

Inspecting, Cleaning, and Rehabilitating Piping Infrastructure

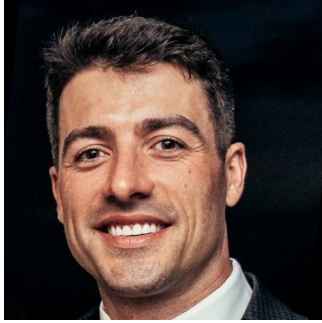
Presented by:

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Progressive Pipeline Management

Monday, March 11, 2024: Session 4

Meet Your Presenters



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Learning Objectives

Extending the lifespan
of existing facilities
infrastructure using
minimally invasive
technologies



Learning Objectives

1. CCTV Inspections

- Obtaining a visual of the existing infrastructure is critical to understanding current piping conditions.
- CCTV inspections enable facilities teams to make informed, risk-based decisions to support the campus's master planning efforts.

2. Cleaning and Maintenance: Improved Options

- Tools continue to update and improve, including:
 - Chain Knockers
 - Sandpaper Fins
 - Pan and Tilt CCTV cameras
 - Portable Jetters (electric, gas-powered)
 - Locating devices

3. Rehabilitation Options

- CIPP Lining
 - Ambient Cure vs. UV
- BIPP
- Piping Replacement

4. Minimized Disruption, Continued Operations

- No tearing down walls, ripping up entire floors, shutting down operations, or big construction projects.

A Need For Minimally Invasive Technologies

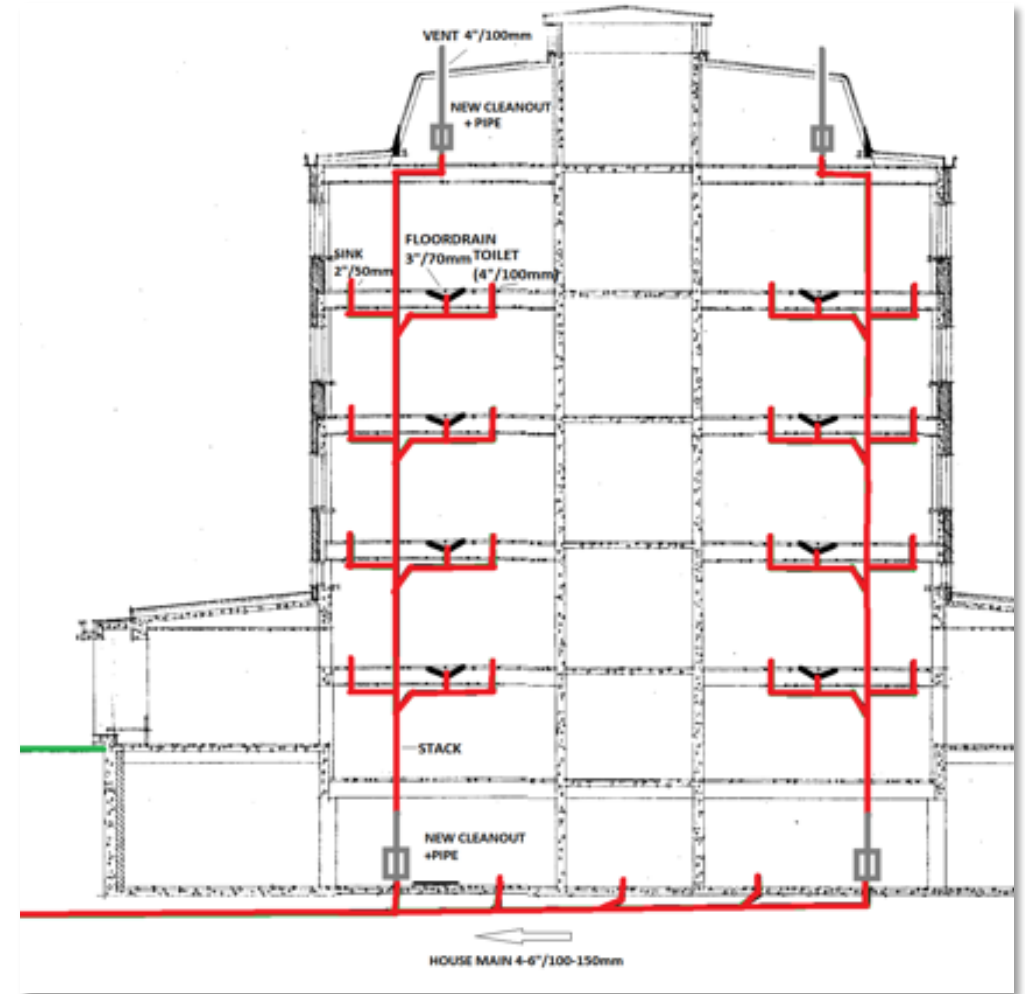
Minimally invasive technologies offer significant value in underground or in-building utility systems, particularly in challenging-to-reach locations.



