Engineered Gaskets + CIPP = Verifiable Watertight Sealing

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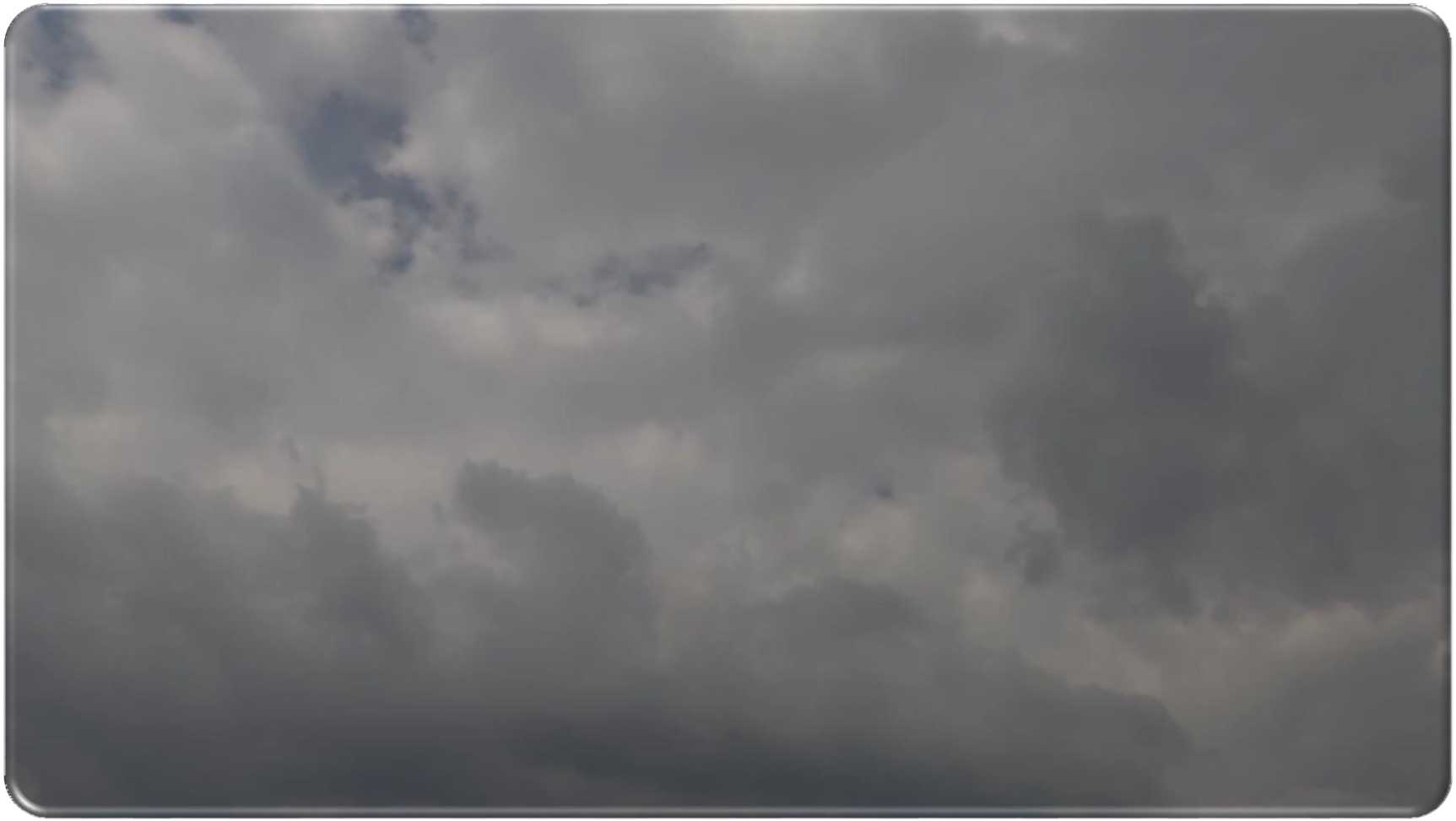
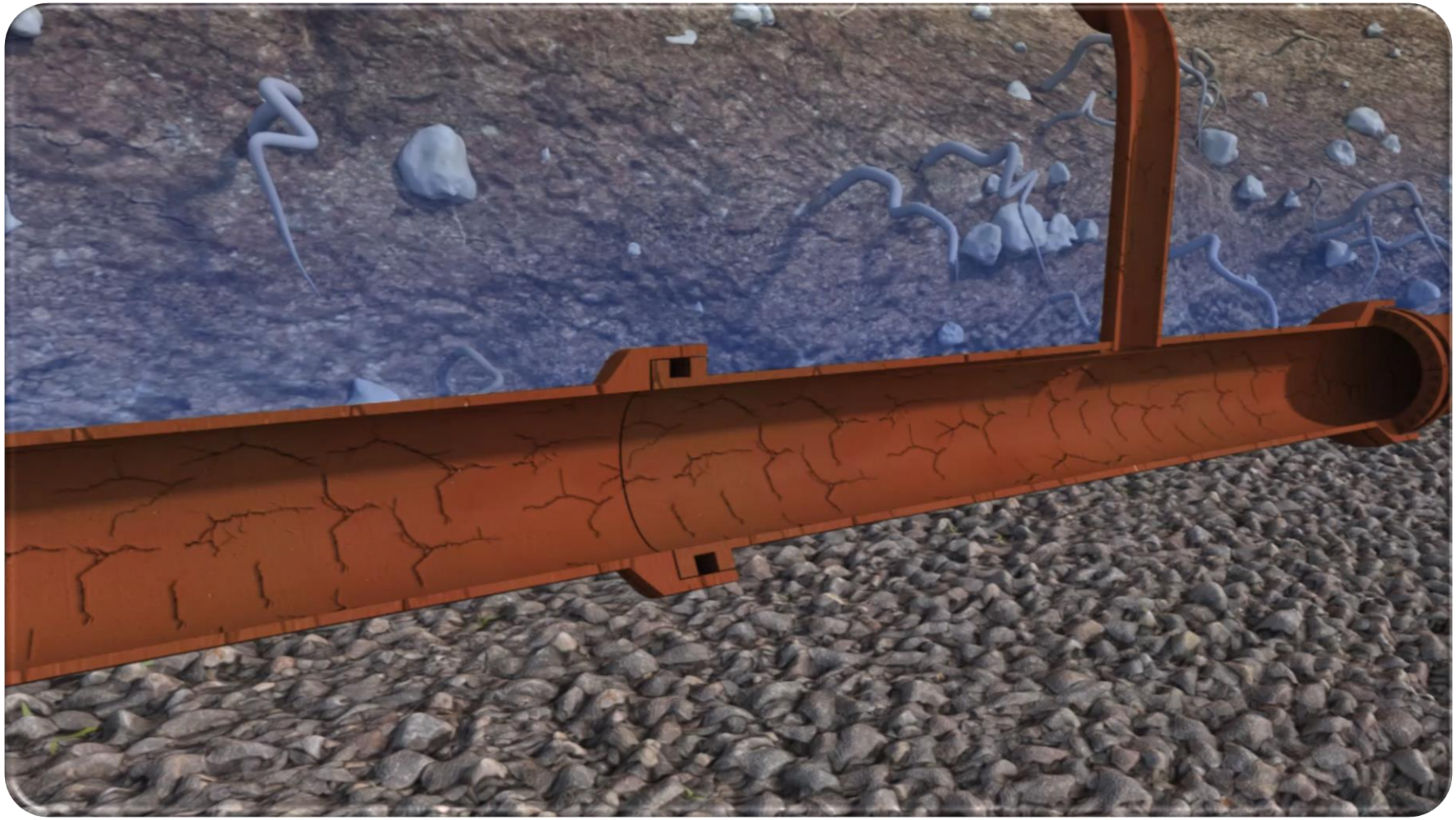
LMK TECHNOLOGIES

