

**SUB WATER DEPARTMENT  
STANDARD CONSTRUCTION SPECIFICATIONS  
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**SECTION 33 11 13.24  
POLYETHYLENE PRESSURE PIPE**

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## **PART 1 GENERAL**

### ***1.1 Description***

This section covers polyethylene (PE) pressure pipe including high density polyethylene (HDPE) pipe. PE and HDPE pipe shall be furnished complete with all fittings, jointing materials, and appurtenances.

### ***1.2 Reference Specification***

Refer to the latest edition of ANSI/AWWA C906, AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for Water Distribution and Transmission.

### ***1.3 Submittals***

- A. Complete layout drawings, details, and specifications covering all PE and HDPE piping and accessories shall be submitted including shop drawings for all fabrications and specials if applicable.
- B. Certified copies of physical and chemical test results shall be submitted for the materials to be provided.
- C. An affidavit of compliance and certification of special quality assurance testing shall be submitted.

## **PART 2 MATERIALS**

### ***2.1 General***

The nominal diameter(s) of the pipe(s) are as shown on the Drawings.

### ***2.2 Polyethylene (PE) Pipe Materials***

- A. Pipe 4-inches to 36-inches

PE pipe 4-inch to 36-inch shall be iron pipe size (IPS) OD. Pipe shall be pressure class rated at 160 psi and have SDR of 11 for PE 3608 or SDR 13.5 for PE 4710, unless otherwise specified on the plans. Pipe shall conform to ASTM D3035 (pipe) and AWWA C906, and be made from ultra-high molecular weight high density polyethylene PE 3608 or PE 4710 (ASTM D3350), cell classification 334434C minimum.

Acceptable PE pipe:

Interstate; Performance Pipe; JM Eagle

B. Pipe 36-inches to 54-inches

PE pipe 36-inch to 54-inch shall be iron pipe size (IPS) OD. Pipe shall be pressure class rated at 125 psi and have SDR of 17 for PE 4710, unless otherwise specified on the plans. Pipe shall conform to ASTM D3035 (pipe) and AWWA C906, and be made from ultra-high molecular weight high density polyethylene PE4710 (ASTM D3350), cell classification 334434C minimum.

Acceptable PE pipe:

Interstate; Performance Pipe; JM Eagle

C. Pipe and Service Tubing  $\frac{3}{4}$  inch, 1 inch, and 2 inch

PE pipe for  $\frac{3}{4}$  inch and 1-inch service lines shall be copper tube size (CTS). PE pipe size 2 inch shall be iron pipe size (IPS). Pipe shall be rated at 200 psi; have SDR of 9 for PE 3608 or SDR 11 for PE4710; conform to ASTM D2239 (pipe) or D2737 (tubing) and AWWA C901; and be made from ultra-high molecular weight high-density polyethylene PE 3608 or PE 4710. All pipe and service tubing supplied under this specification shall come with a minimum 50-year manufacturer's warranty.

Acceptable  $\frac{3}{4}$ -inch, 1-inch, and 2-inch PE pipe:

Performance Pipe; JM Eagle; Interstate; ADS; Centennial Plastics

Insert stiffeners shall be installed in all PE connections by compression joint to fittings. Inserts appropriately sized for insertion into  $\frac{3}{4}$  inch and 1-inch PE pipe shall be manufactured from thermoplastic and be specifically designed to prevent the collapse of PE water service line pipe.

Acceptable insert stiffeners:

Mars Insert Stiffeners

## 2.3 *Fittings*

A. Polyethylene (PE), 2-inch and larger, Butt-Fusion Fittings

Connections between polyethylene and other piping shall be made using fittings suitable for such purposes. Polyethylene fittings shall be of the same HDPE pipe resins and class as the polyethylene piping. PE fittings 2 inch and larger shall be iron pipe size (IPS) OD. Fittings shall be pressure class rating matching the pipe materials indicated in 2.2 A-C above, unless otherwise specified on the plans. Fittings shall conform to AWWA C901 or AWWA C906, and be made from ultra-high molecular weight high density polyethylene PE 3608/4710 (ASTM D3350), cell classification 334434C minimum that carries a NSF Standard 61 listing for use with potable water.

Butt-fusion fittings covered by this standard include all fittings intended to be joined to polyethylene piping by heat fusion. Fittings shall meet the requirements of ASTM 3261 for butt-fusion type fittings.

