

City of Milwaukee
Department of Public Works

Milwaukee Water Works

Material Specifications for
Pipe, Steel, Seamless Carbon Steel
Sizes 6" Through 24"



City of Milwaukee Specification No. 30-D-14
Revised August 2, 2013

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. **MATERIALS FURNISHED UNDER THIS SPECIFICATION SHALL BE MANUFACTURED IN THE UNITED STATES.**

II. **TECHNICAL REQUIREMENTS**

A. **Description:** Steel pipe as described herein shall be extra strong, seamless carbon steel pipe conforming to ASTM A53, Grade B.

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 American Water Works Association Standards:

AWWA C200 Standard for Steel Water Pipe—6 In. (150 mm) and Larger
AWWA C203 Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines—Enamel and Tape—Hot-Applied
AWWA C206 Standard for Field Welding of Steel Water Pipe
AWWA C208 Standard for Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C210 Standard for Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C213 Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C218 Standard for Liquid Coating Systems for the Exterior of Aboveground Steel Water Pipelines and Fittings
AWWA C219 Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe
AWWA C221 Standard for Fabricated Steel Mechanical Slip-Type Expansion Joints
AWWA C604 Standard for Installation of Steel Water Pipe - 4In. and Larger
AWWA C606 Standard for Grooved and Shouldered Joints
AWWA M11 – Manual for Steel Pipe-A Guide for Design and Installation

D. **Design Features - Pipe**

1. Dimensions: Pipe Dimensions shall be as follows

- a. Laying Length – Minimum of 20ft (40ft lengths shall be acceptable) unless otherwise specified on plans.
- b. Diameter – As stated on the bid form or plans.
- c. Thickness – Shall be $\frac{1}{2}$ " (.50) wall unless otherwise specified on plans or contract documents.

2. Pipe Ends:
 - a. Steel Pipe to Steel Pipe Joints: Pipe ends shall be grooved for mechanical couplings (as specified in Section II.E.3) unless otherwise specified on plans or contract documents.
 - b. Transitional Joints: Pipe ends for the transition from steel pipe to ductile iron pipe shall be plain end pipe. Joining of lengths in the shop through the use of a lap joint will not be allowed.
3. Exterior Pipe Coatings: The exterior surface of all steel pipe shall be shop coated, except for the areas left bare for welded joints and for mechanical couplings, in accordance with AWWA C218.
 - a. Coating System Designation 3 – Three coat inorganic or organic zinc/epoxy/urethane
 - b. Exterior pipe coating shall not be applied to the ends prepared for the mechanical couplings.
 - c. Additional coating product shall be available for field touch up required to coating.
4. Interior Pipe Coatings: The interior surfaces of all steel pipe shall be shop lined with Liquid Epoxy (AWWA C210)
 - a. Minimum Dry Film Thickness of 16mil
 - b. NSF 61 certified
 - c. Additional interior pipe coating product shall be available for field touch up as required.
 - d. Grooves for mechanical coupling shall be shop or field coated with thicknesses recommended by coupling manufacturer. Per AWWA C210 section 4.4.33 the interior pipe coating shall overlap the exterior pipe ends grooved for mechanical couplings.
5. Marking of Pipe: The pipe shall be factory marked after coating in accordance with Section 6.1 of AWWA C200. Improper, illegible or incomplete markings will be cause for rejection of the pipe.

E. Design Features – Accessories

1. Pipe Insulation – Exposed Pipe
 - a. Insulation shall have a minimum thickness of 2 inches and a minimum “R-value” of 10, or as specified on plans.
 - b. Insulation shall be shaped to fit the specified O.D. of the pipe diameter specified.
 - c. Exposed mains shall be insulated with polyisocyanurate insulation. The insulation shall be installed as recommended by the manufacturer.

- d. Vapor Barrier – Insulation shall be covered with a vapor barrier, as recommended by insulation manufacturer. All joints created by the insulation and vapor barrier shall be sealed with tape as recommended by insulation manufacturer.
- e. Any joints created by the insulation cover shall be sealed with Saran Vapor Retarder tape to ensure a watertight seal.
- f. Weather Jacket – Vapor barrier shall be covered with an aluminum (0.016” thickness) weather jacket. Aluminum jacket to be fastened with banding; the use of screws, nails or staples will not be allowed. Aluminum jacket shall contain a minimum 4.5 mil thick heat laminated moisture retarder. The aluminum jacket shall be installed over the pipe covering protection saddles. The aluminum jacket shall not be cut around the saddles.
- g. Banding for aluminum weather jacket shall be a minimum of 0.02” thick by ½” wide and shall be stainless steel. Spacing of banding shall be as recommended by manufacturer but not to exceed 18”.
- h. All joints created by mechanical couplings shall be insulated as described above after the joints have been completed and pressure tested.
- i. Stainless or galvanized steel pipe covering protection saddles shall be fastened to the water main at all hanger locations prior to the application of insulation. Insulation shall be placed to fill the void(s) in saddles. The attachment of the protection saddles shall not damage the pipe’s lining. Any coating removed or damaged shall be field repaired. Saddles and insulation shall be wrapped as specified in Section II.E.1.d & e. Approved Products:
 - Anvil International Figures 160 – 165
 - Empire Industries, Inc. Figures 1900 – 1905
 - Cooper Industries, Inc. Figures B3160 – B3165
 - Or approved equal

2. Pipe Insulation – Buried Main

- a. Buried mains (steel and ductile iron) with less than 5 feet of cover shall be insulated with cellular glass. The insulation shall be installed as recommended by the manufacturer.
- b. Insulation Covering – Insulation shall be covered with a waterproof membrane as recommended by insulation manufacturer.
- c. Any joints created by the insulation cover shall be sealed to ensure a watertight seal.
- d. All joints created by mechanical couplings shall be insulated as described above after the joints have been completed and pressure tested.
- e. Heat shrinkable molded tubular end caps shall be used to seal all insulation ends at transitions.