Leaking and Deteriorating Mainline Pipes



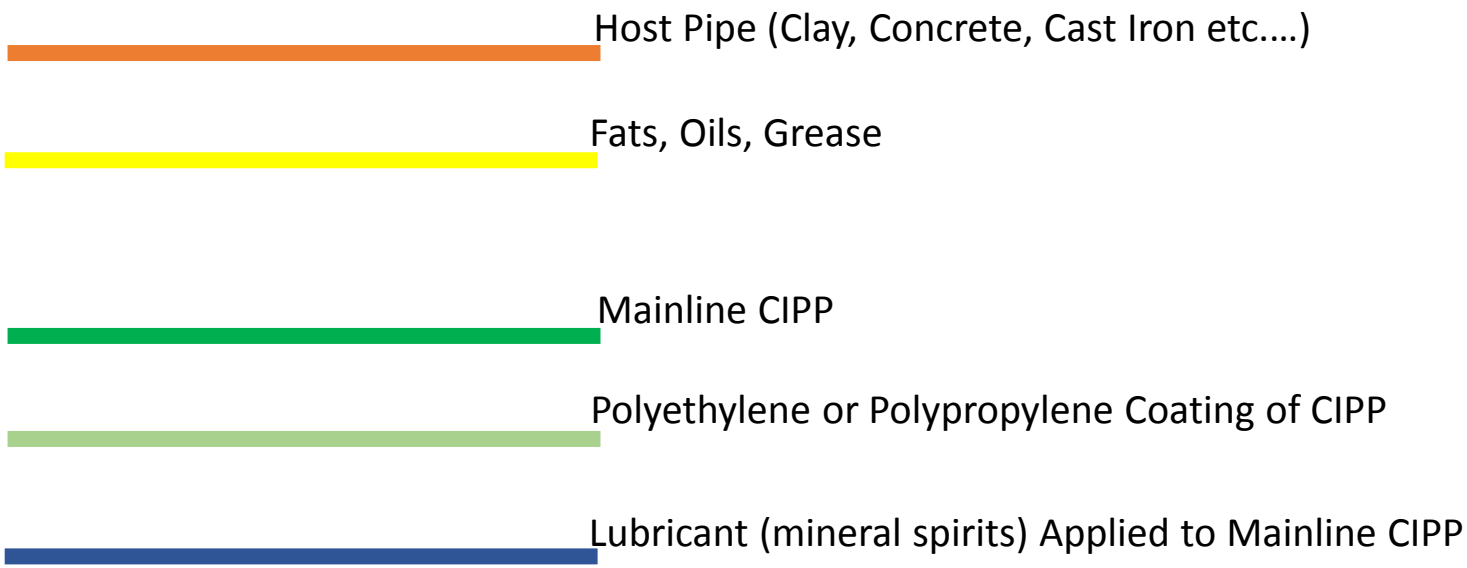
Use of Cured-In-Place-Pipe Only



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

Substrate Layers, Why Bonding Should Not Be the Design?



Mainline CIPP Not Watertight

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

However….

- What is a Gasket?
- Gasket Material Types
- Selecting Gasket Type Used in CIPP
- The Use of Gasket Sealing in CIPP

Definition of Gasket

- A **gasket** is a mechanical seal which fills the space between two or more mating surfaces, generally to prevent leakage from or into the joined objects while under compression. **Gaskets** allow for "less-than-perfect" mating surfaces where they can fill irregularities.