A Need For Minimally Invasive Technologies (In-Building)

With the complex network of pipelines and piping systems that run through, around, and under a facility, resolving plumbing issues can be expensive and disruptive to operations & tenants.

- **Systems are typically located behind walls, under slabs, inside drop ceilings, making them challenging to access**



A Need For Minimally Invasive Technologies (In-Building)

Minimally invasive technologies address plumbing issues with minimal disruption to building occupants and operations. These technologies reduce cost, minimize downtime, and preserve the integrity of the building's infrastructure.

These technologies include:

- **Pipeline Inspection Technologies (CCTV) to diagnose and assess condition**
- **Pipeline Cleaning Technologies**
- **Pipeline System Renewal Technologies**



Closed-Circuit Television (CCTV) Inspections

CCTV inspections of in-building & underground pipelines offer a range of benefits and options for assessing the condition of pipelines ≥ 2 " in diameter.

- Assess the condition of pipelines and identify potential issues or defects.
- Prioritize maintenance and repair activities based on the severity of identified issues.
- Ensure the integrity, reliability, and safety of pipeline infrastructure.
- Facilitate proactive maintenance planning and asset management.



Closed-Circuit Television (CCTV) Inspections (continued)

CCTV cameras allow facilities teams to efficiently inspect pipelines and laterals with minimal disruptions – only an access point is needed.

- Design options:
 - Rugged/durable
 - Slim
 - Ultra Flexible
 - 50' to 325' in length
- Lighting and camera improvements
- Pan and Tilt functionality
- Cable-equipped
- Real-Time adjustments
- Digital Recording



Closed-Circuit Television (CCTV): additional benefits

- Early detection of issues
- Cost Effective: Identifying issues early can help prevent costly future repairs or replacements.
- Documentation for building records
- Locating devices for precise locations and areas of interest



