

SECTION 026608
SMOOTH WALL HIGH DENSITY POLYETHYLENE PIPE FOR
SLIPLINING (S-59A)
(Force Main Sewers)

1. SCOPE

This specification shall govern all work necessary for furnishing and installing smooth wall, high density polyethylene pipe required to complete the sliplining of existing sanitary sewer lines.

2. MATERIALS

- 2.1 Polyethylene: The material used for the liner and for the service taps shall be the same materials as designated below.

ASTM Designation: D-3350 with a cell classification of PE345434C. In addition, the liner shall be manufactured of polyethylene resins classified as Type III, Class C, Category 5 Grade P34 as tabulated in specifications in the older ASTM Designation, D1248. This material shall also conform to the design criteria as specified in Plastic Pipe Institute (PPI) Designation: PE34C8.

If requested by the owner, the pipe and fitting manufacturer shall provide certified copies of the quality control data taken during product manufacture.

Pipe and fittings shall be produced by the same manufacturer from identical materials meeting the requirements of these specifications.

Pipe and fittings shall be pressure rated to meet the service pressure requirements specified by the Design Engineer. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the pipe to which joining is intended.

Molded fittings shall meet the requirements of ASTM D-3261 and this specification. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the outside diameter and minimum wall thickness specifications of ASTM F-714 for the same size of pipe. Fitting markings shall include a production code from which the location and date of manufacture can be determined. Upon request, the manufacturer shall provide an explanation of his production code.

Fitting shall be manufactured in production facilities designed for that purpose. Field fabricated fittings are not allowed.

Pipe shall be manufactured in accordance with ASTM F-714, ASTM D-3035, or the applicable dedicated service specification. Identification markings shall include a production code from which the location and date of manufacture can be identified. Upon request, the manufacturer shall provide an explanation of his production code.

- 2.2 Pipe Rating: The pipe shall have a manufacturer's recommended hydrostatic design stress rating of at least 800 p.s.i. based on a material with a 1600 p.s.i. design basis determined in accordance with ASTM D 2837-69, Standard Method for Obtaining Hydrostatic Basis for Thermoplastic Pipe Materials.

2.3 Dimensions:

<u>Sewer Line I.D.Inches</u>	<u>Nominal O.D. of Liner (Inches)</u>	<u>Min.Wall Thickness Liner (Inches)</u>
24 (CIOD)	22.00	1.95

2.4 Liner Diameter: The inside diameter of the liner pipe at any point shall not vary from the nominal inside diameter by more than one percent or one quarter inch, whichever is greater.

2.5 Wall Thickness: The polyethylene lining to be used shall have a wall thickness that yields an SDR (Standard Dimension Ratio) of 11 or less. The SDR shall be calculated by dividing the outside diameter of the pipe by its minimum wall thickness. The average wall thickness of the liner pipe shall not be less than the nominal wall thickness published in the manufacturer's literature current at the time of purchase and the wall thickness at any point shall not vary from the nominal by more than 10 percent. The manufacturer shall provide sufficient data to demonstrate that the pipe supplied provides a 50 year service life with a maximum external hydrostatic pressure of 10 feet of water above the pipe center line.

All pipes shall be homogenous throughout, and shall be free of visible cracks, holes, foreign materials, blisters, or other deleterious faults. All materials shall be of the highest quality and highest performance. It shall be the product of a manufacturer actively engaged in research, development, and the manufacturer of said materials.

3. CONSTRUCTION METHODS

3.1 Cleaning: All lines to be relined shall be cleaned prior to installation of liner. The Contractor shall select the method of cleaning. All materials resulting from the cleaning operations shall be removed at the downstream manhole of the section being cleaned.

Television Inspection - Upon completion of the cleaning operation and prior to insertion of the liner material, a closed circuit television camera will be pulled through each line. The interior of the main shall be carefully inspected to determine the location and extent of any condition which may prevent proper installation of lining materials.

