

SECTION 02571

PIPE BURSTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section specifies the system, method, or process to include all labor materials, tools, equipment and incidentals necessary to provide for the complete rehabilitation/replacement of deteriorated pipe by the Pipe Bursting System.

1.02 UNIT PRICES

- A. Measurement for installing replacement pipe using pipe bursting method is on a linear foot basis for installed liner pipe, measured from center line of upstream manhole to center line of downstream manhole. Depth range for payment is based on greatest depth measured at manholes from natural ground level to flow line of sanitary sewer for each pipeline segment.
- B. Insertion or access pits, clamp installation, embedment (bedding, haunching and initial backfill), field quality control (testing), sealing liner at manholes, grouting annular space, building up, shaping and reworking manhole inverts and benches, and pre-installation and post-installation cleaning and television inspection of completed work are included in pipe bursting unit price and not paid for separately.
- D. Point repair of sanitary sewer for pipe replacement, digging a sag elimination pit, and bringing the bottom of the pipe trench to a uniform grade in line with existing pipe invert or by other measures that shall be acceptable to the Owner. Payment shall be per linear foot and to include site restoration.
- C. Locating and reconstruction of services and all connections of services will be paid for per each connection made, including fittings and pipe.
- D. The cost of any necessary bypass pumping will be considered subsidiary to the appropriate pay items for pipe installation, or related work and will not be a separate pay item
- E. Refer to Section 01270 - Measurement and Payment, for unit price procedures.

1.03 REFERENCES:

- A. A STM D 1248 - Polyethylene Plastics Molding and Extrusion Materials.
- B. ASTM D 2122 - Determining Dimensions of Thermoplastic Pipe and Fittings.
- C. ASTM D 2412 - Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

- D. ASTM D 2992 - Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting- Resin) Pipe and Fittings.
- E. ASTM D 3262 - "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- F. ASTM D 3350 - Polyethylene Plastics Pipe and Fittings Materials.
- G. ASTM D 3681 - Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition.
- H. ASTM D 4161 - "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

1.04 DEFINITIONS

- A. Pipe bursting: Reconstruction of sanitary sewers by insertion of liner pipe within the bore of the existing pipe, enlarged by breaking and expanding the old pipe.

1.05 SYSTEM DESCRIPTION

- A. Pipe bursting involves rehabilitation of deteriorated gravity sewer pipe by installing new pipe material within the enlarged bore created by using a static, hydraulic, or pneumatic hammer "moling" device, suitably sized, to break old pipe, or by using a modified boring "knife" with a flared plug that crushes existing sewer pipe. Forward progress of the "mole" or "knife" may be aided by hydraulic equipment or other apparatus. Replacement pipe is either pulled or pushed into the bore.

1.06 QUALITY ASSURANCE

- A. The Contractor shall provide qualifications to the representative upon request evidence of competency and authority to perform pipe bursting.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prevent injury to or abrasion of pipe during loading, transportation and unloading. Do not drop pipe from vehicles, nor allow pipe to roll down skids or slopes without proper restraining ropes. Use suitable pads, strips, skids or blocks for each pipe during transportation and while awaiting installation.
- B. Do not use, and remove from construction site, pipe with physical damage such as cuts, gashes, nicks or abrasions which may have occurred during shipping, storage, or handling, which are deeper than 10 percent of wall thickness.
- C. Use wide belly band slings for lifting and moving pipe. Do not use bare chains in contact with pipe.

1.08 PERFORMANCE REQUIREMENTS

- A. Maintain sewage flow by diversion pumping or other method approved by the Engineer.

- B. Clear existing sewers of debris, obstructions and other foreign material, point repair of damaged or sagging sewer.
- C. Perform pipe bursting according to this Section.
- D. Shape manhole inverts as specified in Section 02081 – Cast-In-Place Manhole.
- E. Test lines as specified in Section 02533 - Acceptance Testing for Sanitary Sewers.
- F. Inspect lines by video inspection as specified in Section 02531-Gravity Sanitary Sewers.

