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## LOCAL ORDINANCES DICTATE LATERAL RENEWAL TECHNOLOGIES

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**ABSTRACT:** Cities across North America are challenged with sewer overflows and the impact of extraneous water infiltrating into sewer collection systems. This is minimized by lining the main pipe from manhole to manhole, however ground water continues to migrate behind mainline linings and re-enters at sewer lateral connections. The impact that faulty and leaking laterals have on a sewer collection system is staggering, yet legal boundaries due to local ordinances often limit the success of a municipality's (Municipal Agency or Sewer Agency) sewer rehabilitation and I/I removal program.

Homeowner responsibilities for the lateral can be one of three scenarios. One, local ordinance may dictate the homeowner is responsible for the sewer lateral connection in its entirety (i.e. from the building foundation to the city-owned sewer main). Two, the local ordinances stipulate that the municipality owns or maintains the sewer lateral from the sewer main to the street right-of-way line and the homeowner is responsible for the remainder. Finally, in very few instances, the municipalities accept responsibility for the sewer lateral connection from the sewer main to the house foundation. This methodology correctly recognizes the impact that leaking laterals have on their sewer collection system.

Until recently, lateral connection sealing was limited to mainline pipe rehabilitation technology. Often lateral rehabilitation projects relied on mainline pipe rehabilitation techniques modified for lateral rehabilitation but these non-lateral specific techniques were not necessarily compatible with lateral rehabilitation. This "shoehorning" of mainline techniques has resulted in ineffective sewer rehabilitation projects. This is further exacerbated in locations where the local codes, by relying on the homeowner, limited the success of total I/I reduction (reduction of ground water infiltrating into the pipe or sewerage ex-filtrating out of the pipe) programs to reduce sanitary sewer overflows (SSO's). A variety of technologies have been approved by municipalities to deal with the environmental threat of sewer overflows. This paper will discuss several lateral renewal programs utilized by municipalities, each of which illustrates a different level of sewer lateral ownership and how a typical homeowner might be impacted personally, financially and legally. Therefore, this paper will also discuss proper methods and materials for structurally sealing sewer lateral connections and renewing a specific length of the lateral pipe all while complying with local ordinances. In addition, all this can be accomplished with no excavation required, to complete the work.

## 1. INTRODUCTION

The objective of lateral renewal is to seal leaking pipes and renew structural integrity. Excessive leakage occurs in manholes, the main sewer, lateral pipes and the associated connections. Ownership issues frequently arise when leakage is identified in a lateral pipe, and the question then becomes, who is financial obligated for repairing or renewing the pipe? The US Environmental Protection Agency stated, “the effectiveness of I/I removal efforts may be limited in many collection systems if private sources of I/I are not addressed”. Simpson 2005 Refer to Fig. 1



Figure 1: Leaking Lateral Pipe

## 2. PRIVATE VERSUS PUBLIC:

A municipality’s lateral pipe ownership or maintenance can fall under one of three categories:

- The municipality owns or maintains the lateral pipe from the sewer main to the street right-of way line.
- The municipality maintains lateral pipes both in the public right-of way as well as on private property.
- The municipality does not own or maintain any portion of the lateral pipe.

There are many municipalities that do not own or maintain any part of a sewer lateral except the main to lateral pipe connection. In this case, it is common practice for the municipality to only contract for sealing the connection, after the mainline sewer has been rehabilitated. These municipalities recognize that the sewer laterals are a major source of I/I and a contributing factor to sewer overflows in their collection system. There are legal considerations that prevent a municipality from implementing a lateral pipe renewal program on private property. Many communities don’t even know where to begin with such a program (Simpson, 2005). Research Papers such as, “Private Property Virtual Library produced by the Water Environment Federation Collection System Committee” and “Home Repair state that, although privately owned, leaking laterals are a public problem” These articles are available to educate municipalities on private property I/I issues.

