“A Core Strategy for Utility Cut Repairs”

2007 APWA International Public Works Congress & Exposition
San Antonio, Texas
Monday, September 10th, 2007 3:00 P.M.

E. Marshall Pollock
Utilicor Technologies Inc.

Keyhole Coring and Reinstatement

- A better and smarter way of making and repairing cuts through pavement in order to:
  - Facilitate repairs to underground utilities
  - Locate and map underground utilities (S.U.E.)
  - Avoid damage to underground utilities during HDD
  - Reduce delays and disruption of traffic and public inconvenience during roadwork
  - Minimize damage to roads
  - Save utilities and their contractors time and money
  - Reduce impact of public works construction on the environment
  - Improve worker safety and productivity through better excavation methods

It is the Core Strategy for Utility Cut Repairs
## Excavation Innovation

**Timeline:**

- **1900**
- **1930**
- **1950**
- **1980**
- **1990**
- **2000**

### Traditional Open Cut

- **Pavement Access & Disposal**
  - Cement saw
  - Jackhammer/Backhoe
  - Spoils disposal
  - Trenching equipment

- **Excavation Methods**
  - Backhoe
  - Hand digging

- **Working Conditions**
  - Bell hole
  - Shoring
  - Men in hole

- **Temporary Pavement Restoration**
  - Steel Plate
  - Cold patch
  - Hot patch asphalt

- **Permanent Pavement Restoration**
  - Repaving larger section with concrete and asphalt

### Vacuum Excavation

- **Pavement Access & Disposal**
  - Cement saw
  - Jackhammer/Backhoe
  - Spoils disposal
  - Smaller opening possible (2 ft. x 4 ft.)

- **Excavation Methods**
  - Dry or wet vacuum excavation

- **Working Conditions**
  - Work from surface with long handled tools (1 or 2 applications)
  - or in speed shored hole

- **Temporary Pavement Restoration**
  - Steel Plate
  - Cold patch
  - Hot patch asphalt

- **Permanent Pavement Restoration**
  - Repaving larger section with concrete and asphalt

### Rotary Coring/Keyhole

- **Pavement Access & Disposal**
  - Rotary Coring (no jackhammers, no backhoes, no disposal)

- **Excavation Methods**
  - Dry or wet vacuum excavation

- **Working Conditions**
  - Work from surface with long handled tools (8-9+ applications)

- **Temporary Pavement Restoration**
  - None required

- **Permanent Pavement Restoration**
  - Reinstall pavement core – Permanent Repair
Keyhole coring and reinstatement is a better way

- **Reduced Traffic Disruption:** Faster, one-step permanent pavement repair means reduced traffic congestion with fewer and shorter road closings and no repeat visits.
- **Saves Tax Dollars:** Less intrusive, more precise pavement coring and reinstatement process means less structural damage to road system, longer pavement life and reduced maintenance. Saves millions of tax dollars.
- **Reduced Footprint:** Neat, almost invisible 18 inch diameter circular cut (less than 1/4 the size of conventional road cut), means less scarring of the landscape and better pavement performance (no corner cracks).
- **Environmentally Friendly:** No road-cut spoil to be disposed of and no temporary patching compounds with volatile organic compounds (VOCs) to escape into the atmosphere.
- **Cleaner, Safer, Less Intrusive Worksite:** No jack-hammers or large excavation equipment means less mess during and after excavation and reduced disruption for neighbors.
- **Huge Cost Savings for Utility:** No repaving required, saves time and resources -- can reduce costs by more than 50% - 60%.

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**Coring & Reinstatement History**

**History**
- **Coring is not new.**
  - Coring with circular concrete saws to create horizontal and vertical access holes through concrete has been used by contractors for decades and is a fundamental component of keyhole technology which allows utilities to make repairs to their underground plant in a more effective and less intrusive manner.
- **Reinstatement of the core is relatively NEW.**
  - The process of reinstating the core back into the roadway after completing the utility repair was initially developed by the Consumers Gas Company in Toronto in 1991 and has been successfully used since then in a growing number of municipalities from coast to coast in North America with ZERO failures.
  - June 1992: Golder Associates was retained by Consumers Gas to provide consulting and testing services and to monitor the development of a pavement reinstatement system and evaluate a variety (> 20) of bonding products. Utilibond was selected and performance monitored by Golder and City of Toronto on continuous pilot project basis until April 2002.
- **Utilicor Technologies Inc. (2002 - Present)**
  - Since 2002 Utilicor has been the exclusive worldwide licensee of the Enbridge coring and reinstatement technology and is the exclusive manufacturer of Utilibond.
Public Works Issues

