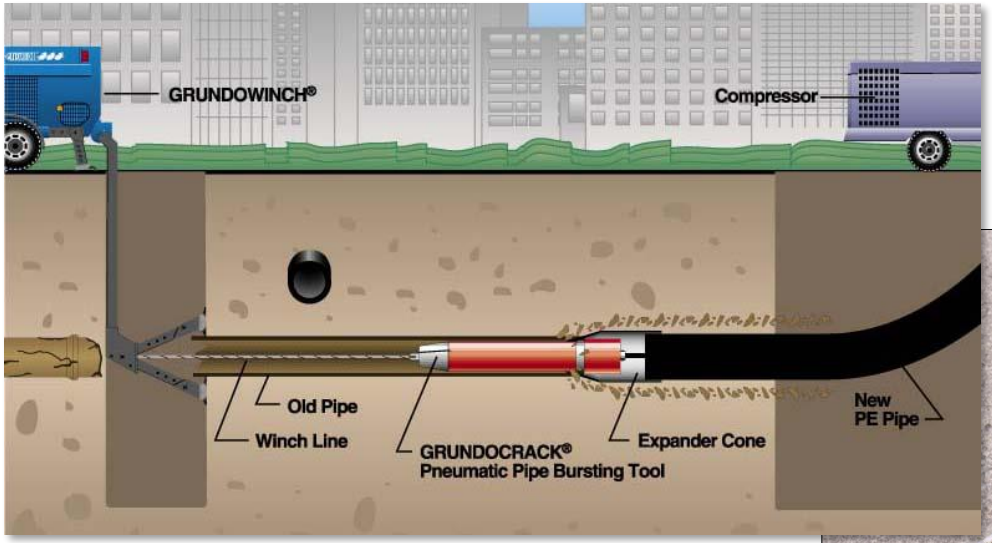
Rehabilitation of the Collection System - A Holistic Approach

Chris Larson – C&L Water Solutions

Meet C&L Water Solutions, Inc.

- Pipe Bursting-water, sewer, and storm

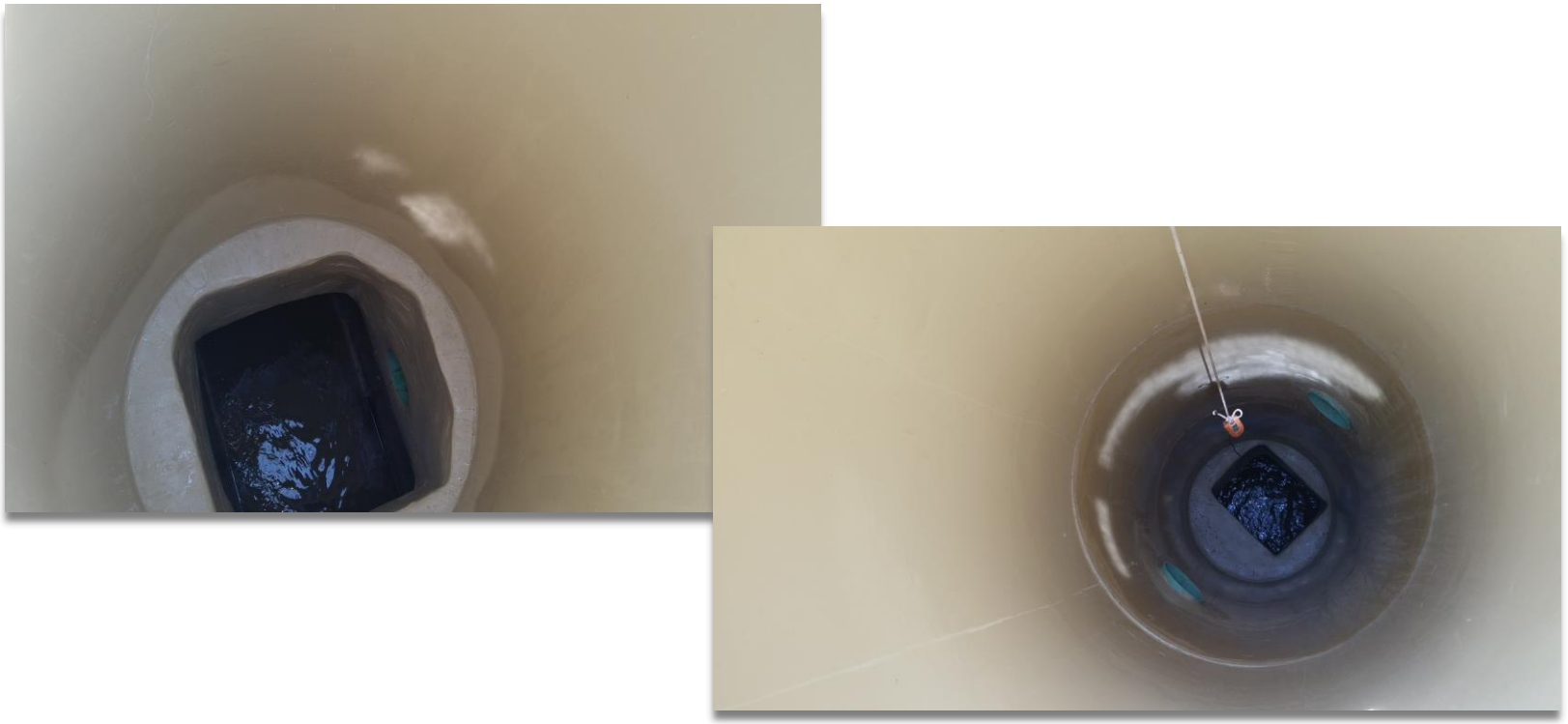


Meet C&L Water Solutions, Inc.

