

**City of Milwaukee**  
**Department of Public Works**

**Milwaukee Water Works**

**Material Specifications for**  
**Pipe, High Density Polyethylene**  
**Sizes 4” Through 16”**



**Milwaukee Water Works Specification No. 4-4V**  
**Revised May 9, 2012**

I. **GENERAL REQUIREMENTS:** Vendors providing materials shall comply with the latest version of City of Milwaukee Specification No. 70b-D-7, except as modified herein. **MATERIAL FURNISHED UNDER THIS SPECIFICATION SHALL BE MANUFACTURED IN THE UNITED STATES.**

II. **TECHNICAL REQUIREMENTS**

- A. **Description:** Material used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density polyethylene (HDPE) 3608 polyethylene resin with a 73° F hydrostatic design basis of 1600 psi.
- B. **NSF 61 Approval:** All materials furnished to the Milwaukee Water Works and which will be in direct or indirect contact with potable drinking water shall be in compliance with NSF 61 Drinking Water System Components - Health Effects.
- C. **Standards:** Unless otherwise stated, Pipe and accessories furnished hereunder shall conform to the latest revisions of the following:

**AWWA C906 Standard for Polyethylene Pressure Pipe and Fittings, 4 In. through 63 In. for Water Distribution and Transmission**  
**AWWA M55 Manual of Water Supply Practices, PE Pipe – Design and Installation**  
**PPI Handbook of Polyethylene Pipe**  
**PPI TR-33 Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe**  
**City of Milwaukee Specification for Horizontal Directional Drilling (HDD)**

D. **Design Features - Pipe**

1. **Materials**
  - a. Pipe supplied under this specification shall have a nominal ductile iron outside diameter (DIOD) unless otherwise specified.
  - b. Polyethylene pipe shall be made from HDPE material having a material designation code of PE3608 or higher.
  - c. The dimension ratio (DR) of the pipe shall be 11.
  - d. HDPE pipe shall be rated for use at a pressure class of 160 psi.
2. **Marking of Pipe**
  - a. Pipe shall be continuously marked with durable printing including the following information:
    - Nominal size
    - Dimension Ratio
    - Pressure Class, psi
    - Manufacturer's Name and Product Series
    - Standard Material Code Designation
    - AWWA Standard Designation Number
    - Plant Code and Extruder
    - Production Date

- b. Any pipe that is illegibly marked shall be rejected.
- c. The pipe shall have blue colored print lines, colored stripes or a coextruded color indicating that the pipe is used for potable water.

**E. Design Features - Accessories**

- 1. HDPE Mechanical Joint adapters
  - a. Shall have material designation code of PE3608 or higher.
  - b. The DR shall be 9 unless otherwise specified.
  - c. HDPE mechanical joint adapters shall conform to C906 for connections to ductile iron pipe and fittings.
  - d. Stainless steel internal stiffeners for transition of dissimilar material.
- 2. Tracer Wire
  - a. In open cut installations, #12 HMWPE blue jacket copper wire suitable for underground burial shall be provided by the contractor.
  - b. In directional bore installations, #10 or #8 HMWPE blue jacket copper wire suitable for underground burial shall be provided by the contractor.
- 3. Electrofusion saddles
  - a. Services connections for 2" and smaller shall be made using electrofusion saddles.
  - b. Saddles shall have an AWWA "CC" threaded outlet.
  - c. Saddles shall be made of HDPE with a minimum material designation code of PE 3608.

**F. Installation**

- 1. Joining
  - a. Pipe shall be joined by the butt fusion procedure as identified in PPI TR-33.
  - b. The heat fusion equipment and the joining procedures shall meet all conditions recommended by the pipe manufacturer.
  - c. The contractor shall furnish evidence that thermal fusion be conducted by personnel that have received proper training in the use of fusion equipment according to the recommendations of the pipe supplier and fusion equipment supplier as specified under Section III E.
  - d. Before joining, surfaces must be clean and dry.
  - e. Handsaws or unlubricated chain saws shall accomplish pipe cutting.
  - f. Butting ends of pipe shall be milled square prior to fusing and have the same DR ratio.
  - g. Installation of butt-fused pipe shall not commence until a trial fusion has passed the bent strap test. The test shall be performed by the contractor according to the manufacturer's recommendation and witnessed by the City of Milwaukee inspector.
  - h. The City of Milwaukee inspector shall visually inspect each fusion joint and shall conduct random non-destructive inspections as appropriate.

