



37TH INTERNATIONAL
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FLORENCE 2019

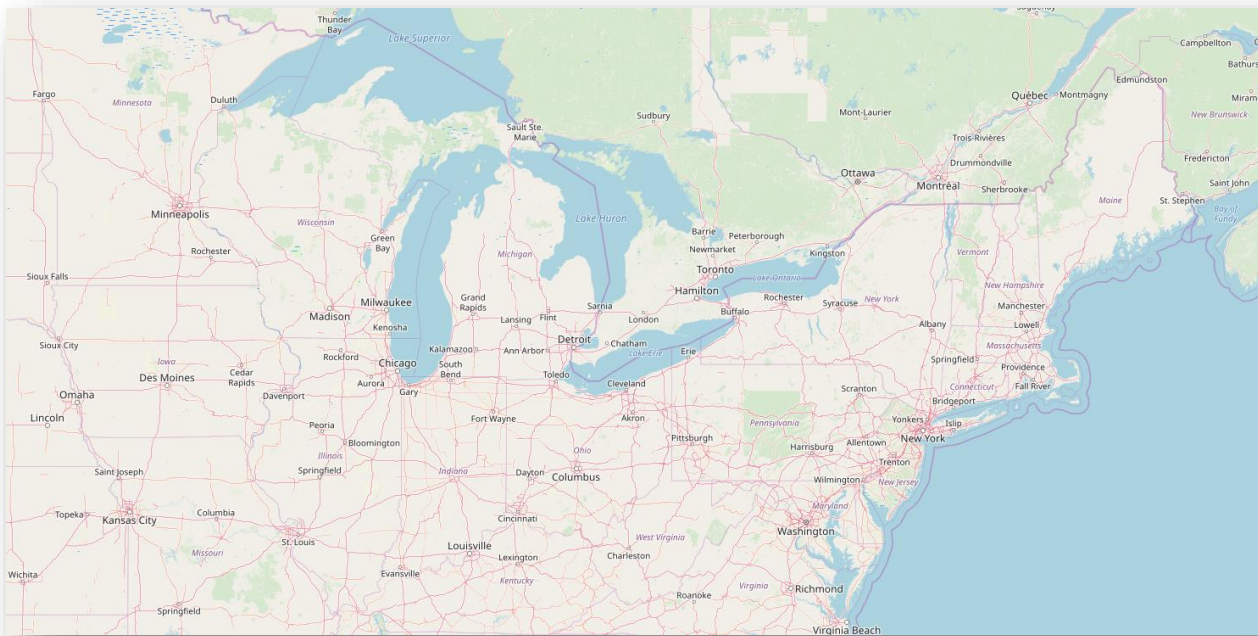
Fortezza da Basso • FLORENCE (Italy)

30th September • 2nd October 2019

Spray Applied Lining Systems Address Unique Infrastructure Problems

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Spray Applied Lining Systems Address Unique Infrastructure Problems



Site location – Lakewood, Cleveland, Ohio

PROJECT

- Lakewood, Cleveland, Ohio
- Manhole 40m deep
- Culvert 110m long
- Constructed 1912 – 1915
- Brick construction

