SECTION 02955
SANITARY SEWER PIPE BURSTING WITH HIGH-DENSITY POLYETHYLENE PIPE

PART 1. GENERAL

1.01 SCOPE

A. The Work to be performed herein shall consist of sanitary sewer pipe bursting including the lateral connection at the mainline sewer.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. American Society for Testing and Materials (ASTM):
      a. D638, Standard Test Method for Tensile Properties of Plastics.
      b. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
      c. D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
      d. D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
      e. D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      f. D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
      g. F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
      h. F585, Standard Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers.
      i. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
   2. Plastic Pipe Institute (PPI).

1.03 DEFINITIONS

A. CCTV: Closed-circuit television.

B. DR: Dimension Ratio

C. DVD: Digital Video Disc

D. HDPE: High-Density Polyethylene Pipe.

E. SDR: Standard Dimension Ratio.

1.04 SUBMITTALS

A. Action Submittals:
   1. Catalog cuts and specifications:
      a. Pipe.
      b. Electrofusion fittings.
      c. Joining, including alignment jig, equipment.
      d. Debeading equipment.
   2. Dimensioned layout drawings including installation details.
   3. Samples: Trial field fusion welds, when requested by the OWNER.

B. Informational Submittals:
   1. Manufacturer's Certificates:
      a. Certificate of material compliance.
      b. CONTRACTOR Certifications:
         1) Installer: Certifications of training by pipe bursting system manufacturer stating that installer have been fully trained in the use of the pipe bursting equipment by an authorized representative of the equipment manufacturer.
         2) Insertion Equipment Operator: Certification from pipe manufacturer of training in the proper method for handling and installing the new pipe.
         3) Fusion Equipment Operator: Certifications of training by the pipe fusion equipment manufacturers that the operators have been fully trained in the use of the fusion equipment by an authorized representative of the equipment manufacturer.
   2. Design Calculations:
      a. Pull/push loads for specified material.
      b. Thrust loads for specified material.
   3. Test Results: Certified factory. For trial fusion weld testing follow ASTM D638.
   4. Installation Plan and Sequencing:
      a. Detailed Construction Methods & Procedures:
         1) Layout plans to include sequence of construction.
         2) Locations, sizes, sequencing for all insertion, receiving, and access pits.
         3) Arrangement and position of jacks, pipe guides, and backstops complete in assembled position.
         4) Reconnection and restoration of existing service laterals.
         5) Detailed descriptions of the methods of modifying and sealing existing manholes.
         6) Detailed procedures for the installation and bedding of the new pipe in the launching and receiving pits.

7) Description of the method to remove and dispose of the host pipe, if required.

5. Bypass pumping submittals shall be in accordance with Section 02542, Sewer Flow Control.
6. Contingency Plan: Provide for the following potential conditions at a minimum:
   a. Unforeseen obstruction causing burst stoppage, such as unanticipated change in host pipe material, repair section, concrete encasement or cradle(s), buried or abandoned manhole or changes in direction not depicted on Drawings provided by the OWNER.
   b. Substantial surface heave occurs due to the depth of the existing pipe versus the amount of upsizing.
   c. Damage to existing service connections or to the replacement pipeline's structural integrity.
   d. Damage to other existing utilities.
   e. Soil heaving or settlement.
   f. Loss of and return to line and grade.
7. Pre- and Post Installation Inspection Data & Reports:
   a. Pre-installation DVD or external harddrive, original.
   b. Post-installation DVD or external harddrive, original.
   c. CCTV Inspection Equipment: Reference Specification 02541, Sewer Television Inspection

1.05 QUALITY ASSURANCE

A. The CONTRACTOR shall be certified by pipe bursting system manufacturer as a fully trained user of the pipe bursting system. Operation of the pipe bursting system shall be performed by trained personnel. Such training shall be conducted by a qualified representative of the pipe bursting system manufacturer. The CONTRACTOR shall provide certificates of training for any employee directly involved in the supervision or operation of the pipe bursting system. CONTRACTOR shall have a minimum of 40,000 linear feet of pipe during preceding 3 years using pipe bursting technology as specified herein.