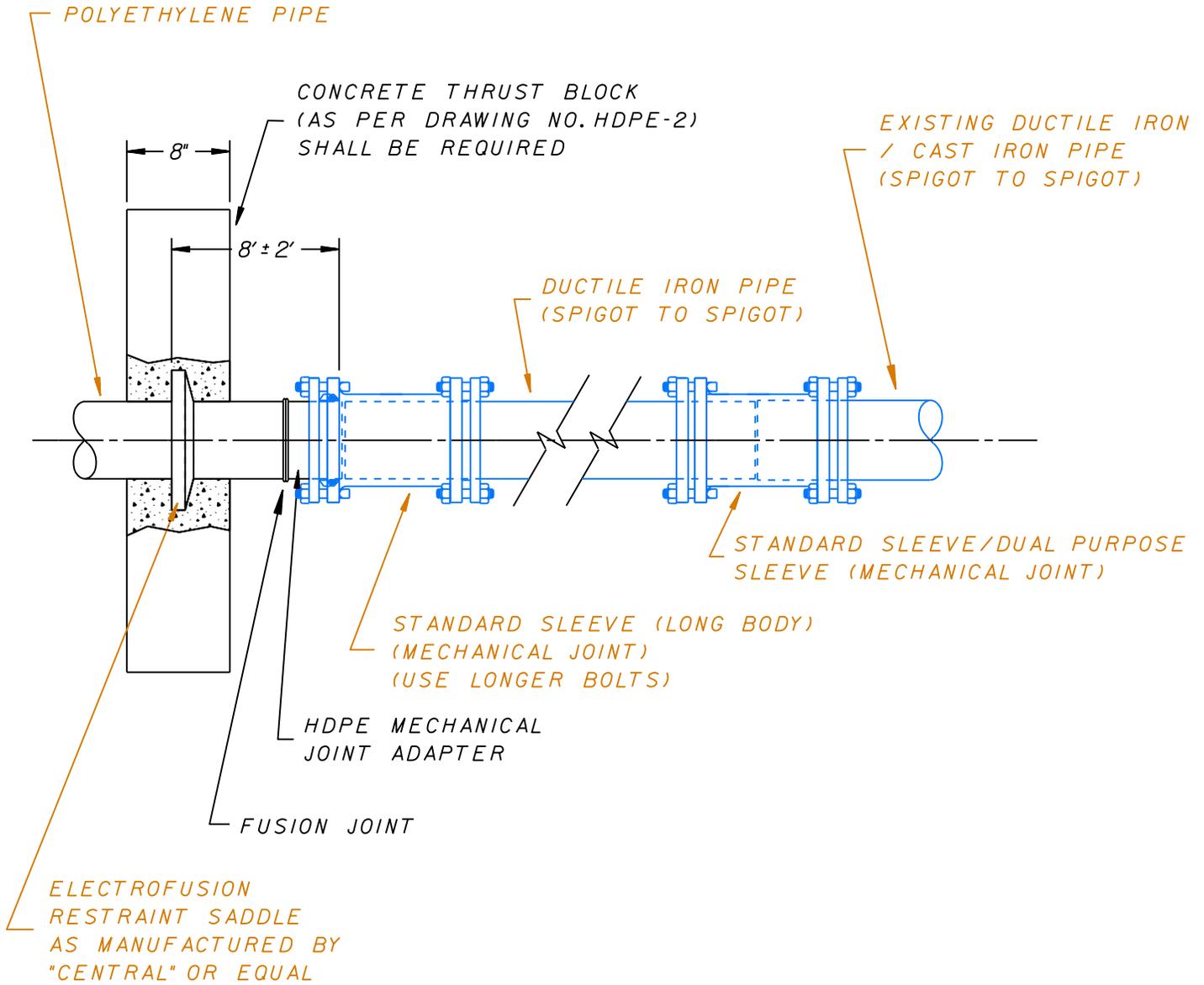
- i. A butt fused HDPE mechanical joint adapter with a stainless steel internal stiffener shall be used as the transition for dissimilar materials.
2. Anchoring
  - a. HDPE pipe shall be restrained to all non-polyethylene mechanical connections with a concrete wall anchor and an in-line joint restraint as shown in Milwaukee Water Works Specification Drawing Nos. HDPE-1, HDPE-2 and HDPE-3.
3. Tracer Wire Installation
  - a. In open cut installations, the contractor shall lay insulated #12 HMWPE blue jacket copper wire directly over the water main. The wire must be attached to the pipe at regular intervals to ensure it stays in place during backfill. Blue identification ribbon shall be installed at approximately 1-2' above the water main.
  - b. In directional bore installations, #10 or #8 HMWPE blue jacket copper wire must be attached to the main.
  - c. At each valve and hydrant, the wire shall be brought to ground level as shown in Milwaukee Water Works Specification Drawing No. HDPE-3. At valves, the wire shall be brought to one foot below ground level on the inside of the valve box and the wire looped and knotted to keep this elevation. The wire is to have 12 inches minimum of loop inside of the valve box riser.
  - d. Any splices shall be soldered and taped with mastic electrical splicing tape, Scotch® 23 or equivalent.
  - e. The Contractor must ensure that the wire is intact by performing a continuity test after installation is completed.

