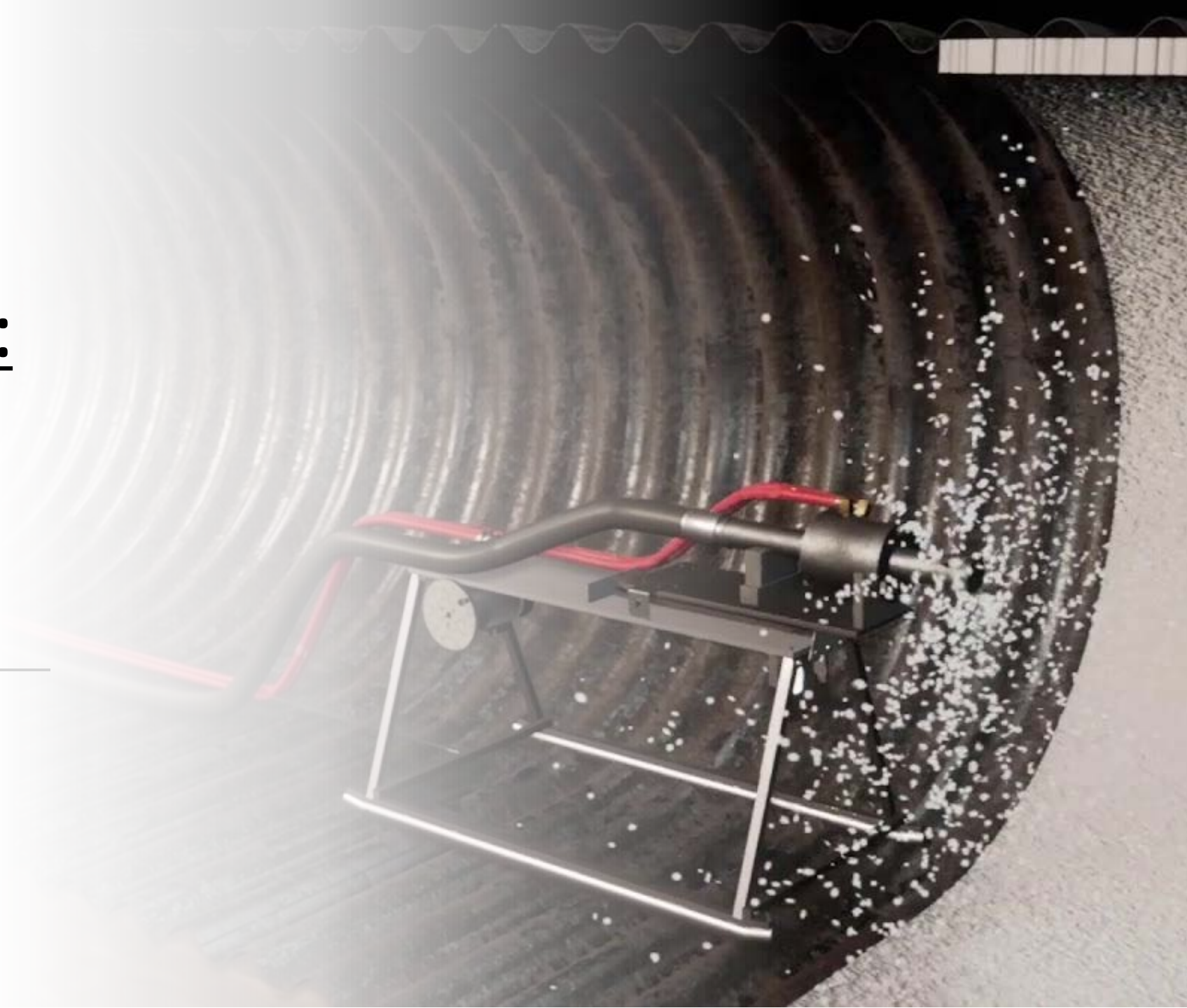


Lessons Learned: Spray Applied Pipe Lining (SAPL)

