**SECTION 33 05 23.20**

# Pipe Bursting

**BASED ON DFD MASTER SPECIFICATION DATED 09/01/2015**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

# PART 1 - GENERAL

**SCOPE**

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete pipe bursting and other work, as required in these specifications, on the drawings, and as otherwise deemed necessary to complete the work. Included are the following topics:

PART 1 - General

Scope

Related Work

Submittals

Quality Assurance

PART 2 - Materials

Polyethylene Resin

Polyethylene Piping

Polyethylene Fittings

Pipe Marking

Service Saddles

Tracer Wire

Drilling Fluid

Non-Shrink Grout

PART 3 - Execution

General

Excavation, Backfill, and Compaction

Locating Service Connections

Handling Pipe

Pipe Bursting
Joining Pipe
Reconnecting Services

Connecting to Utility Structures

#### RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 00 00 00 – (Section Title)

Section 00 00 00 – (Section Title)

Section 30 05 00 – Common Work Results for All Exterior Work

Section 31 23 16.13 – Trenching

Section 33 11 00 – Water Utility Distribution Piping

Section 33 30 00 – Sanitary Sewerage Utilities

Section 33 40 00 – Storm Drainage Utilities

#### submittals

Submit shop drawings, catalog data, and manufacturer’s technical data showing complete information on material composition, physical properties, and dimensions of the new pipe and fittings. Include manufacturer’s recommendations for handling, storage, and repair of pipe and fittings if damaged. Furnish a certificate of compliance with specified pipe material requirements.

Provide certifications of training by the pipe bursting system manufacturer stating that the operators of bursting equipment have been fully trained in the use of the pipe bursting equipment used on the project.

Provide a pipe bursting plan including the following information:

* Pipe bursting equipment used
* Listing of pipe bursting equipment operator(s)
* Location and dimensions of insertion or access pits.
* Pipe bursting construction methods
* Pipe bursting schedule and sequencing
* Pipe bursting contingency plans
* Drilling fluid generation and management

Provide a pipe bursting contingency plan that accounts for the following:

* Unforeseen obstructions that stop or delay the progress of pipe bursting equipment.
* Unforeseen grade changes in existing pipe that may cause excessive deflection of new carrier pipe.
* Excessive surface heaving.
* Damage to existing service connections
* Damage to other utilities
* Soil settlement

Provide certifications of training by the polyethylene pipe fusing equipment manufacturer(s) stating that the operators of polyethylene fusion equipment have been fully trained in the use of the fusion equipment used on the project.

Provide a high density polyethylene (HDPE) fusion welding quality assurance plan.

Provide written copies of quality assurance test results and reports performed by or for the contractor.

#### quality assurance

Note to the A/E: Edit quality assurance testing requirements as necessary to account for project specific requirements.

Provide additional quality assurance testing as required by applicable utility specification sections.

Provide quality assurance testing for HDPE welding as recommended by the manufacturer.

The Contractor shall have a minimum of two (2) years experience using the pipe bursting process and shall have installed no less than fifteen thousand (15,000) feet. The Contractor must have successfully completed at least one job similar in scope to the requirements for this project.

Pressure Testing:

Conduct tests in accordance with applicable utility specification sections. Allowable leakage for high density polyethylene pipe shall be zero. Testing shall be conducted in the presence of the DFD Project Representative or the A/E.

Tracer Wire Continuity Testing:

Continuity test shall be conducted using an ohmmeter. Resistance on tracer wire shall be no greater than 105% of the specified resistance of the tracer wire. Testing shall be conducted in the presence of the DFD Project Representative unless this requirement is waived. Provide a written report describing equipment used, test methods, and detailed test results. In the event of a failed test, Contractor shall make all necessary repairs required to provide a tracer wire system that complies with the testing requirements of this section.

**PART 2 - MATERIALS**

Note to the A/E: Edit material specifications as necessary to account for project specific requirements. Comply with the substantive requirements of the materials described below.

**Polyethylene RESIN**

Polyethylene resin used for manufacturing piping and fittings shall meet ASTM D1248 for Type III, Class C, Grade P34, Category 5, with a PPI recommended designation of PE3408 and a minimum cell classification of PE 345434C in accordance with ASTM D3350. The polyethylene compound shall be combined with carbon black to provide protection against degradation by ultraviolet light. Pipe shall be made from virgin material with no rework compound, except that obtained from the manufacturer’s own production of the same formulation.