Some municipalities have required homeowners to repair their leaking lateral pipes. Often this leads to a financial burden on the homeowner and the challenge of locating a qualified licensed contractor to make the repair. Typically, the homeowner is not knowledgeable or qualified to deal with pipe repairs as is a municipality. The municipality is typically much better qualified to correct leaking lateral pipes and determining a fair market value for such repairs. The municipality is experienced in obtaining competitive bids, specifying the type of repair needed, and knows how to work with contractors. Typically a municipality schedules multiple sewer repairs under one (1) contract, which allows the municipalities to use an economy of scale approach to repairing leaking lateral pipes. Some municipalities even offer a lateral insurance option which can be paid for, by the homeowner, through an affordable monthly premium.

Municipalities, who accept responsibility for a portion or the lateral in its entirety, are renewing laterals by utilizing

Many state regulatory agencies are requiring municipalities to include sewer lateral installation, inspection and maintenance issues in their Capacity, Management, Operations and Maintenance (CMOM) program (WEF CSC, 2007).

a cured-in-place pipe lining, non excavation type technology. These linings designed to seal the main to lateral connection, and provide options to renew any part of the lateral pipe in accordance with the municipality’s codes and ordinances. There are three (3) categories relating to main to lateral CIPP repair technologies:

1. CIPP Connection Sealing
2. CIPP Connection Sealing and lining several feet up into the lateral pipe
3. CIPP Connection Sealing and lining the entire lateral pipe to the property line or further extending the repair to leaky pipe sections located on private property.

### 3. CIPP CONNECTION SEALS

CIPP Connection Seals between the main sewer and the lateral pipe, for the most part have been a glue-in-place “hat style patch” of fabric and thermo-set resin placed at the main to lateral connection which attempt adhere to the mainline pipe upon curing of the patch. These connection seals are intended to stop water that leaks behind mainline linings and re-enters the collection system at lateral connections. However, these glue-in-place connection seals must be installed on an extremely well prepared surface. Improper preparation has limited the success of connection sealing. Three (3) major design issues have been identified that make these “hat style patch” connection seals difficult to install and permanently adhere which makes it difficult for them to remain in place after installation: Refer to Fig. 2



Figure 2: Failed Glued Patch

- The glue-in-place hat style patches offer no design parameters for determining bond strength or the ability to withstand hydrostatic loading from the ground water table rising above the crown of the pipe. This is due to the lack of cylindrical shape and sole dependence on adhering to the host pipe. The glue-in-place patch type repairs performance cannot be predicted and therefore are not-applicable to engineering design calculations as described in ASTM F1216.
- For the most part, the mainline lining is made from a CIPP (cured-in-place pipe) that includes a smooth thermoplastic film on the interior of the lining. These thermoplastic films are typically polypropylene, polyethylene and or polyurethane. Polyethylene and polypropylene resist adhesion, and ester grade polyurethane is not hydrolytically stable, which means the plastic film over time will dissolve. Without removing the thermoplastic film adhesion of the glued-in-place hat style patch becomes problematic.
- Fats, oils, and grease (F.O.G.) universally exists in a existing old sewer pipe, and most cured-in-place pipe-liner, inverted from manhole to manhole, has a lubricant applied to the liner film. The lubricant is added during installation to reduce friction as the liner tube is inverted. These lubricants prevent hat type patch connection seals from adequately bonding to a mainline lining.

### 4. CIPP CONNECTION SEALING SOLUTION

An alternative CIPP connection seal solution is to provide a long-term, structural installation. To accomplish this, the connection seal must take the shape of the mainline pipe, by forming a cylindrical lining, and designed and constructed in accordance with parameters described in ASTM F1216 (Kiest & Gage 2009). The design parameters include: Refer to Fig 3

- Pipe Depth
- Pipe Diameter
- Water Level (above pipe crown)
- Soil Density
- Soil Modulus
- Liner Thickness
- Liner Flexural Modulus



Figure 3: Structural Main/Lateral CIPP

Also in order for a CIPP connection seal to form a long-term watertight seal, the Main/Lateral CIPP must include swelling gasket seals as part of the installation. The connection seal, as described in ASTM F2561-06, must be designed for a minimum service life of 50-years and provide a non-leaking connection between a mainline pipe lining and a service connection pipe. Compression gasket sealing is a globally accepted practice for sealing new pipe joint connections, especially when used for underground applications such as sewer and water. The swelling gaskets form a seal against all pipe lining materials and are typically not affected by lubricants applied to CIPP or F.O.G found in sewers. (Kiest & Gage 2009).

