

## Keyhole Coring & Reinstatement Standard Established in Toronto

In November 2007, after more than 15 years of monitoring and testing the keyhole coring and reinstatement process, the City of Toronto established the first comprehensive, keyhole excavation and reinstatement standard in North America.

The Construction Specification for Keyhole Excavation and Permanent Reinstatement of Keyhole Core is applicable to all keyhole excavations in which a circular hole is cored through the roadway pavement or sidewalks using coring equipment.

In 1996, a pilot program involving hundreds of reinstated cores was conducted, first in composite roads (asphalt over concrete base) and then in full-depth asphalt roads. Integral to this “proof-of-process” was a field experiment, jointly conducted in Toronto by the National Research Council of Canada and the U.S. Army Corps of Engineers in 2000-2001 that compared the keyhole process with conventional utility-cut excavation and repair methods.

“The results were compelling,” says John McGivery, a 40-year veteran of Enbridge Gas who now serves as a company consultant. “Demonstrations showed the keyhole method to be far superior to conventional utility-cut restoration methods.”

After more than six years of demonstration and hundreds of successful reinstatements – with no failures – the process was formally approved by the City of Toronto in 2002 as a permanent repair for composite pavements and, subsequently, for full-depth asphalt roads. In 2003, Toronto began the development



*After the bonding material has been poured into the hole, the core is reinstated and carefully adjusted to be level with the rest of the pavement*

of a performance standard by which the effectiveness of the process could be ensured, and the keyhole standard – TS 4.70 – was finally promulgated in November 2007.

The standard is far reaching and comprehensive. The maximum diameter of the core is specified to be 460 mm or 18 inches, but, with prior approval of the city, larger cores up to 610 mm or 24 inches in diameter, or overlapping cores, may also be cut. The minimum depth of asphalt or flexible pavements in which the process may be employed is fixed at 100 mm or four inches. There is no thickness limitation on other types of pavement or sidewalks.

The standard also requires minimum performance criteria of the high-strength bonding material used to bond the keyhole core or coupon back into the pavement. To be approved, it requires that the bonding material be capable of generating a waterproof bond and, within 30 minutes of application at 70°F, achieve an equivalent traffic-loadable condition that is at least two times greater than the AASHTO H-25 standard, or 30,000 pounds.

The standard prohibits the reinstatement of defective or damaged cores but allows those cores that have been

horizontally delaminated between successive layers of asphalt concrete to be reinstated with the bonding compound. The standard also specifically authorizes the reinstatement of a substitute core of matching size and composition in place of a damaged core.

In the event that the keyhole cut cannot be reinstated within 24 hours (or a temporary covering is required to restore traffic flow), the standard mandates the use of a circular steel road plate, fitted with a collar, that, when inserted into the keyhole, will prevent the hole cover from tipping, tilting, bouncing, or spinning out of the hole.

“This process had its origin in the field, not in the laboratory,” notes McGivery. “It was developed by work crews looking for a better and more productive way of performing and repairing utility cuts. Once we had the basic process down, we sought the assistance of the engineers who helped us improve the equipment and the methodology.”

The process soon became a standard practice for Enbridge and is now an integral part of the maintenance operations of more than 25 gas distribution companies and their contractors in North America.

“It’s not often that you get a chance to play a role in the development of a technology that can have a major impact beyond your own work environment,” says McGivery. “Keyhole coring and reinstatement is one of those, and I am proud to see that it has been formally recognized by the city of Toronto, where it all began almost 20 years ago.”

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