**Myth:** “There is no such thing as a good utility cut repair”

- **Traffic Disruption and long term performance** of utility street cut repairs has been a concern to public works officials for years.
- **Impossibility:** A number of municipally sponsored engineering studies published on the subject in the 1980’s claimed that it is “impossible” to repair or mitigate damage caused by utility cuts.
- **Practicality:** In response, in the 1990’s, Utility conducted research and field demonstration projects showed that the performance of utility cut repairs is directly related to excavation restoration techniques and quality control procedures.
- **Better Way:** In 1991 Consumers Gas Company of Toronto (now Enbridge Gas Distribution) developed and perfected a keyhole coring and core reinstatement process that would yield a permanent utility cut repair that would restore the roadway to the same condition and performance that existed prior to the repair.

The keyhole coring and reinstatement process has been proven to reduce traffic disruption and delay, have no adverse impact on the integrity of the roadway and result in a long term, permanent pavement repair.

Concerns with Conventional Utility Cut Repairs

**Performance Failure:** shortened pavement life
- **Deflection or subsidence** of repaired area, uneven running surface or “pothole” development after the repair.
- **Failure of repair to reinstate road as a load bearing system** resulting in premature deterioration and reduction in pavement life.
- **Lack of waterproof integrity:** Development of pressure corner cracks that allow infiltration of ground water and lead to deterioration of sub-base.

**Different pavement profile and appearance**
- **Failure to match existing road profile** with patching or repair materials leading to lack of uniform performance and appearance.

**Traffic Delays and Disruption**
- **Traffic disruption and delays** involved in initial utility work and subsequent pavement repairs.
The cutting edge in keyhole technologies™

Concerns with Conventional Utility Cut Repairs

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Traffic Delays and Disruption

Coring and Reinstatement can alleviate ALL of these concerns

Minimum Coring Standards

(Metropolitan Toronto)

- **Load Transfer**: Reinstated core must effectively transfer traffic loads from patched area to undisturbed pavement.
- **No Voids**: All voids beneath the slab that may have been created during repair, need to be filled.
- **Waterproof**: Bonded joint needs to be impervious to ground water penetration.
- **Simple Process**: Uses readily available materials of a non-hazardous nature.
- **Replicable**: Consistent process quality. Easily and reliably replicated by typical work crews.
- **Results permanent** and capable of performance through repeated freeze-thaw cycles.
- **Utility responsible** to repair failures.

[Goldar Associates, April 2003]
Engineering Requirements
(Golder Associates)

Bonding compound:

- Fast setting and rapid strength gain to minimize traffic disruption
- High strength to exceed AASHTO standards (safety factor)
- Low shrinkage to ensure waterproof integrity of repair
- Good Bond Strength to create an effective long lasting mechanical joint with remainder of pavement
- Flowable to ensure complete coverage with no voids
- Easy to mix to ensure uniform and consistent application
- Wide Temperature Range of Operation to extend use of the process
- Non-hazardous to crews and public.

Golder Report Findings
[10 year study]

Test of Reinstatement Effectiveness:
- The test of reinstatement effectiveness is the "degree of coupling between undisturbed road structure and newly restored cut."
- Effective coupling: "Effective coupling is achieved where the road will share the effect of traffic loading as postulated in conventional road design theories."

Actual Findings:
- Effective coupling: "Lab trials and previous demonstrations on the rotary cutting method have shown that the pavement coupon has been bonded into the slab in such a manner that the loads of traffic are effectively transmitted to the remaining intact slab."

Long term performance:
- 10 years or more: "Investigation of former trials over a number of years indicates that the repair technique continues to perform well."

Conclusion:
- "Based on trials ... and in-field performance observations, we are satisfied that the equipment, procedures and materials (Utilibond) developed and used by Enbridge Gas Distribution over the last 10 years will ensure satisfactory long term performance of the pavement reinstatement."
Proposed City of Toronto Standard

- A suitable bonding material needs to be impervious to water penetration at the joint after application, is required to securely bond the undamaged keyhole core to the pavement and sidewalk, and to fill the annular space at the joint.

- In order to minimize delay and public inconvenience, rapid set and strength-gain time and workability are meaningful attributes in the bonding process.