Material Types

- **Cork Gaskets:**

Natural cork combined with elastomer bindings giving high flexibility and compression. Applications; Oil, fuel and solvents

- **Non-Asbestos Gaskets:**

Are manufactured from a compressed fiber with an elastomer binding. Applications; Acid, steam, oil and water

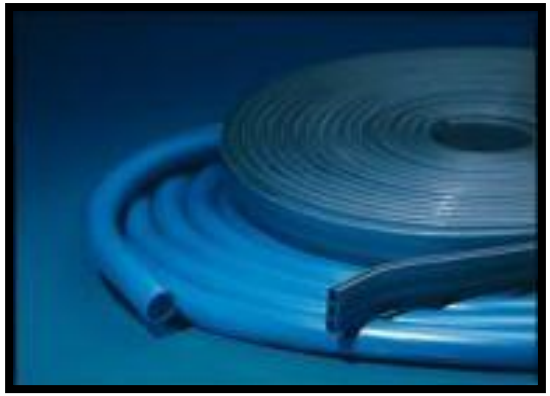
- **Rubber Gaskets:**

Is a soft gasket material. A wide range of elastomers can be used, such as neoprene, nitrile, EPDM (ethylene propylene diene monomer) and natural rubber. Applications; pipes, heat exchangers

Other Material Choices

- Hydrophilic Caulk
  a) Fluid material
  b) Inconsistent
  c) Several days to cure
  d) Least amount of volumetric expansion

- Hydrophilic Rope
  a) Difficult to create hoop
  b) Difficult to install
  c) Can dry out