1.09 SUBMITTALS

- A. Comply with Section 01330 - Submittal Procedures, and Section 01340 - Shop Drawings, Product Data and Samples.
- B. Submit to City a pipe bursting plans which shall minimally included pit locations and schedule, service line replacement, bursting distances and directions, and service outage and reinstatement schedule.
- C. Submit manufacturer's product data with complete information on pipeline materials including physical properties and dimensions pertinent to this job. Furnish certificates of compliance with specifications for materials to be supplied.
- D. Submit independent testing laboratory test reports certifying that polyethylene pipe conforms to ASTM D 1248 and ASTM D 3350, that fiberglass reinforced plastic (FRP) pipe conforms to ASTM D 3262 and ASTM D 3681, as applicable.
- E. Submit manufacturer's product data on clamps.
- F. Submit video inspection as specified in Document 02558 - Cleaning and Television Inspection.

1.10 TESTING

- A. City may have tests performed on field samples by an independent laboratory following applicable ASTM specifications to verify physical properties and characteristics of supplied materials. Provide product samples as requested by Engineer.
- B. City will pay for tests on materials which meet specification requirements. Contractor shall pay for failed tests and consequent retesting.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Liner pipe systems shall be polyethylene or fiberglass reinforced plastic (FRP) products approved by the City.
- B. Approved manufacturers for polyethylene liner: Chevron and Phillips.

- C. Approved manufacturer for FRP liner: Hobas USA, Inc.

2.02 POLYETHYLENE PIPE AND FITTINGS

- A. Provide polyethylene liner pipe, manufactured of solid-wall, high-density, high-molecularweight polyethylene meeting ASTM D 1248, Type III, Class B, Grade P-34, Category 5, with a PPI rating of PE 3408. Use polyethylene material with a minimum cell classification of 345434D or E (inner wall of light color) under ASTM D3350. Higher-numbered cell classification limits yielding desirably higher primary properties, according to ASTM D 3350, are also acceptable. Dimensions and workmanship: Meet ASTM F 714 and ASTM D 2122.
- B. Provide pipe with maximum Standard Dimension Ratio (SDR), and ratio of outside pipe diameter to wall thickness, as specified in Section 02505 High Density Polyethylene Pipe. Select SDR for the deeper of two manholes in each particular pipeline segment.
- C. Fittings for pressure systems shall be ductile iron with a minimum working pressure rating of 200 psi using HDPE MJ adapters to transition from the HDPE pipe to the fitting. At locations where bends are required pre-cast thrust blocks shall be installed.
- D. Stainless steel stiffener inserts, ASTM 240, shall be used for all fittings and connections to HDPE pipe. Stiffeners shall be of SS 304, wedge-type design.

2.03 LINER PIPE SEAL AT MANHOLES

- A. Sealer for annular space between liner pipes and manhole: Oakum strips soaked in Scotchseal 5600 as manufactured by 3M Corporation, or approved equal.
- B. Non-Shrink Grout: Strong Seal's QSR patching material, or approved equal.

2.04 CLAMPS AND GASKETS

- A. Clamps: Stainless steel, including bolts and lugs; Type 108, as manufactured by JCM Industries or equal. Furnish full circle, universal clamp couplings with at least 3/16-inch thick neoprene grid-type gaskets. Select clamps to fit outside diameter of liner pipe as follows:

Liner Pipe Outside Diameter (Inches)	Minimum Clamp Length (Inches)
8.625	18
10.750 or greater	30

2.05 SERVICE CONNECTIONS

- A. The service connection shall be specifically designed for connection to the HDPE sewer main being installed, and shall be INSERTA TEE, as

manufactured by Insert Tee Fittings, Inc., Hillsboro, Oregon, or an approved equal.

2.06 BEDDING MATERIAL

- A. Bedding: Comply with Section 02320 - Utility Backfill Materials.

PART 3 EXECUTION

3.01 OBSTRUCTION REMOVAL AND POINT REPAIR

- A. Make point repairs and remove obstructions, such as roots, rocks and other debris, prior to installing liner pipe. Remove and dispose of debris in accordance with Section 01504 - Temporary Facilities and Controls, or Section 01576 - Waste Material Disposal.
- B. If pre-installation video inspection reveals a sag in the existing sewer that is greater than one-half the diameter of the existing pipe, it shall be the Contractor's responsibility to install the replacement pipe to the result in an acceptable grade without the sag. The Contractor shall take in necessary measures to eliminate these sags, as directed by the City.

