

ITEM 931

PIPE BURSTING/CRUSHING

- 931.1 Description: This item shall govern for methods and materials for the rehabilitation of existing gravity sewer lines by the Pipe Bursting or Pipe Crushing (Pipe Bursting/Crushing) process. The work includes furnishing all labor, equipment, and materials, and performing all operations required for proper installation of the rehabilitation piping as shown on the drawings and specified herein.
- 931.2 Related Specification Items:
- Item 163 - Turf Establishment
 - Item 433 - Cement-Stabilized Sand Backfill
 - Item 477 - Low Pressure Air Test-Sanitary Sewer Lines
 - Item 901 - St. Augustine Grass
 - Item 921 - Sanitary Sewers Lines
 - Item 925 - By-Pass Pumping
 - Item 933 - Sanitary Service Leads and Connections or Reconnections
 - Item 936 - Smoke Testing, Cleaning, and Television Inspection of Sanitary Gravity Sewer Lines
- 931.3 Methods: This section specifies the method or process for furnishing all labor, materials, tools, equipment, and incidentals necessary to provide for the complete rehabilitation of deteriorated gravity sewer lines by the Pipe Bursting/Crushing systems. The following systems are preapproved: T.T. Technologies, T.T.S. Northwestern Company Pipe Bursting Systems, PIM Corporation, (PIM System), Piscataway, New Jersey; McLat Construction (McConnell System for Pipe Crushing), Houston, Texas; Trenchless Replacement Systems, (TRS System), Calgary, Canada; and Miller Pipeline Corporation (Xpandit System), Indianapolis, Indiana Pipe Bursting/Crushing systems. Refer to INSTRUCTIONS TO BIDDERS for information regarding preapproval procedures for alternative processes. Any license fee shall be included in unit price bid.
- 931.4 Definition: The Pipe Bursting system is defined as the reconstruction of gravity sewer pipe by installing an approved pipe material by means of one of the preapproved methods set forth in Paragraph 931.3 of this specification. Essentially the process involves the use of a "moling" device, or cone shaped boring "knife" that bursts outwardly, or implodes and crushes the existing sewer pipe as it advances. Forward progress of the "mole" or the "knife" may be aided by the use of hydraulic/pneumatic equipment or other apparatus, as

specified in the approved methods. The replacement pipe is either pulled or pushed into the bore. The method allows for replacement pipe size on size from eight inches (8") through 15 inches (15") and/or upsizing in varying increments up to 18 inches (18"). This specification is based on the precedent that the Pipe Bursting/Crushing system used has been preapproved by the Engineer. Any residue produced by, or used in the process, shall not be allowed to flow into the sewer system. Contractor shall make necessary provisions to prevent this residue from entering sewer system at no separate cost to the OWNER.

931.5

Material Specifications:

1. Solid Wall Polyethylene Pipe (HDPE):

- a. The replacement pipe shall be manufactured from a high density high molecular weight polyethylene resin which conforms to ASTM D-1248 and meets the requirements for Type III, Class B, Grade P34, Category 5, and has a PPI rating of PE 3408 when compounded. The pipe produced from this resin shall have a minimum cell classification of 345434D or E (inner wall shall be light in color) under ASTM D3350.

Before beginning work, the Contractor shall submit to the Engineer for approval, the vendor's specific technical data with complete physical properties of pipe and pipe dimensions pertinent to this job. A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied.

- b. The outside diameter and minimum wall thickness shall conform to dimensions listed in Table I and shall be measured in accordance with ASTM D-2122.

TABLE I

POLYETHYLENE REPLACEMENT PIPE DIMENSIONS

EXISTING PIPE ID (Inches)	IPS NOMINAL OD (Inches)	MINIMUM OD (Inches)	MINIMUM WALL THICKNESS (Inches)			
			SDR 21	SDR 19	SDR 17	SDR 11
6	6	6.625	.315	.349	.390	.602
8	8	8.625	.411	.454	.507	.784
10	10	10.750	.512	.566	.632	.977
12	12	12.750	.607	.671	.750	1.159
15	18	18	.857	.947	1.059	1.636
18	20	20	.952	1.053	1.176	1.818

18	22	22	1.048	1.158	1.294	2.000
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- c. All HDPE pipe to be install shall be SDR 19 and shall be sized according to Iron Pipe Sizes.
- d. Use of Clamp and Encasement: Where excavations for the insertion of the replacement pipe are made between two (2) manholes, the ends of the HDPE will be cut smooth and square to the axis so that it can be joined in a workman like manner such that both ends meet and touch uniformly and continuously. An all stainless steel (including bolts and lugs) full circle universal clamp coupling with a ¼-inch minimum thickness grid type gasket shall be used, Smith Blair or equal. Clamps shall be selected to fit the outside diameter of the replacement pipe. Minimum clamp widths shall be provided in accordance with Table II.