B. Polyethylene pipe jointing shall be performed by personnel trained in the use of butt-fusion equipment and the recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the polyethylene pipe. Such training shall be certified and conducted by a qualified representative of the pipe manufacturer. Personnel shall have a minimum of 2 years' experience of fusion welding of HDPE pipe.

C. Installation of other materials shall be performed by personnel qualified by the specific product manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products as recommended by the manufacture to prevent damages. Materials shall be made safe from theft, vandalism, and damage.

B. Packing and Shipping:
   1. Markings: Pipe materials shall be legibly marked by manufacturer with the following:
      a. Name and trademark of manufacturer.
      b. Nominal pipe size.
      c. SDR.
      d. Letters PE, followed by polyethylene grade per ASTM D3350, followed by Hydrostatic Design Basis in hundreds of psi.
      e. Manufacturing standard reference.
      f. Production code from which date and place of manufacture can be determined.
   2. Use pads, strips, skids, or blocks for each pipe during transportation and while awaiting installation in the field.

C. Storage and Protection:
   1. HDPE pipe without ultraviolet inhibitor shall not be stored unprotected against outside elements.
   2. Store pipe so as not to be deformed axially or circumferentially.

D. Handling: Use wide band slings for lifting and skids, rollers, or non-abrasive pads for moving pipe. Use of chains and dragging is prohibited.

PART 2. PRODUCTS

2.01 MATERIALS

A. Pipe:
   1. Materials:
      a. Conform to requirements of AWWA C906 or ASTM F714.
      b. Polyethylene resin shall meet or exceed requirements of ASTM 3350 for PE 4710 material. Pressure rating shall be based on hydrostatic design stress of 800 psi at 73.4 degrees F.
      c. Working pressure: 100 psi, minimum (unless otherwise detailed on design drawings)
      d. Inside diameter equivalent to existing pipe or selected pipe size
      e. Shall contain no recycled compound except that generated in manufacturer's own plant from resin of same specification from same raw material.

2. Color:
    a. Inside: Inner wall shall be light color interior (soft gray or white).
    b. Outside: Outer wall with co-extruded green cover or extruded green stripes designating use for sanitary sewer. Pipe with extruded green stripes shall have a minimum of three equally space stripes. Color print lines are not an acceptable method for designation of sewer mains.
3. SDR:
    a. Nominal Size: 8 inches and larger with DIP outside diameters.
    b. Minimum wall thickness conforming to SDR 17 (unless otherwise detailed on the design drawing)

B. Fittings shall be HDPE butt fusion welded fittings in accordance with ASTM D3261 as modified for the specified material.

C. Joints:
1. Pipe jointing shall be by butt fusion welding, as specified in Paragraph 3.03.
2. Electrofusion Couplings:
    a. May be used for repairs or connecting pipe burst segments in the trench with approval of the OWNER.
    b. Manufacturers:
        1) Central Plastics Company; Central Electrofusion System.
        2) IPEX, Inc; Friatec.

D. Service Connection at Mainline Sewer:
1. Service saddles shall be butt fusion or electrofusion saddle type fitting with DIP outside dimension branch connection:
    a. Specifically designed for connection to type of HDPE being installed.
    b. Manufacturers:
        1) Central Plastics Company; Central Electrofusion System.
        2) IPEX Inc.; Friatec.
2. Option: For HDPE pipe sizes 8 inches or greater an Inserta Tee by Inserta Fittings Company may be used.

E. Pipe Connection to Existing Manholes:
1. Pipes shall be connected to existing manholes using a sanded manhole adapter
    a. Manufacturers:
        1) GPK Products Inc.
        2) Approved equivalent

2.02 SOURCE QUALITY CONTROL

A. Certify laboratory data confirming that said tests have been performed on sample of pipe to be provided under this Contract, or pipe from that production run, and that satisfactory results were obtained prior to shipping.

B. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. It shall be uniform in density and other physical properties. Pipe not meeting these criteria shall be rejected.