3.02 DIVERSION PUMPING

- A. Refer to Section 01540 - Diversion Pumping.

3.03 INSERTION OR ACCESS PITS

- A. Locate pits so that total number is minimized and footage of liner pipe installed in a single pull is maximized. Where possible, use excavations at point repair locations for insertion pits.
- B. Prior to excavation, the Contractor shall check with all utility providers and determine locations of utilities in or near the work area. Costs of utility repairs, temporary service and other costs arising out of damage to or interruption of utilities resulting from operations under this contract shall be borne by Contractor at no additional cost to the City.
- C. Perform excavation and backfill in accordance with requirements of Section 02317 - Excavation and Backfill for Utilities.
- D. Perform work in accordance with OSHA standards. Comply with Section 02260 - Trench Safety System for excavations requiring trench safety.
- E. Install and operate necessary dewatering and surface water control measures in accordance with Section 01578 - Control of Ground and Surface Water.

3.04 REMOVAL OR CUTTING OF PLASTIC PIPE TO ALLOW FOR PIPE BURSTING OF THE SEWER

- A. If a pipe that is scheduled to receive rehabilitation is found to have received sliplining or pipe bursting on a previous occasion, the Contractor shall notify the Engineer immediately. The Engineer may direct the Contractor to clean and televise the line segment and/or cut or remove the

existing liner in conjunction with the installation of a new pipe via pipe bursting. Removal or cutting of the existing liner shall be performed upon approval and notification from the Engineer.

- B. The Contractor shall provide the means, method, equipment and labor to cut or remove the plastic pipe to allow for the successful pipe bursting of the sewer.
 - 1. The means or method utilized by the Contractor shall not disturb the surrounding soil or host pipe to the degree where it will effect the installation and operation of the new pipe to be installed.
 - 2. Cutting of the liner or removal of the existing liner shall not interfere or damage the connections beyond the extent required to disconnect and reconnect the service laterals to the main line.
 - 3. Removal of the existing liner will only be allowed if cutting is not possible.
 - 4. Liner cutting or removal shall be considered complete when the existing pipe has been cut or removed and the new pipe has been successfully installed and accepted.
- C. During the liner removal or cutting effort the Contractor may encounter conditions that inhibit pipe removal or the cutting of the pipe. These include, but are not limited to obstructions, couplings, pipe clamps, or cement stabilized sand. When these conditions stop the advancement of the head, the Contractor shall request approval for an obstruction removal from the Engineer. Once approved, the Contractor shall perform all work necessary to remove the obstruction and allow for the resumption of progress of the liner removal or cutting effort.
- D. Line segments with existing conditions that prevent the successful removal or cutting of the liner pipe by conventional methods shall be evaluated on a case by case basis.

3.05 PIPE BURSTING

- A. Pipe bursting shall be accomplished using the hydraulic method. In general, the bursting operation shall be as follows
 - 1. Post notices of service interruption and outages as indicated in the pipe-bursting plan.
 - 2. Isolate the existing system and excavate launch, bursting, and service pipes as indicated in the pipe-bursting plan.
 - 3. Construct placement service lines.
 - 4. Set up the bursting equipment in the bursting pit and insert the bursting rods or cable through the host pipe.
 - 5. Connect the bursting head to the main and the bursting rods or cable in the launch pit.

6. Burst the existing main.
7. Install new service connection fittings and connect new service lines.
8. Flush the new main then connect the new main to the existing system; and
9. Continue this series of operation to complete the full scope of burstings.

B. Joints:

1. Assemble and join sections of polyethylene liner pipe on site, above ground. Make joints by heating and butt-fusion method in strict conformance to manufacturer's instructions and Section 02505.
2. Use operators who are experienced with butt-fusion jointing of pipe. Operators shall be trained infusing polyethylene pipe with similar equipment using proper jigs and tools in accordance with pipe manufacturer's standard procedures.
3. Form joints with smooth, uniform double-rolled back beads made while applying proper melt, pressure and alignment. Joints must be inspected and approved by the Engineer before insertion.

