Flow Control

For most insertion renewal projects it is not necessary to eliminate the entire flow stream within the existing pipe structure. Actually, some amount of flow can assist positioning of the liner by providing a lubricant along the liner length as it moves through the deteriorated pipe structure. However, an excessive flow can inhibit the insertion process. Likewise, the disruption of a flow stream in excess of 50% of pipe capacity should be avoided.

The insertion procedure should be timed to take advantage of cyclic periods of low flow that occur during the operation of most gravity piping systems. During the insertion of the liner, often a period of 30 minutes or less, the annular space will probably carry sufficient flow to maintain a safe level in the operating sections of the system being rehabilitated. Flow can then be diverted into the liner upon final positioning of the liner. During periods of extensive flow blockage, the upstream piping system can be monitored to avoid unexpected flooding of drainage areas.

Consider establishing a flow control procedure for those gravity applications in which the depth of flow exceeds 50%. The flow may be controlled by judicious operation of pump stations, plugging or blocking the flow, or bypass pumping of the flow stream.

Pressurized piping systems will require judicious operation of pump stations during the liner installation.

6. Make Service and Lateral Connections

After the recommended 24-hour relaxation period following the insertion of the polyethylene liner, each individual service connection and lateral can be added to the new system. One common method of making these connections involves the use of a wrap-around service saddle. The saddle is placed over a hole that has been cut through the liner and the entire saddle and gasket assembly is then fastened into place with stainless steel bands. Additional joint integrity can be obtained by extrusion welding of the lap joint created between the saddle base and the liner. The service lateral can then be connected into the saddle, using a readily available flexible coupling(11). Once the lateral has been connected, following standard direct burial procedures can stabilize the entire area.

For pressure applications, lateral connections can be made using sidewall fusion of branch saddles onto the liner. As an alternate, a molded or fabricated tee may be fused or flanged into the liner at the point where the lateral connection is required (see Figures 3 and 4). Mechanical fittings are also a viable option; refer to Chapter 9, PE Joining Procedures, in this Handbook.

7. Make Terminal Connections and Stabilize the Annular Space Where Required

Making the terminal connections of the liner is the final step in the insertion renewal procedure. Pressurized pipe systems will require connection of the liner to the various system appurtenances. These terminal connections can be made readily through the use of pressure-rated polyethylene fittings and flanges with fusion technology. Several common types of pressurized terminal connections are illustrated in Figure 11. All of these require stabilization of the transition region to prevent point loading of the liner. Mechanical Joint (MJ) Adapters can be used. Refer to Chapter 9, PE Joining Procedures, in this Handbook.

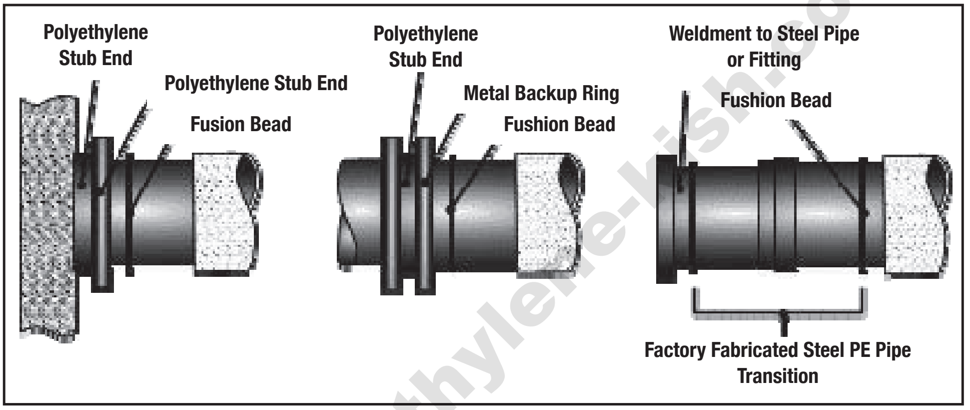

Figure 11 Terminal and Transition Connections for Pressurized Insertion Renewal Projects

Gravity lines do not typically require pressure-capable connections to the other system appurtenances. In these situations, the annular space will be sealed to prevent migration of ground water along the annulus and, ultimately, infiltration through the manhole or headwall connection. The typical method for making this type of connection is shown in Figure 11. Sealing materials should be placed by gravity flow methods so that the liner's buckling resistance is not exceeded during installation. Consideration should be given to the specific load bearing characteristics of the fill material in light of the anticipated loading of the liner.

Other Rehabilitation Methods

Rehabilitation by sliplining is only one (but probably the most popular) of a number of methods using polyethylene pipe currently available for pipeline rehabilitation. As mentioned in the introduction to this chapter, sliplining has been in use for more than thirty years.

Several other methods of rehabilitation that use polyethylene piping will be described briefly here. Please note that, due to rapidly advancing technology, this listing may become incomplete very quickly. Also note that any reference to proprietary products or processes is made only as required to explain a particular methodology.

Swagelining

A continuous length of polyethylene pipe passes through a machine where it is heated. It then passes through a heated die, which reduces the outside diameter (OD). Insertion into the original pipeline then follows through an insertion pit. The liner pipe relaxes (pressurization may be used to speed the process) until the OD of the liner matches the inside diameter (ID) of the original pipeline. Grouting is not required.

Rolldown

This system is very similar to swagelining except OD reduction is by mechanical means and expansion is through pressurization.

Titeliner

A system that is very similar to the swagelining and rolldown systems.

Fold and Form

Continuous lengths of polyethylene pipe are heated, mechanically folded into a "U" shape, and then coiled for shipment. Insertion is made through existing manholes. Expansion is by means of a patented heat/pressure procedure, which utilizes steam. The pipe is made, according to the manufacturer, to conform to the ID of the original pipeline; therefore, grouting is not required.

Pipe Bursting

A technique used for replacing pipes made from brittle materials, e.g. clay, concrete, cast iron, etc. A bursting head (or bursting device) is moved through the pipe, simultaneously shattering it, pushing the shards aside, and drawing in a polyethylene replacement pipe. This trenchless technique makes it possible to install pipe as much as 100% larger than the existing pipe.

Pipe Splitting

A technique, similar to pipe bursting, used for pipes made from ductile materials, e.g. steel, ductile iron, plastic, etc. A "splitter" is moved through the existing pipe, simultaneously splitting it with cutter wheels, expanding it, and drawing in a polyethylene replacement pipe. This trenchless technique is generally limited to replacement with same size or one pipe size (ie., 6" to 8") larger replacement pipe.

Summary

This chapter has provided an introductory discussion on the rehabilitation of a deteriorated pipe structure by insertion renewal with continuous lengths of polyethylene pipe. It also includes a brief description of other rehabilitation methods that utilize polyethylene piping. The sliplining or insertion renewal procedure is a cost-effective means by which a new pipeline is obtained with a minimum interference with surface traffic. An inherent benefit of the technology is the installation of a new, structurally sound, leak-free piping system with improved flow characteristics. The resulting pipe structure allows for a flow capacity at or near that of the deteriorating pipe system while eliminating the potential for infiltration or exfiltration. And the best feature of all is the vastly improved longevity of the PE pipe, especially compared to the decay normally associated with piping materials of the past.

The continuing deterioration of this country's infrastructure necessitates innovative solutions to persistent and costly problems. Insertion renewal, or sliplining, is a cost-effective means by which one aspect of the infrastructure dilemma may be corrected without the expense and long-term service disruption associated with pipeline replacement.

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