



INSTALLATION PRACTICE HYDROPHILIC END SEAL SLEEVE

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INSTALLATION SPECIFICATION FOR HYDROPHILIC END SEAL SLEEVE

1. Intent

It is the intent of this specification to detail a safe, efficient, cost-effective installation method of a hydrophilic pipe end sealing product called Insignia™ End Seal for the junction of a main or lateral pipe and a manhole. The Insignia™ End Seal provides a full-circle compression seal to a substantial area at the ends of a pipe rehabilitated by lining. This hydrophilic sealing product is intended for use in conjunction with most all pipe rehabilitation systems, including but not limited to: inverted CIPP liners, pull-in-place CIPP liners, and fold-and-form plastic pipe liners. The Insignia™ End Seal product shall be commercially available from LMK Technologies or a distributor for use as an adjunct to rehabilitative pipe lining projects on a price per kit basis.

2. Overview

- 2.1 The Insignia™ End Seal product and process consists of providing a full-circle seal at the junction of a main or lateral pipe and a manhole by using a tubular sleeve of hydrophilic material specifically tailored to provide the most safe, efficient, cost-effective, watertight seal at the ends of a rehabilitated pipe. The Insignia™ End Seal product and process overcomes major deficiencies of other known products and methods used at the junction of a pipe at the manhole. For example, the use of a hydrophilic rope is commonly used near the ends of rehabilitated pipe. The use of such a hydrophilic rope may result in imprecise placement within the host pipe, as the flexible rope is prone to shift within the pipe or fall during installation of a pipe liner, resulting in an incomplete seal at the pipe ends. Another example of material used to seal pipe ends is a hydrophilic caulk. The use of such a caulk to seal the ends of a pipe at the manhole may result in inconsistent wall thickness and imprecise placement before and after a liner is installed. Since there are no structural elements to hold the caulk in place, the caulk is allowed to smear and spread throughout the pipe. Additionally, the use of either hydrophilic rope or caulk requires arduous cleaning of the pipe interior before application in an attempt to stick and retain the seal to the pipe as a liner is installed.
- 2.2 The Insignia™ End Seal product and process overcomes these deficiencies by the use of a sealing product that provides a hydrophilic material that does not shift or move during installation of a rehabilitative pipe liner. Additionally, the Insignia™ End Seal product provides a uniform seal and consistent wall thickness around the pipe end after installation of a pipe liner. Furthermore, the Insignia™ End Seal product does not require arduous cleaning of the pipe end before installation.
- 2.3 The Insignia™ End Seal product includes a tubular sleeve constructed of a hydrophilic polymeric material, designed with a specified length and wall thickness to provide a compression seal to the end of a pipe at the manhole. A mechanical fastener is provided with the tubular sleeve that is specifically designed to hold the tubular sleeve in place



during installation of a pipe liner. The mechanical fastener may utilize a double-sided adhesive to ensure that neither the tubular sleeve nor the fastener shift during installation.

2.4 The most common method utilized and associated with the Insignia™ End Seal includes placing the tubular hydrophilic sleeve within the pipe to be rehabilitated adjacent to the manhole. A mechanical fastener is placed against the inner wall of the tubular sleeve during installation, securing the tubular sleeve against the inner wall of the pipe. After the mechanical fastener is secured in place, a liner is inserted through the tubular sleeve utilizing known installation methods. After the liner is set in place, the tubular sleeve will swell in the presence of water, creating a full-circle seal between the newly-installed liner and the host pipe for the entire length of the Insignia™ End Seal.

3. Material

3.1 The materials utilized for the Insignia™ End Seal shall be provided in kits that are designed to accommodate varying pipe diameters, manhole depths, junction configurations, and pipe liner products. The Insignia™ End Seal kits are compatible with most rehabilitative pipe liner products, including cured-in-place, and fold-and-form. Additionally, the Insignia™ End Seal kit may be used with many different pipe liner installation and curing methods, including inversion, pull-in-place, hot water curing, steam curing, ultra violet curing, and ambient curing methods. The components of the Insignia™ End Seal include a tubular sleeve, and a mechanical fastener.