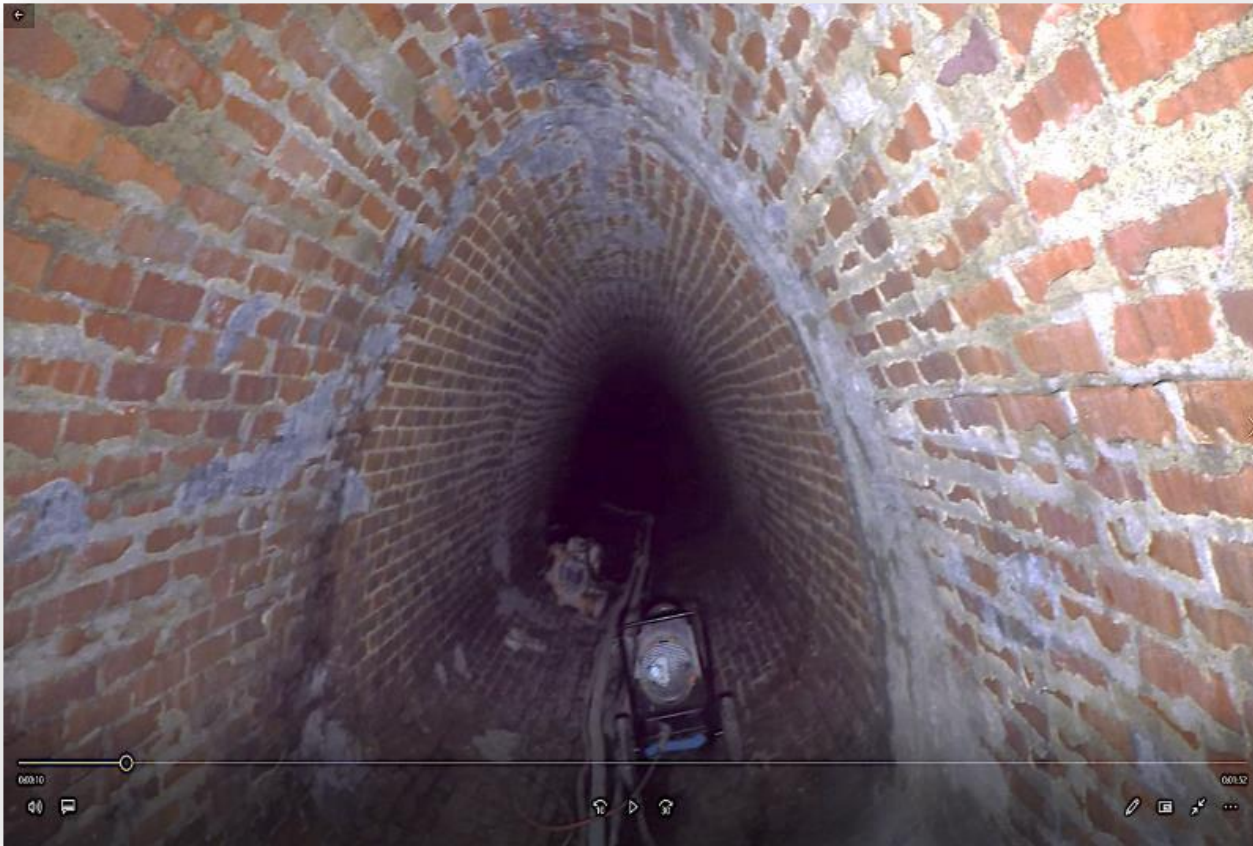
Spray Applied Lining Systems Address Unique Infrastructure Problems



CHALLENGE LOCATION

- Traffic maintenance
- Manhole on T-intersection

Site location – centered in traveling lane of a T-intersection



Heater in Pipe

SPECIAL REQUIREMENTS

- Rain, snow, high winds ...
- Very low temperatures
- Additional heating system requested



Interior of Manhole at the Base

MANHOLE

- Brick construction
- Depth 40m
- DN 1200 – 2400
- Diameter increasing to bottom

