Existing Sewer Lateral Pipe Repair Using Trenchless Methodology

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NASSCO

• Who is NASSCO
Introduction

• Trenchless Methodology
• Codes and standards related to the repair of existing house sewers or lateral pipes
• Legal issues surrounding private property and impact on public utilities
• Selection of materials and technology
• Design, specification and procurement
• Effectiveness of methods

Service Laterals

• Nomenclature:
  • Service Laterals
  • Building Sewers
  • Building Drains
• Over 76 million sewer laterals in USA
• Lateral piping from 4” to 6” in diameter
• ~3.8 billion feet of lateral piping
• All types of pipe material
  • Cast iron, clay, AC, Orangeburg, PVC

Trenchless Methodology

• Grout
• Pipe Bursting
• Cured In Place Pipe (CIPP)
• Main Line Connection Seal
Grout

- Chemical Grouts
  - Chemical catalyst
  - Water activated
  - Application and Use

Lateral Grouting After Mainline Lining

Lateral Grouting – Push Type

- Access through cleanout
- Grouting along lateral
- Partial or full length
Lateral Tap Connection Grouting

- Mainline diameters from 6”–30”
- Effective sealing distances from 8” through 30 feet
- Diameter of laterals 4”, 5” or 6”

Pipe Replacement

- Pipe Bursting
- Application and Use
- Replacement Pipe

Lateral Bursting

- Lateral upsizing is desired
- Badly damaged laterals
- Replaces existing lateral with new pipe
Cured-In-Place Pipe Technology

• Invented in 1971 for use in mainline sewers
• Introduction to USA in 1976
• Over 300,000,000 feet of pipe repaired with CIPP

A textile (fabric or tube) impregnated by a thermosetting resin is inserted (pulled or inverted using air or water) into an existing pipe, expanded and cured (ambient, hot water, steam or light) to form a new pipe within the existing pipe without excavation, or at least minimal excavation to gain access to the existing pipe.

Lateral Lining Systems

• Proven technology
• New technologies and methods of installation
• Documented successes
• Less disruption
  • Infrastructure
  • Business / Residents

Purpose of Lateral Lining

• Rehabilitate service lateral pipe to various lengths
• Provide a watertight seal solution to eliminate leaks from the lateral pipe and remove I/I from entering the public sewer
• Increase service life of critical asset to its Owner
Application

- Service Laterals or Building Sewers
- Building Drains
- Vents
- Connection to Public Sewers

Alternatives / Selection

- Sectional Pipe Lining
- Lateral Pipe Lining
- Control Leakage
- Watertight
- Structural
- Reduce infiltration entering public sewer
- Extended service life of the existing pipe

Application Variables

- Access – Physical and Legal
- Diameters from 2” to 10”
- Multiple bends
- Diameter changes
- Offset joints
- Cracks
- Deposits
- Roots
- Connection to public sewer
Materials

- Resin systems
- Liner/tube or fabric

Liner Tubes or Fabric

- Various types
  - Fiberglass fabric
  - Felt
  - Woven
- Applications
  - Straight pipe
  - Bends
  - Single point or sectional repair
  - Vertical installation

Resins

- Polyester
- Epoxy
- Vinyl ester
- Silicate
Installation Methods

- CIPP
  - Pull or Push in Place
  - Inversion
- Grouts
- Pipe Bursting

Curing Methods

- Ambient
- Hot water
- Steam
- Hot air
- Light – UV and LED

Pre-Lining Process

- Access
- Inspection
- Cleaning
- Repairs
Lateral Rehab Evaluation

- Review CCTV inspection videos – PACP
- Determine extents of defects and deterioration
- Identify location and extents of spot repairs
- Determine service sizes, material, depth, number of service connections (open/capped)
- Evaluate lateral ownership

Inspection – Pan & Tilt

- Mainline sewer CCTV camera with pan & tilt
- Inspection performed from mainline sewer
- No cleanout/access point needed
- Can typically only see up a few feet

Inspection - Push

- Insert camera through cleanout or other access point
- Distance up to 150 ft
Inspection - Lateral Launch
• Launch camera from the mainline sewer
• No cleanout/access point needed
• Can traverse 80+ feet

Lateral Cleaning
• Lateral cleaning techniques have improved
• Up to 80+ feet from mainline sewer
• Done with or without a cleanout/access point