PART 3. EXECUTION

3.01 EQUIPMENT:

A. Pipe Bursting: Provide equipment of sufficient size and power to accomplish the specified pipe replacement under adverse conditions. Utilize hydraulically powered constant tension static pull pipe bursting system or pneumatic hammer.

B. Joining: Capable of meeting conditions recommended by pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.

C. Debeaders shall be capable of removing a cold bead in a continuous strip without damaging the joint or bead

3.02 PREPARATION

A. General:
1. Work shall be supervised by personnel experienced in installation of similar pipe and shall be onsite at all times from time of commencement to time of completion.
2. Locate insertion or access pits so that the total number is minimized and footage of pipe installed in a single run is maximized. Use excavations at point repair locations for insertion pits where possible.

B. Pre-CCTV Inspections:
1. The CONTRACTOR shall perform a pre-installation CCTV inspection.
2. Existing pipe shall be clean and free of obstructions so as not to prohibit pipe bursting operations.
3. CCTV inspections shall be completed in accordance with Section 02541, Sewer Television Inspection.

C. Locating Utilities:
1. The CONTRACTOR shall, prior to starting work, verify the location of all adjacent utilities. The minimum clearance from other utilities shall be approximately two feet. The OWNER may at its discretion reduce the minimum clearance with justification from the CONTRACTOR.

2. The CONTRACTOR shall expose all interfering and crossing utilities by spot excavating at the planar intersection of the pipe and removing the soil from around the utility. The cost of exposing these utilities shall be borne by the CONTRACTOR as part of the pipe bursting operation.
3. Locate existing utilities in accordance with Section 01725, Underground Utility Damage Act, Protection of Utilities.

D. Sub-Surface Conditions:
1. OWNER will furnish the CONTRACTOR with available information listed in the Contract Documents, if any are available. The CONTRACTOR shall verify this information in the field. All additional subsurface investigations deemed necessary by the CONTRACTOR to complete the work shall be included in the Contract at no additional cost to OWNER.
2. Copies of all reports and information obtained by additional subsurface investigations by the CONTRACTOR shall be provided to the OWNER.

E. Point Repairs:
1. Prior to Pipe Bursting
   a. CONTRACTOR shall perform a point repair if indicated on the Project Drawings.
   b. If the pre-installation CCTV inspection reveals obstructions in the existing sewer (heavy solids, dropped joints, protruding service taps or collapsed pipe) which will prevent completion of the pipe bursting process, and that cannot be removed by conventional sewer cleaning equipment, then a point repair shall be made by the CONTRACTOR, with the approval of the OWNER.
   c. Point repairs on existing pipe shall be completed in accordance with Specification 02530, Sanitary Sewer (Gravity).
2. Post Pipe Bursting:
   a. If the post CCTV inspection reveals a sag in the new sewer after pipe bursting has been completed, the CONTRACTOR shall notify the OWNER to determine if a point repair is necessary to correct the sag. At the direction of the OWNER, the CONTRACTOR shall take the necessary measures to eliminate these sags by performing a point repair and bringing the bottom of the newly installed pipe to a uniform grade by excavating the pipe, lifting it, and placing compacted crushed stone bedding under and around the pipe to eliminate the sag.
3. Backfill per Section 02321, Excavation, Bedding, and Backfill for Utilities shall be used for the new pipe as support in order to avoid sagging after backfill and compaction.

F. Locating Service Connections:
1. Sewer service connections shall be identified and located by CCTV prior to start of pipe bursting operation and pipe insertion.
2. The CONTRACTOR shall locate all and expose all sewer service connections prior to pipe insertion to expedite reconnection.
3. The CONTRACTOR shall exercise due diligence in excavating the existing pipe sufficiently to allow for uniform circumferential expansion of the existing pipe through the service connection pit.

3.03 PIPE JOINING

A. General:
1. When requested by the OWNER, prior to pipe installation, two trial fusion welds shall be performed, and reviewed and approved by the OWNER. Full penetration welds shall provide homogeneous material across the cross section of weld. Fusion machine employed for trial welds shall be same machine utilized for project installation.
2. The HDPE pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted.
3. All equipment and procedures used shall be in strict compliance with ASTM F2620 and with the pipe manufacturer's recommendations.
4. Terminal sections of pipe that are joined within the insertion pit shall be connected with an electrofusion coupling (e.g., Central Plastics couplings).
5. All connections shall be completed in the absence of flow and in conformance with the manufacturer's installation procedures.

