1. **Description.** Furnish and install sanitary sewer by pipe bursting.

The pipe bursting process is defined as the construction of sanitary sewers by the insertion of a liner pipe within the bore of the existing pipe, enlarged by breaking and expanding the old pipe.

The pipe bursting process 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 the old pipe or by using a modified boring “knife” with a flare plug that crushes the 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.

2. **References.** The following references will apply:

   - ASTM D3262 – “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting-Resin) Sewer Pipe.

3. **Submittals.** Submit the manufacturer’s product data with complete information on pipeline materials, physical properties, and dimensions pertinent to this project. Furnish a certificate of compliance with specifications for materials to be supplied.

   Submit test reports prepared by an independent testing laboratory certifying that polyethylene pipe conforms to the requirements of ASTM D1248 and ASTM D3350, as applicable.

   Submit the manufacturer’s product data on clamps.

   Submit videotapes as specified in the Special Specification, “Sanitary Sewer (Television Inspection).”
4. **Materials.**

**A. Quality Assurance.** Liner Acceptance: Provide liner material which is homogenous without defects and manufactured to the standards and dimensions specified. Cause for rejection includes physical defects of the liner, such as concentrated ridges, discoloration, excessive spot roughness, pitting, visible cracks, foreign inclusions, and varying wall thickness.

**B. Delivery, Storage, and Handling.** Prevent injury or abrasion to pipe during loading, transportation, and unloading. Do not drop pipe from cars or trucks, nor allow pipe to roll down skids without proper restraining ropes. Use suitable pads, strips, skids, or blocks for each pipe during transportation and while awaiting installation in the field.

Pipe with cuts, gashes, nicks, abrasions, or any such physical damage which may have occurred during shipping, storage, or handling, which are deeper than 10 percent of the wall thickness are not acceptable. Remove these from the construction site.

Use wide belly band slings for lifting and moving pipe. Do not use bare chains in contact with pipe.

**C. Pipe Bursting Systems.** Provide systems from the following companies:

- McConnell Pipe Crushing System
  Houston, Texas

- Miller Pipeline Corporation (Xpandit System)
  Indianapolis, Indiana

- PIM Corporation (PIM Corporation)
  Piscataway, New Jersey

- Trenchless Replacement Systems (TRS)
  Calgary, Canada

- TT Technologies (Grunocrack Pipe Replacement System)
  Aurora, Illinois

**D. Manufacturers.** Provide liner pipe systems made of polyethylene products, approved by the Engineer.

Approved manufacturers for polyethylene liner are Chevron and Phillips.

**E. Polyethylene Liner Pipe and Fittings.** Provide polyethylene liner pipe, manufactured of solid wall, high density, high molecular weight, polyethylene compound conforming to ASTM D1248, 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.
A higher numbered cell classification limit which gives a desirable higher primary property, according to ASTM D3350, is also acceptable. Ensure dimensions and workmanship are in accordance with ASTM F714 and ASTM D2122.

The maximum Standard Dimension Ratio (SDR), the ratio of outside diameter of pipe to wall thickness, is specified in Table 1.

<table>
<thead>
<tr>
<th>Existing Nominal Diameter (in.)</th>
<th>Minimum Outside Diameter (in.)</th>
<th>Minimum Wall Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDR 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>8.625</td>
<td>0.784</td>
</tr>
<tr>
<td>10</td>
<td>12.75</td>
<td>1.159</td>
</tr>
<tr>
<td>12</td>
<td>14.00</td>
<td>1.273</td>
</tr>
</tbody>
</table>

F. Liner Pipe Seal at Manholes.

1. **Sealer for Annular Space between Liner Pipes and Manholes.** Provide oakum strips soaked in Scotchseal 5600 as manufactured by 3M Corporation, or approved equivalent.

2. **Non-shrink Grout.** Strong Seal’s QSR patching material, or approved equivalent.

G. **Clamps and Gaskets.** Furnish clamps made of stainless steel, including bolts and lugs as manufactured by JCM Industries, Type 108, or equal. Furnish full circle, universal clamp couplings with a minimum 3/16-in. thick neoprene, grid-type gasket. Select clamps to fit the outside diameter of the liner pipe. Use the minimum clamp length as specified in Table 2.