Cleaning from Mainline
Lateral Cleaning

Pre-cleaning

Post-cleaning

Sectional Pipe Repair

• Repair is needed in specific locations of a pipe vs entire length
• Repair is required as prerequisite to lining entire length of pipe

Installation Process

• Installation Methods
  • Pull in place
  • Push in place
  • Inversion
• Access
• Materials
• Purpose
Lateral Rehabilitation

- Full length lateral lining
- Connection seal to public sewer

Lateral Pipe Lining

- Double inversion method
- Single inversion method
- Pull-in-place method
- Clean-out inversion method

Main/Lateral Connection Lining

- Sealing the connection between lateral pipe and the public sewer
- Brim Style Connection Lining
- Full Circle Style Connection Lining
Lateral and Main/Lateral Connection Lining
- Pull in place
- Inversion
- Two-step method

Lateral Connection Seal
- Rehabilitates lateral connection to mainline sewer
- Extends 24” – 36” into service lateral
- Installation performed from the mainline sewer
- Does not require cleanout/other access point
- Brim-Style or Full-Wrap in the main

Full Length Lateral Lining
- Installed from mainline sewer or cleanout/other access point
- Extends various lengths and up to 4” cast iron from property
- Can seal connection to the mainline – installed from mainline
- Some products require a cleanout/other access point
Connection Liner or Full-Length Liner

- Distance up lateral needed for rehabilitation
- Goals of the program
  - Consent order driven
  - Structural issues
  - Infiltration issues
- Access - do cleanouts exist
  - Work on private property
  - Product limitations
- Ownership
- Available funding
- Location of groundwater table
  - Can help determine how far up the lateral to line

Installation and Sealing Properties

- Hydrophilic End Seals
  - Gasket
  - Paste
- Physical Bonding
  - Resin Migration
  - Epoxy Bond

Installation and Sealing Properties

- Often a contentious issue
- Opinions vary widely
- Installation
  - Inversion method – resin migration
  - Inflation/Packer system – mechanical bond
Codes and Standards

- IPC
- UPC
- ICC-ES
- NSF 14 SE
- IAPMO
- ASTM F1216
- ASTM F2561
- ASTM F3240
- ASTM F2599
- ASTM F1743

ASTM Standards

- Primary Standards for CIPP
  - ASTM F1216
  - ASTM F1743
- Standards for Lateral Rehabilitation
  - ASTM F2561
  - ASTM F3240
- Standards for Point/Sectional Repair
  - ASTM F2599
- Standards in Development

Certification Entities

- ICC-ES
  - ICC-ES LC1011 – Rehabilitation of Existing Building Drains and Building Sewers
- NSF
  - NSF-14 SE 13004 – Rehabilitation for Small Diameter Pipes
  - NSF-14 SE 10990 – Rehabilitation by Point Repair of Existing Pipe
- IAPMO
  - IGC 321
Resources

- NASSCO – NASSCO.org
  - Overview of Lateral and Main/Lateral Connection Lining and Sealing Technologies
  - Tech Tips and Specification Guidelines
  - Certification and Training courses for inspection
- NASTT – nastt.org
- ASCE – UESI Pipelines Infrastructure
  - Manuals of Practice
- WERF Studies
  - Methods for Cost-Effective Rehabilitation of Private Lateral Sewers
- Other

International Plumbing Code

- ICC Code Development
- Existing Code 2018
  - Section 105.2 – Alternative Materials
  - ICC-ES LC1011 – Rehabilitation of Existing Building Drains and Building Sewers
  - NSF SE 13004 – Rehabilitation for Small Diameter Pipes
- 2021 - Section 717 – Relining Building Sewers and Building Drains

Uniform Plumbing Code

- IAPMO Code Development
- Existing Code 2018
  - Section 301 – Alternative Materials
  - Section 715.3 – Existing Sewers
  - IAPMO IGC 321
  - NSF SE 13004 – Rehabilitation for Small Diameter Pipes
  - 2021 - Section 715.3 – Existing Sewers
Quality Assurance / Quality Control Practices

• Material qualification
• Pre-installation process inspection
• Installation process inspection
• Post-installation inspection

Challenges & Solutions

• Evaluating application specification and conformance to relevant Code
• Addressing installation issues
• Resolving post-installation defects

Future Outlook

• Education opportunities
• Awareness
• Code development