Service Lateral Rehabilitation

Jacob Trapani
BLD Services, LLC
Introduction

• Intent, to provide information on:
  Lateral rehabilitation
  Sealing options
• Studies have shown that 40% to 70% of I/I come from laterals
• Studies have confirmed that many lateral pipes have reached their life expectancy and are failing
Outline

Provide information on:

– Main Line Rehabilitation...Not the Entire Solution
– Understanding the Problem(s)
– Inflow and Infiltration (I/I) from Laterals
– History of Lateral Rehabilitation
– Private Lateral Dilemma
– Product/Process Options
Inflow/Infiltration
Corrective Actions
Main Line Rehabilitation is Not Enough

“Jefferson County (Birmingham, AL) has rehabilitated more than 3 million LF of main line sewers and SSO’s still occur at an unacceptable rate. We’ve discovered that we must address the laterals”
- Daniel White, PE – Deputy Director (Sewer), Jefferson County, AL

“Lateral rehabilitation was successful in reducing the occurrence of surcharging to less than once in two years, whereas the system was still surcharging about 15 times a year after the mainline rehabilitation only.”
- Metro Water Services & Davidson County (Nashville, TN)
Survey Conducted – I/I from Laterals

– 45% of the participating agencies had **estimated** how much laterals contribute to total I/I.
– **Estimates** varied from 7%-80% with an average of 40%.
– Majority **felt** lateral pipes, like main line pipes, have reached their life expectancy and are failing.

Laterals are a major source of I/I within collection systems!
Service Laterals

• Over 76 million sewer laterals in U.S.
• Lateral piping from 4” to 6” in diameter
• Estimated 3.8 billion feet of lateral piping
The emphasis on service lateral rehabilitation was fueled in 1993 by an extensive study* conducted in Nashville, TN to evaluate the effectiveness of lateral rehabilitation on the reduction in I/I.

*(awarded the first Rehabilitation Project of the Year by Trenchless Technology Magazine)
Laterals are Part of the I/I Equation

Flow Monitoring (Oak Valley) – Metro Water Services & Davidson County

Before Any Rehab

After Main Line Rehab

After Lateral Rehab

52%

84%
Lateral Renewal Programs

• Sewer laterals have been called the “Final Variable” of the collection system rehabilitation equation
• Laterals have been given less attention in the past due to:
  – Sheer number of laterals
  – “Snow Flake Effect”
    • No two laterals are alike
  – Lack of consistent effective and affordable inspection and renewal methods for small diameter lines
  – Complex issues of ownership and maintenance responsibilities
Lateral Market – Where is it Going?

- Municipalities are increasing focus on service laterals by including in rehab projects
- Insurance policies are now readily available for private ownership
- Creative pay terms are being implemented for private laterals that have to be repaired
- Inspections of laterals are becoming more common at the time of buy/sell of a house
- Municipality/Utility taking back ownership
Where Does Ownership Take Place?

- From House to Main Line Excluding Tap: 16%
- From House to Main Line Including Tap: 40%
- From House to Property Line: 42%
- Definition Varies within Same Agency: 2%

Overall, the definition of where ownership takes place varies significantly among agencies, with ownership typically extending from the house to the main line, either including or excluding the tap.
Understanding the Problem

Diagram showing various sources of inflow and infiltration, including:
- Inflow Sources
  - Roof Drain Connection
  - Uncapped Cleanout
  - Root Intrusion into Lateral
  - Broken House Lateral
  - Faulty Lateral Connection
- Infiltration Sources
  - Connected Foundation Drain
  - Faulty Manhole Cover or Frame
  - Cracked or Broken Pipe
  - Deteriorated Manhole

Additional images show close-ups of manhole conditions.
Project Scope

Ownership?

To The House

Clean Out

Property Line

Connection

Groundwater Level

1st Joint
Street Repairs
Taxpayer Reaction
Contents

• Introduction
• Rehabilitation Alternatives
  – Sectional Pipe Lining
  – Lateral Pipe Lining
  – Main/Lateral Connection Lining
  – Lateral and Main/Lateral Connection Lining
  – Main/Lateral Connection Sealing
  – Lateral and Main/Lateral Connection Grouting
  – Lateral Pipe Bursting
CCTV – Lateral Inspection

• CCTV capabilities have dramatically improved
• Up to 80+ ft from the mainline Pipe
• No cleanout needed
• Pre & Post rehabilitation CCTV Inspection
Lateral Cleaning