- Specifications for the Bonding Material shall be submitted for review and approval before a Bonding Material is used. The specifications will include results of laboratory and field testing.

- The bonding material must, within 30 minutes at 21°C, reach an equivalent traffic loadable condition that is at least three times greater than the minimum AASHTO H-25 standard on simulated loading slabs prepared to yield a standard mix with a 28 day compressive strength of 35 MPa using 19 mm minus aggregate.

What is Keyhole Technology?

- Method of accessing or viewing underground utilities or plant through small holes or “keyholes”

- vacuum excavated through soft surfaces or through holes cut or cored through pavement.
**Why Keyhole?**

*Smaller is better and less intrusive.*

<table>
<thead>
<tr>
<th>Laparoscopic Surgery</th>
<th>Keyhole Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smaller Incision</td>
<td>Smaller Opening (keyhole)</td>
</tr>
<tr>
<td>Short Recovery Period</td>
<td>Faster Restoration</td>
</tr>
<tr>
<td>Faster Healing</td>
<td>Less Damage to Road System</td>
</tr>
<tr>
<td>Smaller Scar</td>
<td>Smaller Repair Footprint</td>
</tr>
<tr>
<td>Lower Cost</td>
<td>Lower Cost</td>
</tr>
</tbody>
</table>

.mapbox

and safer -- no men in the hole.

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**Keyhole Coring and Reinstatement**

*Size Matters!*

- Smaller, less intrusive.
- The circular geometry and waterproof bond are very important.
- Rectangular cuts after repair:
  - concentrate stress in corners causing cracking …
  - which allows infiltration of water and undermines road base.
- No corners in circular cuts:
  - no corners – no cracks
  - no cracks – no water infiltration
  - no damage to roadbed
- Easily covered with circular road plates
Keyhole Repairs

Keyhole repairs are made from the surface using long-handled tools.

Typical Gas Applications

- Cast iron joint repair
- Sacrificial anode installation
- Low pressure service cut off
- New service installation
- High pressure PE pipe repair
- Daylighting for directional drilling
  installation of PE pipe
- Pipeline integrity inspection

Keyhole Conflict Identification

- Keyhole Coring and Vacuuming process allows you to identify and expose exact location of potential conflicts in advance of directional drilling;
- After drilling, conflict hole is back-filled and pavement core reinstated -- as a permanent repair.
Conflict Identification in HDD

- **Better Scheduling:** Pavement can be cored and vacuum excavated to show conflict in ADVANCE of drilling rig on site;
- Between operations the hole can be covered by a special circular road plate and road opened to traffic.
- After drilling, conflict hole is backfilled and pavement core reinstated -- as a permanent repair;
- Cost saving over conventional excavation and repair = $1,000 per hole.

Keyhole Technology is a Process

<table>
<thead>
<tr>
<th>Core</th>
<th>Vacuum</th>
<th>Repair or Locate</th>
<th>Backfill</th>
<th>Reinstate</th>
</tr>
</thead>
</table>

*The cutting edge in keyhole technologies™*
Coring Process (continued)

- 18" diameter hole up to 22" deep
- neat and accurate
- Time: 10-15 minutes depending on depth and composition
- Center pilot hole is cut simultaneously
Rotary Coring Process (continued)

Rotary Cutter cuts cores of different depths and compositions

... and it can get into tight spaces
Sometimes … two holes are better than one

- When one 18 or 24 inch hole isn't wide enough -- then two can be better and achieve the same economies in restoration costs and speed in reopening the road to traffic.

Effective Opening Size: 30 inches x 12 inches (18 inch drum)
42 inches x 18 inches (24 inch drum)

Rotary Coring Process (continued)

- Once the core has been cut through …
  a core puller is used to remove the core;

- The core is set aside (to be reinstated later).
Vacuum Excavation:

- Once the core had been cut and removed the hole can be vacuum excavated and the exact location of the plant to be repaired or potential conflict identified.

Backfilling

- The hole is then back filled and compacted to the level of the base of the pavement so that the core or coupon of pavement can be reinstated.
**Proper Compaction**

- Failure of backfills (>3%) and recalling field crews costs the gas industry more than $60 Million per year.
- GRI spent $3.2 million to develop soil compaction meter to check roadside soils and prevent premature pavement failure.
- Based on Seismic technology.
- Compaction level monitored in real time -- no delays.
- Saves $20-$75 per excavation (GRI study)

- Piezoelectric sensor at the bottom of hole produces voltage in response to pressure waves transmitted through the soil from the tamper.
- Soil’s transmission efficiency improves as the soil becomes stiffer.
- When soil reaches maximum achievable compaction, voltage increases level off and red indicator signals STOP.
- Fully auditable -- achieves 95% Proctor.