TABLE II

MINIMUM CLAMP WIDTHS

OUTSIDE DIAMETER OF LINER PIPE (Inches)	MINIMUM WIDTH OF CLAMP (Inches)
6.625	15
8.625	18
10.750 or Greater	30

In all excavations where the replacement pipe is uncovered (i.e., insertion pits, sag elimination pits), bedding and backfill shall be in accordance with Specification Item 433-Cement Stabilized Sand Bedding and Backfill Material, and Specification Item 921-Sanitary Sewer Lines, of these specifications. Visual inspection is required for approval of bedding before backfill is completed.

- 2. Alternative Materials: Alternative materials for replacement pipe shall be prequalified. Refer to the INSTRUCTIONS TO BIDDERS section.

931.6 Pre-installation Preparations: The Contractor shall submit a work plan to the Engineer for review and acceptance. The work plan shall address the following minimum preparation/steps, unless approved otherwise by the Engineer.

- 1. Notification of Residents: The Contractor shall notify each resident, commercial or institutional account by way of written notice placed on front door of establishment, of Contractor’s intention to access front or back yard for purpose of sewer main and/or sewer service

rehabilitation operations. Said notice shall state dates, times, and estimated duration for need of access to sewer main and/or service leads. Notice shall also give Contractor's Name, name and phone number of Contractor's contact person. Said notice shall be delivered to each account 7 to 10 days prior to Contractor's need to access sewer main and/or sewer service lead.

2. Safety: The Contractor shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform, trench safety and entry into a confined space. It shall be the Contractor's responsibility to comply with OSHA Standards and Regulations pertaining to all aspects of the work.
3. Pre-installation Television Inspection: It shall be the responsibility of the Contractor to video (TV) inspect the sewer pipe immediately before Pipe Bursting/Crushing to assure that the existing pipe conditions are acceptable for Pipe Bursting/Crushing. This inspection shall be in accordance with Specification Item 936.
4. By-Pass Pumping: When required for acceptable completion of the Pipe Bursting/Crushing process, the Contractor shall provide for continuous sewage flow around the section(s) of pipe designated for the installation of replacement pipe. The pump and by-pass lines shall be of adequate capacity and size to handle the flow in accordance with Specification Item 925 - By-Pass Pumping.
5. Line Obstructions: If pre-installation video (TV) inspection reveals an obstruction in the existing sewer (heavy solids, dropped joints, protruding service taps, or collapsed pipe) which will prevent completion of the Pipe Bursting/Crushing process and that cannot be removed by conventional sewer cleaning equipment, then an Obstruction Removal/Point Repair shall be made by the Contractor, with the approval of the Engineer.
6. Sags In Line: If preinstallation video (TV) 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 result in an acceptable grade without the sag. The Contractor shall take the necessary measures to eliminate these sags by digging a sag elimination pit (point repair) and bringing the bottom of the pipe trench to a uniform grade in line with the existing pipe invert, or by other measures that shall be acceptable to the Engineer.

Installation Procedures: The Contractor shall submit information, in detail, of the procedure and the steps to be followed for the installation of the Pipe Bursting/Crushing system selected, even if the process is named in the specification. All such instructions and procedures submitted shall be carefully followed during installation. Any proposed changes in installation procedures shall require submittal of revised procedures and acceptance by the Engineer.

Immediately prior to the installation of any replacement pipe, the Contractor shall excavate, expose, and disconnect existing service leads on the segment of line to be rehabilitated.

1. Finished Pipe: The installed replacement pipe shall be continuous over the entire length of each pipe segment from manhole to manhole and shall be free from visual defects such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, pipe separation, and other deformities. Replacement pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site. The replacement pipe passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by the Engineer.
2. Pipe Jointing:
 - a. Polyethylene Pipe: Sections of polyethylene replacement pipe shall be assembled and joined on the job site above the ground. Jointing shall be accomplished by the heating and butt-fusion system in strict conformance with the manufacturer's printed instructions.

The butt-fusion system for pipe jointing shall be carried out in the field by operators with prior experience in fusing polyethylene pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer. These joints shall have a smooth, uniform, double rolled back bead made while applying the proper melt, pressure, and alignment. It shall be the sole responsibility of the Contractor to provide an acceptable butt-fusion joint. All joints shall be made available for inspection by the Engineer before insertion. The replacement pipe shall be joined on the site in appropriate working lengths near the insertion pit. The maximum length of continuous replacement pipe which shall be assembled above ground and pulled on the job site at any one time shall be 600 linear feet.

3. Insertion or Access Pits: The location and number of insertion or access pits shall be planned by the Contractor and submitted in writing for approval by the Engineer prior to excavation. The pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull shall be maximized. Locations of damaged pipe shall be used for insertion pits if directed by the Engineer.

The cost for diversion pumping required around an insertion pit from a manhole upstream to a manhole downstream, shall be per applicable item of these specifications.

4. Process Limitations: Though the installation process may be licensed or proprietary in nature, the Contractor SHALL NOT change any material, thickness, design values, or procedural matters stated or approved in the submittals without the Engineer's prior knowledge and preapproval. The Contractor shall submit, in writing, full details about component materials, their properties, and installation procedures and abide by them fully during the entire course of the project.