Jonathan Karam, P.E.
Project Manager
DeIDOT Bridge Design



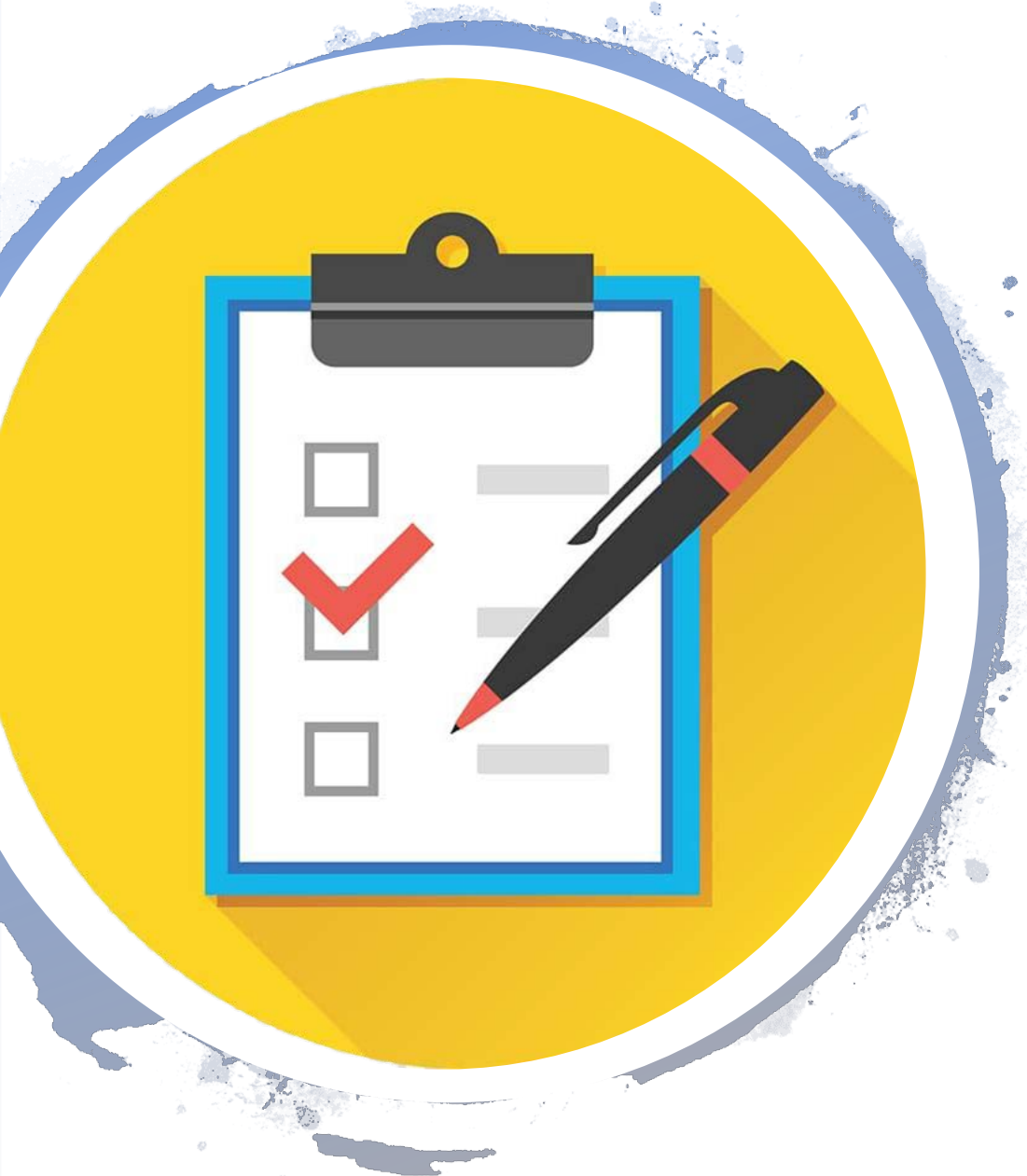


Intro to SAPL

- Spray Applied Pipe Lining involves the use of a fiber-reinforced mortar designed for structural rehabilitation of culverts
- No digging required
- Cost effective
- Frequently used for sinkhole projects to maintain drainage pipes
- Can be hand-applied or spin cast
- Design life of 75 years
- Trenchless alternative to CIPP and Slip-lining

When to use SAPL

- Single Access Bridges
- Utility Conflicts
- Traffic/MOT
- Inadequate Detour
- Cost Factors
- Horizontal/Vertical Geometry Constraints
- Staging/LOC/ROW Restrictions



Highlighted Past Projects

BR 1-238 (StormSeal)

BR 1-657 (GeoSpray)

BR 1-227 (Centripipe)

BR 1-238

Location: Elizabeth Court over Tributary to White Clay Creek, Newark

Pipe Size: (2) 6'-9" x 4'-11" CMP @ 110 ft LF each

Material: Cementitious – StormSeal (2" Liner)