- Lateral Rehabilitation

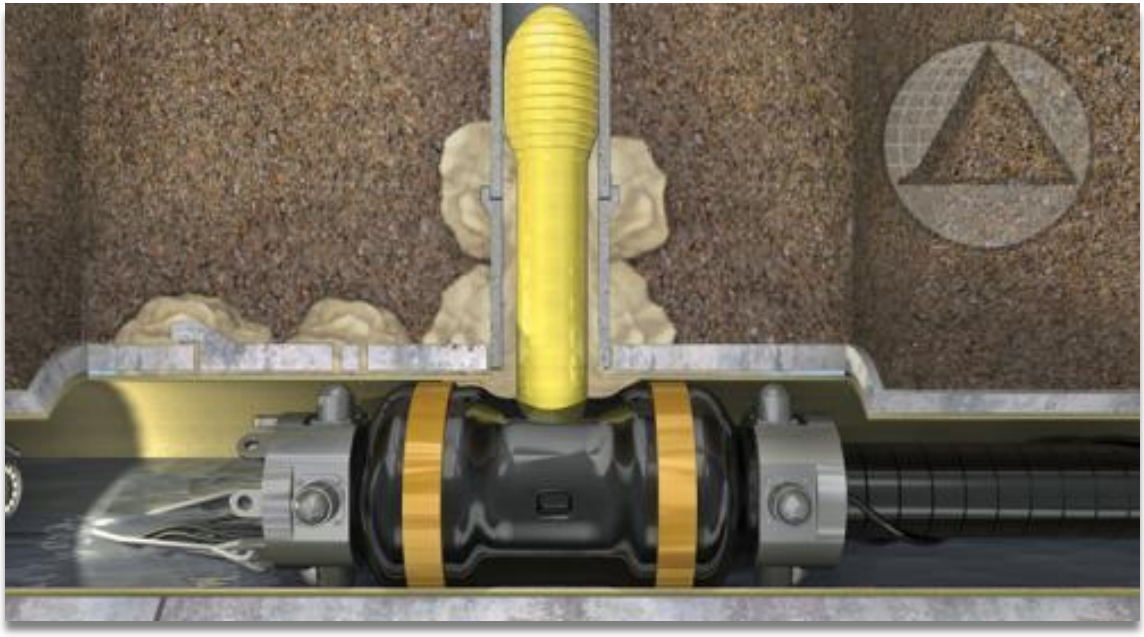
Meet C&L Water Solutions, Inc.

- Manhole Rehabilitation/Coatings and Inserts



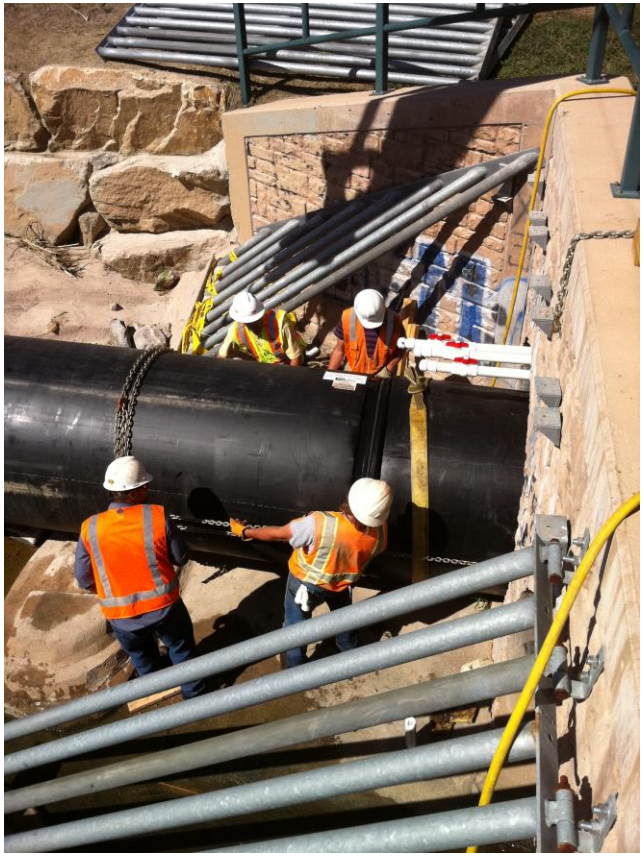
Meet C&L Water Solutions, Inc.

- Chemical grouting (infiltration control)



Meet C&L Water Solutions, Inc.

- Sliplining (FRP/HDPE/C900)



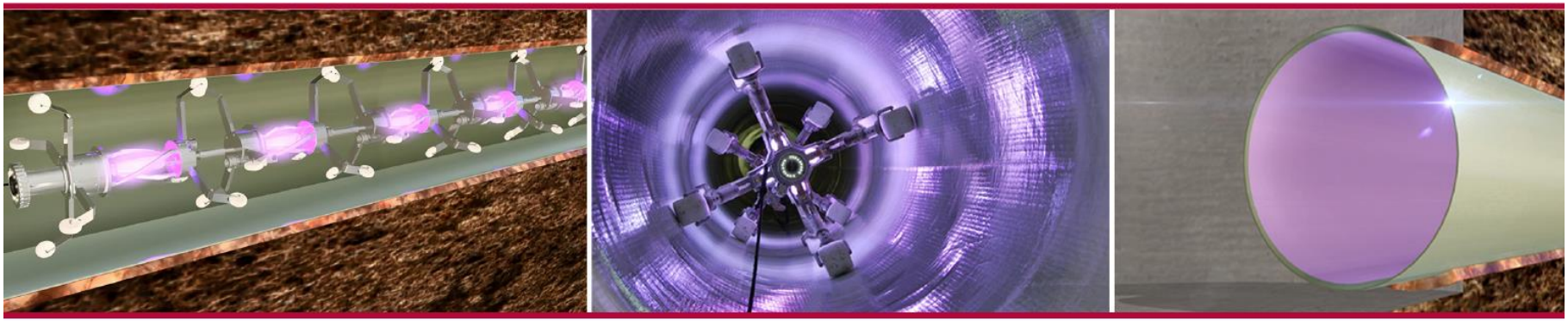
Geopolymer Rehabilitation of Storm and Manholes

Meet C&L Water Solutions, Inc.

Open Cut and Turnkey Bypass Services

Meet C&L Water Solutions, Inc.

- UV-Cured CIPP



Holistic Rehabilitation

- STEPS TO SUCCESS
  1. CIPP Lining
  2. Lateral Lining/Connection Seals
  3. Manhole Rehabilitation

UV Cured Fiberglass Reinforced CIPP

Product

Installation

Conclusion

Benefit Analysis

Q&A

SAERTEX LINER® Technical Envelope

Strengths and Dimensions

- Saertex S+ Liner:
  - 2,900,000 PSI Modulus of Elasticity Short Term
  - 36,259 PSI Tensile Strength Short Term
  - 18”-72”
  - Any given dimension with dimension changes possible

- Saertex M Liner:
  - 1,015,000 PSI Modulus of Elasticity Short Term
  - 29,007 PSI Tensile Strength Short Term
  - 6”-15”
  - Any given dimension with dimension changes possible

SAERTEX LINER® Technical Envelope

C&L WATER SOLUTIONS

Wall Thickness

- 3-8mm is typically all that is required for most design depth, loading & ovality requirements.
- Retains and Improves Hydraulic Capacity
- Access

