SPECIFIER'S GUIDE TO EFFECTIVE MAINLINE SEALING

LMK® TECHNOLOGIES

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Wastewater utilities in North America spend billions of dollars annually to rehabilitate their aging sewer collection systems. Over time, failure of sewer collection systems can lead to increased water infiltration that overloads pipe capacity, pumps and wastewater treatment plants, causing great public expense. Wastewater leaking from the collection system can also lead to pollution of surrounding soils, groundwater and waterways. Too often, however, rehabilitation projects do not fix the problems: defects reappear and sometimes become worse, infiltration continues, and the money spent on the repairs is wasted. In some cases, work must be done a second time, resulting in avoidable expenditures of valuable ratepayer dollars.

Many utilities have turned to cured-in-place pipe (CIPP) lining to address deteriorated infrastructure. Unfortunately, CIPP liners do not inherently address infiltration of groundwater, because they do not bond with the host pipe, for the following reasons:

- Resins that shrink over time due to polymerization, losing as much as five percent of their volume
- Thermoset liners that are subject to thermal expansion, contraction and creep
- The presence of fats, oils and grease (FOGs) which are nearly impossible to completely remove, given limitations of cleaning equipment and methods, creating a substrate layer between host pipe and liner.

These factors result in an annular space between the liner and host pipe, allowing groundwater to migrate behind the new liner and re-enter the collection system at lateral connections and the terminating ends of mainline liners. Several sealing are available, which can help address this challenge

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SEALING OPTIONS:

Non-Asbestos (Non-Hydrophilic) Gaskets:

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

- **Pro:** Material's chemical resistance makes it suitable for industrial and petroleum applications.
- **Con:** Rigid properties of material create difficulties during positioning, inversion and bonding to both liner and host pipe.

Cork (Non-Hydrophilic) Gaskets:

Are natural cork combined with elastomer bindings giving high flexibility and compression. Applications: Oil, fuel and solvents.

- **Pro:** Easy to obtain materials and to manufacture, and can be harvested renewably from oak trees.
- **Con:** Rigid properties of material create difficulties during positioning, inversion and bonding to both liner and host pipe.

Rubber (Non-Hydrophilic) Gaskets:

Are composed of a soft, stretchable gasket material. A wide range of elastomers can be used, such as neoprene, nitrile, EPDM and natural rubber.

- **Pro:** Elastic and stretching properties are ideal for integration with CIPP liners for deteriorated pipes that often contain offsets and other irregularities.
- **Con:** Hydrophobic properties ensure that over time the gasket will fail to seal the expanding annular space created by the phenomenon of resin creep.

Mechanical Sleeves with (Non-Hydrophilic) Gaskets:

Are stainless steel ratcheting sleeves with an external EPDM (ethylene propylene diene monomer) rubber gasket, and designed for and primarily used in structural point repair in unlined pipes, and partially lock to the inside of the liner.

- **Pro:** Could be a solution to retroactively seal CIPP-lined segments where end seals were not used during the initial installation.
- **Con:** Introduces a raised lip at each end, plus an internal ratchet, contributing to debris snags, reducing flow-through performance.

Hydrophilic Rope:

Is a strand of hydrophilic rubber which expands in the presence of water.

- **Pro:** Hydrophilic properties enable a seal from groundwater tracking in the annular space.
- **Con:** Difficult to create full circular coverage of entire outside circumference of liner, and can be moved out of place during liner positioning and inversion.

Hydrophilic Rubber Gaskets:

Are seamlessly molded, cylindrical-shaped hydrophilic neoprene rubber gaskets designed to expand in the presence of water.

- **Pro:** Elastic and stretching properties are ideal for integration with CIPP liners for deteriorated pipes that often contain offsets and other irregularities.

SOLUTION:

Obtaining an optimal value-engineered design for a sealed CIPP collection system would involve addressing both structural and O&M (operation and maintenance) concerns through the use of ASTM standards, particularly as they relate

to molded hydrophilic gaskets, which have long been required in new pipe construction.
ASTM F3240 is the Standard Practice for Installation of Seamless Molded Hydrophilic Gaskets (SMHG) for Long-Term Water Tightness of Cured-in-Place Rehabilitation of Main and Lateral Pipelines. This practice covers the requirements for the installation of SMHG in CIPP rehabilitation of main and lateral pipelines. When exposed to water, engineered and molded Insignia™ hydrophilic neoprene gaskets swell to create a positive compression seal that prevents water tracking between the liner and host pipe. The cylindrical shape of Insignia gaskets generates uniform compression to form a highly effective seal with all types of piping.

Water-Tight Gasket Solution Required

Insignia' engineered hydrophilic gaskets are made of ASTM F3240 compliant hydrophilic neoprene rubber that will expand in the presence of water and seal the ever-increasing annular space. The CIPP gaskets are strategically located at the terminating ends of CIPP where the pipe connects to manholes.

When exposed to water, engineered and molded hydrophilic neoprene gaskets swell to create a positive compression seal that prevents water tracking between the liner and host pipe. The cylindrical shape of gaskets generates uniform compression to form a highly effective seal with all types of liner and host pipes.

This end seal sleeve is much different than a flat rope or other sealing methods that contractors have previously attempted to place in a pipe and keep in position during insertion of the liner. Because the Insignia end seal sleeve is tubular in shape, the seal is continuous, 360-degrees, with no overlapping edges or joints. The seal remains in place as liners are inserted into the pipe by a unique retaining press clip that is positioned on the leading end of the sleeve. This seal will not fall down or be pushed through the pipe during insertion of the liner into the pipeline and is suitable for liners that are either inverted (with air or water) or pulled into place, and whether they are cured ambiently, with steam or with UV light.

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Infiltration of groundwater is a major problem for anyone concerned for a sewer system's future capacity and proper operation. The ability to maintain a sealed collection system is crucial for public health and for a sewer agency's ability to comply with environmental guidelines and statutes. Sealing the collection system from groundwater infiltration and from wastewater exfiltration is one of the biggest challenges faced by those tasked with maintaining and renewing aging collection system infrastructure.

Sewer agencies now have a variety of options to choose from when evaluating methods to seal pipes while addressing structural rehabilitation using CIPP. ASTM 3240 and the use of a Seamless Molded Hydrophilic Gasket offers the best solution available for a consistent result that will address the need to seal the collection system over the entire life of the pipe. To learn more about how Insignia End Seals can benefit your next project, call **815-640-9302** or visit www.lmktechnologies.com.

Left:
PVC pipe with Insignia End Seal Gasket installed at terminating end of CIPP liner.

Far Left:
CIPP liner with Insignia End Seal Gasket sealing technology.