, then vaccum excavation was used to create the depth of hole needed to attach and bury the anode. This is the activity illustrated in the pictures below.
Although the anode attachment was not part of the original plan, the demonstration shows a rehabilitation technique that utilities can employ to extend the life of old mains, after performing NDE. As described earlier, Calgary, has employed a combination of NDE scanning and anode attachment for many years. Using this combination, Calgary has cut in half its leak repairs, saving millions of dollars, while paying for the NDE inspections. On the following pages are annoted pictures of the keyhole anode attachment demonstration.

Several organizations donated time, materials and equipment to this keyhole demonstration, which took place on May 14, 2013. Utilicor provided the services of Andrew Pollock and Colin Donahue and furnished the pavement bonding agent and pea gravel. Behind the scenes, President/CEO Marshall Pollock arranged the demonstration, engaging the services of others (below). Andrew and Colin travelled from Toronto for the demonstration. Dennis Jarnecke of the Gas Technology Institute (GTI) performed the anode attachment. GTI contributed the weld-related materials, and furnished the long-handled tools (some of which were donated to LADWP). Dennis travelled from GTI offices in Illinois, where he also helped with proof-of-concept testing of Rock Solid's KIS tool within an 18-inch diameter hole. Southwest Gas Company provided the truck-mounted coring rig and technician, from Victorville. Badger Daylighting furnished vacuum-excavation services and two technicians, from Downey. LADWP provided additional equipment and field support, including an air compressor and construction staff.

Traffic control by LADWP. The hole location was pre-marked and cleared for excavation.

The coring rig positioned over excavation location.

The core was lifted from the hole by two persons, using a special tool that grips the center pilot hole.

Vacuum excavaton was then performed using a high-volume unit equipped and water jets lances.

This shows the completed excavation. The hole extended several feet below the main to allow proper burial depth for the anode.

An LADWP-supplied anode was then placed in the hole.

A long-handled, air-powered grinder with plastic abrasion disk was used to prepare the pipe surface for wire bonding.

Another long-handled tool was used for exothermically welding the anode to the pipe. (In this case, the attachment was to a steel pipe. A brazing method is needed for attachment to a cast-iron main.)

A corrosion protection patch was placed over the weld using another long

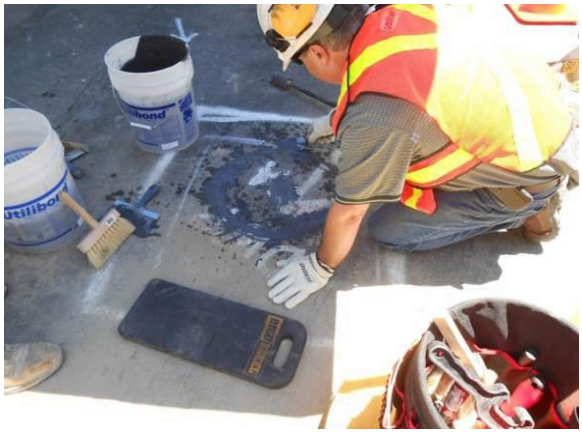
This shows the complete anode installation before backfilling.

The excavations can be plated without a backhoe or other equipment. The plate has an underside ring that extends into the hole, preventing it from sliding. Plates are available that lock in place.

After backfilling using conventional methods, a layer of pea gravel was placed for leveling. This was followed by a dry-fit test to verify that the excavated core would be level with the adjacent pavement.

A grout-like bonding agent (Utilibond) was pored into the hole. The extracted core, shown on the right side of this photo, is ready for placement.

The core is placed into the hole, then wiggled back and forth, forcing the bonding agent up the sides and center of the donut-shaped core. Marks spray-painted before coring assured proper alignment of the core with the rest of the pavement.



Standard cement mason tools and techiques were used to finish the surface.

The restored hole was ready for traffic in less than one hour. (In lower temperatures more time is required.) This picture was taken the next day.