SAERTEX multiCom®

SAERTEX LINER® Technical Envelope

Infiltration Control

- 3rd Party Testing Verifies 99-100% Impermeable
- Low Heat=Less than .05% Thermal Contraction
- Mechanical Bond
- Manhole End Seals

SAERTEX LINER® Technical Envelope

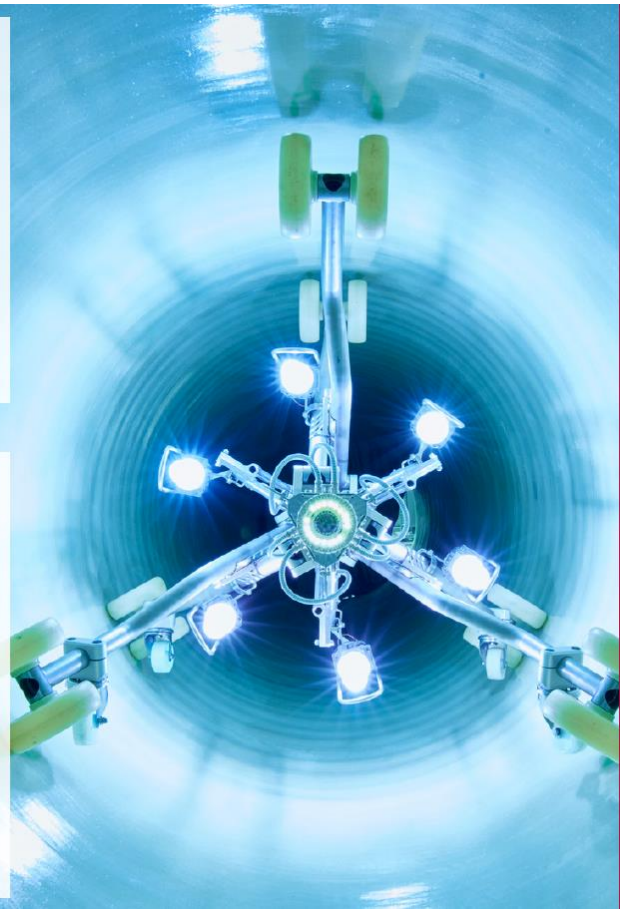
Infiltration Control

SAERTEX multiCom®

Quality Control

- UV process balance
- Resin activation
- Speed/time/distance controlled/monitored
- Manufacturers chart

- Temperature Sensors
- Ambient/Wall
- No water used, no cool down time
- Immediate re-instate



SAERTEX LINER® Technical Envelope

Environmental Impact, Styrene and Energy

- Low Equipment Footprint
  - No Boilers, No Towers, Low Noise
  - Lower Emissions, 3 GPH vs. 73 GPH
- 0 Detectable Levels of Styrene Emission, 3rd Party Tested. (Caltrans Study)
- No gas emission
- Impacts of Styrene:
  - Residents and Customers
  - Algae Blooms
  - Treatment Plant Process

Figure 3. Algal blooms at Site 3, photographed 24 days after installation. Algal blooms appeared within 6 to 8 days after installation at Sites 1, 2, and 3 and were present up to 8 in below water surface near pipe outlet and up to 50 m downstream.

Design Life

- 20,000 Hour Long Term Ring Stiffness Testing
  - 70 yr design life vs. 50 yr for traditional methods of CIPP (40%)
  - Higher Retention Values 70 – 80%
- Meets and exceeds ASTM F-1216 and 2019
- Abrasion Testing
- Chemical Resistance Testing ASTM 543, Zero impact

Test of the short-term flexural strength

Test of the long-term flexural strength

SAERTEX LINER® Technical Envelope

Design – ASTM F2019.19

FINALLY! A design for FRP CIPP is available:

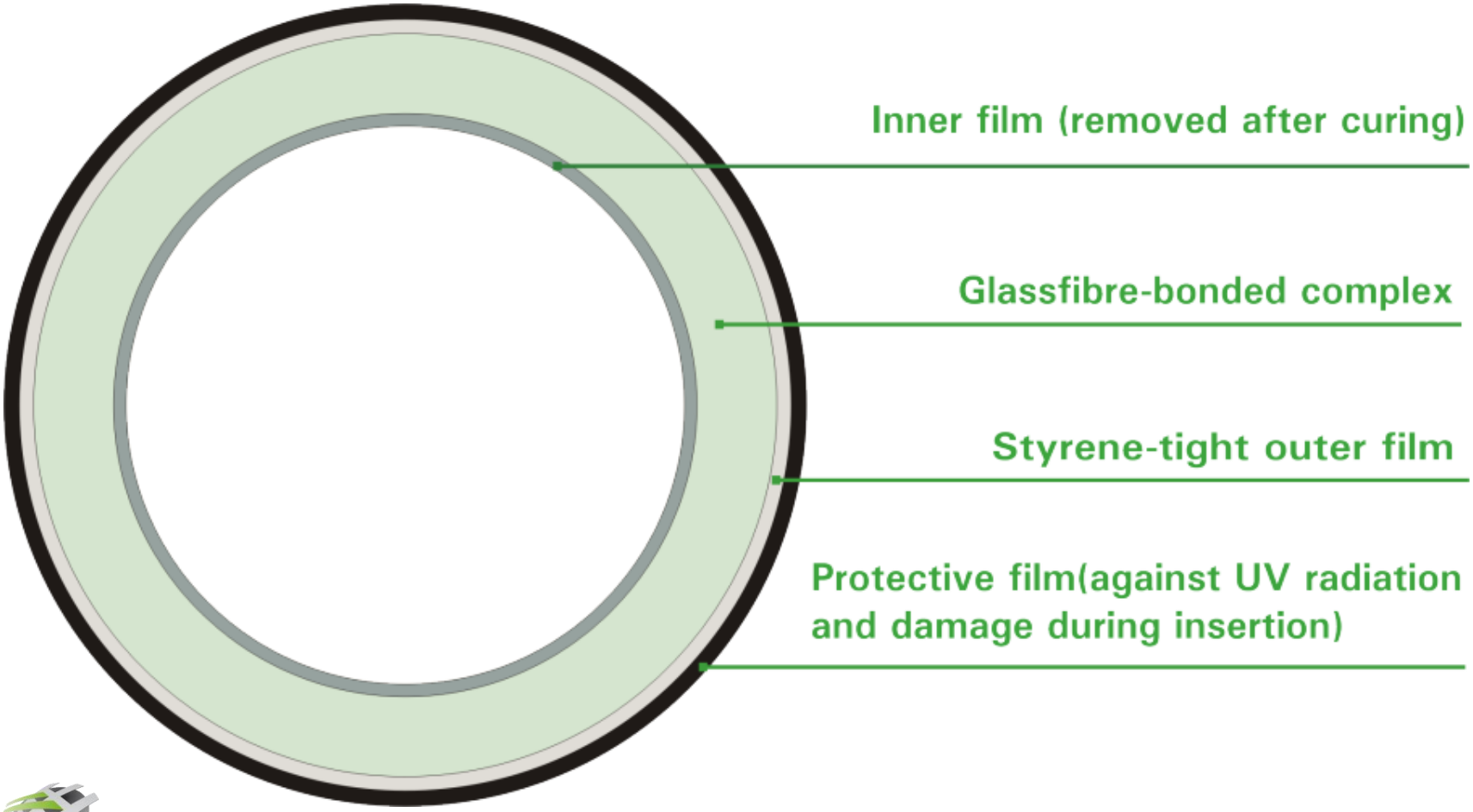
1. ASTM F1216 without the use of X1.2 and X1.4
   - Incorrect Use of DR 100
   - Better Defining Ground Water
2. ASCE – Modified Glock Buckling Analysis
   - Adopted design by engineering community
   - Likely going to replace F1216 for all CIPP designs
   - Allows for irregular shaped pipe
3. Means thinner walls based on material properties and long term testing data and lower installed cost.