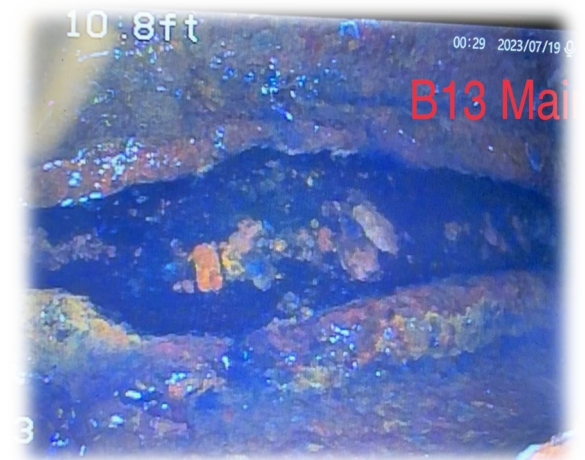
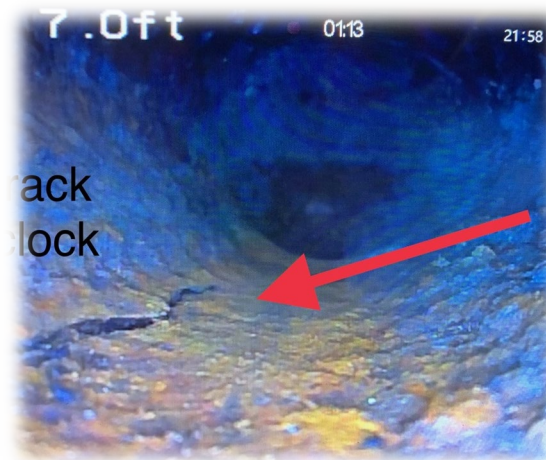
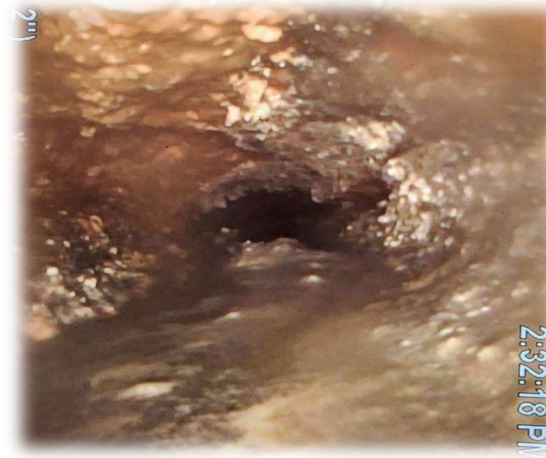
Remote CCTV Inspection Example Video



Potential Concerns Found By Inspection

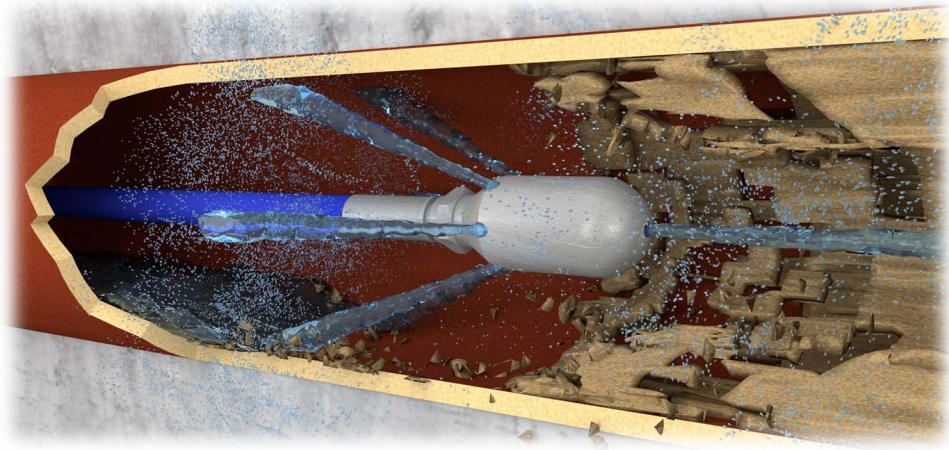
Potential Concerns:

- Blockages and debris
- Collapsed mains
- Offset joints & protruding laterals
- Unique piping configurations
- Cracks
- Heavy tuberculation
- Incorrect Drawings