### III. QUALITY ASSURANCE

- A. The pipe or fitting manufacturer's production facilities shall be open for inspection with a reasonable advanced notice.
- B. No polyethylene pipe or fittings shall be accepted for use in the Milwaukee Water Works after two years from the date of manufacture.
- C. Submissions to the Milwaukee Water Works shall include the results of material testing that are required by AWWA C906.
- D. Submissions to the City of Milwaukee inspector shall include the manufacturer's recommendation for installation.
- E. Submissions to the City of Milwaukee inspector shall include the names and project lists for the contractor's fusion equipment operators and supervisors including the years of experience with the type of equipment.

**IV. MATERIAL INSPECTION**

- A. All certifications required under Section III C shall be submitted before any material is inspected.
- B. The Superintendent of Milwaukee Water Works or a duly authorized representative will inspect all materials under this specification.
- C. The Milwaukee Water Works shall be given at least four (4) working days notice for scheduling of material inspection.
- D. At the time of inspection, the contractor shall be prepared to provide pipe samples for physical laboratory tests.
- E. Any material found not conforming to this specification will be rejected.
- F. Replacement materials shall conform to all the requirements of this specification.

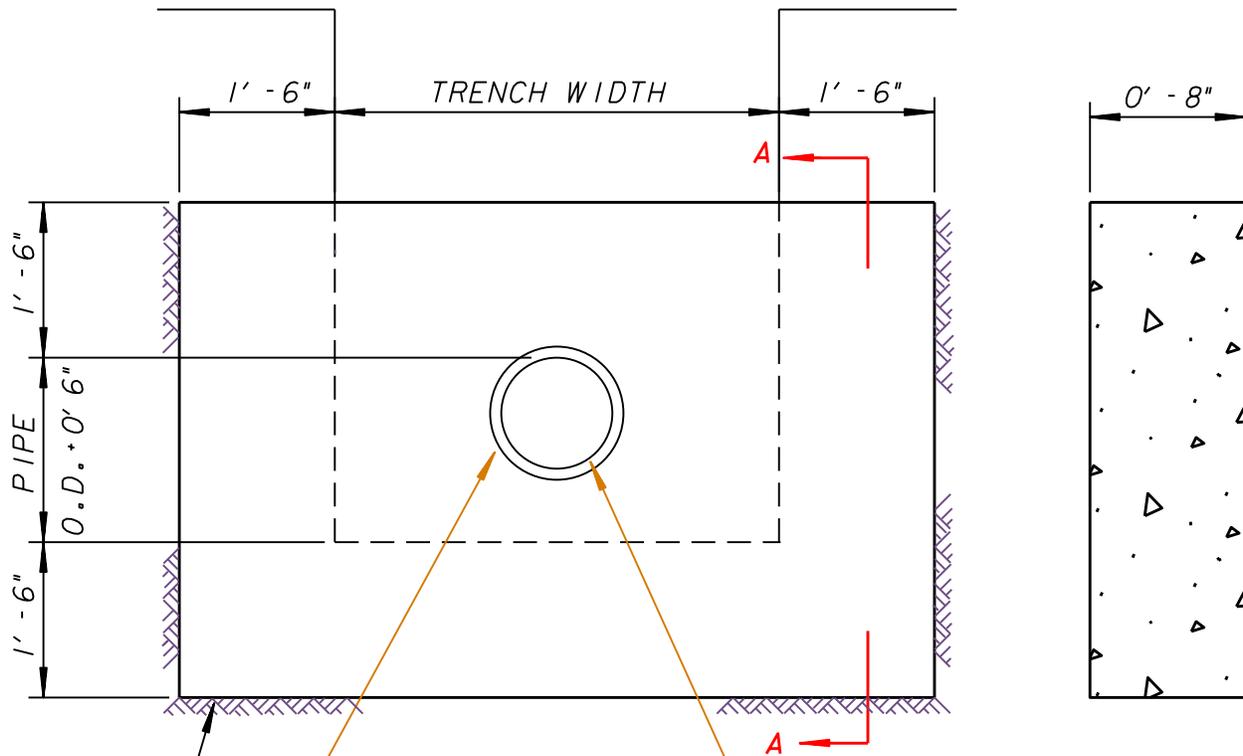


**NOTE:**

STANDARD SLEEVE (MECHANICAL JOINT) TO BE USED WITH DUCTILE IRON PIPE AND DUAL PURPOSE SLEEVE (MECHANICAL JOINT) TO BE USED WITH CAST IRON PIPE

NOT TO SCALE

<p>APPROVED</p>  <p>6-11-12 MAINS DESIGN ENGINEER</p>	<p>DATE</p> <p>6-11-12</p>	<p><b>Milwaukee Water Works</b> <b>Water Engineering</b> Department of Public Works</p>	
<p>    </p> <p>6-11-12 CHIEF DESIGN ENGINEER</p>	<p>6-11-12</p>		<p><b>HDPE - DUCTILE IRON / CAST IRON CONNECTION (4"-16")</b></p>
<p>CHECKED BY T.A.M.</p>	<p>DRAWN BY S. MILLER</p>	<p>DATE 06-01-2012</p>	<p>DRAWING NO. <b>HDPE-1</b></p>
<p>SPECIAL DEPUTY COMMISSIONER OF PUBLIC WORKS</p>			