**GTI No Bottom Testing**

GTI Findings (2003):
- **Utilibond** had sufficient bonding strength to support an otherwise unsupported 8” core of asphalt exposed to more than 40,000 passes of the 9000 lb AASHTO standard test vehicle in which the wheel path passed directly over the core.
- Equal to more than seven years of traffic a non-arterial road.
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 the single axel 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 repaving required
Excavation Alternatives

- Jack hammer and Hand Digging
- Jack hammer and Vacuum
- Coring and Vacuum

Excavation and Repair Results

- Conventional Rectangular Cut
- Temporary Patch
- Permanent Keyhole Core Reinstatement
Cost of Excavation Alternatives

<table>
<thead>
<tr>
<th>Activity</th>
<th>Conventional</th>
<th>Coring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw cut, jack-hammer, dispose of spoil</td>
<td>$50</td>
<td>--</td>
</tr>
<tr>
<td>Core 18” hole</td>
<td>--</td>
<td>$100</td>
</tr>
<tr>
<td>Vacuum and backfill 4 feet deep</td>
<td>$200</td>
<td>$200</td>
</tr>
<tr>
<td>Temporary pavement patch</td>
<td>$25</td>
<td>--</td>
</tr>
<tr>
<td>Permanent core reinstatement</td>
<td>--</td>
<td>$75</td>
</tr>
<tr>
<td>Permanent pavement repair</td>
<td>$1000*</td>
<td>--</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$1,275</td>
<td>$375</td>
</tr>
</tbody>
</table>

*Coring and Reinstatement savings = at least $900*

* Up to $5000 in jurisdictions that require mill and overlay from curb to centerline 100 feet in each direction.

Advantages of Coring and Reinstatement

- Operationally Superior;
- Aesthetically Pleasing;
- Functionally More Effective;
- Environmentally Friendly; and
- Field Proven.

It is the “front-end” and “back-end” of cost-effective vacuum excavation through pavement.
Operationally Superior

- Reduced repaving budgets.
- Improved Logistics: Single crew, one-stop, same-day coring and pavement reinstatement means simplified scheduling, no temporary patching or repaving and no repeat visits.
- Special road plate lets you core and vacuum ahead of HDD -- no delays.
- Fewer complaints about traffic disruption, weakened or failed roads.
- Faster, safer and physically less demanding on work force -- no jack hammers and reduced potential for workplace injury

Aesthetically Pleasing

Creates favorable impression with the public

- Rotary cored and reinstated access hole almost invisible in the foreground. (Permanent)
- Conventionally repaired sidewalk cut in background. (Temporary)
- No unsightly utility cut “reminders” or potholes.
- No stress cracks or other failures.
- No “slip, trip and fall” litigation.
Functionally More Effective

- Works better -- less damage to pavement
  - Reinstated core exactly matches the original pavement profile.
  - The pavement system is restored to its original design specifications – no deterioration in performance.
  - No stress cracks, ground water penetration or premature failure.
  - Road re-opened to traffic much sooner -- less inconvenience to public.

- KEY selling points to the DOT and municipality.

Environmentally Friendly

- No noisy and dusty pavement breaking machines.
- No spoil to be trucked and disposed of in dumps.
- No release of Volatile Organic Compounds (VOC’s) from temporary patching material or cut asphalt.
- Re-uses existing materials
"Since the initial reinstatement, more than 145,000 transit buses and more than 13 million commercial and other vehicles have passed directly over the keyhole with no apparent weakening or other degradation of the reinstated core or the adjacent road system or paved surface."

Golder Associates April 21, 2003

Bond in Cross-Section

Source: Golder Report, April 21, 2003
Bond in Cross-Section

- 3” x 15” deep mini-core samples cut through opposite sides of the core or “coupon” demonstrate effective coupling between core and remaining slab of pavement.

- Light gray line is Utilibond showing excellent bonding of the asphalt-concrete core (central area) and the undisturbed pavement (outer layer) with complete infilling of the voids in the pea gravel (bottom).

Source: Golder Report, April 21, 2003

Pavement Bonding

**Good Structural Bonding**
- forces transmitted from one part of the structure to another through the joint.
- force taken up by bonding agent and transmitted through bond to the next member.
- good bonding is important in pavement repair where the end result is to reinstate the capacity of the pavement to perform as a load bearing system.