An affidavit of compliance and certification of special quality assurance testing shall also be submitted.

Acceptable PE butt-fusion fittings:  
Central Plastics Company; HARCO

B. Polyethylene (PE) Fittings, 1 inch and Larger Electrofusion Fittings

Polyethylene electrofusion fittings shall meet all of the material specifications and certifications in 2.3 above. In addition, electrofusion fittings shall be tested and supplied in accordance with AWWA C906 specifications and have a 24 digit ISO compliant barcode label that facilitates fusion of the fitting with other manufacturers' electrofusion processors. Wire heating elements and connections shall allow for continual monitoring of the fusion cycle and be guaranteed to provide a joint that is as strong as the pipe material and be leak free.

Acceptable Polyethylene Fittings, 1 inch and Larger Electrofusion Fittings:

Central Plastics Company; MTD Trifusion; Performance Pipe;  
Poly-Cam; Frialen; Plasson

## **2.4 Fusion Welded Joints**

A. Butt-Fusion Welded Joints

All fusion welded joints shall be made under the direct supervision of a factory certified operator. Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground per ASTM D3261. The joining method shall be by thermal butt-fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt-fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 75 psi interfacial fusion pressure.

Butt-fusion joining shall be 100 percent efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe and shall be leak free. Extrusion welding, or hot gas welding, of HDPE shall not be used for pressure pipe applications or in fabrications where shear or structural strength is important.

B. Electrofusion Welded Joints

All fusion welded joints shall be made under the direct supervision of a factory certified operator. When electrofusion joints are allowed by the design and project specifications the following shall apply: Electrofusion shall be performed in strict accordance with the manufacturers' recommendations. The electrofusion equipment used shall meet all of the fitting and pipe manufacturer conditions including, but not limited to, temperature requirements of 400°F, alignment, clamping, cleaning and pipe preparation, electrical attachments, continual process monitoring, fault identification, and warning. Electrofusion joining shall be 100 percent efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe and shall be leak free.

**2.5. Tracer Wire**

All water mains and services shall have an electrically conductive tracer wire installed in the trench for locating the pipe in the future. The tracer wire shall be located in the bottom of the trench next to the pipe and run the full length of the installed pipe with each end clearly visible and able to be extended 12 inches above ground at each valve box or enclosure, meter box, and fire hydrant. The tracer shall be spliced into the existing tracer wire at water main connection locations in accordance with Standard Drawing W1.16. Tracer wire shall be 14-gauge solid copper with a minimum 40 mil. PVC or HDPE insulation, blue in color, and specifically rated by the manufacturer for direct burial. The wire shall be UL rated for 140° F and specifically rated by the manufacturer for direct burial.

**PART 3 EXECUTION**

**3.1 General**

- A. Inspection: Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. All defective pipe and fittings shall be removed from the site of the work.
- B. Installation: PE pipe shall be installed in accordance with Section 33 10 00, except as modified elsewhere in these specifications. Trench excavation and backfill of PE piping system shall conform with the requirements of Sections 31 23 23 Trenching and Backfill and as shown on the plans.
- C. Sanitary Sewer Separation: The CONTRACTOR shall furnish all labor, equipment and materials required to replace sections of existing sanitary sewers or encase existing sanitary sewers in reinforced concrete as required to comply with Oregon Health Authority – Drinking Water Program requirements for minimum separation of water mains from sanitary sewers, as well as Oregon Administrative Rule 333-061-0050(9). Encasement of sanitary sewers shall be constructed in accordance with Standard Drawing W1.23.

- D. Sanitary Practice During Construction: Piping shall be prepared and protected from unsanitary conditions as specified in Part 3 of Section 33 10 00, Water Mains and Appurtenances, General.

### **3.2 *Joining***

- A. All fusion welded joints shall be made under the direct supervision of a factory certified operator. Operator certification are to be provided to Owner prior to commencement of work. When electrofusion joints are allowed by the design and project specifications, the following shall apply: Electrofusion shall be performed in strict accordance with the manufacturers' recommendations. The electrofusion equipment used shall meet all of the fitting and pipe manufacturer conditions. All joining procedures shall be reviewed and approved by the Engineer prior to purchasing materials and jobsite delivery.