Pipeline Cleaning Techniques

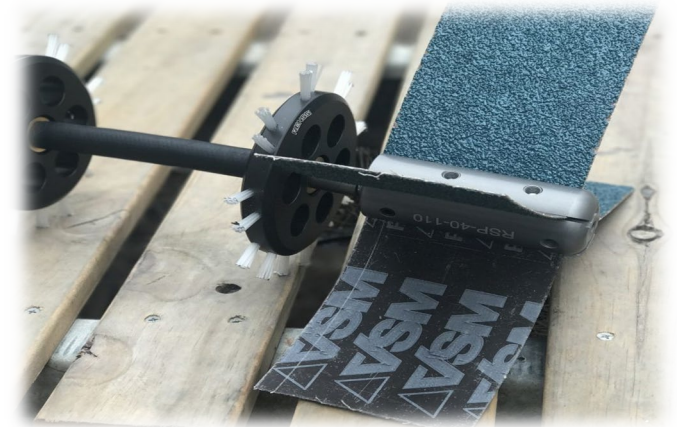
High Pressure Water Jetting



Vacuum Trucks



Sandpaper Fins



Chain Knockers



High Pressure Water Jetting

Harben Jetter – Tow Behind



Portable Jetters

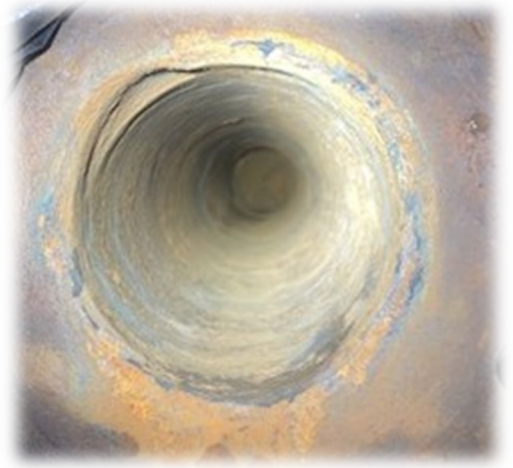
Gas



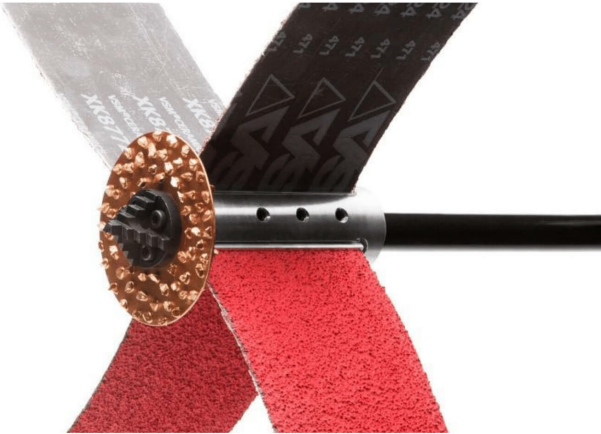
Electric



Chain Knockers



Sandpaper Finns



Vacuum Trucks



Pipeline Renewal

- Traditional Pipeline Replacement vs. Renewal
- CIPP & BIPP For Facility and Building Piping Renewal
- CIPP & BIPP Limitations
- Determining The Best Solution
- Installation Process
- CIPP Installation Process
- BIPP Installation Process
- Case Studies



Traditional Pipeline Replacement vs. Renewal

Traditional Pipe Replacement is costly, messy, time-consuming, and disruptive.

- High cost, unpleasant odors, closed off areas, noise, dust, vibrations
- Excavation, breaking down walls, inconvenient
- Extended project timeline – extensive process
- In older buildings, environmental risk potential: Asbestos or lead



