Applications of Trenchless Technology for Transportation Projects
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Rehabilitation Capabilities

• Solutions for any Crossing:
  – 3” (75mm) to 120” (3m) and larger
  – Any Geometry
  – Pipes and Structures
  – Gravity, Low Pressure, and High Pressure
  – Sewer, Storm Sewer, Water, Industrial, Gas, Telecommunications, Power, HVAC
The Need
Why Select Trenchless Rehab?

- Structural Renewal & System Sustainability
- Pavement Life Cycle Cost Savings
  - Elimination of soil subsidence from infiltration erosion
  - Don’t cut the pavement
- Improved storm water flow
- Limited disruption to traffic flow
DOT Pipe Rehab Programs

• 10 years ago:
  – Rehab projects: typically emergency repair of a few failing pipes
  – Mobilization cost was exorbitant
  – Few contractors to bid

• Today:
  – Annual culvert rehab projects in the $2M+ range
  – Planned, district by district culvert rehabilitation
  – Leverages economies of scale
  – Attracts more bidders
  – Lowers O&M costs
Other DOT Initiatives

• DOT Specifications for rehab of pipe crossings
• Inter-agency fees for cutting pavement
  – Pavement life is reduced as much as 20% even with proper post-cut repairs
  – By charging agencies for increase in life-cycle cost, “true costing” positively influences technology selection
Cost Savings through Predictive Maintenance

• Agencies are using PM to decide which pipes to rehabilitate & when
• PM principles should also be considered when selecting rehabilitation technologies
• Consistency in “as-constructed” design properties (modulus, thickness, corrosion & abrasion resistance) are essential to future PM
• Variability prevents performance life prediction, limits PM, and increases life-cycle costs
• Quality assured, consistent technologies are available; most are pre-manufactured
Predictable Solutions
Pre-Manufactured

Quality Assurance
Thermoformed Pipeliners

- Over 4,000 miles installed
- Specified by over 30 State DOTs
- 3” to 30”
- PVC / PVC Alloy / PE3408 / PE100
- ASTM F1871, F1504, & F1533
- Gravity & Pressure
Fast & Simple Installation

1. The folded pipeliner is pulled through a culvert under a road.

2. The pipeliner is plugged and expanded with steam pressure.

3. The pipeliner forms a permanent, tight-fitting new pipe.
Thermoforms to Fit
Grout-In-Place Pipe

- 6” to 120”
- HDPE & 13,000 psi grout / Spiral PVC
- Widespread European and Asian use; European standards
- Pressures up to 150 psi
All shapes and dimensions possible
Grout-in-Place Panels

- Rehabilitate any structure
- HDPE, PP, PVDF, or ECTFE
- Anchored to resist hydrostatic back pressure
- 1,000,000 sq. ft installed in North America without a failure!
Also Available

- Sliplining (most common alternative)
- Pipebursting
  (No insertion pit & no connections for most culverts!)
• PVC & PE are known for their durability in water & sewer applications, and Rehab Pipeliners are no exception.

• With appropriately conservative design, Rehab Pipeliners are expected to far exceed a 100 year design life.
Structural Capacity

• Deep burials
  – Burials exceeding 80’ have been successfully completed
• Groundwater depths exceeding 40’
• Missing & crushed (not collapsed) pipe
• Shallow Burials with severe live loading
Improves Flow

• Material Manning of 0.009
• No loss of flow capacity
• Minor increase in flow rates
• Plan to avoid scouring issues with steep culverts
Lower Risk Exposure

- Mistakes are less disruptive & easier to correct
- Fewer construction variables
- Start-Stop capability
- Can generally re-process a thermoformed liner
- Correction of errors rarely causes excavation
- Lower risk exposure means a more competitive bid & lower cost
Protecting the Environment

- No noxious fumes to impact the community
- No volatile or environmentally hazardous chemicals (no styrene)
- Solid pipes have no liquid resin to escape downstream
- Encapsulated GIPP precludes grout from escaping downstream
- Often the only technologies approved for use in environmentally sensitive projects.
Examples of Field Performance
Extreme Live Loading

- Trains, Planes, Automobiles, and Logging Trucks
Difficult Access

• Remote locations with limited access
• Backyards with sensitive landscaping
• Or even narrow alley ways
• Steep slopes
Less Community Disruption

• Let the traffic flow
• Don’t disrupt the landscaping
• Even let the General play golf!
Weather Extremes

- Hot weather
Weather Extremes

- Hot weather
- Cold weather
Weather Extremes

- Hot weather
- Cold weather
- Wet Weather
Questions:

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Once needs are met

Cost becomes the primary consideration
Exceptionally Cost-Competitive

- Provides **significant savings** over traditional dig & replace methods
- Has particular **advantages for rural communities & short culverts**
  - lower mobilization costs
  - lower shipping costs (no refrigeration required)
- Thermoformed Pipeliners routinely **win competitive bids** against all trenchless pipe rehab technologies
- GIPP becomes routinely applicable & cost-competitive above 36” or in specialty applications
- **Becoming even more competitive** with ever-increasing economies of scale