AERIAL CROSSING REHABILITATION

The Only Above Ground Topic at an All-Underground Conference

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AGENDA

- What and Why are Aerial Crossings?
- Components of an Aerial Crossing
- Rehabilitation Considerations
- Rehabilitation Methodologies VS Aerial Crossing Rehabilitation
- Experience as a YP
- Questions
What are Aerial Crossings?

- Created when utilities become exposed above ground
  - **Creeks and Rivers**
  - Highway Crossings
  - Low Lying Depressions
  - Maintaining Cover Below Grade is No Longer Viable

Cite: https://www.ece-ltd.com/Environmental-Management/
Components of an Aerial Crossing

- Above Ground Pipeline and Encasement Or Concrete Collars
- Pier Support
- Stream Bank Stabilization
  - Concrete Rip Rap
  - Turf Reinforcements
  - Gabions
- Manholes (Upstream and Downstream)
Other Options to an Aerial Crossing

Siphons
- Buried below the depression
- Results in a planned pipe sag
- Relying on the upstream head conditions to maintain needed flowrates
- Typical built with two or more parallel pipelines
- Frequent internal monitoring and pipeline flushing
Why an Aerial Crossing?

- Can maintain the same slope and subsequent velocities as buried pipe
- Easier access to maintain and repair
Rehabilitation Design Considerations

- Outdoor Factors
  - Temperature
  - Weather Patterns
  - Vandalism
  - Debris
- Lack of Embedment
- Additional Loads
When Choosing AC Rehab Options

- Project Location/Amount of Staging room
- Major Businesses, Schools, Residential Neighborhoods, Etc.
- Diameter of the Aerial Crossing
- Length of the Aerial Crossing

Cite: https://www.nv5.com/markets/water/waste-water/
Criteria for All Methodologies

- Cleaning of the pipeline is essential
- Structural integrity evaluation recommended
- Material protected from exposure of ambient conditions
- Rehabilitate to fully deteriorated conditions

Cite: https://theconstructor.org/construction/construction-sewer-sanitary-pipe-methods/18047/
## COMPARISON FACTORS
### UNDERGROUND VS AERIAL CROSSING REHABILITATION

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Cured in Place Pipe (CIPP)

- Flexible felt liner with thermosetting resin (Corrosion resistant material)
- Lined through interior of pipeline through access points
- Cannot be performed during live flow
- No grouting of the annular space (if any)
- Resin able to fills any cracks
- Fully structural pipe rehabilitation
- Cured using heated water, steam, or U.V. light
- Small diameter reductions (~4%-6%)

**CIPP: Aerial Crossing Rehab**

- High elasticity resin/Vinyl ester liner required
- Same process as underground design
- Typically water cure
- Epoxy grout or repair clamp may be used for concerns with external cracking

Cite: https://cippliningequipmentandsupplies.com/past-projects/#
Slipling Rehabilitation

- Inserting smaller diameter pipe into the existing pipeline
- Corrosion resistant pipe material recommended
- Annular space grouted
- Large diameter reductions (~1’)
- Can be performed during live flow

Cite: https://trenchlesstechnology.com/rehabbing-the-humber-sanitary-trunk-sewer/
Sliplining: Aerial Crossing Rehab

- Corrosion resistant pipe material recommended (FRP)
- Same process as underground design
- Need to consider cage access, aerial host pipe stability, structural condition
- Cellular grout with geofoam recommended

Spray in Place Pipe (SIPP)

- Geopolymer Mortar sprayed in the interior of the existing pipeline
- Applied using spin cast application, low pressure spraying, or hand applied-man entry
- Larger pipeline = thicker material
- No annular space
- Corrosion resistant material
- Small diameter reduction
- Cannot be performed in live flow

Cite: https://www.mswmag.com/editorial/2014/04/manhole_equipment_and_rehabilitation
Lining material does not differ between underground and aerial crossings.

Spin cast process recommended for most round structures.

Carbon fiber reinforcement used during construction.

Thicker application of liner versus underground design.

No annular space.

Cite: https://www.estormwater.com/field-study-supports-viability-spray-applied-geopolymer-liner
Spiral Wound HDPE

- Steel reinforced strips of high-density polyethylene (HDPE) with steel fully encapsulated inside
- Spirally along the inside of the pipe with winding cage; fusion welded seam
- Annular space grouted (Typ. Pumping)
- Diameter reductions ~ 6”
- Corrosion resistant material
- Can be performed during live flow

Cite: https://www.conteches.com/pipe/steel-reinforced-polyethylene-sppe-pipe/sppe
Spiral Wound: Aerial Crossing Rehab

- Same material used as underground design; same liner thickness
- Same process as underground design
- Need to consider cage access, aerial host pipe stability, structural condition
- Cellular grout with geofoam recommended
- Staged grouting recommended
Conclusion

Choosing an Aerial Crossing Rehabilitation for your project:

- Specifics to aerial crossing condition and location
- Additional design elements (piers, manholes, etc.)
- Project length and size
Special Thanks
Aerial Crossings: My YP Experience