B. Joint Preparation:
1. Inside and outside of pipe ends shall be cleaned with cotton or non-synthetic cloth to remove dirt, water, grease, and other foreign materials.
2. Pipe ends shall be cut square and carefully aligned prior to heating.

C. Joining:
1. Fusion shall be performed by technicians certified by a manufacturer of pipe fusion equipment.
2. Using an alignment jig, the butt-fused joint shall be true alignment, brought together in firm, rapid motion, applying sufficient pressure to form a uniform rollback beads (1/8 inch to 3/16 inch) on the entire outer and inside circumference of pipe. The joint shall be allowed adequate cooling time before removal of pressure.
3. The fused joint shall be watertight and shall have tensile strength equal to or greater than that of the pipe.
4. All joints shall be subject to acceptance by the OWNER prior to insertion.
5. The CONTRACTOR shall cut out and replace defective joints at no additional cost to OWNER.

D. Weld Debeading:
   1. Internal beads shall be removed with an approved debeading device without inducing any defects to the pipe or bead. The pipe and bead must be completely cooled before the bead is removed.
   2. The removed beads shall be in one continuous strip without splitting or defect. The contractor shall remove any joint with defective beads and fuse a new joint.

E. Defects:
   1. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10 percent of the wall thickness (ASTM F585), shall not be used and shall be removed from the Site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above.
   2. 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 OWNER shall be discarded and not used.

3.04 BYPASSING OF FLOWS

A. Use flow bypass pumping for reducing flow below the maximum depth or for completely bypassing flow.

B. Bypassing of flows shall be provided in accordance with Section 02542, Sewer Flow Control.

3.05 PIPE INSTALLATION

A. General:
   1. The minimum depth of cover over the installed pipe shall be 4 feet for size on size pipe bursting, and shall be 8 feet for increased pipe size pipe bursting. The CONTRACTOR may request approval of the OWNER reduce the minimum depth of cover.
   2. A minimum amount of ground heaving may be allowed, as determined by the OWNER, if soil conditions are not favorable and up-sizing of the pipe is required.
   3. Unless otherwise noted, settlement or heaving of the ground surface during or after construction will not be allowed. The CONTRACTOR is solely responsible for the costs for repairing any surface heaving, unless specified otherwise.
   4. Existing pipe shall be clean and free of obstructions so as not to prohibit pipe bursting operations.
   5. Pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the OWNER

6. Lay pipe true to lines and grades within existing sewer as indicated on the Project Drawing
7. Conduct pipe insertion operations to prevent damage to the installed pipe and adjacent facilities.
8. Advancement of bursting head with "chain" is prohibited.
9. Void created by bursting device shall be sufficient in size to accommodate HDPE pipe.

B. Pit Shaft:
1. Excavate for the purpose conducting the trenchless operations and for placing end joints of pipe.
2. Wherever end trenches are cut in the sides of an embankment or beyond, such work shall be sheeted and braced in a manner to prevent earth caving.
3. Backfill in accordance with Specification 02321, Excavation, Bedding, and Backfill after pipe has been installed and tested.

C. Existing Manhole:
1. Utilize existing manholes where practicable. Otherwise, excavate predetermined machine and insertion pits.
2. Remove inverts, benches, and channels to permit access for installation.
3. Enlarge input and output pipe openings to accommodate maximum OD size of bursting device.
4. At no time shall bursting device and installation process place undue stress on existing manhole opening surface. In the event the existing manhole sustains visible damage the manhole shall be replaced in accordance with section 02530, Sewer Manholes.
5. Make structure and manhole connections 12 hours (or as otherwise recommended by pipe manufacturer), after pipe insertion.
6. Secure pipe to concrete structures or manholes after pipe has been installed.
   a. Grout in place approved manhole adapter to create a water tight seal between the manhole and adapter.
   b. Connect the newly installed pipe to the existing manhole by inserting the pipe into the manhole adapter.
7. Reconstruct benches and channels after new pipe is installed to form a smooth transition to eliminate sharp edges.

