SECTION 02580 – PIPE BURSTING GRAVITY SEWERS

PART 1 - GENERAL

1.01 SUMMARY

A. This section governs all labor, materials and equipment for the installation of gravity sewer pipe by the trenchless method of bursting existing pipes. The work shall be done as shown on the Drawings and in conformity with these specifications and the contract documents. The operation shall be conducted with a hydraulic or pneumatic pulling or pushing apparatus and a pipe expander or pipe reaming device. The pipe expander or reaming device shall be pushed or pulled through the existing pipe on grade, widening the existing pipe material for the insertion of the new pipe material.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements, or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 01000 – General Project Requirements.
B. Section 01015 – Specific Project Requirements.
C. Section 01300 – Submittals.
D. Section 01581 – Public Communications.
E. Section 02686 – Cleaning and Assessment of Gravity Lines.
F. Section 02702 – Testing Requirements for Sanitary Sewer: Mains and Manholes.
G. Section 03370 – Sanitary Sewer Manhole Construction.

1.04 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
B. American Society for Testing and Materials (ASTM):

ASTM C923	Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM C1173	Standard Specification for Flexible Transition Couplings for Underground Piping.
ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
ASTM D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
ASTM D2657	Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

C. Plastics Pipe Institute (PPI):

TR-3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe.

1.05 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

B. Product Data:
   1. All pipe, fittings, and accessories to be used.
   2. The manufacturer's installation recommendations including the recommended allowable pulling force to prevent damage to the pipe.
   3. If HDPE is used, information indicating the interior color for the HDPE pipe.

C. Installation Procedure:
   1. The Contractor shall submit, in detail, the procedure and the steps to be followed for the installation of the pipe bursting system selected including, but not limited to:
      (a) Traffic control plan.
      (b) Layout, storage, and pipe handling areas.
      (c) Plan for locating, exposing, and reconnecting service laterals.
      (d) Bypass pumping plan.
      (e) Point repair plan for removing sags, offset joints, constrictions, or obstructions.
   2. Any proposed changes in installation procedures shall require submittal of revised procedures and acceptance by the City.

D. Preconstruction Television Inspections (in accordance with Section 02686 – Cleaning and Assessment of Gravity Lines).

E. Post-Construction Television Inspections (in accordance with Section 02686 – Cleaning and Assessment of Gravity Lines).

F. Updated schedule of repairs for the segments included in the contract documents which is to be submitted after the preconstruction CCTV inspections have taken place and the segments reviewed for any modifications to the planned work.

G. Certificates:
   1. Affidavit of compliance with applicable standards.
   2. Test certificates.
   3. As requested, Certificates of Training for the processes used.

1.06 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.

B. Work shall be performed by a Contractor, with a proven record of performance for similar installations. Contractor shall submit the following:
   1. Manufacturers shall be experienced in the design and manufacture of pipe, fittings, specials, or appurtenances for a minimum period of 5 years.
   2. Warranty:
      (a) Terms: Standard Manufacturer's warranty.
      (b) Warranty Period: Per the contract documents.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Pipe, fittings, and accessories shall be handled and stored in a manner that will ensure installation in sound, undamaged condition and as recommended by the manufacturer.
B. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings.
C. Keep interior of pipes and fittings free of dirt and debris.
D. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry or use slings or other approved devices designed to protect the pipe. Do not drag pipe unless approved by the City/Design Professional as part of the pulling plan for the HDPE pipe.
E. See also Section 01000 – General Project Requirements for product handling and storage requirements.

1.08 PUBLIC COMMINICATIONS

A. Public communications shall be conducted in accordance with Section 01581 – Public Communications.

PART 2 - PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. HDPE pipe for trenchless sewer line replacement shall be solid wall high density polyethylene (HDPE) pipe, meeting the requirements of ASTM F714, ASTM D1248, and ASTM D3350.
B. The pipe shall be manufactured from high density high molecular weight polyethylene resin and shall meet or exceed the requirements of ASTM D3350 for PE4710 material with a cell classification of 445474C, or better.
C. The minimum wall thickness of the HDPE shall meet the following:

Table 1. Minimum Wall Thickness

Trench Depth	Minimum SDR
0 – 15 feet	17
> 15 feet	15.5

D. The pipe shall have sufficient strength to withstand both service and installation loads.
E. The pipe and fitting manufacturer shall certify that samples of their production pipe have undergone stress regression testing, evaluation, and validation in accordance with ASTM D2837 and PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the pipe manufacturer to be 1600 psi at 73°F and 800 psi at 140°F.

2.02 RESTRAINED JOINT PVC PIPE

A. Approved PVC pipe for trenchless sewer line replacement includes:
   1. CertaFlo™
   2. Certa-Loc™

B. Pipe manufacturer shall certify the pipe provided meets the requirements of ASTM D2241 and is made of PVC plastic having a minimum cell classification of 12454 as defined in ASTM D1784.
C. The pipe shall have a minimum wall thickness meeting or exceeding SDR 26.
D. The pipe shall have sufficient strength to withstand both service and installation loads.