- B. Preparation: After completing insertion pit excavation, remove top of existing sanitary sewer line down to the spring line. Connect power winch cable to end of liner by use of suitable pulling head equal to outside diameter of liner. Secure pulling head to liner and attach to power winch cable so that liner can be satisfactorily fed and pulled through sanitary sewer line. Prevent ragged edges of existing pipe from scarring liner pipe. Follow insertion procedures in ASTM F 585. Do not allow sand or other debris to enter liner.

C. Pulling Liner:

1. Maximum length of continuous liner assembled above ground and pulled at any one time: Do not exceed length recommended by manufacturer's printed instructions.
2. Limit pulling force exerted on liner to that indicated below for the appropriate outside diameter of the polyethylene liner. Provide a suitable pulling force measuring device connected to the winch or pulling mechanism.

Polyethylene Liner O.D. (Inches) 8.625	Maximum Pulling Force (Tons) 4.0
10.75	7.5
14.0	10.5
16.0	12.0
18.0	21.5

- D. Alternate Insertion Techniques: Pushing, or a combination of pulling and pushing, may be used subject to the Engineer's approval. Avoid liner buckling or dimpling by limiting stroke of pushing implement. Cut out and remove portions damaged during insertion process.

3.06 CLAMP INSTALLATION

- A. Where excavations for liner pipe insertion are made between two manholes, cut ends of liner pipe smooth, square to pipe axis. Join liner pipes with appropriately-sized stainless steel universal clamp couplings. Butt together gaps between ends of liner pipe with space between ends not exceeding one inch.
- B. Bedding: Install cement-stabilized sand bedding in accordance with Section 02321 - Cement Stabilized Sand. Extend bedding 12 inches above clamp/liner pipe.

3.07 FIELD QUALITY CONTROL

- A. After liner installation, perform the following tests:
 - 1. Low pressure air test: Perform before sealing liner in place at manholes, and before making service reconnections to liner. Check integrity of joints made, and verify that liner has not been damaged.
 - 2. Service lateral connection test: After all service laterals have been completed for a particular sewer section, verify integrity of reconnections at points where they join liners and existing service lines by performing smoke test.
 - 3. Refer to Section 02533-Acceptance Testing for Sanitary Sewers for applicable test procedures.

3.08 SEALING LINER IN MANHOLES

- A. Allow liner pipe to normalize to ambient temperatures and recover from imposed stretch before cutting to fit between manholes, sealing at manholes, and shaping manhole inverts. Allow at least 12 hours for normalization of polyethylene liners.
- B. Cut liner so it extends 4 inches into manholes. Make smooth, vertical cuts and slope areas over top of exposed liner using non-shrink grout.
- C. Seal annular spaces between liner at each manhole with specified chemical liner pipe seal and non-shrink grout. Place strips of oakum soaked in sealer in a band to form an effective watertight gasket in the annular space between liner and existing pipes in manhole. Make width of the sealing band at least 8 inches.
- D. Finish seal liner pipe to host pipe with non-shrink grout placed around annular space from inside manhole. Apply grout in a band at least 6 inches wide.

- E. Reshape and smooth manhole inverts as specified in Section 02555 – Manhole Rehabilitation. Use approved manhole rehabilitation material to form smooth transitions with reshaped inverts and raised manhole benches to eliminate sharp edges of liner pipe, concrete benches and channeled inverts. Build up and smooth manhole inverts to match flow line of new liner.

3.09 POST-INSTALLATION VIDEOTAPE INSPECTION OF COMPLETED WORK

- A. Provide the Engineer with video inspection showing completed work including condition of restored connections. Comply with Document 02533 - Acceptance Testing for Sanitary Sewers.

3.10 FINAL CLEANUP

- A. Upon completion of installation, testing and inspection, clean and restore project area affected by work of this Section. Restore site in accordance with Section 01740 - Restoration of Site Improvements.

END OF SECTION