Test of the short-term flexural strength

Test of the long-term flexural strength

Installation

The Construction of SAERTEX-LINER®



Case Study Photos

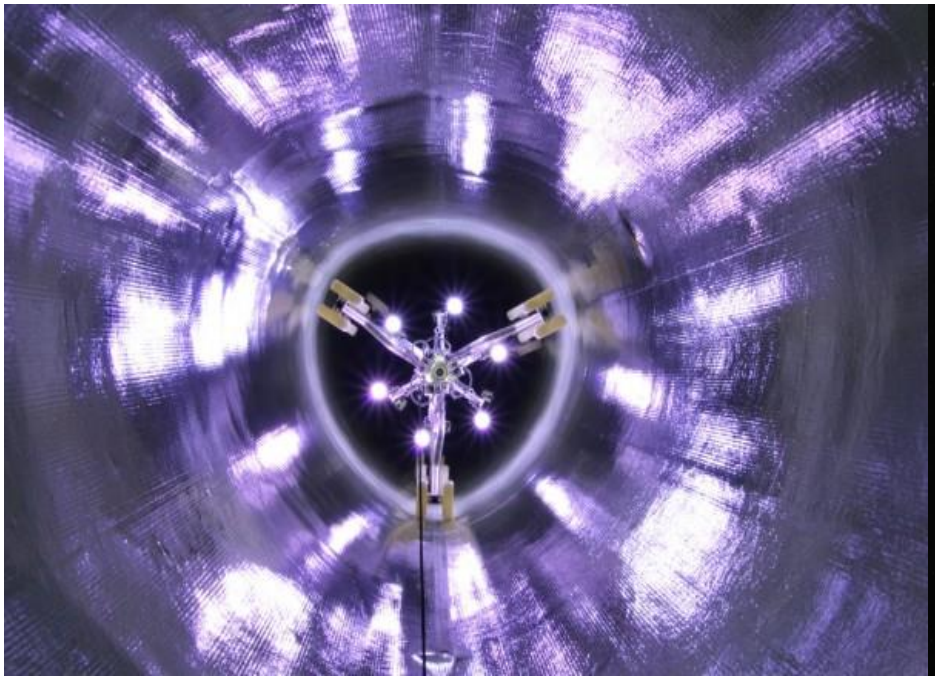
- The Problems

Lead to…

Complete Failures

Case Study Photos

The Solution



Case Study Photos

The Solution

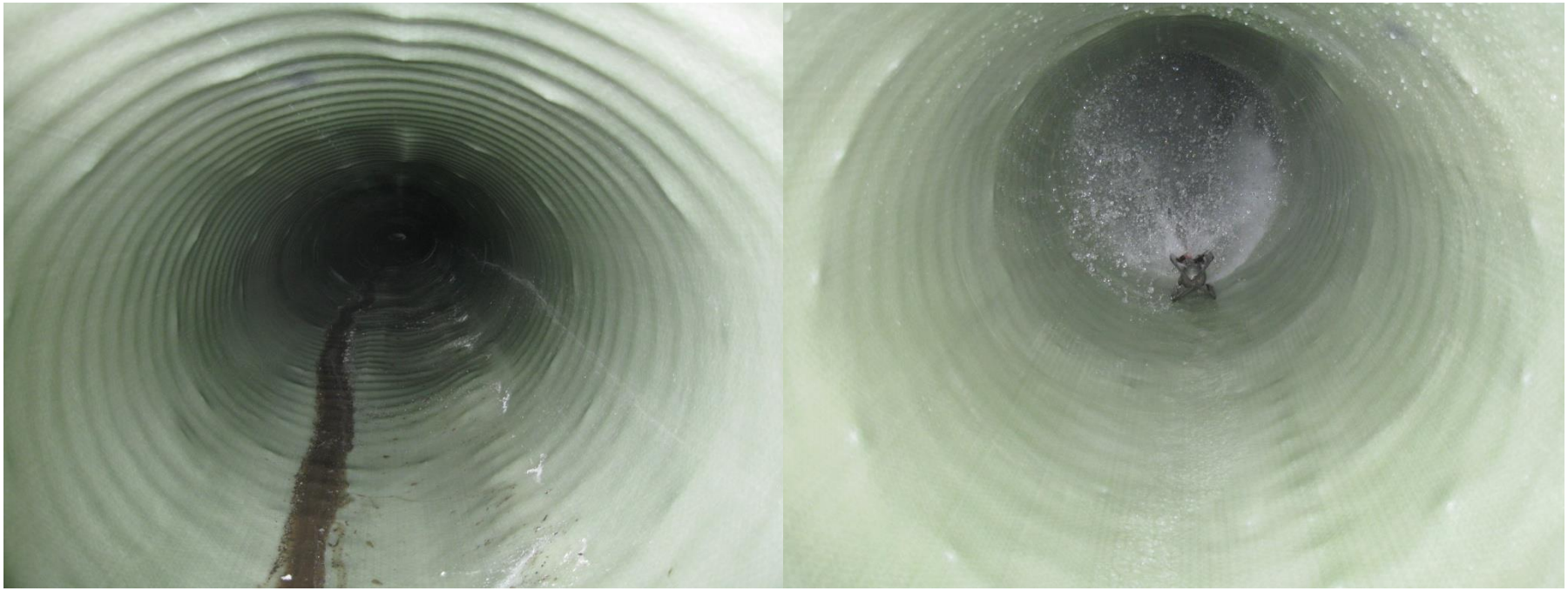
Summit County 18 and 24”