A television report log and video tape shall be furnished on each line inspected. The observations are to be recorded on a television inspection form. This log shall indicate the internal condition of the sewer segment, the deviations in line and grade, abnormal conditions of the pipe barrel and joints, and the location and quantity of each source of infiltration and inflow. The distance from the beginning manhole shall be noted for each observation made on the report form. Photographs of each defect shall be made from the television monitor for further study and justification for rehabilitation.

All observed obstructions shall be removed by the Contractor before initiating liner insertion. All excavation and backfilling for removal of obstructions, liner insertions, manhole rehabilitation and side sewer connection, if any, shall conform to requirements set out in this specification.

3.2 Bypass Sewage: It shall be the responsibility of the Contractor to bypass the sewage, if necessary, around the section or sections of line that are to be sliplined. Under no circumstances will dumping of raw sewage on private or City property be allowed. Bypass shall be made by pumping the sewage into a downstream manhole or adjacent system, or other methods as

may be approved by the Owner and the Engineer. The pump and bypass line shall be of adequate capacity to handle the flow. If bypass pumping is not a continuous operation, flow through the sewer line shall be restored at the end of a work day. Complete plugging of the existing line will not be permitted unless adequate bypass capacity for anticipated flows is provided or other means of handling the flows is approved by the Engineer.

- 3.3 Pipe Jointing: Sections of the Polyethylene (PE) liner pipe shall be joined into continuous lengths on the job site above ground. Joining shall be accomplished by the butt-fusion method and performed in strict conformance with the pipe manufacturer's recommendations using approved equipment. Except where flange connections or mechanical connections are specified, pipe and fittings as determined by the Engineer shall be butt-fusion joined in accordance with the manufacturer's recommended procedure. Before construction begins, the Contractor shall furnish to the Engineer for his review and approval, four copies of all details of the butt-fusion jointing procedure proposed for use. The Contractor shall make arrangements to have a technical representative of the pipe manufacturer present for the start-up of the butt-fusion jointing and training of the Contractor's personnel or arrangements shall be made for the pipe manufacturer's representative to remain on the job until all jointing has been completed. When requested by the Engineer, samples of butt-fusion joints shall be furnished by the Contractor for laboratory testing. The test of such samples shall clearly demonstrate joint integrity, strength, etc.
- 3.4 Insertion: After completing the access shaft excavation, the top half of the existing sewer down to the spring line shall be broken or cut and removed for the full length of the access shaft. A power winch cable shall then be connected to the end of the liner by use of fabricated or flexible pulling head so that the liner can be pulled into the existing sewer. Precautions shall be taken not to damage the liner by scoring on a ragged edge of the old sewer line during sliplining. Whenever possible, liner shall be pulled through manholes and liner sections shall be joined in pits other than in manholes. The purpose of this requirement is to (1) provide a smooth invert without grouting and a uniform condition for manhole rehabilitation and (2) minimize the number of insertion pits. Details for joining of liner section in manholes shall be submitted to the Engineer for approval prior to construction. Sufficient time (minimum 12 hours) shall be allowed after pulling the pipe for the pipe to recover to its original length since polyethylene liner will elongate due to stress during pulling, and allow for stabilization of length due to temperature. During the installation of the liner, should the liner break or separate, the excavation required to rejoin the pipe and all other work necessary to complete such repair shall be done for no separate pay.
- 3.5 Service Connections: After the liner has been pulled into place, allowed to recover, and secured to the manhole walls, each side sewer service shall be connected to the new liner. Service laterals shall be connected by the use of an approved remote tapping system or a prefabricated saddle. If the prefabricated saddle is used, a neoprene gasket shall be installed between the saddle and the liner pipe so that a complete water seal is accomplished when the two piece saddle is placed around the polyethylene pipe and pulled together with stainless steel bands. Inspection of this line did not reveal any connections to the sewer except at manholes. Laterals connecting to existing manholes shall be reconnected to the rehabilitated manhole as shown on the drawings and to the satisfaction of the Engineer.
- 3.6 Backfill: At all points where the liner pipe has been exposed, as in access shafts, outside of manholes, service connections, etc., the Contractor shall remove all debris and create a void along each side of the pipe at the spring line to undisturbed soil. Width of the void shall not exceed existing pipe O.D. plus four feet. Suitable spacers shall be