931.8 Sealing and Benches in Manhole: The replacement pipe shall be installed with a tight fitting seal with the existing or new manhole. Half-inch diameter activated oakum band soaked in Scotch Seal 5600 or equal shall be applied circumferentially on the replacement pipe and encased with a cementitious mortar to prevent inflow at the manhole. The top half of the pipe within the manhole shall be neatly cut off and not broken or sheared off, at least six inches (6") away from the manhole walls. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels, if any. Channel cross-section shall be U-shaped with a minimum height of half pipe diameter to three-fourths of the pipe diameter for 15 inches (15") and larger. The side of the channels shall be built up with mortar/concrete, as specified, to provide benches at a maximum of 1 in 12 pitch towards the channel.

Payment for above work shall be incidental to sewer rehabilitation by the Pipe Bursting/Crushing system, since that payment is made from centerline to centerline of manhole(s).

The replacement pipe in the manhole shall be sealed as specified above before proceeding on to the next manhole section and all manholes shall be individually inspected for replacement pipe cutoffs, benches, and sealing works.

931.9 Service Leads: After the replacement pipe is in place, the Contractor shall reconnect the existing active service leads as designated by the OWNER. This shall generally be done by excavating and installing external taps.

Remove a portion of the existing sewer around each service connection to expose new pipe, and provide sufficient working space for making new service connection or reconnection. Connect service lead in accordance with Specification Item 933. Any by-pass pumping that is required to maintain service to residences, offices, shops, or any other facility shall be provided at no additional cost.

Maximum diameter service lead of four inches (4") permitted on six-inch (6") sewer line. Six-inch (6") service leads permitted on sewers eight inches (8") and larger. Unless otherwise approved, new service leads to be of same size as existing service lead. Provide adapters as may be required for transition from saddle to PVC pipe.

External service reconnection includes extending lead to structurally good condition existing pipe.

- 931.10 Testing of the Replacement Pipe: All costs for testing the replacement pipe by a pressure method will be incidental to the installation. Two (2) types of testing shall be required after the replacement pipe has been installed in the existing sanitary sewer main. The first is a low-pressure air test of the replacement pipe in accordance with Specification Item 477 before it has been sealed in place at the manholes and before any service reconnections have been made. The purpose of this test is to check the integrity of the joints that have been made and to verify that the replacement pipe has not been damaged by inserting it into the sanitary sewer. The second test is a service lead connection test in accordance with Specification Item 936, Paragraph 2.E.2. "Smoke Test for Sliplined or Pipeburst Sewers." The test shall be done after all service leads have been made for a particular pipe segment between adjacent manholes. This test shall verify the integrity of the connection at the point where it joins the replacement pipe and existing service lead.
- 931.11 Post Televising of Completed Sections: In accordance with Specification Item 936. Post television inspections, tapes, and reports, etc., shall be incidental to the installation of the replacement pipe.
- 931.12 Clean-Up Operations: Dispose of all excess material and debris off-site. Restore areas of construction to condition equal to, or better than, that which existed prior to construction operations, including solid sodding of St. Augustine grass areas. Solid sodding to be in accordance with Specification Item 901; hydro-mulch other grassy areas in accordance with Specification Item 163. Complete clean up shall be accomplished not greater than 2,000 feet behind pipe bursting/crushing operation.
- 931.13 Measurement and Payment:
- A. Cleaning and Televising of Sanitary Sewers: Pay for cleaning and televising in accordance with Specification Item 936.

- B. Pipe Bursting/Crushing: Measure by linear foot from center of manhole to center of manhole (or terminal cleanouts) along replacement pipe of size installed. Pay for replacement pipe furnished and measured as stated, including excavation and backfilling of insertion or access pits at Contract unit price bid for size measured.
- C. Point Repairs: Pay for point repairs in accordance with Specification Item 932. Excavations initially begun as Obstruction Removals or Point Repairs which the Contractor later decides to use as insertion pits are considered as insertion pits and not paid for separately. Pay for terminal clean-outs or plugs located at the upstream end of a section of line that are removed or excavated to facilitate cleaning, televising, and pipebursting/crushing as a point repair under Specification Item 932. Include cost of replacement of clean out in unit price bid for Point Repair.
- D. Service Leads: Pay for reconnection of house, or building service leads, or stacks in accordance with Specification Item 933. Payment is full compensation for materials, labor, and equipment necessary to locate and make these connections. Any number of houses or buildings discharging into a common point of sewer line is counted as one, and only one, service reconnection. Service reconnects within limits of a point repair considered as incidental to point repair and no separate payment will be allowed.
- E. Service Lead Extension: Pay for service lead extension of all sizes in accordance with Specification Item 933.
- F. Testing: No separate pay for smoke testing or low pressure air testing after completion of pipe bursting/crushing or service connection. Include cost in unit price bid for item for which it is a component.
- G. Trench Safety System: Pay for Trench Safety System in accordance with Specification Item 429.
- H. Solid Sodding with St. Augustine Grass: No separate measurement nor payment.
- I. Turf Establishment: No separate measurement nor payment.
- J. By-Pass Pumping: No separate measurement nor payment.
- K. Removal and Replacement of Streets, Driveways, Parking Lots, and Sidewalks: In accordance with Specification Item 530.

END OF ITEM 931