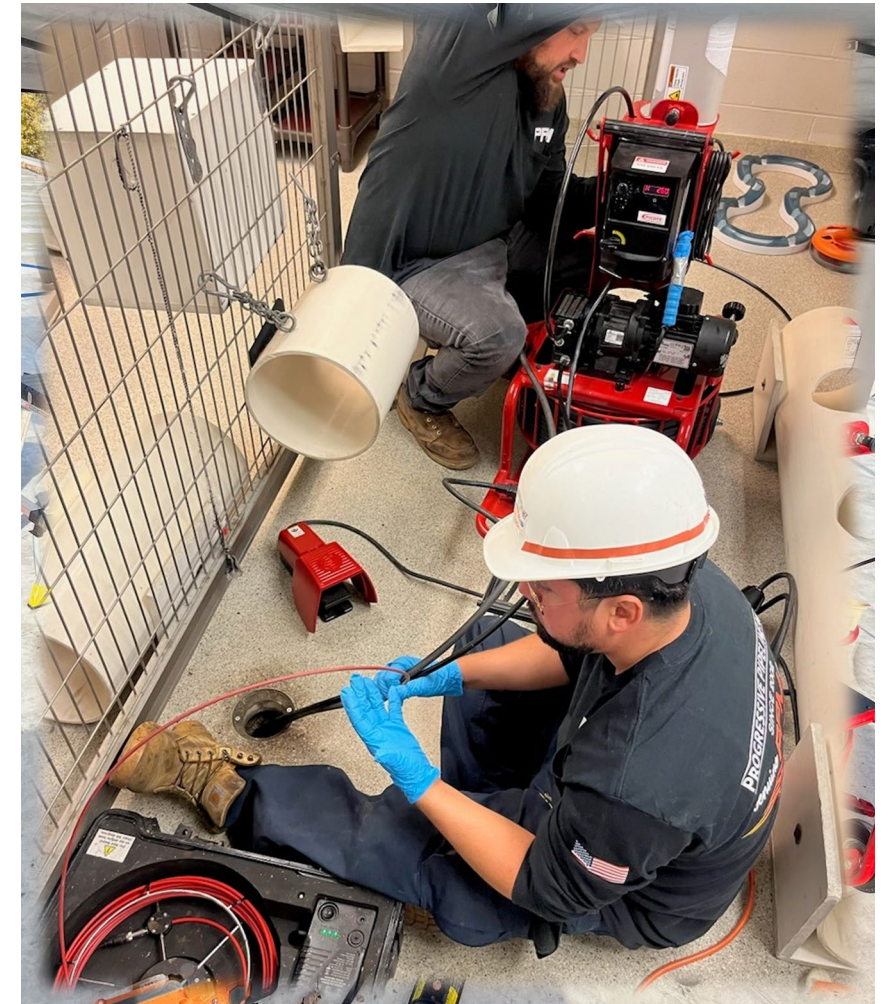
Traditional Pipeline Replacement Vs. Renewal

Minimally-Invasive Pipe Renewal

- CIPP (Cured-In-Place-Pipe): UV and Ambient Cure
- BIPP (Brush-In-Place-Pipe):

ADVANTAGES

- Minimizes Disruption
- Faster project timeline
- Cost effective solution to extending lifespan of aging pipes



Minimally Invasive Methods for Pipe Renewal

CIPP – Cured-In-Place-Pipe:

- Felt liner with pre-impregnated resin
- Creates a “pipe within a pipe”
- Provides *structural* rehabilitation
- Seals cracks and voids
- Stops root and water infiltration
- 50-year design life
- Ambient or Ultraviolet Light (UV) Cured



BIPP – Brushed-In-Place-Pipe:

