Sliplining Rehabilitation of Large Diameter Sewers

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Abstract

Much of this nation's infrastructure is very deteriorated and requires significant updating in order to maintain service levels. Included in this widespread need is the vast network of sanitary sewers. Since these pipelines are almost exclusively underground, direct replacement by open cut methods would likely be cost prohibitive as well as very disruptive to surface activities.

For these reasons, several in-place renewal techniques have been developed to rehabilitate sewer lines with minimal excavation. One such method is lining the existing host pipe with a new, slightly smaller pipe. This process is called sliplining.

Introduction

Sliplining is a semi-trenchless renewal method since access to the host pipe is gained by excavating a pit above the existing line and removing the top half of that pipe for a distance long enough to insert the new liner pipes. Prior to lining the existing pipe, generally, any debris, sludge or other material that may prevent passage of the liner pipe, must be removed. After lining, typically laterals are reconnected by point excavation. The installation is normally completed by grouting of the residual annular space to secure the liner position and improve resistance to external loads.

Several different types of pipes are used in sliplining including PVC, HDPE and fiberglass (primarily centrifugal cast fiberglass reinforced polymer mortar, acronym CCFRPM).

Diameters and Joints

Each of the pipe material types is available in specific diameter ranges and generally with one of two joint types; gasket-sealed bell-spigot (segmented system) or fused ends (continuous system).

Pipe Material Diameters Joint/System Installation

PVC </= 54" Gasket-sealed/Segmented Push-in

HDPE-Solid wall </= 54" Fused ends/Continuous Pull-in

HDPE-Profile wall </= 144" Gasket-sealed/Segmented Push-in

CCFRPM </= 102" Gasket-sealed/Segmented Push-in

Advantages

1. All of the joining systems can be leak-free, thereby stopping infiltration and exfiltration.

2. All of the materials are highly corrosion resistant, so further internal deterioration due to chemical

attack is prevented.

3. Properly designed and installed, all of these systems provide structural reinforcement and may restore full integrity or more.

4. Routinely, full flow capacity recovery can be achieved and, frequently, it can be increased because of the excellent hydraulic characteristics of these pipes.

Meaning's "n" Pipe diameter for equal flow

0.009 new 13% smaller vs. pipes with "n" = 0.013

0.011 slimed 13% smaller vs. pipes with "n" = 0.016

17% smaller vs. pipes with "n" = 0.018

Typical diameter reduction is 6", although this depends on the pipe wall thickness and desired amount of clearance for insertion. Examples:

30" (32" OD) into a 33" existing (tightest fit) (9% reduction)

48" (51" OD) into a 54" existing (typical fit) (11% reduction)

84" (88.5" OD) into a 96" existing (loose fit) (12% reduction)

5. Only general cleaning to remove debris, sludge, etc. that would prevent passage of the liner pipe is required. No surface cleaning of the host to create a bond is necessary.

6. Insertion of segmented liner systems can almost always be done in "live" flow without by-pass pumping, flow diversion or plugging.

Fused (continuous) systems can only be done in low flow conditions or with flow diversion, by-pass or temporary plug.

7. Insertion pits for segmented systems can be small; slightly longer than the pipe section length.

Insertion pits for continuous (fused) systems must be longer to enable bending the liner from the surface into the host sewer.

8. Insertion push or pull distances can be quite long provided that the host pipes' alignment is suitable ("straight"). Longest single push known to me is 5600 feet of CCFRPM 51" inserted into an existing 57" RCP.

9. Insertion of segmented systems can be very quick. Sustained installation rates of 240 feet per hour have been achieved many times.

Disadvantages

1. Sliplining is a semi-trenchless method. Access pits for insertion of the liner pipes is required.

2. Passage of the liner pipes through curves or Pl.'s in the host line may require short sections, fittings or excavation.

3. Reconnection of laterals typically requires a point excavation at the lateral.

4. Sliplining requires that the diameter of the line be reduced. However, this does not necessarily mean a loss of flow capacity. In fact, many times the flow capacity will actually be increased after lining despite the reduction in diameter.