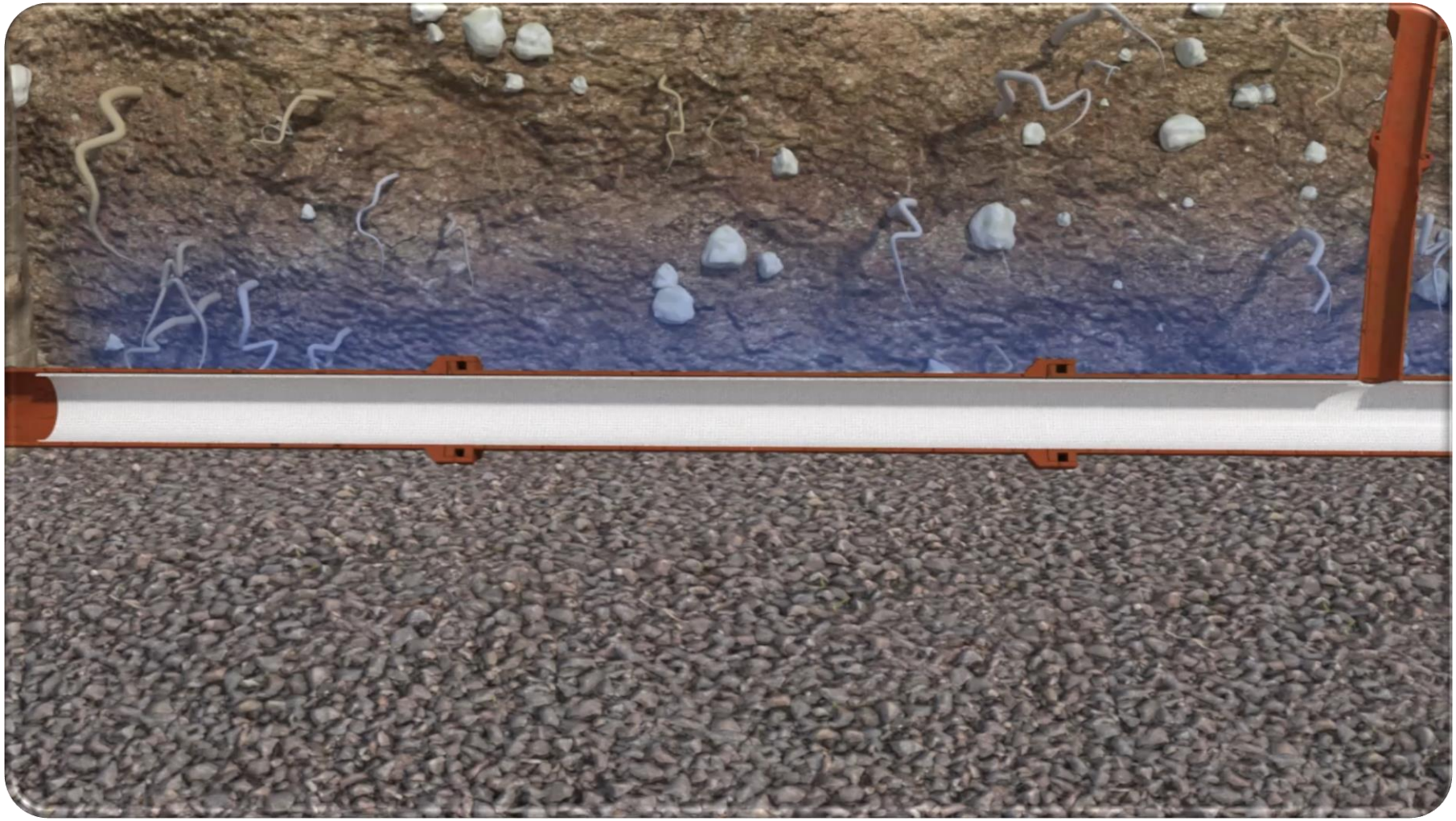


Watertight Gasket Solution Required

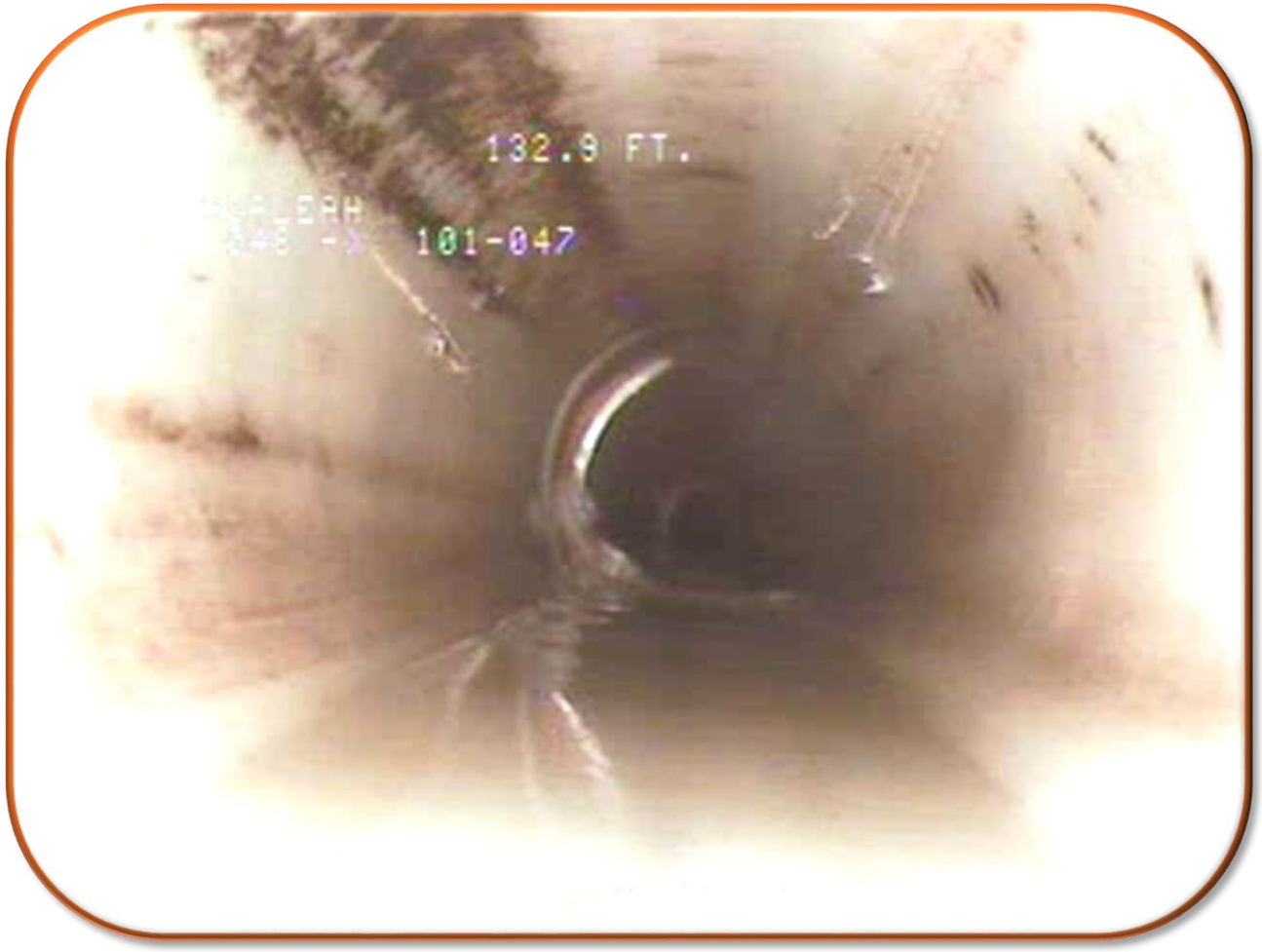
- **Must:**
  - Be installed between liner and host pipe
  - **<u>Swell with water to fill annular space</u>**
  - Withstand hydration and dehydration cycles

- **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



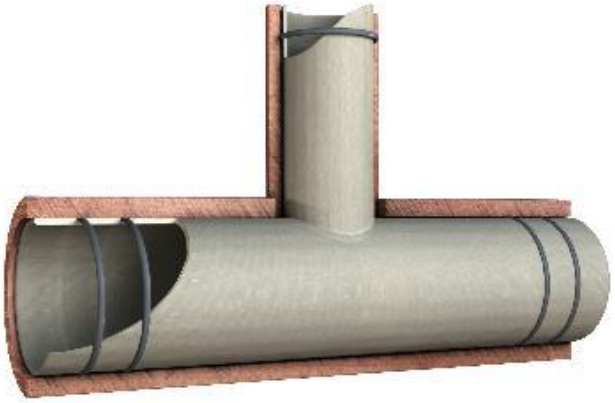
Post CCTV: Rehabilitated Mainline



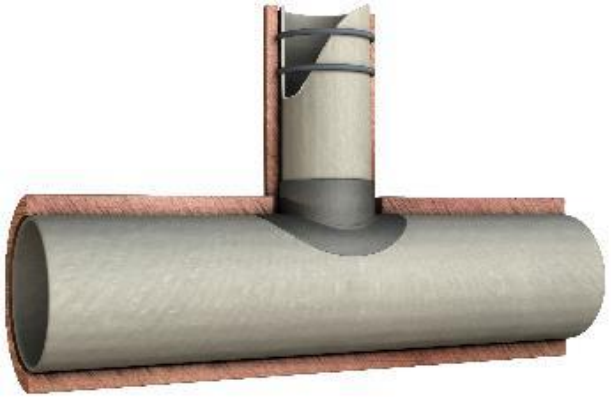
Now We Need to Renew and Seal the Laterals and Their Connection to the Main Pipe