**POLYETHYLENE PIping**

High density polyethylene (HDPE) piping, meeting the requirements of AWWA C906, current version. Pipe dimensions and workmanship shall be in accordance with ASTM F714 and ASTM D2122. Pipe shall be of diameter shown on the drawings, with dimension ratio (DR) of DR11, unless otherwise noted.

Pipe, fittings, and joints shall meet or exceed the following physical properties:

|  |  |  |
| --- | --- | --- |
| Property | ASTMTest method | Value |
| Density, gm/cc | D1505 | 0.955 |
| Melt Index, gm/10 min | d1238-e | 0.10 |
| High Load Melt Index, gm/10 min | D1238-F | 12.0 |
| Tensile Strength @ Break, psi | d638 | 4,500 |
| Tensile Strength @ Yield, psi | d638 | >3,200 |
| Elongation, % | d638 | >800 |
| Flexural Modulus, psi | d790 | 136,000 |
| Environmental Stress Cracking Resistance F20’ Hours (100°c) | d1693 (Cond. C) | >5,000 |
| Brittleness Temperature, °f | d746 | <-180 |
| Melting Point, °f | d789 | 261 |
| Vicat Softening Temperature, °f | d1525 | 255 |
| Hardness, Shore D | D2240 | 66 |
| Volume Resistivity, ohm-cm | D991 | 2.6 1016 |
| Recommended Hydrostatic Design Stress: |  | 1600 psi @ 73.4°F800 psi @ 140°F |

**polyethylene fittings**

HDPE fittings manufactured in accordance with ASTM D2683 (socket fused) or ASTM D3261 (butt fused). Fittings shall be supplied by the HDPE piping manufacturer. Butt fusion outlets shall be made to the same dimensional characteristics and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.

**PIPE MARKING**

Each length of straight and special pipe and each fitting shall be plainly marked on the outside to identify the design pressure or class of pipe, proper location of the pipe or fitting in the pipeline, and the date of manufacture.

**SERVICE SADDLES**

Heat fusion saddles shall be made of polyethylene pipe compound that meets the requirements of ASTM D1248, Class C and suitable for fusion welding to polyethylene pipe.

**tracer wire**

Tracer wire shall be #10 stainless steel wire with 45 mil HDPE jacket.

**drilling fluid**

ANSI/NSF 60 (Drinking Water Treatment Chemicals – Health Effects) certified bentonite-based drilling fluid.

**NON-SHRINK GROUT**

Conform to the Corps of Engineers Specification for Nonshrink Grout, CRD-C 621-83. The following listed grouts meet these requirements and are acceptable for use:

* UPCON High Flow, The UPCO Company, Cleveland, OH
* Master Flow 713, BASF Construction Chemicals, LLC, Shakopee, MN
* W. R. Meadows - 588, W. R. Meadows, Inc., Hampshire, IL
* Crystex, L&M Construction Chemical, Inc., Omaha, NE
* Or equal.

The grout used shall be cured with a curing compound sprayed on or as recommended by the grout manufacturer.

**PART 3 - EXECUTION**

**General**

Comply with the requirements of applicable specification sections for the utility line being installed.

Conduct any necessary field surveys, subsurface investigations and geotechnical investigations necessary to complete the work.

Locate all known utilities located adjacent to or crossing the utility line being replaced. Excavate to expose utilities prior to initiating pipe bursting. Verify clearance of the utility line proposed for replacement by pipe bursting. Clearance shall meet applicable code requirements and the requirements of the pipe bursting process.

Locate and verify the clearance of known structures and foundations/footings located adjacent to or crossing the utility line being replaced.

Remove existing flow channels and enlarge pipe openings in manhole and structure walls as necessary to facilitate installation of the new pipeline.

#### excavation, BACKFILL, AND COMPACTION

Excavate insertion and receiving pits, and other access points as necessary to complete the work.

Comply with applicable requirements of Section 31 23 16.13, Trenching.

#### locating service connections

Locate all service connections by first televising the entire line scheduled for replacement. The televising process shall indicate the location of the service connections based on dimensions from a known, fixed location.

Excavate to expose all service connections prior to initiating pipe bursting.

Provide flow diversion at all service connections as necessary.

