

Low Impact Repair Solutions to a High-Impact Sewer Problem

Rebecca Caldon, PE Albany Department of Water and Water Supply



The Problem

Beaver Creek Trunk Sewer Line

7 foot diameter combined sewer brick pipe built in 1895 22inch diameter chimney manholes





The Problem

- Active combined sewer pipe that must function through construction.
- Limited right of way with narrow residential street.
- Pipe aligned down center of the road.
- Laterals tied into the large diameter trunk sewer.



Pipe Condition

Engineering Report: Arcadis

• Full final report with recommendations.

Inspection: Savin Engineers, PC.

 Walked the pipe with a video camera and narrated using NASCO certified PACP inspection standards.



Pipe Condition

Structural crown cracking for several hundred feet of length.



Pipe Condition

Mineral deposits and infiltration along hundreds of feet of pipe.



Specification Writing

Performance Specification:

Procedure:

Compressive, Flexural, and Tensile Strength Modulus of Elasticity Chemical Resistance Freeze/Thaw Durability Bond Strength Shrinkage Test Rapid Chlorine Permeability Density Abrasion Resistance 1.5 Hour Initial Set 3 Hour Final Set Product Submittals Design Thickness Cleaning & Pre-inspection Site Preparation & Manhole Rehabilitation Structural Patching Infiltration Patching Product Application in ½ Inch Lifts Photo & Video Post Inspection Photo & Video One Year Inspection

The goal of the performance specification was to open the bidding to different technologies.

Finding a Solution

Four products and several contractors had interest in bidding:

- 1. Centrifugally Cast Epoxy Pipe
- 2. Centrifugally Cast Concrete Pipe (CCCP)
- 3. Gunite
- 4. Cured in Place Pipe (CIPP)*

* It was determined that CIPP was not a viable option due to the required street disturbance and bypass pumping required to install a liner. The low bidder for the project was Arold Construction out of Kingston, NY using the AP/M Permaform lining system

The design of the lining included reinforcing grid, patching, and 2 inches of material applied in ½ inch lifts.

Preparation Work Manhole Retrofit

Existing 22" Chimney Manholes are not large enough for bypass pumping.

The retrofit of a new manhole riser and cover was included as an option for access.

Design:

- 1. Remove top 4 to 8 feet of brick manhole.
- 2. Install stone and compact around existing manhole chimney.
- 3. Install slab around existing manhole.
- 4. Install manhole riser bearing on new slab and grout into place.
- 5. Install frame and cover and backfill.



Preparation Work

Bypass Pumping System

Bypass pumping for dry weather flows

- Typical 4 6 mgd during dry weather.
- During wet weather pipe can flow full which can mean 150 to over 250 mgd.

Used sound attenuated pumps to be run through cure time. Second pump available at all times.

Ran 12" solid bypass pipe with some driveway and sidewalk closures.

Installed a removable dam for quick changes due to wet weather.



Preparation Work

Bypass Pumping System



Preparation Work Bypass Pumping System



Structural Repair

Used in Areas with Cracking over $\frac{1}{2}$ - 1" Wide at Crown

- Basalt Filament Reinforcing Mesh
- Tapcon into Brick
- Fill Voids with Hand Applied Cementitious Spray Material
- Patching done using hydraulic cement



Structural Repair

More crown crack repair.



Repair and Pipe Preparation

Primer or Skim Coat

- Thin application of Permacast PL 8000.
- Structural repair patching at crown above the mesh can be seen in this photo.

Infiltration Patching

- Mineral deposits removed.
- One component resin product.
- Applied in areas with visible infiltration.





Above Ground

- Pump
- Water tank
- Pallets of material
- Hoses
- Generator

Two laborers operating the machine and adding material while in communication with the spray crew in the sewer line.

Underground

- Spray Nozzle and Sled
- Hand Tools
- Bypass equipment at the upper manhole

With the modified manholes spray lining equipment can run from either direction.

Two laborers with the sled monitoring speed and spray parameters. Hand tooling as required.



Spray Lined with Permacast PL 8000

Construction Benefits:

- Quick application and cure
- Can stop and restart application
- Only need a manhole for access
- Laterals quickly restored
- Structural solution
- Flexibility for installation timing



- Surface appearance
- Fiber content of cement



• Final one-year inspection





Lessons Learned

Schedule was not as flexible as expected.

Prep work is significant and needs time.

There is not a definitive spray lining calculation method for lining a structurally deficient pipe.

Resident impacts were not as severe as expected and good communication kept public complaint down.

Centrifugally cast cementitious pipe is less disruptive than other methods we have tried.

QUESTIONS?



Rebecca Caldon, PE Engineer Albany Department of Water and Water Supply (518) 434-5104 rcaldon@albanyny.gov