D. Manhole Drop Connections:
1. Manhole drop connections shall be installed in accordance with Specification 02530, Sewer Manholes.

E. Rescue Shafts:
1. In the event that the pipe-bursting machine encounters an obstruction and is halted, the CONTRACTOR will be required to excavate down to the machine to free the obstruction and continue the installation.

2. The CONTRACTOR is notified that the construction of such shafts will be considered incidental to the installation by the pipe bursting construction method.
3. Any rescue shafts will be properly braced, shored, or utilize trench boxes to meet applicable Federal, State, and local requirements.
4. Backfill and compaction for such rescue shafts shall be in accordance with Section 02321, Excavation, Bedding, and Backfill for Utilities.

3.06 LUBRICATION

A. Lubrication shall be used if in the opinion of CONTRACTOR such lubrication is necessary to ensure the successful completion of the job.

B. The CONTRACTOR shall make arrangements for the injection of bentonite into the annular space behind the pipe bursting head, as the lubricant if required.

3.07 SERVICE LATERALS

A. Shutdown:
1. Notify OWNER at least 1 week prior to the shutdown when it is necessary to shutdown a private service line while Work is in progress and before the service lines are reconnected. Notify building occupants with a KUB approved door hanger not less than 36 hours prior to shutdown.
2. When a service lateral will be disconnected the flow shall be controlled in accordance with Specification 02542, Sewer Flow Control.
3. No service is to remain shut down without sewer flow control or a leak free temporary connection. Otherwise, CONTRACTOR shall then provide temporary living quarters (i.e., hotel) for the resident at no additional cost to OWNER or the resident. Temporary living quarters shall be approved by OWNER and coordinated through OWNER's Customer Support Representative. Commercial sewer services shall be maintained when businesses are open.

B. Service Lateral Connection:
1. The exact location and number of service connections shall be determined from a pre-CCTV inspection and field located by marking existing service connections. CONTRACTOR shall determine and identify all active services. CONTRACTOR shall connect all active service connections.
2. Services shall not be reconnected from abandoned or vacant lots, unless directed otherwise by OWNER. Restore and correct missed or faulty reconnections as well as damage caused to property OWNERS for not reconnecting the services soon enough or for not giving notice to the OWNERS.
3. Make service connections 12 hours, minimum, (or as recommended by pipe manufacturer) after pipe insertion to allow for cooling and relaxation.

4. Sewer service connections shall be connected to new pipe and installed in a hole drilled to the full inside diameter of the outlet. Service connections shall be an Inserta-T or an electrofusion saddles per the material requirements herein.
5. Service laterals and associated appurtenances shall be installed in accordance with Specification 02532, Sanitary Sewers (GRAVITY).

3.08 RESTORATION

A. The CONTRACTOR shall restore all lateral, launching pits and disturbed surface areas to their original condition.

3.09 POST INSTALLATION CCTV INSPECTIONS

A. The CONTRACTOR shall perform post-installation CCTV inspections in accordance with Section 02541, Sewer Television Inspection.
   1. Post construction video shall be submitted to the OWNER on DVD's for review within two weeks after permanent lateral reinstatements have been completed. Should any portion of the inspection video be of inadequate quality or coverage, as determined by the OWNER, the CONTRACTOR will have that portion re-inspected at no additional expense to the OWNER.

B. From the CCTV inspection, the newly installed pipe shall be visibly free of defects, which may affect the integrity or strength of the pipe. If in the opinion of the OWNER such defects exist, the pipe shall be repaired or replaced at the CONTRACTOR's expense.

3.10 TESTING OF GRAVITY SEWERS

A. Testing of gravity sewers shall be in accordance with Section 02532, Sanitary Sewers (Gravity).

3.11 FINAL CLEANING

A. Prior to inspection and acceptance of pipe by OWNER, flush and clean system to remove accumulated construction debris, rocks, gravel, sand, silt, and other foreign material.

END OF SECTION