Water Main Lining
A Sustainable Alternative to Open Cut Replacement

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B&W Client Seminar, Crystal Lake
May 1, 2014

- Reduction in Cost, Time, and Disruption
- Products / Suppliers / Contractors / Municipalities
- Installation Process
- Example Projects
- Conclusions / Question / Answer
Water Systems are Failing...and Budgets are Shrinking
Is There a Strategy to Fix More Pipe with Less Funds?

1. Plan Ahead
2. Rethink our current methods
3. New Technology
4. Replacement vs. Rehab

Consider Water Main Rehab
Positives of CIPP Lining

- Rapid Installation
- Little Excavation
- Low Impact on Traffic
- Improved Flow Characteristics
- Structural Stability
- Corrosion Resistance

All **Green** benefits *(less dust, noise, gas, etc.)*

Cost Savings
Open Cut Construction Disruption is Greater than Trenchless
Trenchless WM Rehabilitation Will Reduce Disruption
Trenchless WM Rehabilitation Will Reduce Disruption

Open Cut
1,500 sq. yds.

Trenchless
250 sq. yds.

Existing 8-inh in parkway, ¼ mile
Trenchless WM Rehabilitation Can Reduce Project Cost

<table>
<thead>
<tr>
<th>Replacement:</th>
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<tbody>
<tr>
<td>$400</td>
<td>per foot</td>
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<tr>
<td>$2,000,000</td>
<td>per mile</td>
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<table>
<thead>
<tr>
<th>What if...</th>
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<tbody>
<tr>
<td>$300</td>
<td>per foot</td>
</tr>
<tr>
<td>$1,500,000</td>
<td>per mile</td>
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$500,000 Savings
Total Project Cost is More Than Engineering & Construction Cost

Direct Costs
- Planning
- Engineering
- Construction

Social Costs
- Disruption
- More Traffic
- Environmental
Where to Think About Lining as a Solution?

- Critical locations
  - rail, pipeline, and road
- IDOT and County Roads
- Residential Mains
- Transmission Mains
- Busy Right of Ways
- Minimal Services
### Where is Lining Being Implemented in our Region?

<table>
<thead>
<tr>
<th>City</th>
<th>Soon</th>
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<tbody>
<tr>
<td>Glenview</td>
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<tr>
<td>Glen Ellyn</td>
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<tr>
<td>Crest Hill</td>
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<td>Park Forest</td>
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<td>Skokie</td>
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<tr>
<td>Naperville</td>
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<tr>
<td>Aqua Illinois</td>
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<tr>
<td>Illinois American</td>
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<tr>
<td>Many Large Cities in North America</td>
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</tbody>
</table>

- Buffalo Grove
- Downers Grove
- Lisle
- LaGrange
- Streamwood
- Lombard
What is CIPP for Water Main?

Materials

a) CIPP Tube (Fiberglass Reinforced Felt)
b) Thermoset Epoxy Resin
Certifications and Manuals:

- NSF / ANSI 61 Certification
- ASTM F1216 and F1743
  - http://www.astm.org/Standards/F1216.htm
  - http://www.astm.org/Standards/F1743.htm
- AWWA M28
- IEPA Approved
Design Parameters

- Pipe Condition
- Depth
- Design Life: 50-100yrs
- Groundwater
- Ovality
- Soil Modulus
- Working Pressure
- Pipe Slope and Bends
- Laterals
Other Technologies?

Spray Epoxy Liner
Spectrum Contracting
Triton Lining
Who Supplies the CIPP Liner?

IEPA has approved Suppliers/Products

- **Sanexen** – Aquapipe
- **Insituform** – Insitumain Blue
- **Norditube** – Nordipipe \((\text{partial})\)
Licensed Installers

- FER-PAL
- Insituform
- SAK
- Michels
- Sheridan Plumbing
Installation Process

- Temporary By-Pass
- Dig Access Pits
- Pipe Cleaning
- Plugging and Inspecting
- Installation and Curing
- Testing
- Reinstallate Services
- Restore Water Main Service
Temporary By-Pass

- Notification
- Fire Hydrant Connection
- Pipe on Surface
- Temp Drive Ramps
- Home Spigot Connection
Temporary By-Pass

Disinfection

Security
Temporary By-Pass
Access Pits

1. Traffic Control
2. ~ 6’ x 10’ x 12” below pipe
3. Minimize locations
   • Valve, Fittings
4. Trench Boxes
5. 300-500 feet
Pressure Pipe Cleaning
Pressure Pipe Cleaning

Rust and Scale Deposits need to be removed

Cleaning (High-velocity water jetting machines)

Televising (CCTV) → Plugging Services

• Mechanically powered equipment
• Cable attached devices
• Pipe pigs
• Rotary Chain-boring
Plugging and Inspecting

**Internal Pipe Inspection**
- Plugging of Services
- Televising (CCTV)

**Leaking water must be stopped**

**Inspection to Owner/Engineer before lining installation**

**2-inch services??**
Liner Installation

1. Impregnate
2. Insertion (Pull / Invert)
3. Pressurize and Circulate
   • Hot Water
4. Cure / Cool / Cut

References:
• ASTM F1216 and F1743
• AWWA M28
• IDOT Permit
Liner Installation

Two Insertion Techniques:

- Pull
- Aquapipe

- Inversion
- Insitumain
1. Samples
   • Short-Term Flexural (Bending)
   • Tensile and Thickness Properties
   • Failing Sample Ramifications

2. Pressure Testing
   • ASTM and IEPA
   • 150 psi for 2 hours
   -or-
   • 1.5 times working pressure for 2 hours
Reinstate Services and CCTV

Insitumain
Blue iTAP™
Install New Services

Small excavation required

Stainless steel saddle with multiple O-Ring and rubber grid map (5” or 8” wide)

Tapping Bits:
- Standard for Cast Iron
- Shell Cutter for Liner
Pit Connections

**Insitumain**
Hymax
Coupling
Connection
(see right)

**Aquapipe**
No Mech
Connection
Adhesion

Liner
Coupling
New Pipe
Restore Water Service

1. Disinfection
2. Flushing
3. Restore Permanent Services
4. Dismantle Temporary Services
5. Site Restoration and Cleaning
GPS/TV of Lined Water Main
Example Project - Oak Park, Illinois

Ridgeland Avenue CIPP
Example Project - Crest Hill, Illinois
Route 30 Water Main CIPPE
Example Project - Park Forest, Illinois

Sangamon Street Water Main

CIPP
Water Main Lining - Points to Remember

- Literature Review: Can do ≠ Will do
- Engineering Design – less effort
- Plan for worst case
- Ask the Experts / Contractors / Manufactures
- Discuss schedule with installers
- Lead Services
- Sewer Separation Requirements?
Water Main Lining - More Points to Remember

- IEPA approved technologies – Permit Required
- 20-40% less expensive than open cut
- 400-800 foot spans
- 6 to 20-inch max diameter (currently)
- >2-inch services cannot be robotically reinstated
- Liners can span tees & gate valves if you wish to abandon them
- Extends life by 50+ years
Water Main Lining is a Sustainable Alternative to Open Cut Replacement
Thank you kindly for your attention

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Special Thanks to
FER-PAL, Oak Park, Crest Hill, Lombard, Sanexen, Insituform, NASSCO, NASTT, Spectrum