

SPECIFICATIONS FOR SEWER PIPE AND LINING INSERTION - TRENCHLESS; GENERAL GUIDELINES
(As Provided by NASSCO)

- 1 Intent: The intent of trenchless sewer pipe Insertion is to rehabilitate the existing sewer line in a manner which will correct the following deficiencies ...
- (1.1) Cracked/broken/collapsed pipe caused by poor construction, unstable soil, earth movement, infiltration, root damage, destructive loading , cleaning tool damage, etc.
 - (1.2) Corrosion of pipe caused by acid attack above flow level.
 - (1.3) Erosion of pipe caused by abrasion below the flow level.
 - (1.4) Degradation/deformation of pipe caused by loss of masonry.
 - (1.5) Infiltration of groundwater and soil through leaking pipe joints and structural defects.
 - (1.6) Exfiltration of sewage through leaking pipe joints and structural defects.
 - (1.7) Inflow of surface water and infiltration of groundwater through abandoned or illegal connections.
 - (1.8) Root re-growth after removal.
 - (1.9) Pipe Capacity Problems; Smooth, tight fitting sewer pipe can usually improve the sewage flow characteristics of the existing line.

Note ... sewer pipe refers to the installation of a structural pipe as opposed to coatings or membranes for corrosion or infiltration and exfiltration prevention.

- 2 Design Loads: The Engineer usually determines the design loads for the pipe to be installed and determines the required thickness with regard to the materials specified. External loads (earth loads/live loads/hydrostatic pressure), construction loads (external grout pressure/jacking force), support developed by annulus grouting, long-term flexural strength/modulus, together with appropriate safety factors are engineering considerations. The Design is specific to the Process. Consult with the firm whose Specification is used. Each Product Specification's Sponsor is listed on the Title Page.
- 3 Corrosion Resistance: Available materials shall have sufficient corrosion resistance to handle sanitary sewage. Epoxy, polyester, polyethylene, PVC, and vinylester offer high corrosion resistance for various applications. If service connections are to be cut through the line, the Engineer must determine if fiberglass reinforced material will degrade due to wicking at exposed fibers.
- 4 Pipe Materials: The Engineer must select the pipe material and/or process with regard to specific job requirements. Many materials and composite materials are available. Examples...

are licensed and/or performed by NASSCO member firms. The listed methods must have a required number of successful installation projects in North America to be included in these Specification Guidelines.

7 Dimensional Change: For certain processes, dimensional changes can occur during forming, installation or after installation.

8 Installation Procedures:

(8.1) Cleaning: The Contractor shall clean the sewer line prior to the TV inspection and subsequent line installation (see SEWER LINE CLEANING).

(8.2) TV Inspection: The pipeline shall be inspected to determine the location of any conditions which may prevent proper line installation (see TELEVISION INSPECTION).

(8.3) Obstruction Removal: It shall be the responsibility of the Contractor to clear the line of obstructions such as solids, dropped joints, intruding service connections, or collapsed pipe that would prevent line installation. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning methods, the Contractor shall make a point repair excavation to remove or repair the obstruction. Each excavation for obstruction removal shall be approved in writing by the Owner's Representative prior to the commencement of the work and shall be a separate pay item.

(8.4) Flow Control: If necessary for effective TV inspection and line installation, the Contractor shall bypass the effluent around the section or sections designated for pipe insertion. The bypass shall be made by plugging an existing upstream manhole, if necessary, and pumping the effluent into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow (see SEWER FLOW CONTROL).

(8.5) Pipe Installation: Procedures for liner installation are specific to the method being used and may vary with material, thickness, pipe size, pipe shape, etc. When proprietary techniques are used, the licensor's Specification for proper installation should be used.

(8.6) Excavation (Sliplining): When excavations for sliplining are made between manholes, the Contractor will establish the excavation points on the basis of location of the lines, pulling distances, and traffic conditions. The locations of the excavation points should minimize traffic disruption. The number of excavations can be reduced by planning to insert the liner in both directions from a single insertion pit.

