

THE MYTH, THE FACT, AND THE LEGEND: INSIGNIATM HYDROPHILIC SEALING SYSTEM

Over the course of time, people have bought into stories that are believed to be true only later to be found that the story is nothing more than a myth. Dating back to the belief that the earth was flat, the demystifying of these supposedly all-pervading truths has always generated astonishment and awe in a society. A classic example of one such modern myth is the conviction among users of trenchless pipe renewal technologies in that cured-in-place pipe (CIPP) will not only structurally restore the pipe but that inflow and infiltration (I&I) will also be eliminated by bonding the liner to a host pipe preventing future leakage in a sewer collection system.

Before making our way through the distorted facts of I&I elimination, it is important that one understands the purpose and the long-term goals for sealing a collection system. In any given collection system, I&I can cause havoc for a few valid reasons. Consequently, if CIPP itself could really eradicate I&I, as the myth perpetuates, the results would be significant and would save a tremendous amount of time, effort, and tax dollars on municipal sewer renovation programs. However, truth be told, it is beyond conventional wisdom to install CIPP in a greasy sewer and expect the CIPP to bond and form a water tight seal for the designed 50 years, especially

- Requires additional energy which equates to additional tax dollars spent
- Overtaxing of the collection system whereby reducing capacity
- Sewer overflows that pollute our environment and adversely affects clean water

Effects of I&I on a collection system



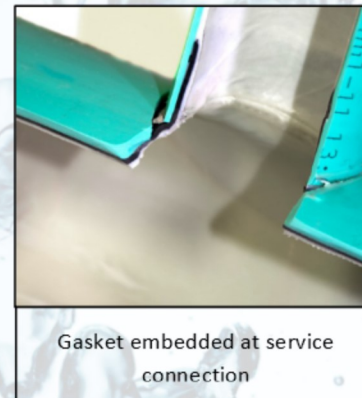
present on the walls of a host pipe are in no way diminished due to high pressure hydro cleaning. Additionally, shrinkage of CIPP occurs during



End Seal Installation

grout post-lining, to packing of cementitious material at the liner/manhole interface, to the insertion of expanding end seals positioned in the pipe prior to lining. The concept of a compression gasket to form an engineered seal is an accepted industry practice used for years in the installation and joining of sewer pipes. Even though the engineering society understands that the best long-term solution is an engineered gasket seal, one must select the proper gasket, which is designed for CIPP applications.

The use of a hydrophilic rope or belt shaped material commonly used in a cold-concrete-joint is not suitable for CIPP renewal works. Those who have attempted to use this type of seal will appreciate the challenges of effectively securing a penannular or non-monolithic gasket to the inside of a pipe. Some of the problems that occur with this method are the fact that gluing anything into a wet and greasy sewer pipe is a challenge in itself. If the gasket falls over during insertion of the liner, the result is a large bump at the invert of the pipe; or the contractor simply doesn't install the problematic gasket as required. Even if one were to assume the gasket could remain in-place as the liner is inserted, the ends of the gasket would have to abut or overlap. The belt type gasket creates a significant opportunity for separation or a gap in the gasket resulting in continued leakage where hydraulic loading is present. Furthermore, these belt shaped gaskets are fairly narrow, producing an insignificant sealing surface. They are also quite bulky in thickness, reducing the cross section of the pipe, which may hinder the insertion of robotic cutters, maintenance and lateral connection lining equipment.



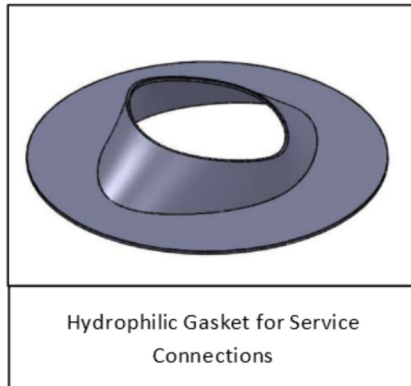
Gasket embedded at service connection

In order to correct these deficiencies, a considerable amount of research and development has been initiated to produce a truly engineered mechanical end seal which is simple to install, is effectively secured to the inside of the pipe, and has a significant sealing surface and a low profile that maximizes the cross section of the pipe opening.

Those who invested in the research and development could not put their checkbook away until the research project proved to conclude a total system seal that is compatible with all mainline CIPP systems, regardless if the mainline liner is pulled into place or inverted into place. To achieve the objective



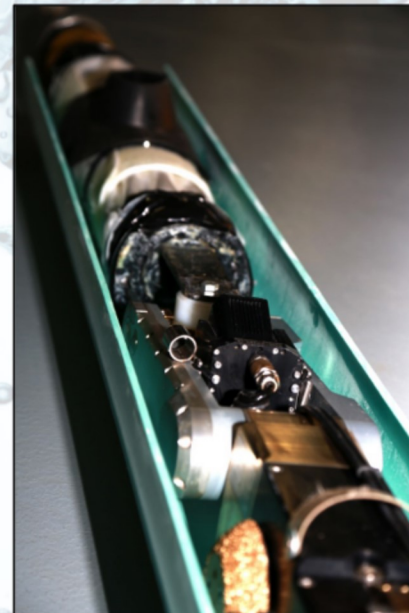
water that infiltrates through lateral pipe defects and another is water that tracks behind mainline linings and re-enters the collection system at service connections and manholes.



The renewal of lateral pipes and the main/lateral connection is typically performed by pressing a resin saturated mainline member against the interior of a mainline CIPP as a resin saturated liner tube is inverted into the lateral pipe. Most commonly, the lateral pipe is renewed to the public/private property line. The challenge is how to form a long-lasting seal between the lateral CIPP and the mainline CIPP. Long-term bonding to the interior surface of a mainline CIPP is problematic for a few practical reasons: 1) CIPP includes inner coatings made of materials that are incompatible for long-term thermoset bonding; 2) CIPP liners are lubricated with mineral oil, vegetable oil, cooking grease and similar lubricants to reduce friction during inversion (these materials are well-known release agents that actually prevent bonding); 3) Thermal expansion/contraction of plastic CIPP; and 4) If water is present, it is a relentless force working against any bonded connection.

The solution for obtaining a long-term seal starts by applying common engineering principles. The science of a compression gasket seal is where two structural materials are joined and during the joining process, the gasket is compressed resulting in a flexible seal that has been proven to be extremely effective in sealing pipes for many years in the pipeline industry. In the case of CIPP applications, the design team applied these same engineering principles. The research project concluded with a final solution for a mainline and service lateral collection system seal consisting of a high-strength, low-profile, short, full-hoop CIPP outfitted with a flange or hat-shaped, hydrophilic neoprene rubber gasket and a single-piece lateral liner tube assembly. The full-hoop mainline member provides a structural bridge as an opposing force from the swelling gasket occurs forming a compression seal that is comparable

to that of new pipe. An added benefit of this sealing method is compatibility with all mainline CIPP lining systems and the



Hydrophilic Hat Installation
Equipment