3.2 Tubular Sleeve: The member that creates the end seal is a hydrophilic neoprene rubber of approximately 50 Shore A durometer. The tubular sleeve has a uniform wall thickness of approximately 2 mm, a length of approximately 3.5 inches, and a diameter slightly less than the interior pipe diameter. The hydrophilic neoprene rubber has the following characteristics:

Characteristic	Unit	Value	Test Method
Shore A Hardness	point	50 +/- 5	ASTMD2240
Tensile Strength	psi	177	ASTMD412
Elongation at Break	%	523	ASTMD412
Specific Gravity		1.2	ASTMD297
Swell Capacity in Water Contact	%	200	GRCS

3.3 Sizes: The Insignia End Seal Sleeve is available in sizes of 6", 8", 10", 12", 15", 18", 21", and 24"

3.4 Mechanical Fastener: There are several mechanical fasteners available for use with the Insignia™ End Seal product. A first option is a shape-memory alloy that has been formed into a specific acute or other curvilinear configuration having an outer profile that is generally greater than the circumference of the pipe before insertion. This conformation allows the alloy to be bent into a configuration that fits inside of the tubular sleeve and the pipe. Once inside the pipe, the alloy is pressed against the wall of the tubular sleeve, thus pressing the tubular sleeve against the wall of the pipe. The shape



memory characteristic of the fastener urges the fastener to return to its original profile. The alloy remains in a strained configuration, pressing the tubular sleeve against the pipe wall. A second option for a mechanical fastener is a ratcheting retaining ring. The ratcheted retaining ring includes a strip of material having a total length generally greater

than the pipe diameter. A ratcheting worm gear is attached to the strip and the strip is formed into a ring shape of variable diameter. The ratcheting retaining ring allows an operator to manually adjust the outer profile of the mechanical fastener, allowing for a small initial diameter before placement into the pipe. After the ratcheting retaining ring is placed within the pipe, the diameter of the retaining ring may be expanded by actuation of the worm gear to tightly hold the tubular sleeve in place.

- 3.5 Dual-sided Adhesive Tape: For some mechanical fasteners, a dual-sided adhesive tape may be used to affix the mechanical fastener to the tubular sleeve before installation within the pipe. This feature encourages the mechanical fastener to remain within the tubular sleeve during installation of the tubular sleeve and the pipe liner.

4. Installation Recommendations

- 4.1 Access to the ends of the pipe to be rehabilitated: Access a manhole where a main pipe or a lateral pipe connects. A technician may access the manhole interiors via conventional methods to access the main or lateral pipe to be rehabilitated. The pipe interior at the manhole shall be measured from 6:00 to 12:00 and from 3:00 to 9:00. The mean shall be the nominal inner diameter.
- 4.2 Cleaning and Inspection: All roots, deposits, and debris should be removed from the pipe with hydraulically powered equipment, high velocity jet cleaners, or mechanically powered equipment as per NASSCO recommended specifications for sewer collection system rehabilitation. Since the Insignia™ End Seal provides a seal based on compression instead of adhesion, extensive cleaning beyond obvious obstructions is optional. A full-circle seal at the ends of the pipe will be achieved regardless of the presence of fats, oils, and grease which is inherent in sewer pipes even after high velocity jet cleaning. It should be noted that the various pipe rehabilitation installation methods have different installation standards (such as ASTM standards and manufacturer's recommendations), and those installation standards should be observed during installation of the liner.
- 4.3 Placement of the Insignia™ End Seal Product: After the ends of the pipe have been accessed and cleaned and inspected, the Insignia™ End Seal product is placed inside the end of the pipe adjacent the manholes. The mechanical fastener is placed into a conformation such that the outer profile of the mechanical fastener is smaller than the diameter of the pipe to be rehabilitated, and the mechanical fastener is placed within the tubular sleeve. Dual-sided adhesive tape may be applied to the outer surface of the mechanical fastener to adhere the outer surface of the mechanical fastener to the inner surface of the tubular sleeve. The tubular sleeve is then placed inside the end of the pipe, and the mechanical fastener is placed into a conformation where the tubular sleeve is held to the pipe wall.



4.4 Installation of a Rehabilitative Liner: After the Insignia™ End Seal product has been placed into the ends of the pipe, a rehabilitative liner product shall be installed into the pipe. The Insignia™ End Seal product is intended for use in conjunction with most pipe rehabilitation systems, including but not limited to: cured-in-place pipe liners and fold-and-form pipe liners. The Insignia™ End Seal kit may be used with many different pipe

liner installation and curing methods including, inversion, pull-in-place, hot water curing, steam curing, ultra violet curing, and ambient curing.. Since the Insignia™ End Seal product has a uniform wall thickness and is held firmly within the pipe to be rehabilitated, a compression seal will be provided to a large area of the pipe end adjacent the manhole. Since the Insignia™ End Seal product may be used with a variety of rehabilitative pipe liners, the standard installation practices of each individual pipe liner method should be closely followed. Therefore, procedures should be used that meet applicable NASSCO, ASTM, NACE and SSPC standards and provide quality assurance controls that meet the manufacturer's printed recommendations.

Patents:
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