HIGH DENSITY  
POLYETHYLENE PIPE

ELECTROFUSION  
RESTRAINT SADDLE  
AS MANUFACTURED BY  
"CENTRAL" OR EQUAL

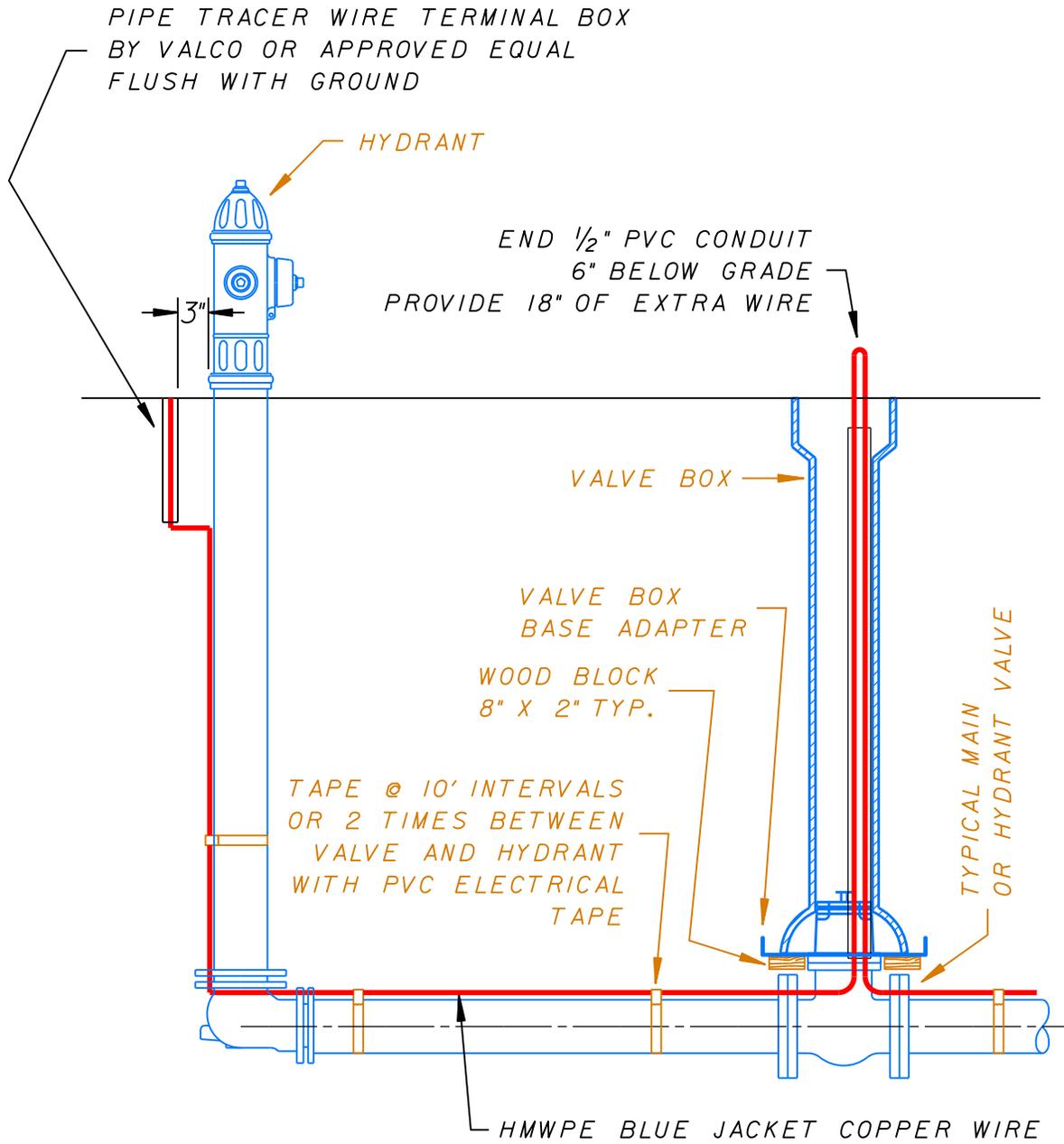
CONCRETE THRUST BLOCK

NOTES:

1. CONCRETE THRUST COLLAR DESIGN BASED ON WATER PRESSURE OF 150 PSI AND ON SOIL BEARING PRESSURE OF 4000 LBS. PER SQ. FT.
2. CONCRETE TO BE CLASS "A" .
3. CONCRETE TO BE POURED AGAINST FIRM NATURAL GROUND.

NOT TO SCALE

<p>APPROVED</p>  <p>DATE 6-11-12</p> <p>MAIN DESIGN ENGINEER</p>	<p>Milwaukee Water Works Water Engineering</p> <p>Department of Public Works</p>		
<p>    </p> <p>DATE 6-11-12</p> <p>CHIEF DESIGN ENGINEER</p> <p>DATE 6-11-12</p> <p>SPECIAL DEPUTY COMMISSIONER OF PUBLIC WORKS</p>	<p><b>CONCRETE THRUST BLOCK</b></p> <p><b>FOR HDPE PIPE (4"-16")</b></p>		
<p>CHECKED BY T.A.M.</p>	<p>DRAWN BY E.J.F.</p>	<p>DATE 06-01-2012</p>	<p>DRAWING NO. <b>HDPE-2</b></p>