Case Study Photos

The Solution

Case Study Photos

The Solution



Summit County 18 and 24”

Case Study Photos

The Solution

Weld County 42”

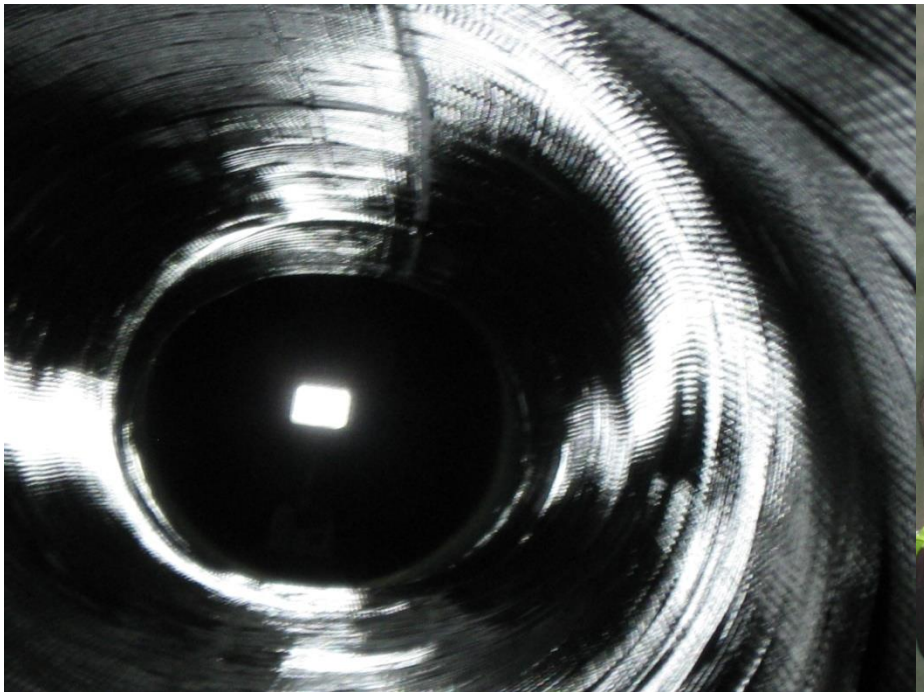
Case Study Photos

The Solution

Weld County 42”

Case Study Photos

The Solution



Weld County 42”

Case Study Photos

The Solution

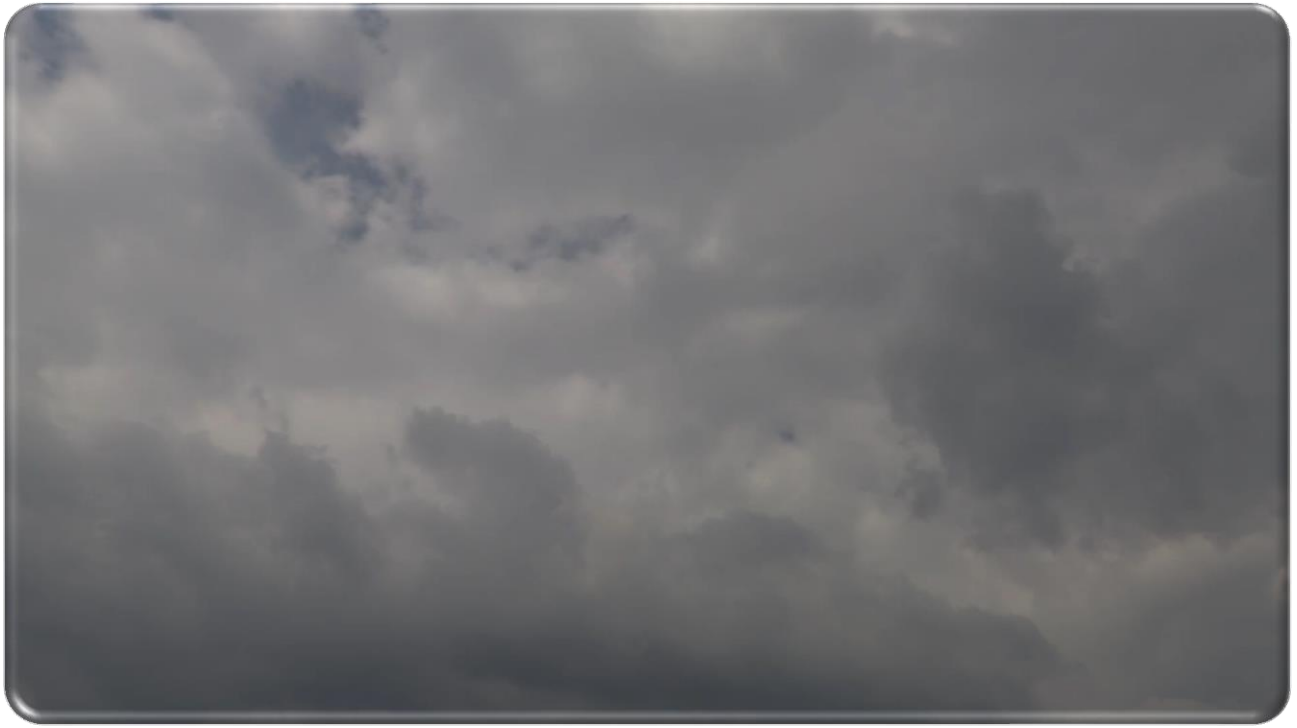
Weld County 42”