<table>
<thead>
<tr>
<th>Liner Pipe O.D. (in.)</th>
<th>Minimum Clamp Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.625</td>
<td>18</td>
</tr>
<tr>
<td>10.750 or greater</td>
<td>30</td>
</tr>
</tbody>
</table>

5. **Testing Requirements.** The Engineer may run tests on field samples following applicable ASTM specifications at an independent laboratory to verify the required physical properties and characteristics of the supplied materials. Provide product samples as requested by the Engineer.

The Department will pay for tests on liner material which meets specification requirements. The Contractor will pay for failed tests and resetting of failed materials.

6. **Performance Requirements.** Maintain the flow of sewage by diversion pumping or other method approved by the Engineer.
Perform pipe bursting according to this Section.

Shape manhole inverts as specified in the Special Specification, “Manhole Rehabilitation.”

Test lines as specified in the Special Specification, “Sanitary Sewers.”

Televising lines as specified in the Special Specification, “Sanitary Sewer (Television Inspection).”

7. Construction.

A. Obstruction Removal and Point Repair. Make point repairs and remove obstructions such as roots, rocks, or other debris, before installing the liner pipe. For sewer line point repairs, the minimum length of pipe to be replaced for each repair is 12 ft. Remove and dispose of debris in accordance with applicable rules and regulations. Water jetting of debris downstream of project limits is not permitted.

B. Diversion Pumping. Install and operate diversion pumping equipment to maintain sewage flow and prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from the Engineer.

Design piping, joints, and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater.

In the event of accidental spill or overflow, immediately stop the overflow and take action to clean up and disinfect spillage. Promptly notify the Engineer so that required reporting can be made to the Texas Commission on Environmental Quality and the Environmental Protection Agency.

C. Insertion or Access Pits. Locate pits so that the total number is minimized and footage of liner pipe installed in a single pull is maximized. Use excavations at point repair locations for insertion pits, where possible.

Before excavating, check with various utility companies (CenterPoint Energy, Verizon, Comcast) and determine the location of utilities in the vicinity of the work area. For damage done to utilities, provide the resulting repair, temporary service, and other such work at no expense to the Department.

Perform excavation and backfill in accordance with Item 400, “Excavation and Backfill for Structures.”

Perform work in accordance with OSHA standards.

Install and operate necessary dewatering and surface water control measures.

D. Polyethylene Liner Pipe Installation.
1. **Joints.** Assemble and joint sections of polyethylene liner pipe on site above the ground. Make joints by heating and butt-fusion method in strict conformance with manufacturer's instructions.

Use operators who are experienced with the butt-fusion method for pipe jointing in the field. Employ operators trained in fusing polyethylene pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer.

Form joints with a smooth, uniform double rolled back bead made while applying the proper melt, pressure, and alignment. Joints will be inspected by the Engineer before insertion.

Prevent damage to liner or breakage of butt-fused joints. Allow sufficient time for liner to return to its normal length.

2. **Preparation.** After completing the insertion pit excavation, remove the top of the existing sanitary sewer line down to the spring line. Connect a power winch cable to the end of the liner by use of a suitable pulling head equal to the outside diameter of liner. Secure the pulling head to the liner and attach it to the power winch cable so that the liner can be satisfactorily fed and pulled through the sanitary sewer main. Provide proper bumpers in the insertion pit to prevent ragged edges of the existing pipe from scarring the liner pipe. Refer to insertion procedures given in ASTM F585. Do not allow sand or other debris to enter the liner.

3. **Pulling Liner.** For the maximum length of continuous liner assembled above ground and pulled at any one time, do not exceed the length recommended by the manufacturer's printed instructions.

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:

<table>
<thead>
<tr>
<th>Polyethylene Liner O.D. (in.)</th>
<th>Maximum Pulling Force (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.625</td>
<td>4.0</td>
</tr>
<tr>
<td>10.750</td>
<td>7.5</td>
</tr>
<tr>
<td>14.0</td>
<td>10.5</td>
</tr>
<tr>
<td>16.0</td>
<td>12.0</td>
</tr>
<tr>
<td>18.0</td>
<td>21.5</td>
</tr>
</tbody>
</table>

4. **Alternate Installation Techniques.** Pushing the liner as an insertion method, or a combination of pulling and pushing, may be used subject to the Engineer's approval. Avoid liner buckling or dimpling by limiting the stroke of the pushing implement. Cut out and remove any portion damaged during insertion process.