- Lateral cleaning techniques have improved
- Up to 80+ ft from the main line Pipe
- No clean out needed
- Done during CCTV inspection
- Removal of roots & debris
Lateral Rehabilitation Methods

- Chemical Grouting
- Pipe Bursting
- Flood Grouting
- CIPP Lining (most common)
CIPP Lateral Lining

• Liners are similar to those used in main line CIPP rehabilitation
• Multiple Resin Systems
  – Polyester – Vinylester – Epoxy - Silicate
• Cure Systems
  – Ambient – Steam – Water – UV
• Meet typical ASTM specs for CIPP
Specifications

• F1216, F1743, D5813, D790, D2990
• Specifications for CIPP Laterals
  – Demand experience
  – Request and check references
  – Allow multiple products to bid
Hydrophilic Materials

- Used to seal lateral connection at the main
- Expands upon contact with water
- Various Configurations
  - Paste
  - Gaskets
  - O-Rings
- Air pressure testing confirms the sealing at the lateral connection to the main
- Various materials have been tested after years of service and confirmed effectiveness to seal through hydration/dehydration cycles
“Brim” Style of CIPP Lateral

- Industry terminology – “Top Hat”
- Process installed from the mainline
- No clean out is required
- Typically installed after mainline CIPP
- A bladder is used to inflate to put in place the resin saturated liner
- Hydrophilic material is used to seal the connection at the main
- Generally installed in shorter lengths
“Full-Wrap Style of CIPP Lateral

- Can be installed before or after main line rehabilitation
- Installed from mainline
- No clean out is required
- A bladder is used to inflate and position the resin saturated liner in place
- Liner forms a full circle around the inside of the main sewer pipe
- The main liner is approx. 16” in length and is $360^0$ within the main line pipe
- Typical lateral lengths are from main line up to 60 ft.
- A clean out is usually required for lengths longer than 60 ft.
- Hydrophilic material is used to seal the lateral connection at the main and the terminating end of the CIPP lateral
Grouting

• Packer is positioned inside the sewer at the lateral location
• The packer bladders are inflated isolating the predetermined portion
• A two component chemical grout is pumped
Lateral Pipe Bursting

• The bursting head is either pulled or pushed in
• A “power pack” is used for pushing/pulling
• The majority are pulled in
• The new pipe can be a larger size
Sectional Pipe Lining

• Used when just a few areas need rehabilitation
• Three Cured-In-Place liner methods:
  - Pull-In-Place
  - Push-In-Place
  - Inversion
Sectional Pipe Lining

• Inversion Method:
  – Resin saturated liner tube
  – Inversion bladder
  – Liner can be positioned at any distance
  – Varying diameters/lengths
Lateral Pipe Lining

- Involves rehabilitating laterals from a lateral access point
  - At or near the sewer main
  - At or near the building foundation

- Four Methods:
  - Double inversion
  - Single inversion
  - Pull-In-Place
  - Clean-Out Inversion
Double Inversion Method

Liner Inversion

Bladder Inversion

Bladder & Liner pressurized
Single Inversion Method

- Liner & bladder are simultaneously inverted
- Camera is inserted into the bladder
- Pressure is maintained and the liner cures
Main/Lateral Connection Sealing

- Connection prepared by cutting/milling robot
- Main line packer is positioned
- A lateral bladder is launched and isolates the connection
- A resin epoxy material is injected under pressure
- Resin is ambient or heat cured
Main/Lateral Connection Sealing

Step 1: Cutter mills annular gap where lateral meets mainline.

Step 2: Packer injects silicate resin through gap to rebuild bedding, stop roots/infiltration, and bond lateral to main line.
Main/Lateral Connection Sealing

Permanently seals lateral and first joint with average of 20 lbs of resin.

Applicable for both lined and un-lined main pipe.
Lateral and Main/Lateral Connection Grouting

– A flexible push/pull packer allows grouting of laterals from above ground access
– The grout packer usually isolates an area of 3 to 5 feet
Lateral Resources

• NASSCO - Lateral Committee - 2012
  – Overview of Lateral and Main/Lateral Connection Lining and Sealing Technologies

• WERF Studies
  – Survey of Public Works Agencies – 2004
  – Methods for Cost-Effective Rehabilitation of Private Lateral Sewers – 2006

• Miami-Dade Water and Sewer District
  – Comprehensive Lateral Investigation Program - 2007
Thank You

Questions?