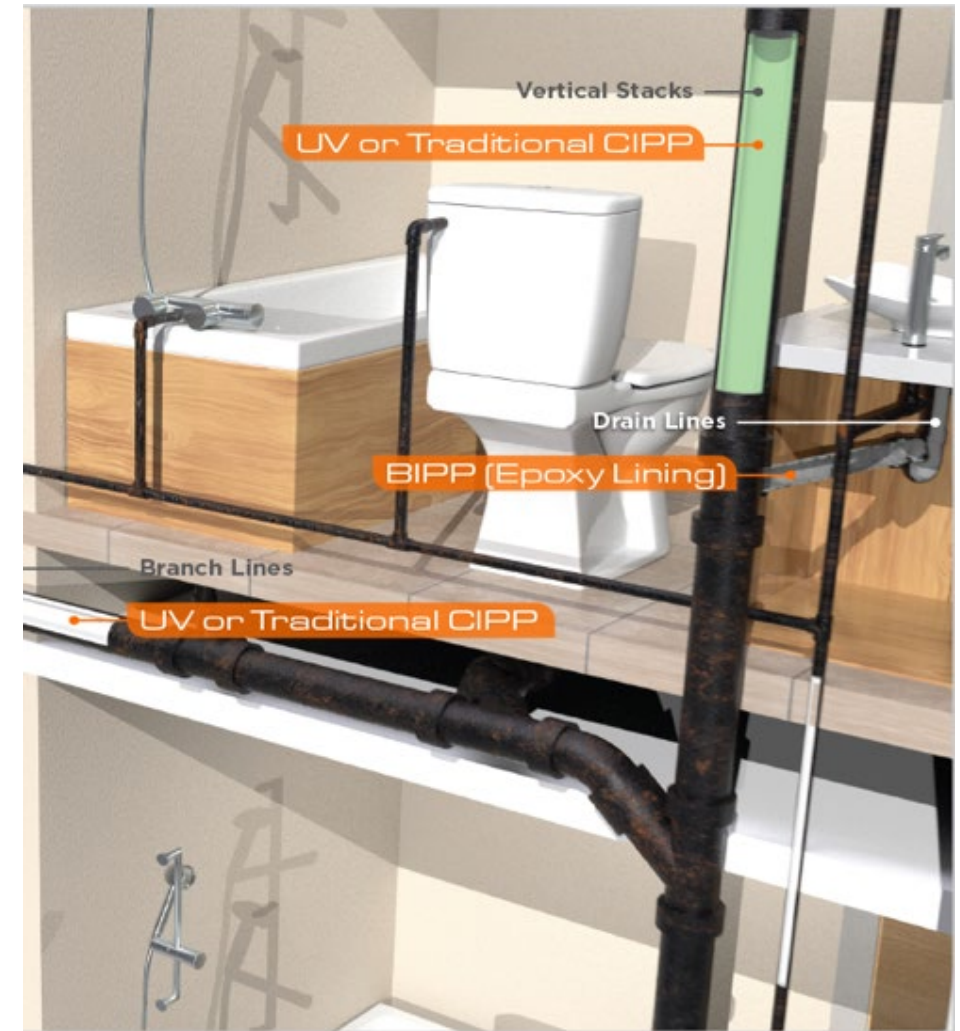
- Corrosion Protection
- Extends life of pipe – reduces future issues
- Quick and effective installation process
- Low risk installation
- Suitable for smaller diameters, irregular configurations
- Can be applied in potable water mains
- Often used in vertical lines



Benefits of CIPP & BIPP

Benefits of Both Methods:

- Minimizes utility service interruptions and disruption to operations or tenants.
- Seals leaks, corrosion protection
- Quick installation
- Extends life of piping system
- Capable of navigating complex bends and dips
- Minimizes excavation & re-construction costs.
- Improved Flow



CIPP & BIPP Limitations

CIPP

- Pipe must not be severely deteriorated or collapsed
- Relies on host pipe for structure
- Limited access, trouble with sharp bends, multiple bends
- Liner will block any connections and therefore connections must be reinstated with cutting tool

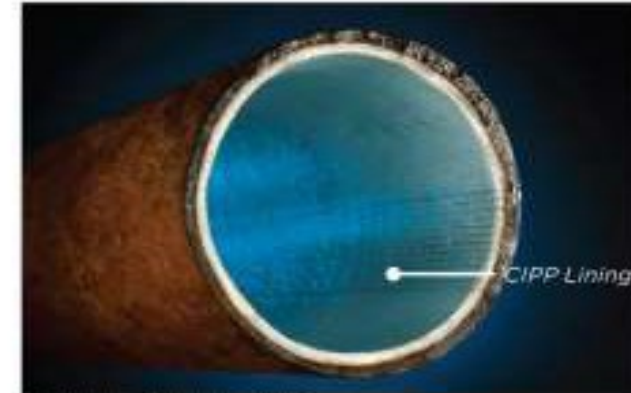
BIPP

- Unable to rehab holes, big cracks
- Clean host pipe necessary for proper epoxy adhesion
- Best suited for vertical stacks
- Less durability than CIPP