2.03 NON-SHRINK GROUT

A. Non-shrink grout shall be used in accordance with Section 03370 – Sanitary Sewer Manhole Construction.

2.04 MANHOLE ADAPTERS

A. Manhole adapters for pipes between 4 and 12 inches in diameter shall be Fernco Concrete Manhole Adapter or approved equal.
B. Manhole adaptors for pipes greater than 12 inches in diameter shall be as specified in Section 01015 – Specific Project Requirements.

2.05 RE-ESTABLISHMENT OF SERVICE CONNECTIONS

A. Saddles:
   1. HDPE Pipe:
      (a) Heat fusion saddles shall be made of polyethylene pipe that meets the minimum specified physical properties and is suitable for fusion welding.
      (b) Fusion saddles shall be Branch Saddle as manufactured by Driscopipe, Miller, DuPont, or approved equal.
   2. PVC Pipe:
      (a) Fitting shall consist of a PVC hub, rubber sleeve and stainless-steel band as manufactured by Inserta Tee®, GPK Products or approved equal.
      (b) Saddle fitting with an elastomeric ring gasketed bell-end service connection, a minimum wall thickness of SDR 26, a rubber sealing gasket, and with stainless steel straps for connection to the pipe.
B. Compression Fit Connection:
   1. The connection shall be specifically designed for connection to the sewer main being installed.
   2. Service connection shall consist of a PVC hub, rubber sleeve and stainless steel band. Rubber sleeve and gasket shall meet the requirements of ASTM F 477. Gaskets shall be installed by the manufacturer. The water-based solution provided by the manufacturer shall be used during assembly. Do not use pipe lube.
   3. Connection shall be Inserta Tee as manufactured by Inserta Fittings Co. or approved equal.
C. Non-Shear Flexible Coupling:
   1. Connections to existing service laterals shall be made using Non-Shear flexible couplings.
   2. All flexible couplings shall conform to ASTM C1173 and shall be as manufactured by Fernco Inc., MaxAdaptor or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION PROCEDURE

A. The Contractor shall submit, in detail, the procedure and the steps to be followed for the installation of the pipe bursting system selected, including location of insertion and launching pits, 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 City.

3.02 PIT LOCATIONS

A. Location and number of insertion or launching pits will be chosen by the Contractor and will typically be located near existing or proposed manholes, P.I.'s in the line, at logical breaks in the construction phasing, or at locations to comply with access or maintenance requirements.

3.03 EQUIPMENT

A. The Contractor shall utilize pipe bursting equipment with adequate pulling/pushing force to complete pulls in a timely manner. The Contractor shall provide equipment on the pulling mechanism to verify the pulling/pushing force exerted on the pipe does not exceed the manufacturer's recommendation for allowable pulling force to prevent damage to the pipe. Where the actual pulling force exceeds the allowable pulling force the Contractor shall take steps to reduce the pulling force necessary by either oversizing the cut or lubricating the outside pipe surface.

3.04 MINIMIZE NOISE IMPACTS

A. Means and methods should be employed and described in appropriate submittals to ensure that work of a high decibel volume is performed away from business and/or residential properties to the best extent possible. Such description shall include times and durations that are compatible with the neighborhood in which the work is being performed. No such work will be performed in the late afternoon, early evening or weekends unless described, submitted and approved in advance on projects that work outside of usual and customary hours has been previously approved.

B. Provide silencers or other approved devices to reduce machine noise, when it exceeds regulated limits.

3.05 PROTECTION

A. The Contractor shall provide protection for the general safety of workers, pedestrians and traveling public throughout this project. Existing surface improvements and underground facilities and utilities shall be the contractor's responsibility to protect and/or support. Damage caused by the Contractor shall be repaired at no expense to the City. Protection to be provided includes, but is not limited to:

1. Barricades, warning lights and signs for excavations.
2. The Contractor shall install all pulleys, rollers, bumpers, alignment control devices and other equipment to protect existing manholes, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances shall the pipes be stressed beyond their elastic limit.
3. Do not allow sand, debris, or runoff to enter sewer system.

4. Verify location of all underground utilities and facilities potentially impacted by rehabilitation or other activities and take necessary precautions to provide protection from damage. Damage caused by Contractor shall be Contractor's responsibility and repaired at Contractor's own expense, and at no additional cost to the City.
5. Protect the new pipe and components during all phases of work, including hauling, installation, entry into the launching pit, and prevention of scarring or gouging of the pipe or components.