POLYETHYLENE WRAP FOR DUCTILE MAIN INSTALLATION IS NOT SHOWN

**NOTES:**

1. LOCATING WIRE SHALL BE INSTALLED AT ALL HYDRANTS AND VALVES
2. TRACER WIRE MUST BE TAPED TO POLYETHYLENE WRAPS FOR DUCTILE IRON INSTALLATIONS

NOT TO SCALE

<p>APPROVED</p> <p><i>Malcolm J. Smith</i></p> <p>6-11-12</p> <p>MAINS DESIGN ENGINEER</p>	<p>DATE</p> <p>6-11-12</p>	<p><b>Milwaukee Water Works</b> <b>Water Engineering</b></p> <p>Department of Public Works</p>
<p><b>TRACER WIRE DETAIL</b></p>		
<p><i>Julia G. Sant</i></p> <p>6-11-12</p> <p>CHIEF DESIGN ENGINEER</p>	<p>DATE</p> <p>06-01-2012</p>	<p>CHECKED BY</p> <p>T.A.M.</p>
<p><i>Chris</i></p> <p>6-11-12</p> <p>SPECIAL DEPUTY COMMISSIONER OF PUBLIC WORKS</p>	<p>DRAWN BY</p> <p>S. MILLER</p>	<p>DRAWING NO.</p> <p><b>HDPE-3</b></p>