## 5. PREPARING THE PIPE

State-of-the-art robots are used to prepare the pipe by cutting, grinding and washing. This work includes trimming back protruding service taps, brushing out rough CIPP service cuts and washing the connection area. These robots can also be used to remove leaking or failed glued-in-place connection seals and repair the main to lateral connection using a structural Main/Lateral CIPP.

## 6. CIPP CONNECTION SEALING AND SHORT LATERAL LINING

This process, described in ASTM F2561-06, incorporates the same full-circle structural lining and gasket sealing as used for CIPP connection sealing. The lateral lining tube however, extends several feet up into the lateral pipe. Installation is achieved by inserting the main/lateral lining assembly into the main pipe, robotically positioning and inverting the liner tube up the lateral pipe without access to or ending at a cleanout.



Figure 4: Lateral Lining

## 7. CIPP CONNECTION SEALING AND LATERAL LINING TO PROPERTY LINE

This process, described in ASTM F2561-06, incorporates the same full-circle, structural lining and gasket sealing as used for CIPP connection sealing and short lateral lining. The lateral lining tube extends to the property line and is continuous in length with no overlapping liners. The Main/Lateral CIPP lining assembly is resin saturated (wet-out) together and cured all at the same time forming a homogenous main and lateral lining (Refer to Fig. 4). The swelling gaskets, which are part of the Main/Lateral CIPP, provide for the universal compression seal to the mainline lining. A clean-out is necessary to effectively clean the pipe, measure lengths, verify pipe diameters, robotically position the liner assembly, increase production and reduce risk during liner insertion.

## 8. CIPP CONNECTION SEALING AND LATERAL LINING PUBLIC AND PRIVATE

This process, described in ASTM F2561-06, incorporates the same full-circle, structural lining and gasket sealing as used for connection sealing to the property line. The lateral lining tube extends to a specified location on private property or to the building foundation. The liner is continuous in length or in cases when conditions prevent a continuous lining, two liners overlapping one onto the other may be used, provided swelling end seals are used (Refer to Fig. 5). In this case, the end of a lining tube includes a hydrophilic O-ring so when the second liner overlaps the first liner, the swelling gasket is positioned between the lining tubes forming a water-tight connection between the two overlapping linings. As with all of the other methods the swelling gaskets provide for the universal compression seal to the mainline lining. This process requires a clean-out to effectively clean the pipe, robotically position the liner assembly, control flow and reduce risk during liner insertion.



Figure 5: Lateral Lining

## 9. EXTENDING LATERAL LINING POST CIPP CONNECTION SEALING

Where the service connection has already been reconstructed with a CIPP Connection Seal, but now the municipality has modified its codes and ordinance and wants to continue their renewal program by lining lateral

pipe. This can be accomplished by inserting a liner through a cleanout, into the lateral pipe with the end of the liner overlapping onto the existing CIPP connection seal. However, this type of repair should only be performed provided swelling end seals are used at each end of the lateral lining tube, to prevent water tracking between the liners. This is accomplished when the lateral liner is provided with a hydrophilic swelling O-ring which becomes embedded between the existing CIPP connection seal and the new installed lateral liner.

## **10. CONCLUSION**

The best results, in removing I/I, from a sewer collection system are achieved when the leaking lateral pipe is repaired regardless of whether the leakage is located in the mainline sewer or the lateral pipe. Municipalities will find more success by working with the homeowners towards an integrated solution for I/I reduction while resolving private property I/I and legal issues relating to codes, ordinances and work performed on private property. This process is made less complicated by the technological advances. Long-term structural and effective main/lateral CIPP solutions are available to meet each municipalities I/I removal needs.

## **11. REFERENCES**

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