used to center the liner within the existing pipe, or hold the liner at the top of the existing pipe. The space between the liner and the pipe shall be filled with cement grout which shall contain a minimum of seven sacks of cement per cubic yard of sand and enough water (but no more) to provide a mixture that will flow around the pipe. As the bottom portion of this grout begins to set up, a drier mix shall be placed on top of the liner until a cover over the liner approximately the O.D. of the existing pipe is formed. In the voids along each side of the existing pipe, the Contractor shall place cement stabilized sand consisting of 3 sacks of Portland Cement per cubic yard of fine aggregate for concrete, mixed dry and placed in six inch lifts for the full width and length of the excavation and shall also be placed over the above described grout until a depth of twelve inches over the top of the original pipe is achieved. Each lift shall be hand tamped and utmost care shall be exercised to avoid damaging the inserted liner pipe and its encasement of the existing pipe. After the stabilized sand is in place and accepted by the Engineer, backfilling to finished grade may be completed using material from the excavation, select material or cement stabilized sand, all at the Contractor's option and as approved by the Engineer.

- 3.7 Sealing Manholes: The annular space between the polyethylene liner and the existing sewer line shall be sealed where the sewer link enters or exits each manhole. The annular space may be sealed with a mechanical device, chemical seal, or quick setting concrete. The method chosen shall be approved by the Engineer prior to construction.
- 3.8 Grouting Annular Space: The annular space between the polyethylene liner and the existing pipe shall be filled with a grout having good flow characteristics, minimum shrinkage, and permanence of support. One suggested mix design per cubic yard is: 500 lbs. of 3/8" washed river gravel (rounded), 2,100 lbs. of sand, 7 sacks of Portland Cement and 21 ounces (3 ounces per sack of cement) of Pozzolite 300R as manufactured by Master Builders, or Sikamix 100 as manufactured by Sika Chemical Corporation, or equal. The gravel may be omitted if proven to be of no benefit. Another suggested mix design per cubic yard is: 1,150 lbs. of sand, 400 lbs. of fly ash, 658 lbs. of cement and 83 gal. of water. If neither of these mix designs is used, the Contractor shall submit a mix design to the Engineer for approval prior to beginning the grouting process. It is intended that the annular space be 100% filled, but particular attention must be paid to those areas just downstream of manholes to avoid air traps. Equipment for placement of grout shall be used so as to prevent segregation of the grout components and to cause the grout to flow around the liner and completely fill the voids in the annular space. Under no circumstances shall grout be dropped down the shafts onto the polyethylene liner. Grout shall not be permitted to rise in the vertical shafts more than two feet above the top of the existing pipe. The Contractor shall have operable vibrators on the job to aid the flow of the grout. The Contractor shall have operable pumps on the job site to remove water from the vertical shafts as it is displaced by grout to prevent an excessive hydrostatic head on the polyethylene liner. Grouting method details shall be submitted for approval.
- 3.9 New Manholes: In those places where the main access shaft is excavated at an existing manhole, the manhole will be replaced with a new manhole. The new manhole shall essentially be equal to the rehabilitated manhole shown on the drawings except that a concrete vault will not have to be constructed at the bottom. Details of such construction shall be subject to review and approval by the Engineer before construction. All materials shall be new and the best quality and workmanship shall be that of skilled craftsmen. New manholes constructed under this section shall not be reason for extra compensation. All materials not used in the backfilling operation shall be disposed of off site by the Contractor and all areas must be restored to their original conditions.

4. CLEANUP

After all installation work has been completed, the Contractor shall clean up the area around the work area and return the ground cover to a like or better condition as existed prior to construction. All pavement shall be repaired as specified. All broken pipe, and other material not a part of the ground cover shall be hauled off and properly disposed of by the Contractor.

5. MEASUREMENT AND PAYMENT

- 5.1 Measurement: Unless specified otherwise in the Special Provisions, Sanitary Sewer Sliplining will be measured by the linear foot for each size installed.
- 5.2 Payment: Unless specified otherwise in the Special Provisions, Sanitary Sewer Sliplining shall be paid by the linear foot for each size installed, complete in place.