Segmented pipe is installed from inside a manhole or from an insertion pit normally located at a change in line direction or at some other accessible location determined by the Contractor based on pulling/pushing distances, traffic conditions or interfering utilities. Pipe can be pushed or pulled distances in excess of 3,000 feet depending on pipe diameter, pipe stiffness, and condition of the existing line. Insertion pits should be of a length to accommodate the method of insertion used. The width of the pit is determined by the diameter of existing pipes and allowance for sufficient working room on either side. Sheathing and bracing requirements will depend on pit depth and ground conditions and should be constructed in accordance with applicable safety regulations. The top of the existing sewer line shall be exposed to the spring line and crown of the pipe shall be carefully removed as necessary for liner pipe insertion. Care should be taken not to disturb the bottom portion of the existing pipe as this will remain in place to conduct sewage flow, cradle the liner pipe during insertion and provide a stable base for the liner pipe. Refer to pipe manufacturer's literature for additional guidelines.

MATERIALS

Cured in Place Pipe (CIPP) with Polyester, Vinylester, Epoxy Materials

Fiberglass Pipe (Slip Line) with Polyester, Vinylester, Epoxy Materials

Polyethylene Pipe

Alloys of Thermoplastic Materials (Pipe)

Ployvinylchloride (PVC) Pipe

- 5 Pipe Size: The nominal pipe size is not necessarily the size of the pipe in the field. It is essential that the actual inside diameter of the host sewer pipe be measured wherever it is exposed before Trenchless pipe insertion is undertaken. Example

VITRIFIED CLAY PIPE

Nominal Pipe Size (inches)	Minimum* I. D. (inches)	Maximum** I.D. (Inches)
6	5.68	6.32
8	7.50	8.37
10	9.50	10.37
12	11.37	12.43
15	14.18	15.56
18	16.83	18.69
21	19.62	21.75
24	22.50	24.75
27	25.50	27.88
30	28.37	30.88
33	31.12	33.94
36	33.75	37.12

*Extra strength clay pipe, ASTM C200-65

**Standard strength clay pipe, ASTM C 13-65

Pipe size determines the applicability of several pipe installation methods and materials. Pipe size is a major consideration in the selection of candidates.

- 6 Pipe Insertion Methods: Candidate methods must be selected which will, in fact, correct the existing deficiencies and prevent their recurrence. The listed Specifications give a number of methods which

- (8.7) Infiltration Prevention: If there is an annulus between the existing pipe and the liner, infiltration must be prevented from entering the sewer at manholes and service connections by one or more of the following means:
- A. Annulus grouting
 - B. Sealing liner at manholes
 - C. Attaching building sewers to the liner
 - D. Chemical grouting at service connection

- (8.8) Annulus Grouting: Methods or products which have an annular space between the two (2) pipes require annulus grouting to develop the required strength and to prevent groundwater from entering the sewer.

Precautions should be taken to prevent collapsing the line with grouting pressure. Various grouts can be placed using low pressure and the newly installed pipe line can be hydrostatically pressurized during grouting. Grout must be prevented from flowing into service connections.

- (8.9) Sealing at Manholes: Pulled-in-place pipes which are not sealed by the annulus grouting must be sealed where the line enters and exits each manhole. The annular space shall be sealed for a distance of at least one pipe diameter inside the host pipe.

Foam sealant should not protrude into the manhole and should be finished over with a quick-set, nonshrink cement grout. Finishing inside the manhole shall be accomplished using a quick-set cement type grout to raise the manhole trough to the invert of the liner pipe. NOTE: Only the upstream seal should be made prior to connecting services.

- (8.10) Reinstating Service Connections: After installation, the Contractor shall reinstate the service connections as designated by the Owner. Certain processes allow this to be done remotely from within the sewer liner using appropriate robotic equipment. Where holes are cut through the line, they shall be neat and smooth in order to prevent blockage at the service connections. Cut-in service connections shall be opened to minimum of 90% of the flow capacity of the building sewer.

- 9 Acceptance: The finished pipe shall be continuous over the entire length of the installation. The liner shall be free as commercially practicable from visual defects, damage, deflection, holes, delamination, uncured resin, and the like. There shall be no visible infiltration through the liner or from behind the liner at manholes and service connections. Cut-ins and attachments at service connections shall be neat and smooth.

- 10 Cleanup: After installation has been completed and accepted, the Contractor shall clean up the project area and return the site ground cover to grade. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. Sidewalks, driveways, and street surfaces disturbed by the installation shall be recovered under the appropriate pay item.

11. Warranty: During the warranty period any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner mutually agreed by the Owner and the Contractor.