Determining The Best Solution

Determining the Best In-Wall Renewal Solution Depends on the Building's Piping System & Surrounding Environment

PIPE DETAILS	RECOMMENDED APPLICATION		
	UV-CIPP (LED)	CIPP	BIPP
PIPE TYPES			
Vertical Stack Pipe	X	X	X
Branch Waste Lines	X	X	X
Drain Lines	X	X	X
Horizontal Sewer Main	X	X	X
PIPE CONDITION			
Corrosion Protection	X	X	X
Sealing	X	X	X
Cracks	X	X	
Structural	X	X	
Leaks	X	X	X
DIAMETERS			
1-1/4" - 8"			X
2" - 8"	X		
2" - 24"	X	X	X



CIPP/UV-CIPP Lined Pipe



BIPP (Brushed-In-Place Pipe)

Pre-Installation Process

Pre-Installation Steps for CIPP & BIPP:

- Site Selection, Layout & Project Design
- CCTV Inspection
- Pipe Cleaning
- Post-Cleaning CCTV Inspection
- EQ and Material Setup



CIPP Installation Process

Liner Measured & Cut



Resin Saturation



CIPP Installation Process

Load into Inversion Drum



Inverting



Curing



CIPP Installation Process



<https://www.youtube.com/watch?v=BfW0wJ5XsWg>

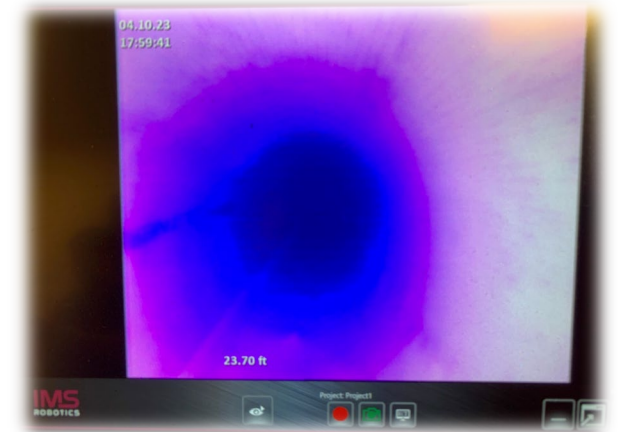
Reinstating Connecting Lines

Connection Reinstatement Process



CIPP Installation Process

Post Lining CCTV



BIPP Installation Process

EQ and Material Setup



BIPP Installation Process

Epoxy Mixing and Pump



BIPP Installation Process

Epoxy Application



BIPP Installation Process



BIPP Installation Process

Final Product



BIPP Installation Process

Post-BIPP Steps

- Ambient Curing
- Heat and Blower Drying
- Final CCTV Inspection



Additional Resources

CCTV Cameras for Cross-Bore Inspections



Case Study: CIPP – 637ft / 4” Roof Drains

BACKGROUND & SITUATION:

- 15 story building with 150 residential condos & apartments.
- 60-year-old roof drain system, five cast iron drains, each 4” in diameter.
- Each roof drain is approximately 120’ long, vertical runs covering a total of 637’ of pipe.
- Roof drains leaked throughout the building walls and ceiling, causing excessive water damage.
- CCTV camera inspections revealed significant corrosion. Many lines were extremely brittle with multiple cracks.
- One section of pipe had a 3’ gap where the pipe had corroded completely away.