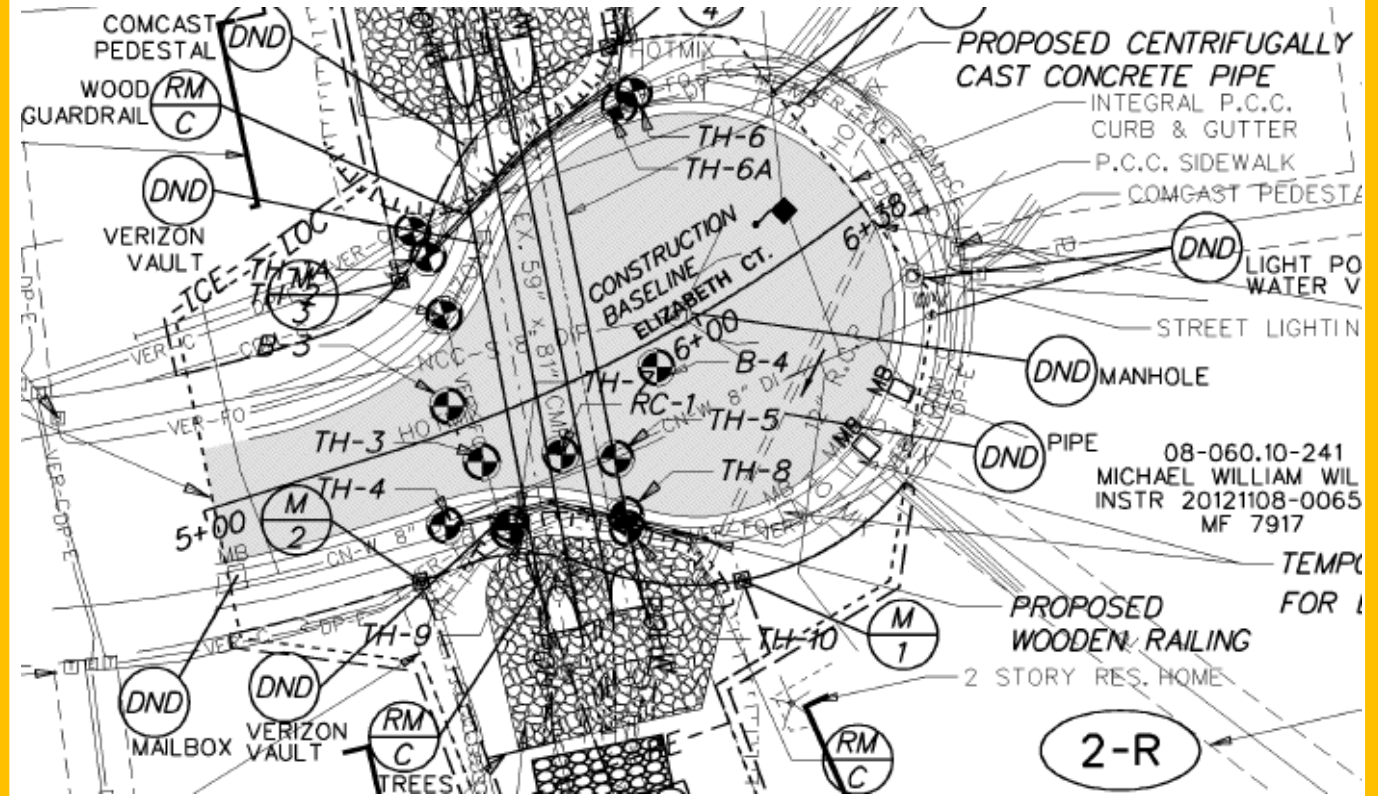
Constraints:

- Cul-de-sac/Single access bridge (lack of access for residents/emergency personnel)
- Utility issues (utilities are located over the culvert on both ends)
- Replacement costs
- Limited room for staging
- No Detour

BR 1-238 Plan View

- 3 underground cable lines (crosses pipe twice)
- 1 underground electric line (crosses pipe twice)
- 1 underground sewer line
- 1 underground water line

*You're
Irreplaceable*





BR 1-238 Before/After



BR 1-657

Location: South Dupont Highway/Pulaski Highway (Rt. 13/40), New Castle

Pipe Size: (2) 48" x 72" CMP @ 250 LF each

Material: Cementitious Geopolymer – GeoSpray (2" Liner)

Included installation of Concrete Cloth for scour countermeasures



Constraints:

- Underground/aerial Utilities
- Possible realignment/raising of roadway necessary to conform to design standards
- High impact to businesses and homeowners
- Over 77,000 AADT
- Estimated Replacement Costs could exceed \$10M
- Railroad involvement
- Extensive MOT (including Pedestrians)



