A Cost Saving Core Strategy for Reconnecting Service Laterals after Trenchless Rehabilitation
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Outline

1. Introduction: Keyhole Technology in the Gas Industry

2. Coring and Reinstatement and Municipal Approval

3. Advantages of Keyhole Coring & Reinstatement

4. AWWRF Reconnecting Service Laterals Thru Keyhole

5. Connecting Laterals using Keyhole Methods
What is Keyhole Technology

- Method of accessing or viewing underground utilities through small holes or “keyholes”
- Keyhole coring to excavate pavement and vacuum excavation to expose the utilities
Keyhole Applications

- Expose Underground Facilities and Perform Necessary...
City of Des Moines Water Department

- Uses Keyhole Technology to cathodically protect water mains
  - Core the pavement and vacuum
  - Use long-handled brazing tool to install anodes
- Result – reduction in cracked mains
Potholing for HDD – Cored Openings

- One contractor performed over 2,500 cores in 2006
- About 80% are for inspection purposes only
Cast Iron Joint Sealing -- Encapsulation
Cathodic Protection
Service Abandonment

• Steel and PE service abandonments
Valve Maintenance
Camera Inspections on Live Mains
Finished Repair – Almost Invisible
Municipalities Support Trenchless Technologies

CATT Canadian Annual Municipal Infrastructure Survey Feb. 2013
[117 Respondents from everywhere but PQ PEI and Nfld.]

- 71% say Trenchless is **Cost Effective or Very Cost Effective**
- 73% say Trenchless is **Useful or Very Useful in Environment sensitive areas**
- 67% say Trenchless is **Useful or Very Useful for deep pipelines**
- 67% say Trenchless is **Useful or Very Useful in congested urban settings**

But they continue to be reluctant to adopt NEW pavement excavation and restoration methods that can actually help extend pavement life because they believe ...
The Municipal Myth of Utility Cuts:

“There is no such thing as a Good Utility Cut Repair.”
But there is: Coring and Reinstatement
Why a Cored Keyhole?

- Smaller is better and less intrusive

Laparoscopic Surgery

- Smaller Incision
- Short Recovery Period
- Faster Healing
- Smaller Scar
- Lower Cost

and safer -- no men in the hole
Why Coring and Reinstatement?

- **Better Excavation Method**
  - No jack-hammers/Back hoes -- less disturbance
  - Environmentally friendly, reuses materials, creates no spoils and no VOCs

- **Size and Shape**
  - Less than 1/10th size of conventional restoration
  - Reduced surface scarring
  - Circular geometry with no corner cracks

- **Proven Strength -- NO Failures**
  - Reinstated core will support 50,000 lbs

- **Greater Satisfaction -- Reduced Delay**
  - Reduced pavement deterioration -- no potholes
  - Reduced traffic delay -- no additional road closing for repaving -- In and Out the same day.
  - Aesthetically pleasing – perfect surface match -- invisible

- **Reduces Pavement Restoration Cost by 87%**
Shape is Important

Rectangular format concentrates FOUR times Traffic Pressure in corners than Circular format, causing corner pressure cracks that allow water penetration.
How you Cut is Important Too.

- Conventional excavation weakens pavement well beyond the cut causing subsidence in “Zone of Influence”
- Precise coring operation minimizes Zone of Influence and reduces pavement damage

The precise coring process and vacuum excavation minimizes or eliminates any “Zone of Influence”.
• Core is removed with a core puller and set aside …

• After Vacuum Excavation, the work is performed with long-handled tools
Reinstatement of the Core

- A layer of pea gravel is used to level out the base and the Utilibond™ is mixed with water and poured into the hole...

... the core is reinserted into the hole ...

... and fitted to the level of the surface.
The Completed Repair

- Utilibond™ sets-up in 10-15 minutes
- Bond gains sufficient strength in 30 minutes to support equivalent load equal to five transit buses
- 5 times the AASHTO standard or over 50,000 pounds.
- The road can be safely reopened in 30 minutes!

... with no subsequent road closings or repaving required.
And Which Permanent Repair Do You Want?

$1200 Restoration Cost

$100 Restoration Cost
Bond Strength

- Utilibond is the ONLY bonding compound that gains full strength in 30 minutes and is stronger than the pavement.