Seeing the Light

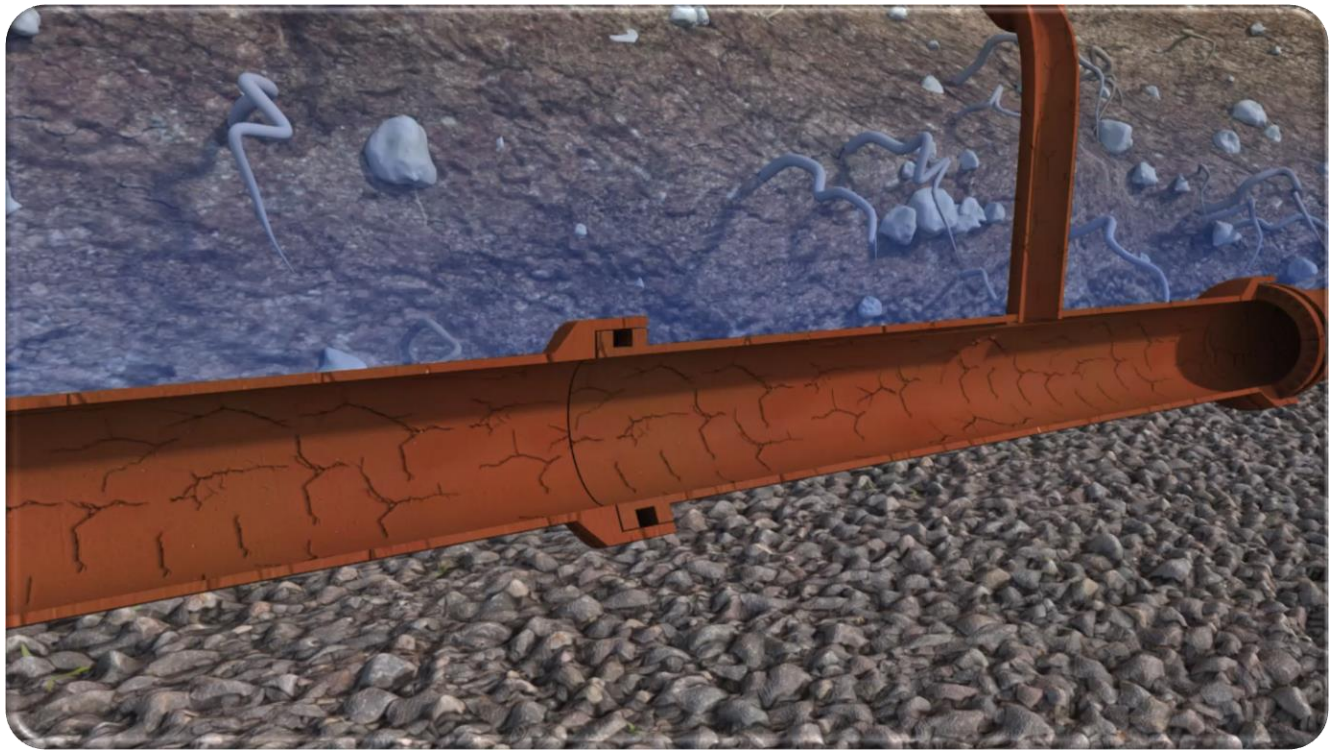
Lateral and Mainline Gasket Sealing

A Sealed System – LMK Gasket Technology

Leaking and Deteriorating Mainline Pipes



Use of Cured-In-Place-Pipe Only



Mainline CIPP Not Watertight

- **Why isn't CIPP watertight?**
  - We do not adequately prepare the mainline pipe for bonding
  - Resins do not bond to the mainline pipe
  - All resins shrink
  - There is always an annular space between the host pipe and CIPP lining

Mainline CIPP Not Watertight

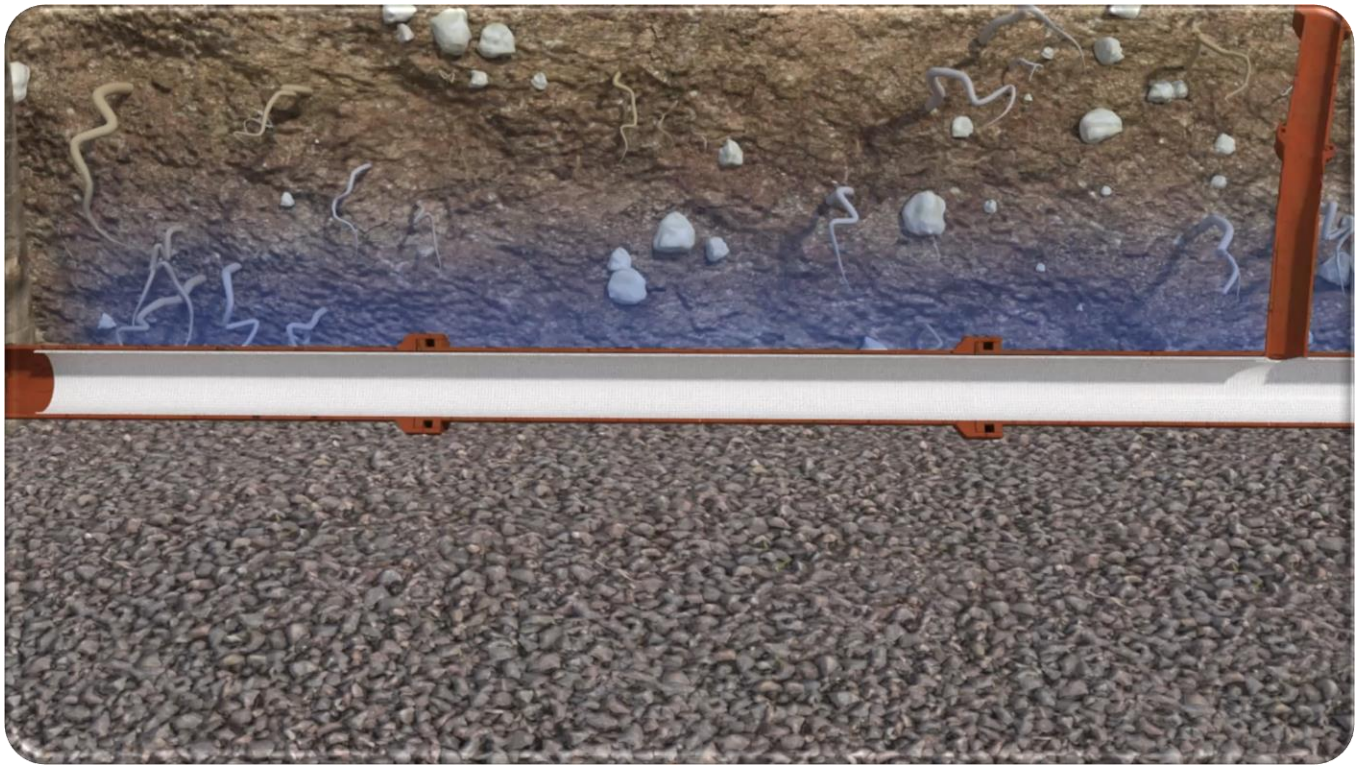
- **CIPP simply needs gaskets just like;**
  - New Pipe
  - Water Hoses
  - Valves

Watertight Gasket Solution Required

- **Must:**
  - Be installed between liner and host pipe
  - **Swell with water to fill annular space**
  - Withstand hydration and dehydration cycles

- **Solution:**
  - Hydrophilic Molded Gaskets
    - End Seal Sleeve installed in mainline **before** CIPP
    - Simple Standard Operating Procedure Installation
    - Consistent Installation Location