EX. DRAINAGE PIPES



BR 1-657



RT. 40

RT. 13



Construction Photos



BR 1-657 Before/After



BR 1-227

Location: Paper Mill Road over Middle Run, Newark

Pipe Size: (1) 120" x 85" Aluminum CMP @ 128 LF each

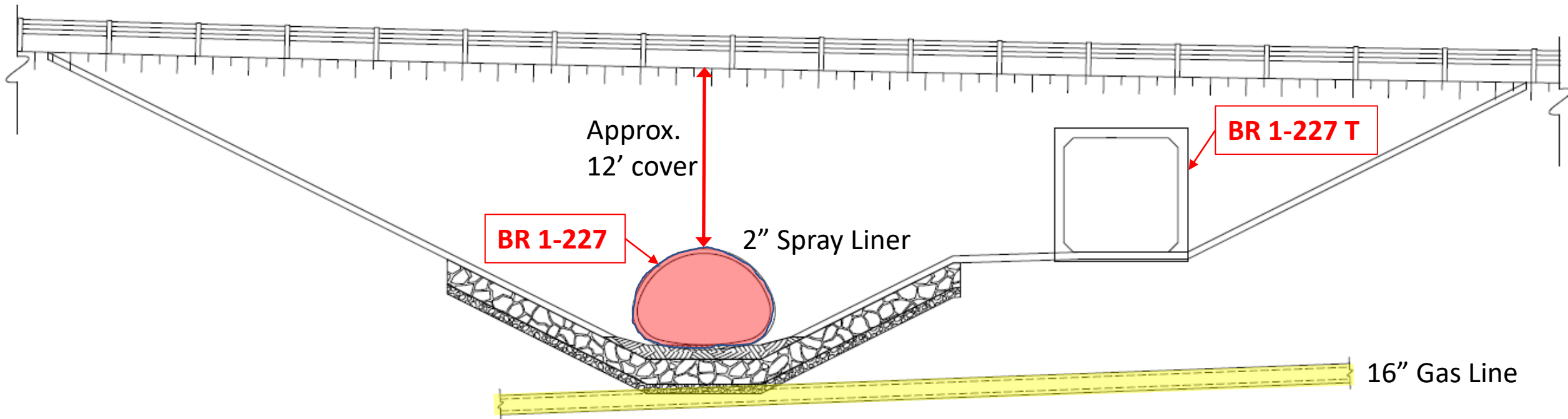
Material: Cementitious – Centripipe (2" Liner)

Constraints:

- Replacement Costs
- Over 12' of cover on top of culvert
- ROW issues (Adjacent to County/State park)
- MOT
- Over 16,000 AADT
- Utility issues (DPL gas line directly underneath culvert)



BR 1-227 Elevation View



BR 1-227 Before/After



Specifications

Standard Specifications

for

Road and Bridge Construction

AUGUST 2020

SP #601501: Spray Applied Structural Liner for Pipes

- Updated unit of measure (SF)
- Detailed work plan
- Separate requirements for material types (Portland Cementitious, Geopolymer, Polyurethane)
- Added Figure 601501-1. Minimum Cover over Corrugations

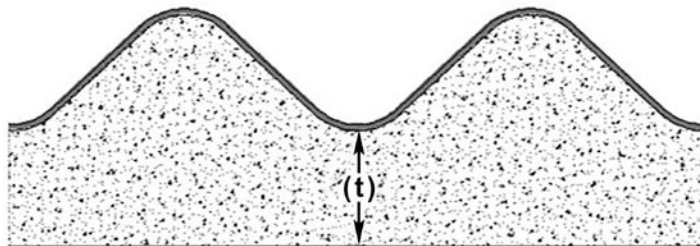
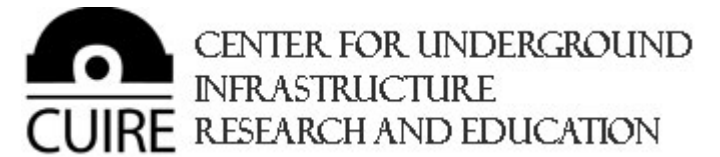


Figure 601501-1.



Research

- SAPL Pooled Fund Study
 - In coordination with the University of Texas in Arlington
 - Includes ODOT, NYDOT, CTDOT, NCDOT, MNDOT, FDOT, PennDOT
 - Developing a structural design methodology
 - Performance based specification
- UD Research
- NTPEP Testing



Lessons Learned



- SAPL supplier must have approved plan
- SAPL supplier must seal/stamp design and have it reviewed by DeIDOT Bridge Design
- Follow latest specifications
- Include Pre-lining meeting
- Include additional inspectors
- Oversee the mixing process
- Verify correct installation of liner
- Validate thickness indicators
- Collect testing samples each day lining is performed
- Coordinate material testing with DeIDOT Lab

Final product to be approved by DeIDOT Bridge Design for acceptance



Future SAPL

- Pipe Liner Bundle (BR 1-242, 1-362, 1-406)
- UD Research
- Polyurethane SAPL (SprayWall)
- UHPC SAPL (Ductal UHPC Liner)





Questions?