3.06 TELEVISION INSPECTION

A. The Contractor shall video (CCTV) inspect the sewer pipe, in accordance with Section 02686 – Cleaning and Assessment of Gravity Lines.
B. Preconstruction Television Inspection: Pipe shall be inspected immediately prior to pipe bursting to verify the existing pipe conditions are acceptable for pipe bursting and to locate and verify all active service line connections. If existing pipe conditions are not acceptable for pipe bursting, contact the City. If there is a sag in the existing line, see paragraph SAGS IN LINE below.
C. Post-Construction Television Inspection: Contractor shall inspect the pipe after pipe bursting to locate and verify that all active service line connections were re-established.
D. Preconstruction and Post-Construction Television Inspection documentation shall be submitted for review and acceptance of the Work.

3.07 SEWAGE BYPASS

A. When required for acceptable completion of pipe bursting, the Contractor shall provide for continuous sewage flow around the section(s) of pipe designated for the installation of replacement pipe. The pump and bypass lines shall be of adequate size and capacity to handle the flow.

3.08 SAGS IN LINE

A. If the Pre-Inspection CCTV reveals an unidentified sag in the existing sewer, the Contractor shall inform the City and request direction. The City may require the Contractor to eliminate the sag and install new pipe at a uniform grade prior to pipe bursting the remaining portion of the pipe segment. If the sag has been identified in the Contract Documents, the Contractor shall address the sag as directed in the Contract Documents prior to pipe bursting.
B. If Post-installation video (CCTV) inspection reveals a sag in the new line where none existed prior to the Work being performed, the Contractor shall remove or repair the sag at no additional cost to the City.

3.09 SERVICE LATERALS AND CONNECTIONS

A. Existing service connections shall be located and exposed before initiating sewer main replacement operations. All service laterals attached to the existing sewer shall be completely disconnected and isolated from the existing sewer before the pipe bursting operations. Service laterals shall not be reconnected to the new sewer line until the new line is installed. Any services remaining off line for more than 12 hours, or any connections deemed necessary by the City to protect the customer, shall be bypass pumped until such time that they can be reconnected.
B. Reconnection of service laterals to the installed pipe shall be accomplished using an approved method.

3.10 PIPE JOINING

A. HDPE Pipe:

1. The HDPE pipe shall be assembled and joined at the site using the butt-fusion method conforming to ASTM D2657 to provide a leak proof joint. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.
2. The butt-fused joint shall be in true alignment and shall have uniform roll-back beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to or greater than that of the pipe.
3. All internal beads shall be removed after the cooling time using a suitable bead removal tool. Use of the bead removal tool shall not induce any slits, gouges or defects in the pipe wall. The beads shall be bent back at several positions. No evidence of the bead splitting shall be seen. If the bead is seen to split at any point, then the joint shall be cut from the pipeline and remade. If a similar defect recurs, all further production jointing shall cease until the equipment has been thoroughly cleaned and examined. New trial joints shall be made and shown to be satisfactory.
4. All defective joints shall be cut out and replaced at no additional cost to the City. All joints shall be subject to acceptance by the City and/or his representative prior to insertion. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness, shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and joint fused in accordance with the procedures stated above. In addition, any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by the City and/or his representative shall be discarded and not used.
5. The wall color of the interior pipe surfaces shall be light green or other color approved by the City so that a clear detail examination with CCTV inspection equipment may be made. Product data indicating the interior color to be used shall be submitted for review and approval.

B. PVC Pipe:

1. PVC shall be joined and assembled as recommended by the manufacturer of the pipe.

C. Where excavations for the insertion of the replacement pipe are made between two manholes, the ends of the pipe will be cut smooth and square to the axis of the pipe so that it can be joined in a manner such that the gap between pipe ends does not exceed one-half (1/2) inch. A Fernco coupling or a full circle repair clamp with a minimum width of 12 inches (Smith-Blair or approved equal) shall be used. The butt-fusion method of pipe joining may be used as well for HDPE pipe.

3.11 HDPE PIPE RELAXATION AND COOLING

A. The installed pipe shall be allowed the manufacturer's recommended amount of time, but not less than four (4) hours, for cooling and relaxation due to tensile stressing prior to any reconnection of any service lines, sealing of the annulus or backfilling of

the insertion pit. Four (4) inches to eight (8) inches of excess length of new pipe shall be allowed to protrude into the manhole.

3.12 MANHOLE SEALING

A. Existing Manholes:
   1. A manhole adapter shall be placed circumferentially on the replacement pipe and encased with a non-shrink grout to prevent infiltration into the manhole.
   2. The manhole adapter shall be installed in accordance with manufacturer's recommendations.
   3. Non-shrink grout shall be installed in accordance with Section 03370 – Sewer Manhole Construction.

B. New Manholes:
   1. Where new manholes are installed in conjunction with pipe bursting, the manhole shall be sealed in accordance with Section 03370 – Sanitary Sewer Manhole Construction.

3.13 FIELD QUALITY CONTROL

A. Prior to service line reinstatement, all pipelines shall be tested in accordance with Section 02702 – Testing Requirements for Sanitary Sewer: Mains and Manholes.
B. If air testing is not possible, the Contractor shall notify the City for further direction.

END OF SECTION