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



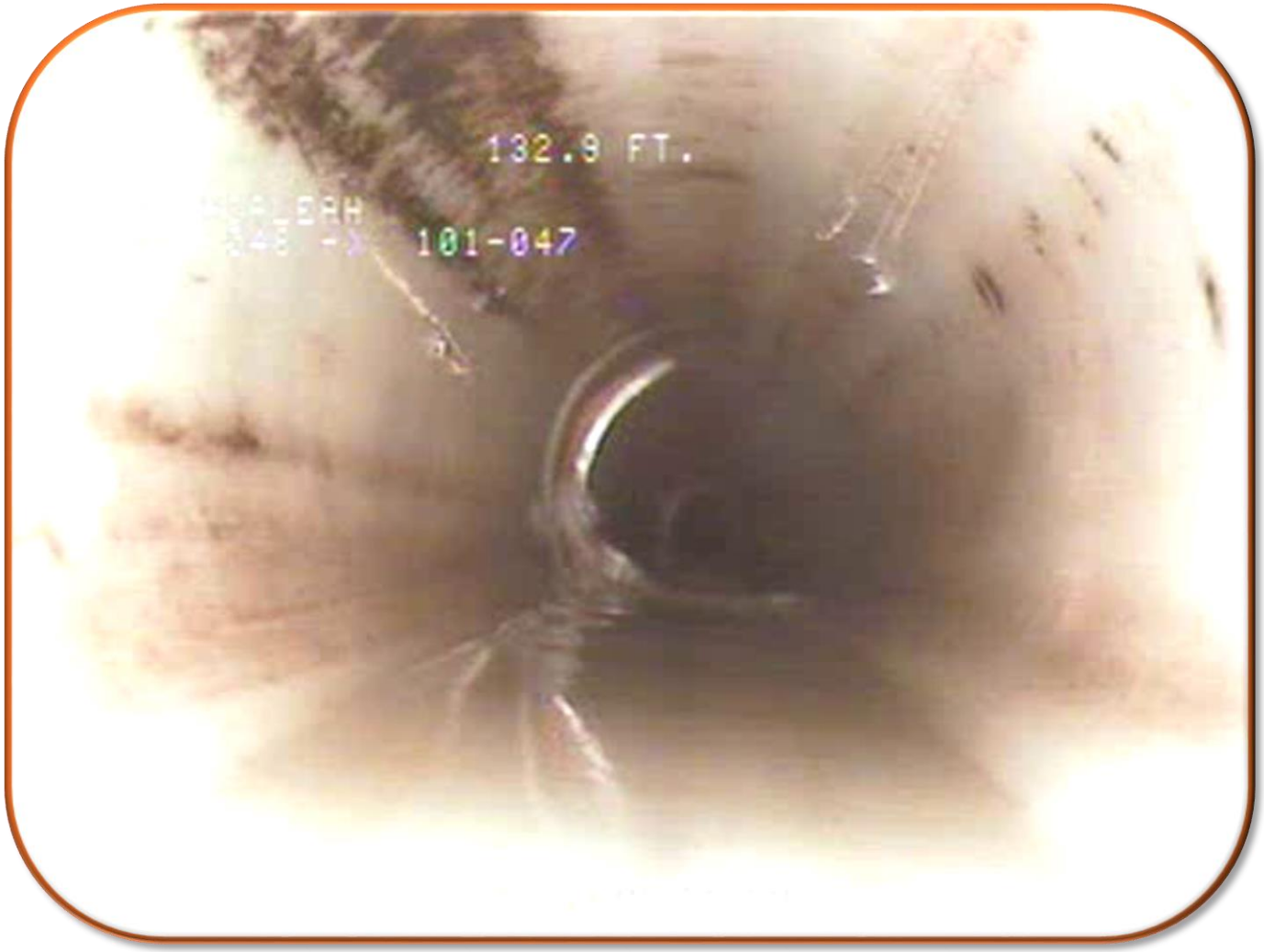
Exceeds ASTM F2561
Enhanced seal using "Hydro Hat"

Permanently Sealed
Design Life = Service Life

ASTM F2561

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

Post CCTV: ASTM F2561 Liner



Installing Connection Liner with Molded Gaskets- Lateral Line Up

Installing Connection Liner with Molded Gaskets- Lateral Inversion

Post Video – Access Through Outside Cleanout

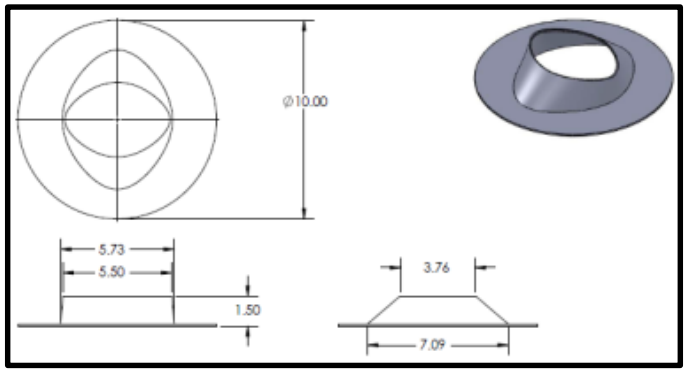
What If We Don't Have An Outside Cleanout?

Demonstration of No Cleanout Installation Process

Engineered Gaskets Used Today

INSIGNIA™ Molded Hydrophilic Gaskets

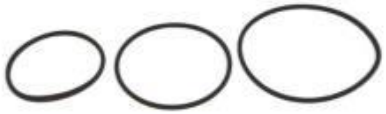
- "Verifiable"
  a) Seamless
  b) Profile can be seen through CIPP
- 50 Plus Year "Service Life"
  a) 10,000 hour hydration/dehydration testing complete
- Strategic Fixed Position
- Part of ASTM F2561 standard for main-to-lateral connection lining



Hydrohat CAD Drawing

End Seal

Hydrohat

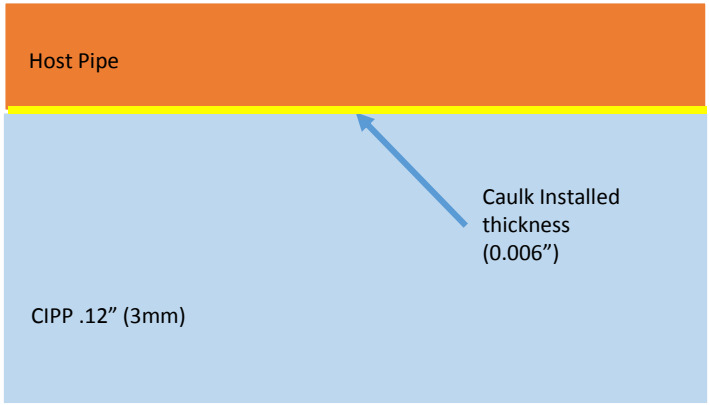


O-Rings

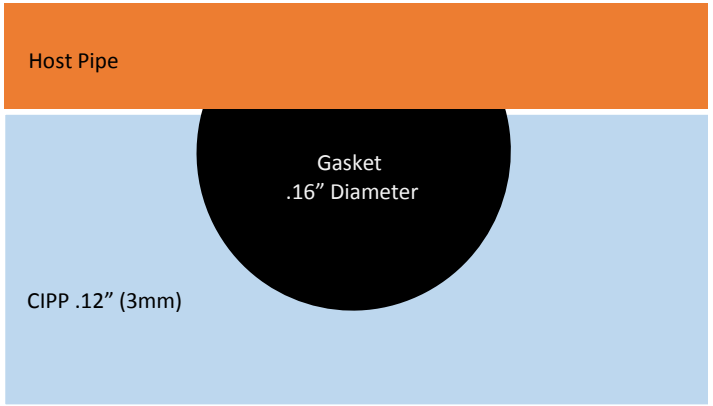
Effects of Creep on CIPP Sealing Mechanisms
5 feet of Groundwater