Spray Applied Lining Systems Address Unique Infrastructure Problems



Brick culvert

CULVERT

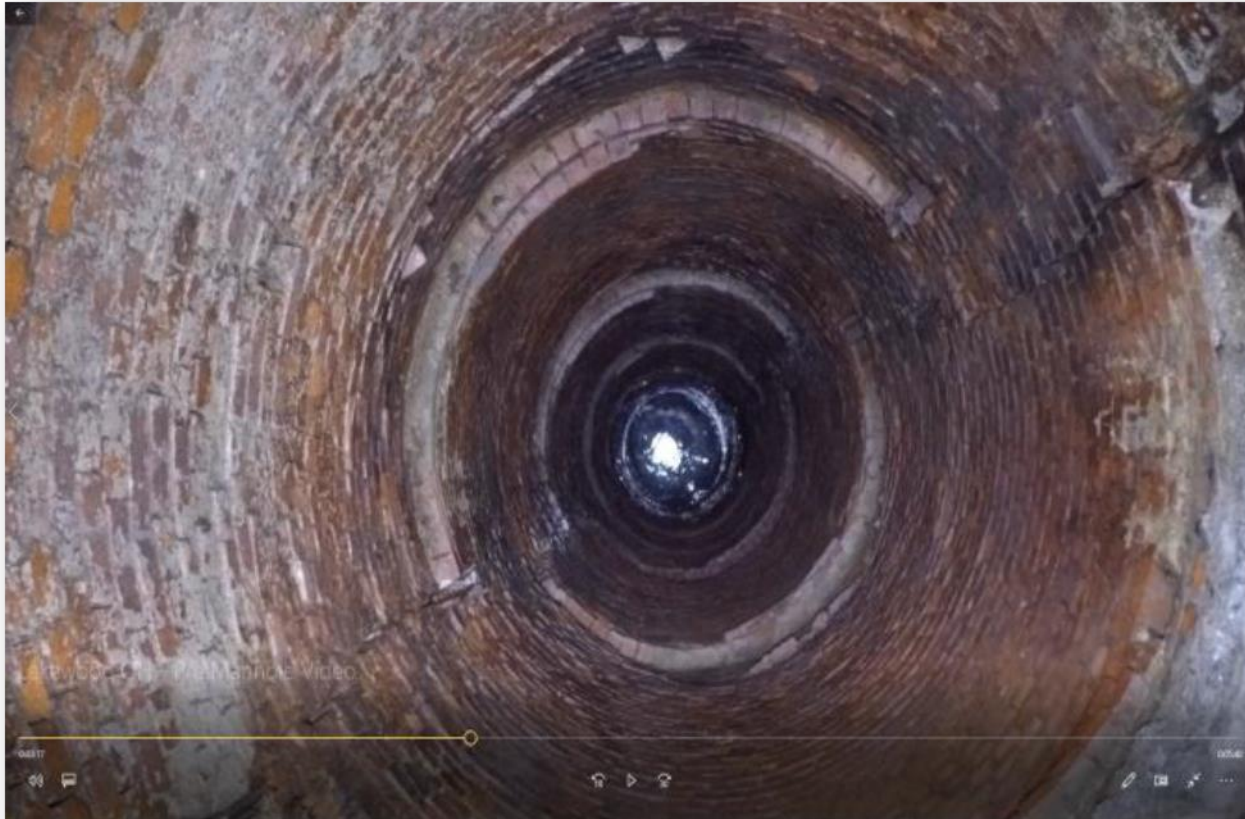
- Brick construction
- Length 110m
- Height 2.0m
- Width 1.7m
- W egg-shaped



OUTFALL

- At bottom of steep river embankment
- Extremely difficult to access

Outfall - Rain event



WHY GEOPOLYMER SPRAY LINING?

- Extraordinary depth
- Age of construction
- Shape of culvert
- Soil, traffic and hydraulic loadings on manhole
- Significant abrasion due to flow changes

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Manhole Access Structure

WHY GEOPOLYMER SPRAY LINING?

- Excellent long-term performance (50+)
- Resisting inflow & infiltration (I&I)
- Withstanding deicing salts!
- Applicable from pH0 – pH14
- Highest freeze-thaw resistance
- Comfortable handling and application
- **Full structural rehabilitation**



Manhole Original Condition

APPLICATION PROCESS

- Basket attached to a winch and crane to hold the crew
- Lowered into the manhole to spray apply and hand trowel the geopolymer mortar
- Section completed - crane operator lowers basket to next stage
- This step was repeated throughout the process



Manhole Structural Lining Completed (View from the bottom up)

RESULTS

- 23 working days
- A month ahead of schedule
- Manhole and culvert completely restored
- Full structural integrity
- Another 50+ years of corrosion-free service



CULVERT renovation

- Spray apply
- Patented spray head

Brick culvert

KEYS TO SUCCESS

- Sophisticated engineering and design methods



Pipe Structural Lining Completed

- Selection of right material
- Outstanding compressive strength
- Proper application under harsh conditions