Disconnect service connections as necessary to avoid damage to the service pipe resulting from heaving and expansion associated with the pipe bursting process.

#### handling pipe

Storage and handling of polyethylene pipe shall not result in damage to or deformation of the pipe. Protect polyethylene pipe from long-term exposure to temperature fluctuations and sunlight.

Prepare pipe on a relatively smooth surface, free of sharp rocks, sticks, or debris. Utilize cribbing, pipe stands, rollers, or other equipment as necessary to support the pipe.

Lift and move piping using ropes, slings, or straps. Do not use unprotected chains, hooks, or clamps to lift pipe.

When lifting and moving pipe, provide a minimum of two points of support. Do not support pipes at butt-fused joints.

Sections of pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and rejoined at the Contractor’s expense.

Plug all pipes at end of each workday. Provide a watertight plug to prevent entry of foreign materials into the pipe.

**pipe bursting**

Prepare bursting equipment/pipe insertion launch and receiving areas. Excavate to provide pits, and modify existing utility structures as necessary. Upon completion of work, restore all launch and receiving areas to original condition.

Locate pits such that their total number is minimized and the length of replacement pipe installed in a single pull is maximized. When practicable, locate pits where interference to vehicular traffic and inconvenience to the public is minimized. Access pit locations shall coincide with service connections, changes in line or grade, existing manholes to be removed, or other conditions which require excavation. Arrange pit locations to allow liner to be pulled through existing manholes wherever possible.

Use static, dynamic or other pipe bursting method as necessary to complete the work. Select method based on existing pipe type, up-sizing requirements, soil conditions, site space restrictions, and other applicable factors.

Burst pipe to create appropriate space and conditions to allow installation of new carrier pipe. Utilize shields and expanders as necessary to provide a suitable sized space and avoid damage to the new carrier pipe by existing pipe fragments.

Pull new carrier pipe in directly behind bursting equipment. Limit pulling forces exerted on the pipeline such that manufacturer’s recommended maximum values are not exceeded and damage to the pipeline is prevented. Lubrication to reduce pulling friction may be used as recommended by the manufacturer. Under no circumstances shall the pipe be stressed beyond its elastic limit.

Install tracer cable during bursting operations. Extend tracer cable to end of carrier pipe and secure. Test continuity of the tracer cable prior to demobilizing.

**joining pipe**

At start of each day, complete fusion weld tests in accordance with manufacturer’s recommendations to verify that fusion equipment is operating properly.

Polyethylene pipe ends shall be joined using butt fusion methods. Join polyethylene pipe to polyethylene fittings using butt fusion or socket or saddle fusion methods. Fusion methods shall comply with both pipe and fusion equipment manufacturers’ requirements and ASTM F2620.

The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt-fusion joints shall be tested in accordance with ASTM D638.

Join polyethylene pipe to mechanical joint or flanged fittings in accordance with both fitting and pipe manufacturers’ requirements. Provide HDPE pipe stiffeners, wedge type retainer glands, and clamp type joint restraint system.

### Connect terminal sections of pipe that are joined within excavations with electrofusion couplings. Couplings shall be as manufactured by Central Plastics, Inc., Integrity Fusion Products, Inc., IPEX USA, or equal.

### Allow the manufacturer’s recommended amount of time for cooling and relaxation due to tensile stressing prior to connecting pipe to adjacent pipe sections, fittings, or structures, or backfilling of the insertion pit. Provide sufficient excess length of new pipe at insertion pits to allow for cooling and relaxation.

### Reconnecting services

Reconnect all existing service connections and provide new connections as shown on the drawings.

Install new service connections using polyethylene fittings as approved by the DFD Project Representative. Connect fittings to carrier pipe using thermal fusion methods. Orient and align service connections to provide a smooth transition from the existing service to the carrier pipe.

### connecting TO UTILITY STRUCTURES

Following the relaxation period, seal the annular space at all manholes and structures with non-shrink grout for the full depth of the structure wall in such a manner as to form a smooth, uniform, watertight joint. Pipe ends terminating in manholes and structures shall protrude far enough into the manhole or structure to allow installation of electrofusion flex restraints. Restraints shall be fused to the outside of the pipe end against the grouted structure wall. Install restraints in accordance with the manufacturer’s recommended procedures.

**END OF SECTION**