* Construction Technology Laboratories
  An AASHTO Accredited Laboratory

Time to open road to traffic (minutes)

- Utilibond: 30
- Product A: 60
- Product B: 90

Crew cost

- Utilibond: $72.50
- Product A: $145
- Product B: $217

* assume two man crew and truck @ $145.00 per hour

Time is money!

University of Illinois
Urbana-Champaign
**Restoration of Utility Cut Study**  
**Toronto Field Experiment 2001-03**

**CONVENTIONAL TRENCH**
- Noticeable **failures** in conventional cut.
- **Joint between road and cut opened.**
- **Settlement** in trench along wheel path
- **Joint seal was lost** because of traffic.
- **Higher levels of moisture** (compared with keyhole).

**ROTARY CUT KEYHOLE**
- **No defects.**
- **Performed well** throughout life of project.
- **Core remained level** with the road.
- **The bonding material remained intact**
- **Waterproof bond.**

**REPORT:** “Keyhole construction is an effective restoration technique that should be encouraged whenever feasible.”

**US Army Corps of Engineers**

**National Research Council Canada**
Advantages for Utility or Contractor

- **Improved Appearance.**
- **Saves Money:** Reduced paving budgets.
- **Positive Community Relations:** Faster, less intrusive process. Fewer complaints from neighbors or municipalities about traffic disruption, noise, unsightly road cuts, sunken patches or weakened or failed roads.
- **Improved Logistics:** Single crew, one-stop, same-day coring and reinstatement means simplified scheduling, no temporary patching or repaving and no repeat visits. Works in cold weather – longer season.
- **Field-Proven Process:** Zero reported failures in more than 15 years and over 250,000 successful corings in tough urban climates.
Advantages for the Municipality & Public

- **Improved Appearance.** Almost invisible, matching circular core -- less than 1/10 the size of conventional road cut).

- **Improved Pavement Performance Saves Tax Dollars.** Road restored to original design specification. No sunken patches or weakened or failed roads. *No Potholes.*

- **Cleaner, Safer, Less Intrusive Worksite:** No jack-hammers or large excavation equipment -- less noise and mess and reduced disruption for neighbors. No spoil trucked through city.

- **Fewer Complaints from Public.**

- **Reduced Traffic Disruption**

- **Improved Logistics:** Restoration is immediate.
Advantages for the Environment

• **Environmentally Friendly.** No noisy and dusty pavement breaking machines. No temporary patching compounds with volatile organic compounds (VOCs) to escape into the atmosphere, and no wasteful T-section cutbacks needed.

• **Reduce, Reuse and Recycle.** No new asphalt or concrete paving materials required. No pavement spoil to be disposed of in dumps.

• **Reduced Carbon Footprint. Reduced Emissions:** Coring involves 2 pieces of mechanized equipment vs. up to 8 or 10 (two trips) for conventional method -- **One-Sixth** the amount of carbon emissions.

• **Fewer and Shorter Road Closings** Less traffic disruption, and fuel wastage and increased pollution from idling engines. **Everybody Wins !!!**
Reconnecting Service Laterals after Low-Dig
(Report of the AWWA Research Foundation 2007)

- **2007** study conducted by Boyle Engineering, Miller Pipeline, Louisiana Tech University, Los Angeles Department of Water and Power for AWWA Research.

- **Need to Replace or Rehabilitate** a million miles water pipelines over next 25 years.
- Limited space in right of way for new construction – needed to consider **Pipeline Rehabilitation.** (e.g. Folded HDPE pipe; Expanded PVC; Tight-fitting HDPE; Split & Pull, HDD, and others).

- **Common issue:** Cost and inconvenience of service lateral reconnection.
- Examined existing tools and emerging technologies that could be used for the No-Dig and Low-Dig reconnection of service laterals after mainline rehabilitation.
- Conducted **Field trials** of pipebursting methods and lateral reconnection through a keyhole.
Conventional Excavation & Repair
Keyhole Technology

Pavement Restoration Cost Savings

$250,000 per mile of main
5 Connecting the Laterals: Vacuum Excavation
Excavated Service Lateral and Old Main
Saddle and Connection to Service Lateral
Long-Handled Keyhole Tools
Connecting the Lateral Using Keyholes Tools
Final Connection
Questions & Answers

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