**Good Multiresistant Bonding.**
- joints need to withstand environmental forces -- temperature cycling, vibration and resist the infiltration of water.
- constant traffic vibration can fracture the bond of a poorly reinstated core and allow infiltration of ground water at the perimeter of the repair and lead to washout of the sub-grade causing premature degradation or failure of the pavement

*A pavement bond must not only be strong but it must be waterproof.*
Bond Strength

- Tests of 3 commercially available bonding compounds were conducted in July 2003 at the Department of Civil Engineering, University of Illinois at Urbana-Champaign.

- The Utilibond™ bonded core gained sufficient strength within 30 minutes to support the combined weight of five transit buses -- over 52,000 lbs.

- Safety Factor: 5 times the AASHTO H-25 standard.

Fast-Strength Gain ... Time is Money!

- Utilibond's rapid hydration and ultra-fast strength-gain allows roadways to be opened in 30 minutes.

- Resulting in crew time savings of more than $70 per hole over other bonding products with slower strength-gain.

- Improved Public Convenience: road work and utility cuts cause 400 million hours of traffic delay and disruption, cost drivers $6 Billion in wasted time and collectively waste 2.3 Billion gallons of fuel annually.
Restoration of Utility Cut Study

- **Objective:** to develop a guide for best restoration practice based on sound engineering principles.

**Toronto Field Experiment: Observations**

<table>
<thead>
<tr>
<th>CONVENTIONAL TRENCH</th>
<th>ROTARY CUT KEYHOLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noticeable failures in conventional cut.</td>
<td>No defects in keyhole cut.</td>
</tr>
<tr>
<td>Conventionally repaired joint between road and the cut opened.</td>
<td>Keyhole section established Oct. 2001 continued to perform well throughout life of project.</td>
</tr>
<tr>
<td>Visible settlement in trench along wheel path.</td>
<td>Surface of restored keyhole remained level with the road profile.</td>
</tr>
<tr>
<td>Material used to seal joint lost under action of traffic.</td>
<td>The bonding material surrounding the AC/PCC core remained intact (no cracking or separation.</td>
</tr>
<tr>
<td>Sand cover at base of trench exposed to higher than normal levels of moisture (compared with keyhole).</td>
<td>Waterproof bond.</td>
</tr>
</tbody>
</table>

"Keyhole construction [is an] effective restoration technique that should be encouraged whenever feasible to minimize need for opening large trenches in the future."

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Damage Prevention: Reducing Risk

- Existing infrastructure has become very congested and is wearing out
- We continue to add and change utilities because of expansion, modernization and changing missions
- Overall, we do not have adequate records to tell us where all our utilities are located
- Failure to accurately locate underground plant before digging can result in damage or serious injury
We know there’s something under there …

Underground infrastructure comprises about 20 million miles of pipe, cable and wire.

-- Bell Communications Research and National Transportation Safety Board (1994)

- Electrical cables
  - High and low voltage
  - Signal cables
  - Cathodic protection cabinets and cables
  - Conduit systems, cable pits and chambers

- Gas lines
  - Distribution lines (high, medium and low pressure, cast iron, steel, Polyethylene)
  - Mains and Services (fittings, valves, service joints, casings, tracer wire, cathodic protection)

- Petroleum Lines
- Communication cables
  - Phone lines -- copper and fibre optic
  - Conduit systems
  - Coaxial and data cables

- Sewer/water mains and services
  - Pits
  - Tunnels
  - Connections
  - Valves

- Steam Lines

… but where is it?

Seeing is Believing

- As built drawings, if available, are often unreliable
- Some surface locating methods may be inaccurate
- Traditional surface locating methods cannot accurately determine depth

“The only certain method of determining facility depth is to expose the pipe, conduit, or cable through hand digging or through vacuum excavation.”

-- National Transport Safety Board, December 1997
Careless Excavation is Leading Cause of Damage

“The leading cause of accidents on distribution pipelines is excavators unintentionally striking our lines, commonly called “third party damage”. Year after year these strikes cause 60% of the total ruptures on utilities and the vast majority of injuries and fatalities.”

— AGA Testimony U.S. Senate Committee on Commerce, Science, and Transportation, May 2000

“Excavation and construction (outside force damage) are the largest single cause (more than 40%) of accidents to pipelines in the US and worldwide”.