### **3.3 *Installation***

- A. Install pipe and accessories in accordance with these specifications and the manufacturer's instructions.
- B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
- C. Install pipe and fittings to the line and grade specified on the Drawings, with joints centered, pipe properly supported and restrained against movement, and all valve stems plumb.
- D. Lay pipe from the low end toward the high point. Provide a continuous, smooth invert. Bell holes shall be dug where necessary and the pipe shall be placed and supported on bedding material the full length of the barrel.
- E. All loose dirt shall be removed from the bottom and the trench backfilled with specified bedding material to pipe laying grade.
- F. The open ends of all pipes and special castings shall be plugged or otherwise closed with a watertight plug before leaving the work for the night, and at other times of interruption of the work. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.
- G. The weight of cast iron, ductile iron and other metallic fittings shall be supported by a poured-in-place concrete cradle. In-line valves shall be supported and anchored to an in-line thrust block as detailed in the drawings.
- H. Tracer Wire
  - 1. Two Tracer wires are to be utilized on all PE pipelines for future locating purposes. Tracer wire shall be installed on the top centerline of the pipe. The wire shall be secured to the top of the pipe at maximum 10 foot intervals using 6-inch strips of 2-inch wide duct tape. The tracer

wire shall be routed through all valve boxes (including isolation valves, air release valves, blow-offs and drain valves), meter boxes, fire hydrants, vaults, and listening ports to provide access to terminal ends of the wire. All locations of tracer wire intersections shall have a direct burry splice kit to provide electrical continuity and protected from adverse soil conditions with the use of shrink tubes or other approved waterproof connector devices. The result of the tracer wire installation shall be a continuous wire circuit electrical isolated from ground. Where there is an extended length of pipeline without surface access for the tracer wire, additional valve boxes and covers shall be installed as needed and as directed by the SUB Engineer. The distance between tracer wire access locations shall not exceed 1,000 feet. Valve boxes and covers shall be identical to that shown on Standard Drawing W1.16. cathodic protection for tracer wire shall be installed in accordance with Standard Drawing W1.22.

2. Tracer wire shall be installed in conjunction with all service lines. Tracer wire shall be accessible from within the meter box and shall have electrical continuity with any tracer wire laid in conjunction with the waterline to which the service is tapped.
3. Leave slack in mainline tracer wire equivalent to a 12-inch diameter loop at each valve box and at each service tap to facilitate splicing, locating, and waterproofing.
4. Test for continuity and isolation from ground in the wire after all work has been completed on the test section. Perform intermediate testing after backfilling operations and prior to surface restoration work. Test continuity between access locations by use of a temporary wire connecting test points in-line with an ohmmeter. Measure resistance with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test section does not exceed 5 ohms for each 500 feet of location wire being tested. Measure isolation from ground with an approve 1,000 volt Megger, applied for one minute. The isolation of a test section will be accepted if the isolation resistance of the test section is at least 10 megohms. Locate and repair all breaks or defects in the wire and re-test until specified results are obtained.

I. Marking Tape

Marking tape shall be installed over all HDPE pipelines. Marking tape shall be installed approximately 1 foot above the top of the pipe for its full length with the written warning words facing up.

- J. Trench excavation and backfill of HDPE piping system shall conform to the requirements of Sections 31 23 33 Trenching and Backfill.

- K. Thrust Restraint (shall be approved by the Engineer) All tees, plugs, caps, bends, offsets, as well as other appurtenances which are subject to unbalanced thrust, shall be properly braced with concrete thrust blocks. Concrete thrust blocks shall have a minimum 28-day compressive strength of 3,000 psi. The concrete blocking shall bear against solid undisturbed earth at the side and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings. Where shown on the plans or specified elsewhere in the Technical Specifications, the CONTRACTOR shall provide internal or external joint restraint systems at the fittings and on all joints within the specified or shown distance on each side of the fitting or joint.

### ***3.4 Testing and Disinfection of HDPE Pipe Mains***

- A. Testing and disinfection of HDPE pipe mains shall be done in accordance with ASTM F2164-02, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure and AWWA Standard C651.
- B. All chlorinated water used in disinfection of the water main shall either be discharged through an approved connection to a public sanitary sewer system or shall be dechlorinated to limits acceptable by the Oregon State Department of Environmental Quality (DEQ) prior to discharge into any storm drainage system or open drainage way. No chlorinated water shall be discharged into a storm drainage system or open drainage way without a dechlorination under a plan meeting DEQ's requirements.

**END OF SECTION**