Immediately After Installation

Caulk Sealing Mechanism



Molded Gasket Sealing Mechanism

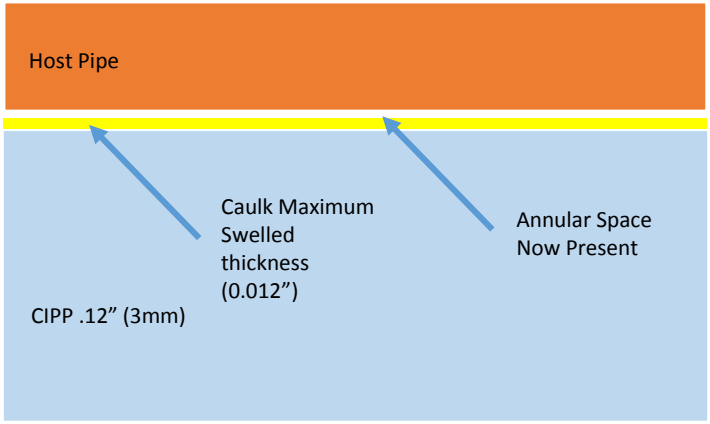


To Scale

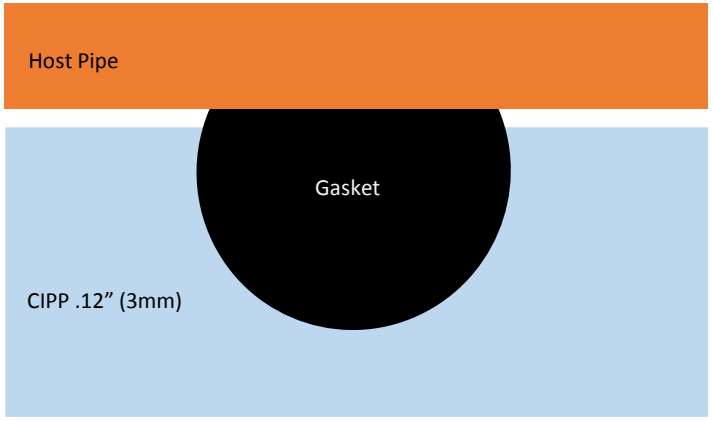
Effects of Creep on CIPP Sealing Mechanisms
5 feet of Groundwater