Mainline CIPP and Molded End Seal Gaskets

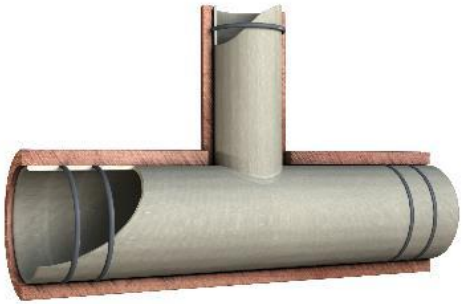


Post CCTV: Rehabilitated Mainline

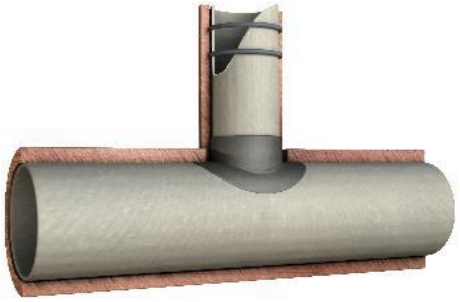
Now We Need to Renew and Seal the Laterals and Their Connection to the Main Pipe

Gaskets that are Used in Main-to-Lateral Lining

Line Connection and Lateral with CIPP and Hydrophilic Gaskets



ASTM F2561
Full wrap, sealed in main and lateral



Exceeds ASTM F2561
Enhanced seal using "Hydro Hat"

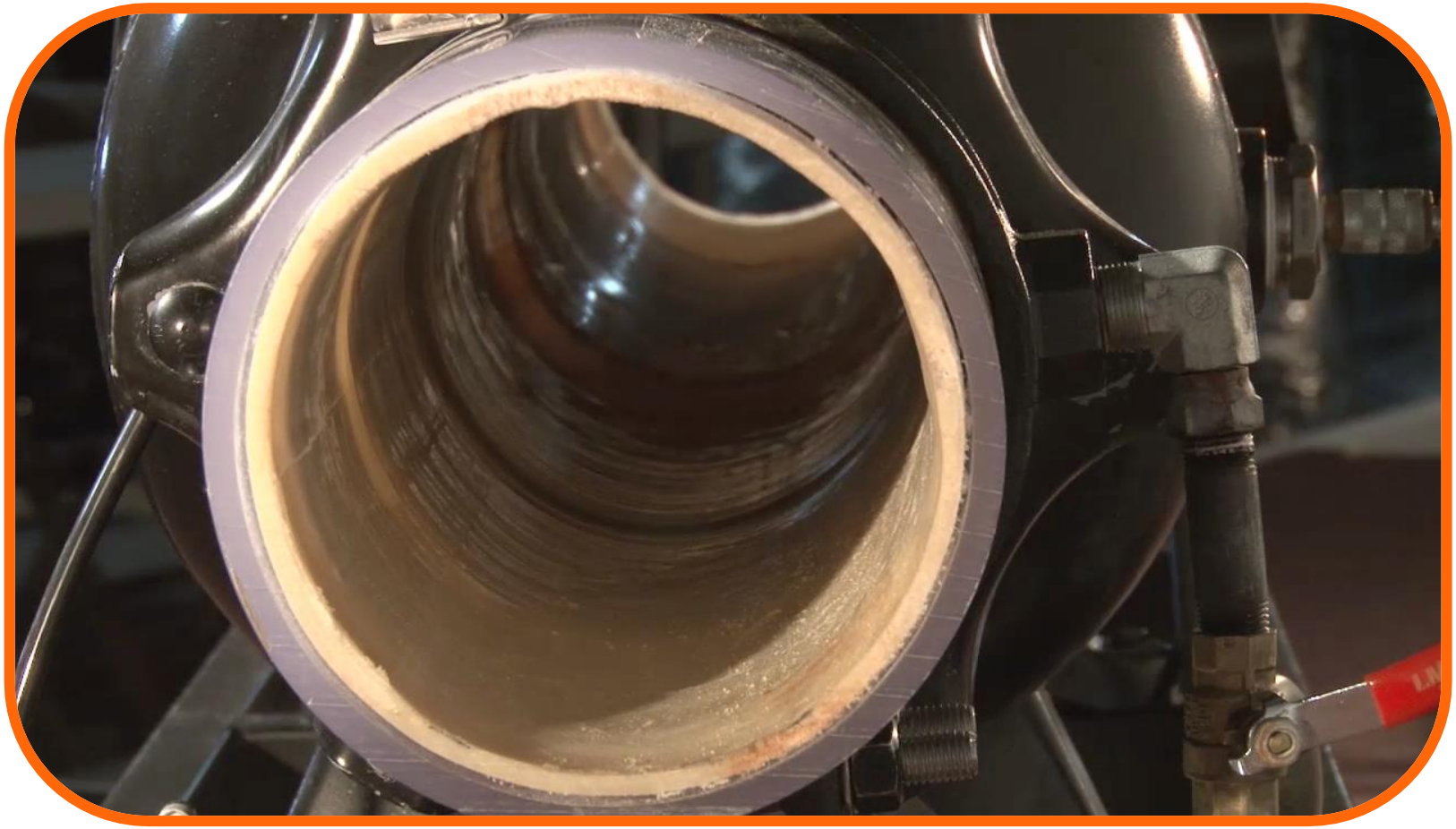
Permanently Sealed
Design Life = Service Life