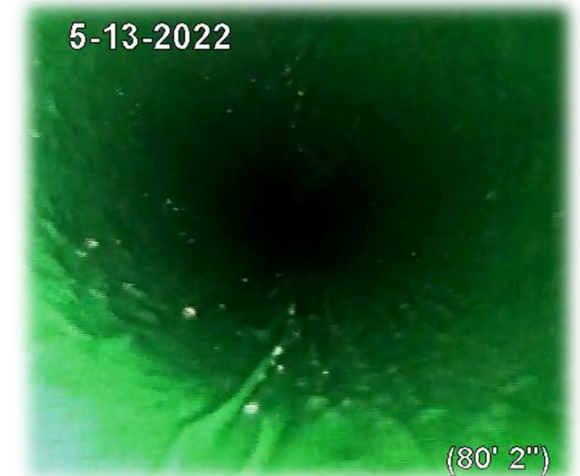
Case Study: CIPP – 637ft / 4” Roof Drains

SCOPE:

- Following a CCTV inspection and cleaning, the liner was measured and cut to the exact specs of each pipe; soaked in resin; loaded into a pressure drum; then inverted and installed.
- To address the missing section of pipe, a PPM crew member climbed into a ceiling hatch to guide the inverted liner across the gap.
- A chain of ultraviolet (UV) lights on a cable was inserted from the inversion point to the end of the liner to fast-cure the resin.

RESULTS:

- A post-CCTV inspection confirmed the liner was in place; formed a structurally sound CIPP within the host pipe; and had no obstructions.
- The entire project of lining and remediating the roof drains was completed without displacing the residents.
- The building owners avoided the high costs and disruption of the alternative ‘rip out and replace’.



Case Study: UV CIPP: 2 Parallel Sewer Mains, 22 BIPP Connections

BACKGROUND & SITUATION:

- 2 story building with 75 rooms for special needs residents.
- Drainage system backing up throughout the building. A solution was necessary.
- Prior 3rd party installer had incorrectly lined a section of pipe while the water was running, leading to a “shark fin” in the line.
- Excavation was necessary to remedy the situation. PPM was called in to complete the project.
- Two parallel horizontal mains stretching 350'. 6” to 8” to 10” mains.
- CCTV camera inspections revealed extreme tuberculation, system overflowing with wipes and debris.
- CCTV inspections of 22 connections showed corrosion, blockages, and brittle pipes in need of support.



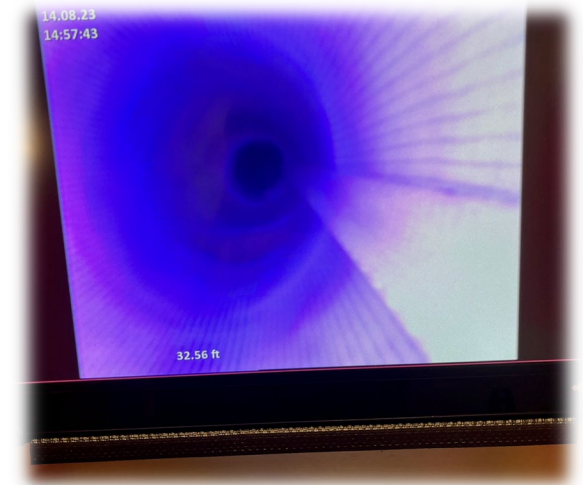
Case Study: UV CIPP: 2 Parallel Sewer Mains, 22 BIPP Connections

SCOPE:

- CCTV inspection and heavy cleaning necessary. Multiple cleaning techniques needed – Harben jetter, chain knockers, sandpaper fins, and vacuum truck.
- Pits to be dug every 120’.
- UV CIPP lining of 7 sections. 6”, 6”-8”, 8” to 10”. Lines transitioned.
- Cleaning of 22 connections for BIPP process.
- Access panels and access points to be made on first floor.

RESULTS:

- A post-CCTV inspection confirmed the liner was in place; formed a structurally sound CIPP within the host pipe; and had no obstructions.
- The entire project of lining and remediating the roof drains was completed with minimal disruption.
- The building owners avoided the high costs of displacing residents. Building was able to operate near to “as usual”.



Questions?



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THANK YOU!