— US DOT Office of Pipeline Safety

“Excavation damage is the single largest cause (53%) of interruptions to fiber cable service.”

— Federal Communications Commission

“In 2005 there were an estimated 675,000 utility strikes that occurred in the United States during excavation.”

Careless HDD can also result in Cross-Bores

“An accident waiting to happen”

When a gas line goes through a sewer pipe:
- Blockage can cause sewage backup into buildings and homes;
- Auguring equipment (“Roto Rooter”) used to clear sewer lines can rupture the gas line;
- Allowing escaping gas to migrate into buildings and homes and result in explosion, fire and death.

“Cross-bores involving gas lines in sewers are the most dangerous because when sewer lines clog and require cleaning, the equipment used can rupture the gas lines, allowing the gas to escape and explode”

-- NASTT Cross Bore Committee 2006

A 2001 search for cross-bores in Kentucky located 400 cross-bores in 200 miles of mainline sewers and the connecting laterals.

-- NASTT Cross Bore Committee 2006

Estimated cross-bore frequency: 2 per mile of sewer
News Item: Gas Explosion Destroys Home

MIDDLETOWN, Ohio (March 13, 2006) -- Several Butler County residents escaped serious injury after a gas explosion destroyed a home Monday morning.

The blast occurred shortly after 11 a.m. at a house at 2212 Crescent Blvd. Fire Chief John Sauter said a plumber from Royal Rooter was using an auger to clear a clogged drain when he accidentally hit a natural gas line. After he pulled the tool free, the plumber said sewage blasted out of the pipe, and he noticed the smell of gas.

The plumber told a woman and her three granddaughters to immediately get the family out of the house, knowing what would happen next.

“He didn’t let them stop to get any personal items,” Sauter said. “I believe their backs were still turned as they were fleeing the scene (when the house exploded).”

It sent smoke, fire and debris throughout the neighborhood just minutes after Temple, her grandchildren and a plumber from Royal Rooter escaped unharmed.

The cost of not knowing EXACT Location

- Major property damage
- Death or serious injury
- Evacuation of population
- Disruption of essential services, inconvenience to public
- Ecological damage
- Costs to rehabilitate injured workers, repair damaged facility, rehabilitate environment, replace construction equipment
- Medical and hospital costs
- Down time, loss of business, loss of revenue
- Increased insurance premiums
- Criminal charges and civil legal action
Potholing or daylighting makes sense

- For as little as $375 you can avoid this

$600,000

Or this …

PE gas distribution pipe drilled through side walls of sewer lateral
A Core Strategy for Utility Cut Repairs

FOR THE UTILITY/CONTRACTOR

- **Saves Money:** Dramatically reduced paving budgets.
- **Positive Community Relations:** Faster, less intrusive process. Fewer complaints from municipalities about traffic disruption, unsightly road cuts, sunken patches or weakened or failed roads.
- **Improved Logistics:** Single crew, one-stop, same-day coring and pavement reinstatement means simplified scheduling, no temporary patching or repaving and no repeat visits.
- **Field-Proven Process:** Zero reported failures in more than 15 years and over 50,000 successful corings in tough urban climates.

FOR THE CREW

- **Easy to Operate:** No extensive training required.
- **Easy on the Back:** Physically less demanding, no jack-hammers, shovels and backhoes. Reduces potential for workplace injury.
- **Easy to Use:** Utilibond packaged in easy-open, pre-measured polyethylene pails. Just add water, mix and pour. No awkward measuring from fragile paper bags.

... and end up with this.
A Core Strategy

FOR THE COMMUNITY

- **Reduced Traffic Disruption**: faster, one-step permanent pavement repair means reduced traffic congestion with fewer and shorter road closings and no repeat visits.
- **Saves Tax Dollars**: Less intrusive, more precise pavement coring and reinstatement process means less structural damage to road system, longer pavement life and reduced maintenance. Saves millions of tax dollars.
- **Reduced Footprint**: neat, almost invisible 18 inch diameter circular core (less than 1/4 the size of conventional road cut, means less scarring of the landscape and better pavement performance (no corner cracks).
- **Environmentally Friendly**: No road-cut spoil to be disposed of and no temporary patching compounds with volatile organic compounds (VOCs) to escape into the atmosphere.
- **Cleaner, Safer, Less Intrusive Worksite**: No jack-hammers or large excavation equipment means less mess during and after excavation and reduced disruption for neighbors.

Questions and Discussion

Marshall Pollock
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