ASTM F2561

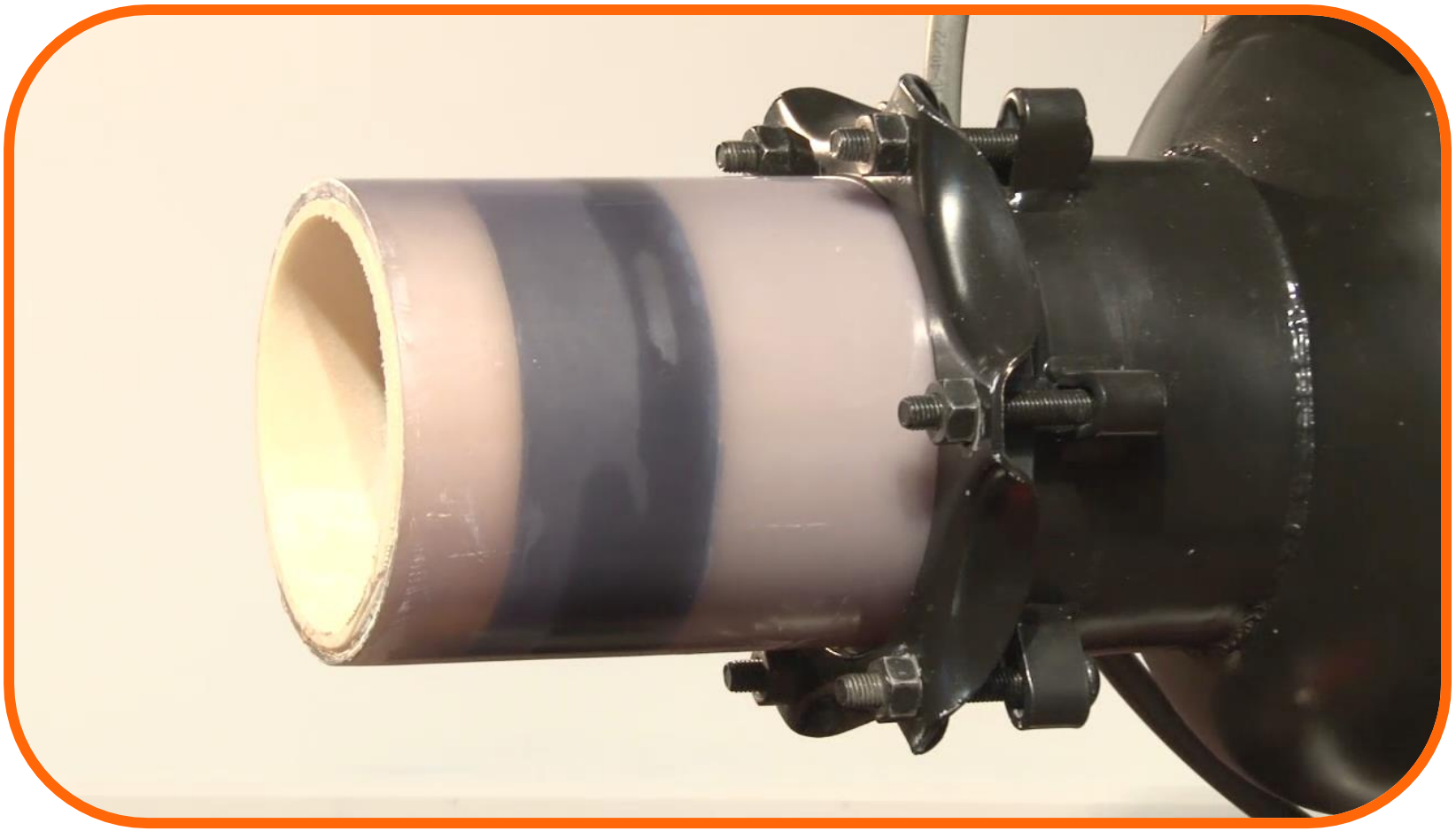
Just because it's trenchless, doesn't mean it's equal!

Test Apparatus: Silicate Resin

Laboratory



What Does a Sealed System Look Like?

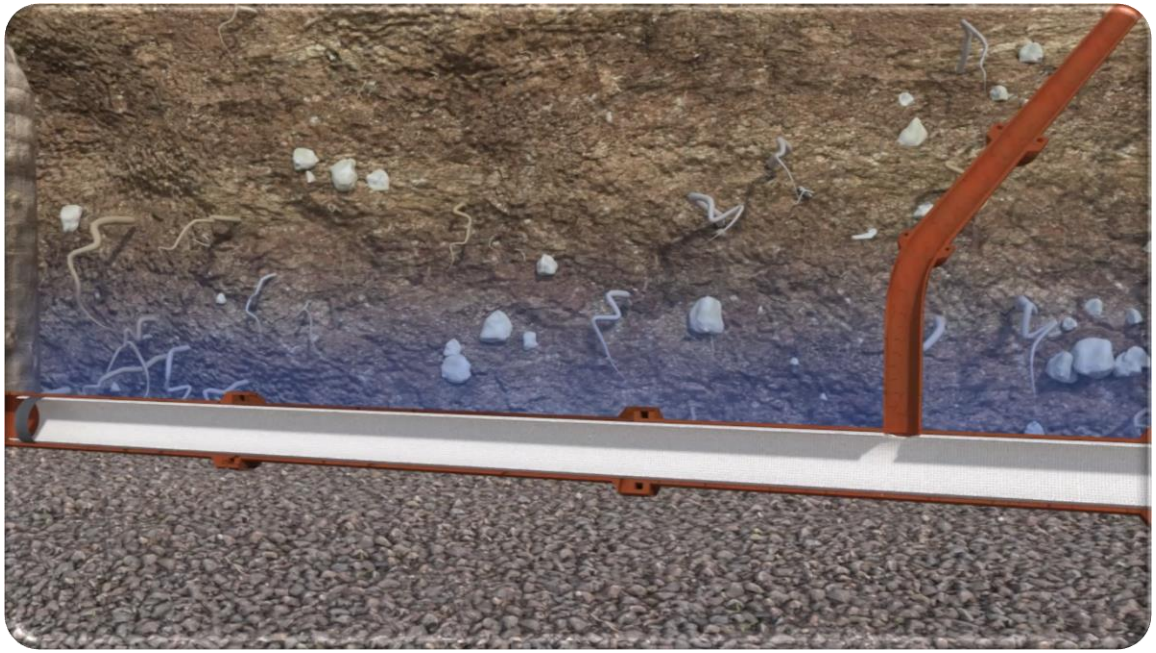


Demonstration of No Cleanout Installation Process

Post Video –
Access Through Outside Cleanout

What If We Don’t Have An Outside Cleanout?

Completely Sealed System
Molded Gaskets at All CIPP Terminations



Holistic Rehabilitation ManholesRehabilitation for Wet Conditions

Manhole rehabilitation:

- 100% solids epoxy coating/lining products specified
- Minimum of 125 mil thickness, 250 psi+ min. adhesion
- Chemical grout injected into manhole walls, patching with compatible high strength mortar, then top coat with epoxy
- Proper surface preparation is essential!

Holistic Rehabilitation in Action!

Utah Valley Drive Sewer Rehabilitation Project

- Owner: American Fork City, UT (south of SLC)
- Location: Utah Valley Drive – high tech & business center
- Construction: January 2015 – May 2015
- 6,100 LF of sewer pipe (10”-18” in dia.)
- 22 lateral connections
- 22 lateral manholes
- Engineer: Horrocks Engineers
- Contractor: C&L Water Solutions

American Fork City

Partner with Us!

Q&A

Contact us for more details or to discuss future projects:

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Direct Line: 720-980-6501

clarson@azuria.com