Pipe Bursting Water Mains

Process, Design, Construction, and Case Studies

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What is Pipe Bursting?

- trenchless rehabilitation & replacement technology
- fracture or split existing pipeline while simultaneously installing new “factory manufactured” pipe
- replace aging or capacity deficient mainline and lateral systems with same size or larger diameter pipe
- 4 inches to over 36 inches in diameter
Process and Systems

- Two Main Types or Classes of Pipe Bursting Systems
  - Pneumatic
  - Static
Pneumatic Pipe Bursting System
• Pipe Burst Existing Fracturable pipes only (Cast Iron, PVC and Asbestos Cement “Transite”)

• New Pipe - only HDPE
Static Pipe Bursting System - Step 1

(least commonly used system in water pipeline bursting)
Static Pipe Bursting System - Step 2

New Pipe
Static Pipe Bursting System - Step 3
• Pipe Burst Not Only Existing Fracturable Pipe but, also Non-Fracturable Pipe (HDPE, Ductile Iron, Steel)

• Accessories used to help split fittings & repairs

• New Pipe - All types (FPVC, HDPE, Restrained Joint PVC, Restrained Joint Ductile Iron)
Design Considerations
# Classifications of Difficulty and Increase of New Pipe Diameter

## IPBA Classification

<table>
<thead>
<tr>
<th>IPBA Classification</th>
<th>Degree of Difficulty</th>
<th>Depth of Pipe (ft)</th>
<th>Existing Pipe ID (in)</th>
<th>New Pipe Diameter Comparative to Existing Pipe</th>
<th>Burst Length (ft)</th>
<th>Original Trench Width</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Minimal</td>
<td>&lt;12</td>
<td>2 – 12</td>
<td>Size on Size</td>
<td>0 – 350</td>
<td>Relatively wide trench compared to expander head outside diameter.</td>
<td>Compressible soils outside trench (loose sand, gravel, soft clay).</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Moderate</td>
<td>&gt;12 to &lt;18</td>
<td>12 – 18</td>
<td>Single Upsize</td>
<td>350 – 500</td>
<td>Trench width less than 4&quot; wider than the expander head outside diameter.</td>
<td>Moderately compressible soils outside trench (medium dense to dense sand, medium to stiff clay).</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Comprehensive</td>
<td>&gt;18 +</td>
<td>20 – 36</td>
<td>Double / Triple Upsize</td>
<td>500 – 1,000</td>
<td>Incompressible soils outside trench.</td>
<td>Constricted trench geometry (width less than or equal to outside diameter of burst head).</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Developmental</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Per IPBA (International Pipe Bursting Association) – a Division of NASSCO
“Upsizing” – Expansion (where it goes)

Pipe Bursting: Typical Compaction

- Expander
- New pipe
- Connection center point
- Existing pipe
**Burst Depth of Cover**

8” Pipe Expander
Approx. 11” ---

6” Existing Pipe --

6” to 8” requires an 11” O.D. expander

The differential is 5” (11” expander − 6” pipe)

5” x 10 = 50” or approx. 4’-2” min. depth to prevent “heaving”

rule of thumb:
10 x upsize difference in diameters
Soil Conditions

Degree of Difficulty Increases
Lubrication
Lubrication
Temporary Bypass Pipelines

• Common Practice – minimal cost

• Maintain water & fire services

• Allows for the Trenchless Technology process

• Minimum impact on public and environment (predictable/manageable)
Temporary Bypass Pipelines

- Demand Considerations - residential, commercial, industrial, and fire protection
- Utility provides criteria
- Contractor or Utility determines size, layout and permits
Fused HDPE
Fusible PVC
Restrained Joint PVC
Restrained Joint
Ductile Iron
Pipe Bursting vs. Open Cut

“Direct Costs”

- Less material removed and replaced
- Less Dewatering
- Less equipment and labor
- Utilizes existing utility corridor and ROW
- Lower cost overall
Pipe Bursting vs. Open Cut

“Indirect Costs”

- Smaller work zone or “footprint”
- Less disturbance to traffic
- Less time
- Less Impact to businesses & residents
- Less emissions – lower carbon footprint “Green Benefits”
Pipe Bursting vs. other rehabilitation Options
Sliplining, CIPP, Cement lining, etc.

• No reduction in inside diameter (hydraulic capacity)
• Same size or larger pipe diameters
• Factory Manufactured Pipe (vs. CIPP and CML, etc.)
• Hard service reconnects (not simply “reinstated”)
• Better return on investment –
  engineering economic life benefits (new pipe)
## Savings by Water Agencies…

<table>
<thead>
<tr>
<th></th>
<th>City of Billings, MT</th>
<th>Consolidated Water, CO</th>
<th>Cheyenne Water, WY</th>
<th>Lee's Summit, MO</th>
<th>Greensboro, NC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approx. Footage thru 2014</strong></td>
<td>18,215</td>
<td>167,740</td>
<td>20,990</td>
<td>43,100</td>
<td>38,080</td>
</tr>
<tr>
<td><strong>Existing Pipe Diameter</strong></td>
<td>4-8&quot;</td>
<td>4-8&quot;</td>
<td>4-8&quot;</td>
<td>4-8&quot;</td>
<td>2-8&quot;</td>
</tr>
<tr>
<td><strong>New Pipe Diameter</strong></td>
<td>8-12&quot;</td>
<td>4-8&quot;</td>
<td>8-12&quot;</td>
<td>6-8&quot;</td>
<td>6-8&quot;</td>
</tr>
<tr>
<td><strong>Savings over Open Cut</strong></td>
<td>50%</td>
<td>50%</td>
<td>20%</td>
<td>23%</td>
<td>20% +</td>
</tr>
</tbody>
</table>

Nationally – Savings between 20-50% using pipe bursting over traditional open cut.
Questions?

Thank You!,

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