8 Years After Installation

Caulk Sealing Mechanism



Molded Gasket Sealing Mechanism

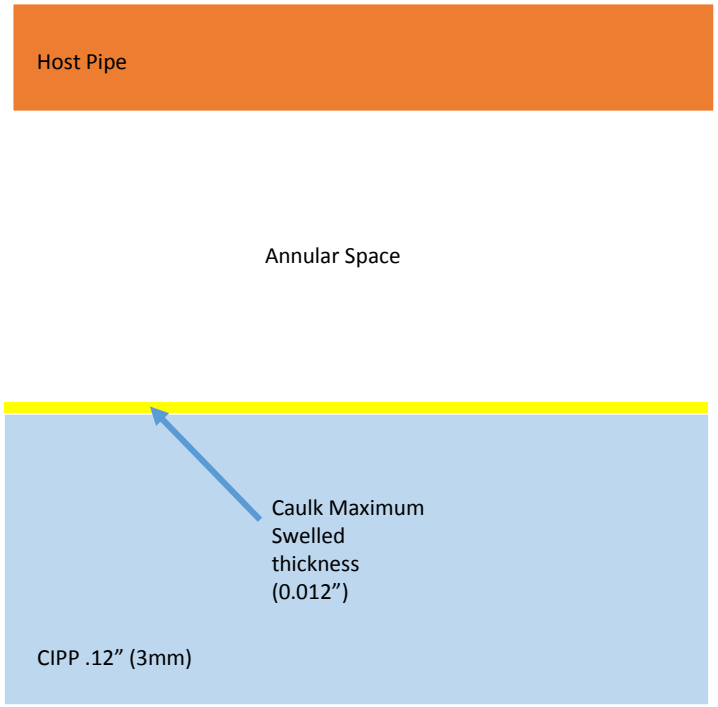


To Scale

Effects of Creep on CIPP Sealing Mechanisms
5 feet of Groundwater

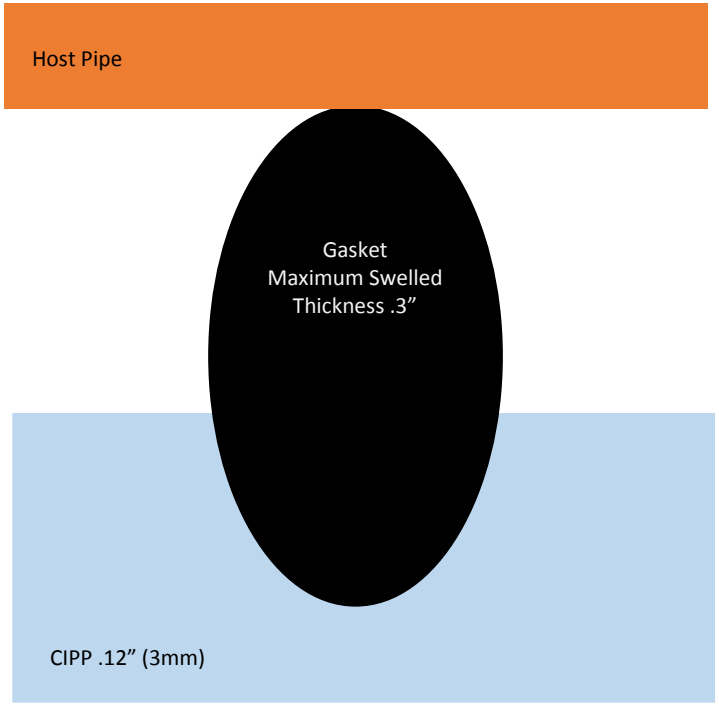
95 Years After Installation

Caulk Sealing Mechanism

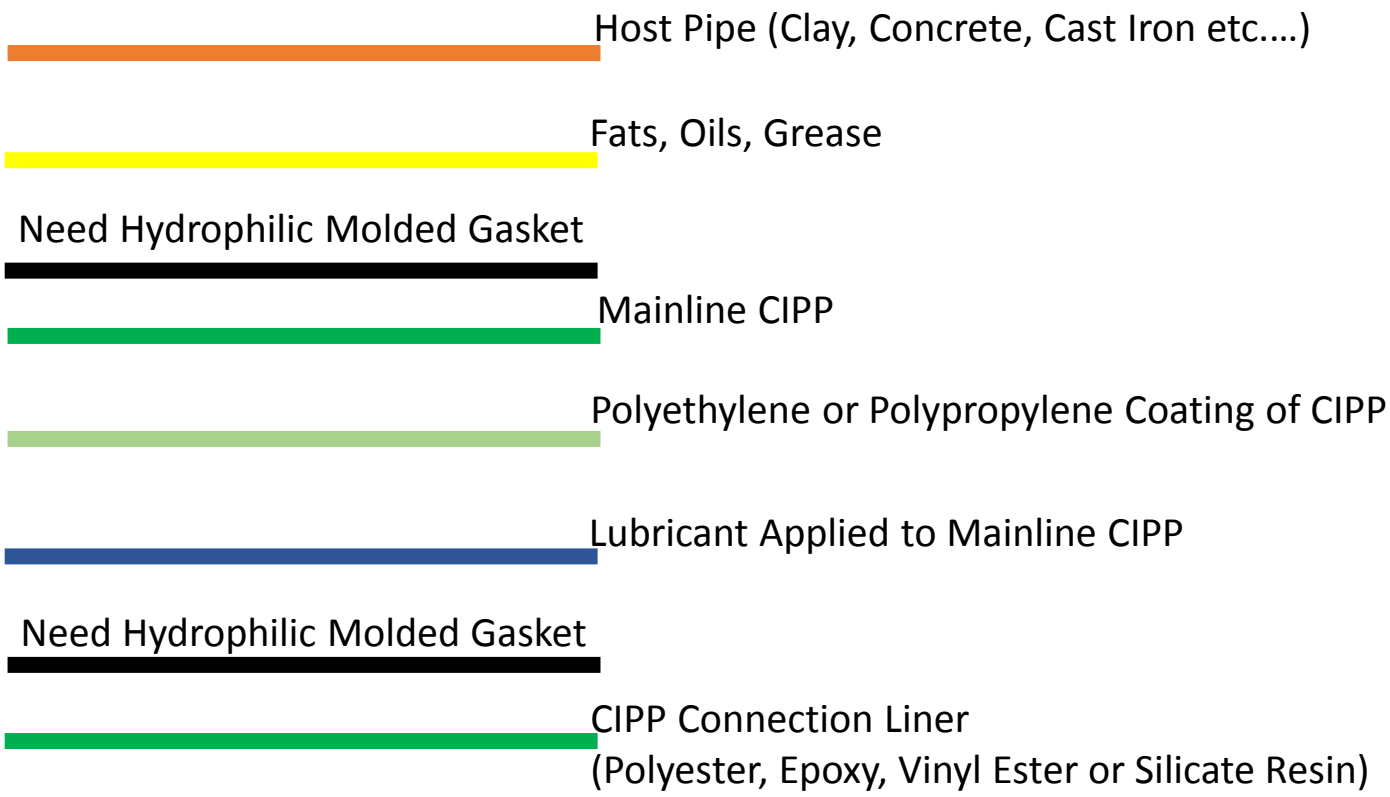


To Scale

Molded Gasket Sealing Mechanism

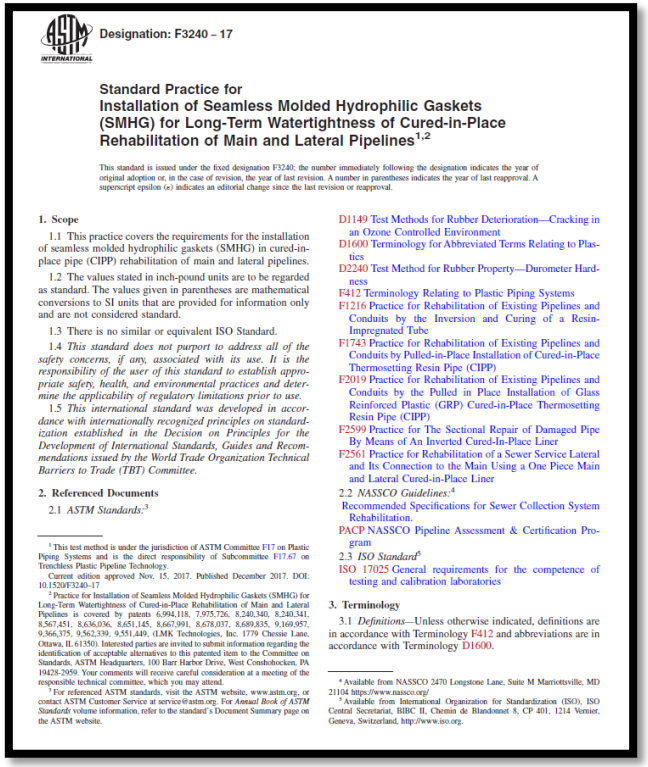


Adding the Missing Pieces to the Puzzle



ASTM F3240-17

Standard Practice for Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Watertightness of Cured-in-Place Rehabilitation of Main and Lateral Pipelines



Designation: F3240 – 17

Standard Practice for Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Watertightness of Cured-in-Place Rehabilitation of Main and Lateral Pipelines[1,2]

