AERIAL CROSSING REHABILITATION

The Only Above Ground Topic at an All-Underground Conference

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https://www.engineersofthesouth.com/projects/florence-aerial-sewer-crossings/

https://www.connectcec.com/projects/i-40-crosstown-water-and-sewer-relocation/

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

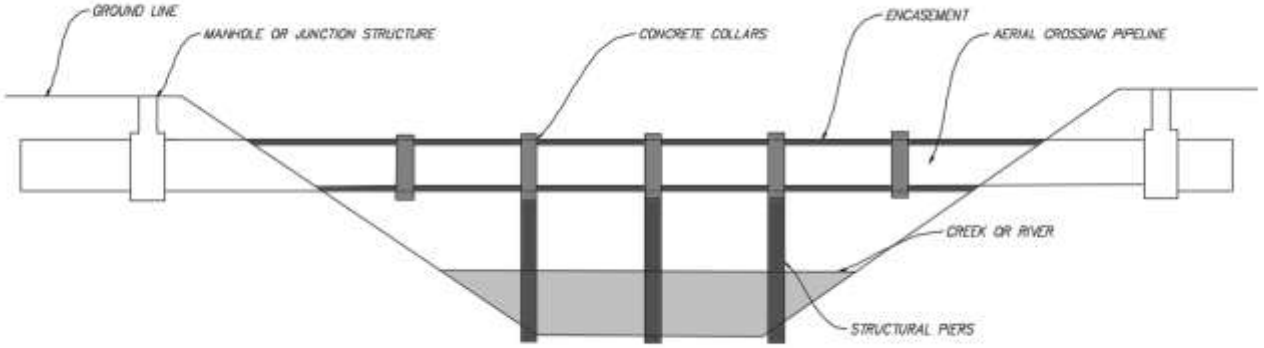
What are Aerial Crossings?

- 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/

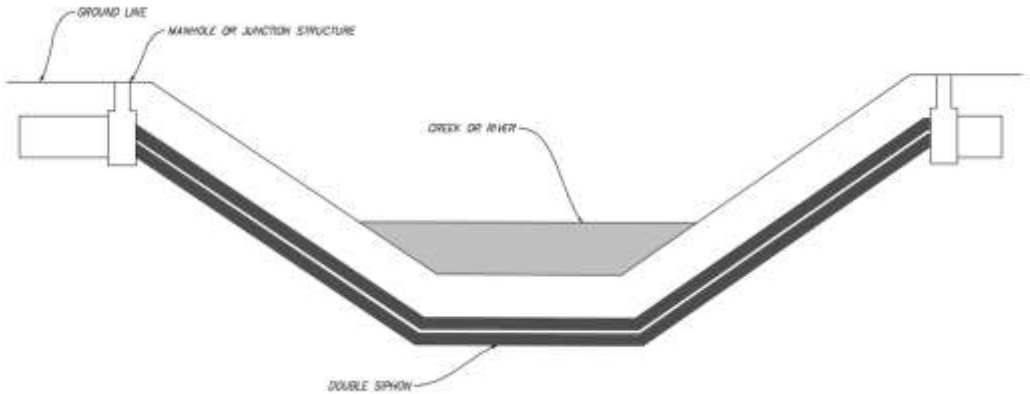
Components of an Aerial Crossing

- 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/

Rehabilitation: Method Versus AC Rehabilitation

COMPARISON FACTORS UNDERGROUND VS AERIAL CROSSING REHABILITATION
MATERIAL
REHABILTATION PROCESS
DESIGN CONSIDERATIONS
GROUTING (IF APPLICABLE)

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%)

Cite:https://www.rti.eu/en/rohrsanierung/sanierung-druckleitungen/schlauch-lining-druckleitungen/

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

Cite: http://www.hobaspipe.com/case-histories/sanitary-sewer/large-diameter-slipline-in-evanston/

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

SIPP: Aerial Crossing Rehab

- 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-srpe-pipe/sprpe

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

Cite: https://www.conteches.com/pipe/steel-reinforced-polyethylene-srpe-pipe/sprpe

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

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Special Thanks

QUESTIONS?

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Aerial Crossings: My YP Experience