E. **Clamp Installation.** Where excavations for liner insertion are made between two manholes, cut the ends of the liner smooth, square to axis of the liner. Join liner pipes with appropriately sized stainless steel universal clamp couplings.
Ensure the gap between the ends of the liner pipe is butted together with a maximum allowable space between the ends of 1 in.

a. **Bedding.** Install cement-stabilized sand bedding. Extend the bedding 12 in. above the clamp/liner pipe.

F. **Field Quality Control.** After liner installation, perform the following tests:

- Low Pressure Air Test before the liner has been sealed in place at the manholes, and before any service reconnections have been made to the liner. Check integrity of joints that have been made and verify that the liner has not been damaged by inserting it into the sanitary sewer.

- Service Lateral Connection Test; after the service laterals have been completed for a particular sewer section. Verify the integrity of connections at points where they join the liners and existing service lines.

- Refer to the Special Specification, “Sanitary Sewers” for applicable test procedures.

G. **Manhole Rehabilitation.** Following pipe bursting and installation of new pipe, clean and line the manhole in accordance with the Special Specification, “Manhole Rehabilitation.”

Repair any damage to the manhole caused by pipe bursting operations before manhole rehabilitation.

H. **Sealing Liner in Manhole.** Allow the liner pipe to normalize to ambient temperatures as well as recover from imposed stretch before cutting to fit between manholes, sealing at manholes, and manhole invert shaping. Normalization usually takes 8 to 10 hours for polyethylene.

Cut the liner so that it extends 4 in. into the manhole. Make a smooth, vertical cut and slope area over top of the exposed liner using non-shrink grout.

Seal the annular space between the liner and the sanitary sewer main at each manhole with a chemical seal and non-shrink grout. Place a strip of oakum soaked in sealer in a band to form an effective water-tight gasket in the annular space between the liner and the existing pipes in the manhole.

Make the width of the sealing band a minimum of 12 in. or one-half the diameter of pipe, whichever is greater. Finish the seal with a non-shrink grout placed around the annular space from inside the manhole. Apply grout in a band a minimum of 6 in. wide. Use a sealing method, including chemicals and materials, approved by the Engineer.

Use cementitious grout to form a smooth transition with a reshaped invert and a raised manhole bench to eliminate sharp edges of the liner pipe, concrete bench, and channeled invert. Build up and smooth the invert of the manhole to match the flow line of the new liner.
I. **Post-Televising of Completed Work.** Provide the Engineer with videotape showing the completed work including the condition of the restored connections. Comply with the Special Specification, “Sanitary Sewer (Television Inspection).”

J. **Final Cleanup.** Upon completion of installation, testing, and inspection, clean and restore the project area affected by the work of this Section.

8. **Measurement.** This Item will be measured by the foot. Measurement will be made for installed liner pipe, measured from the center line of the upstream manhole to the center line of the downstream manhole.

9. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Pipe Bursting (Sanitary Sewers)” of the size specified. This price is full compensation for furnishing and installing the new liner pipe material, joints, grout and sealer, clamps and gaskets, equipment, labor, tools, and incidentals.

Pay estimates for progress payments will be made as measured according to the following schedule.

- An estimate of 50 percent payment will be authorized when the rehabilitation is completely installed and backfilled.
- As estimate for 100 percent complete will be authorized when the installation has been tested, videotape has been provided, and surface restoration is complete.

Removal of obstructions including hard deposits, concrete, debris, pipes, or any other material in a manhole, or that is accessible from the manhole wall, is subsidiary to items for rehabilitation of sanitary sewer pipes and manholes.

Insertion or access pits, clamp installation, embedment (bedding, haunching, and initial backfill), field quality control (testing), sealing liner at the manhole, grouting of annular space, building up, shaping, and reworking the manhole inverts and benches; and post-installation televising of the completed work; removal and replacement of existing driveways, sidewalks, and landscaping are subsidiary to the installation of pipe bursting.

The cost of sewer line point repair, including excavation, embankment, backfill hauling, and lawful disposal of excavated material, pipe, pipe fittings, adapters, concrete, smoke testing, and restoration of the site is subsidiary to this Item.

Excavation initially begun as a point repair, which the Contractor later decides to use as an insertion pit, will be considered as an insertion pit and not paid for separately.