This standard is issued under the fixed designation F3240; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the requirements for the installation of seamless molded hydrophilic gaskets (SMHG) in cured-in-place pipe (CIPP) rehabilitation of main and lateral pipelines.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 There is no similar or equivalent ISO Standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
D1600 Terminology for Abbreviated Terms Relating to Plastics
D2240 Test Method for Rubber Property—Durometer Hardness
F412 Terminology Relating to Plastic Piping Systems
F1216 Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F1743 Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
F2019 Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
F2599 Practice for The Sectional Repair of Damaged Pipe By Means of An Inverted Cured-In-Place Liner
F2561 Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

2.2 *NASSCO Guidelines:*[4]
Recommended Specifications for Sewer Collection System Rehabilitation.
PACP NASSCO Pipeline Assessment & Certification Program

2.3 *ISO Standard*[5]
ISO 17025 General requirements for the competence of testing and calibration laboratories

3. Terminology

3.1 *Definitions*—Unless otherwise indicated, definitions are in accordance with Terminology F412 and abbreviations are in accordance with Terminology D1600.

[1] This test method is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.67 on Trenchless Plastic Pipeline Technology.
Current edition approved Nov. 15, 2017. Published December 2017. DOI: 10.1520/F3240-17

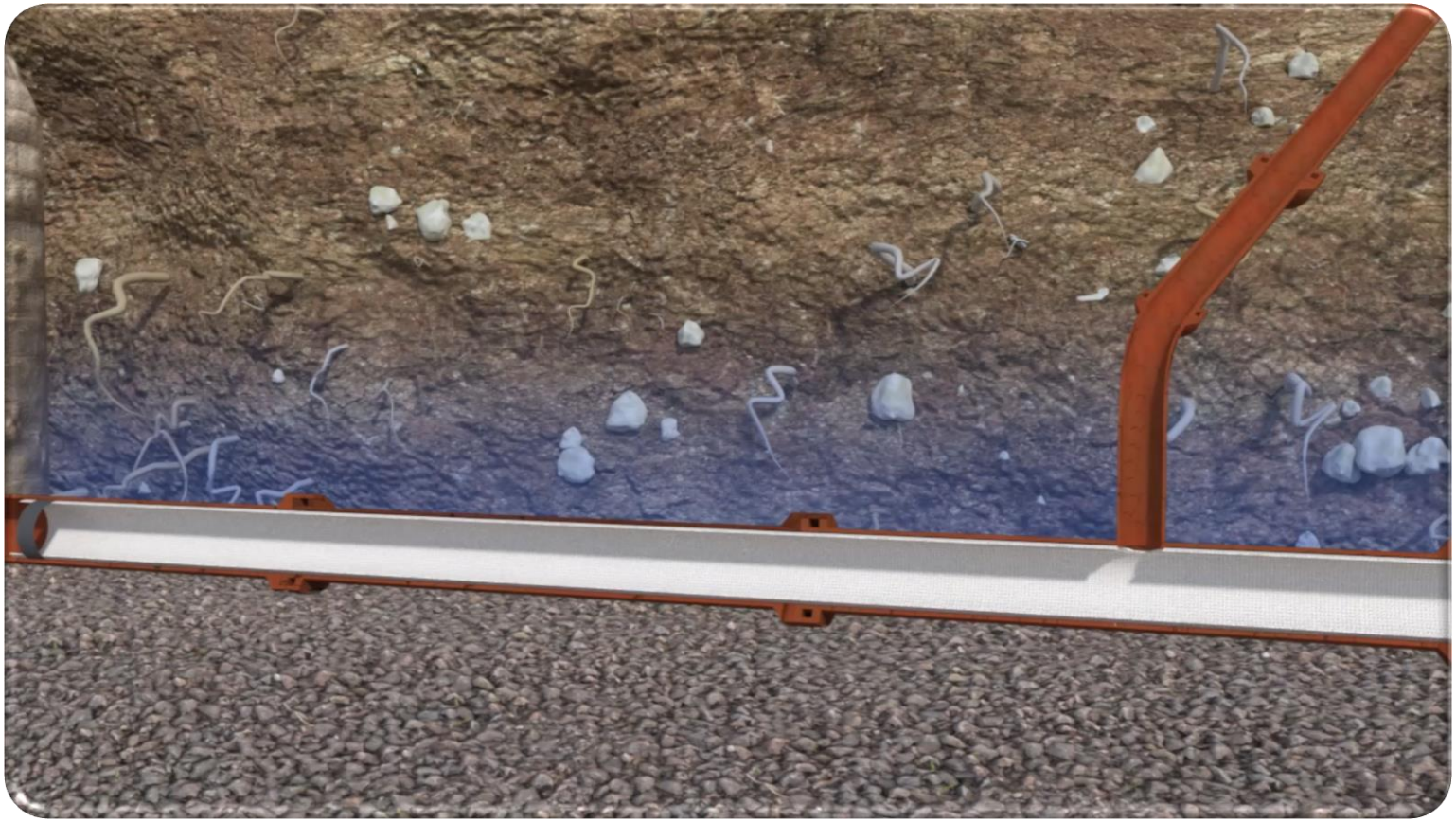
[2] Practice for Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Watertightness of Cured-in-Place Rehabilitation of Main and Lateral Pipelines is covered by patents 6,994,118, 7,975,726, 8,240,340, 8,240,341, 8,567,451, 8,636,036, 8,651,145, 8,667,991, 8,678,037, 8,689,835, 9,169,957, 9,366,375, 9,562,339, 9,551,449, (LMK Technologies, Inc. 1779 Chessie Lane, Ottawa, IL 61350). Interested parties are invited to submit information regarding the identification of acceptable alternatives to this patented item to the Committee on Standards, ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from NASSCO 2470 Longstone Lane, Suite M Marriottsville, MD 21104 https://www.nassco.org/

[5] Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, http://www.iso.org.

Completely Sealed System
Molded Gaskets at All CIPP Terminations



Thank You For Your Time
Questions and Answers