3. Pipe Insulation – Pre installed

- a. Pipe may be pre insulated at the option of the contractor or if specified on the plans.
 - b. The pipe shall be insulated using a factory insulation process.
 - c. Insulation of associated joints shall be as per manufacturer recommendations.
 - d. Pipe and the spiral metal jacket shall be prepared as per manufacturer recommendations to insure adhesion of the insulation to the pipe and jacket.
 - e. Material – Factory Applied Rigid polyurethane Foam.
 - f. Thickness – 2 inches or as specified on plans.
 - g. Density – 2.2 to 3.0 lbs/ft³
 - h. Closed Cell Content 90% min
 - i. Water Absorption – 4.0% by volume
 - j. Thermal Conductivity – 0.14 to 0.17 Btu in/ft² hr °F
 - k. System Compressive strength – 200 lbs/in²
 - l. Aluminum Jacket shall be 18 ga (Thickness 0.042” – 0.048”)
 - m. Pipe joints shall be completed using the prefabricated polyisocyanate or urethane foam half shells and metal consistent with that on the factory insulated pipe. Use stainless steel bands as required to secure the half shells with jacket as specified in E.1.g
 - n. When pre-insulated pipe has been provided the galvanized steel pipe protection saddles will not be required at the support locations.
 - o. Pipe covering protection shield will be required at support locations, 18 gauge (Thickness 0.042” – 0.048”), 304 stainless steel and 12 inches in length. Shield shall be secured to outside of aluminum jacket with 2 stainless steel bands as specified in E.1.g at the support location. Approved Products:
 - Anvil International Figure 167
 - Empire Industries, Inc. Figure 167
 - Copper Industries, Inc. Figure B3151
 - Or approved equal
 - p. Transition to the buried pipe insulation, remove preinstalled insulation system where pipe penetrates bridge abutment. Seal the ends and install the buried pipe insulation per specification. Use of non specified pipe insulation will not be allowed and the contractor will be responsible for all costs to excavate and remove improper insulation and install the proper insulation system.
 - q. Heat shrinkable molded tubular end caps shall be used to seal all insulation ends at transitions. End caps shall not interfere with the installation of the pipe couplings or the insulation at the pipe couplings.
4. Couplings for joining pipe lengths shall be in accordance with AWWA C219.

- a. Transition Couplings shall be specifically designed to join steel and ductile iron pipe of the same nominal diameter. Coupling shall have steel center ring, epoxy coated both sides, rubber gaskets specifically formulated for water service, and Type 304 stainless steel bolts and nuts. Coupling shall be able to sustain a hydrostatic pressure of 250 psi. Coupling shall have a center ring minimum length of 10" and accommodate joint deflection up to 4 degrees.

Approved Products:

- Romac Style 501
- Dresser Style 62
- Smith-Blair Style 413
- or approved equal

- b. Mechanical Couplings for steel pipe joints shall be flexible groove-joint couplings. Housings shall be ductile iron, ASTM A536, Grade 65-45-12, epoxy coated or as recommended by the manufacturer for use with steel pipe. Couplings shall have Type 316 stainless steel bolts and nuts. An anti seizing lubricant shall be applied to the bolt to prevent galling during tightening, as recommended by manufacturer. Gaskets shall be EPDM, certified in accordance with NSF 61 for potable water service. Contractor shall ensure that the grooved pipe ends will be compatible with the coupling being used. The coupling manufacturer shall provide groove dimensions.

Approved Products:

- Victaulic Style 77
- Gruvlok Style 7001
- Or Approved equal

5. Wall Penetration Seals(when specified)(Underdeck Utility Support)

- a. Steel sleeves 3" larger than pipe OD is required for abutment penetration. To be installed through abutment set in non-shrink grout.
- b. Sleeve shall extend 3" beyond abutment limits.
- c. Pipe to sleeve seals shall be modular mechanical type, consisting of interlocking rubber links shaped to continuously fill the annular space between the pipe and the sleeve.
- d. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe. After the seal assembly is positioned, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe (including insulation and coverings) and the wall opening.
- e. Bolts and nuts to be Type 316 stainless steel.
- f. To prevent damage to the insulation a galvanized steel protection sleeve shall be provided at the abutment penetrations.

6. Pipe Support(Underdeck Utility Support)

- a. All piping support components shall withstand the dead load imposed by the weight of the pipe filled with water, plus insulation, covering, coating, lining, jacketing, and shall have a safety factor of 5.
- b. Maximum hanger spacing shall be 8ft or as shown on the plans. Provide not less than two hangers between pipe joints.
- c. Pipe hangers shall be as specified on plans, provide all necessary hardware for complete hanger assembly.
- d. Pipe hangers shall be trapeze roller style, with oversized rollers to accommodate insulation and jacketing. Hangers shall be Hot-Dip Galvanized or coated per manufacturer recommendations to reduce corrosion. Approved Products:
 - Anvil International Figure 171
 - Empire Industries, Inc. Figure 277
 - Cooper Industries, Inc. Figure B3114
 - or approved equal
- e. Pipe protection saddles shall be provided from the same manufacturer as the pipe hanger. Pipe protection saddles shall be aluminum or Type 304 or Type 316 stainless steel.
- f. All hardware, including deck inserts, shall be Type 316 stainless steel.
- g. All hardware shall be sized for compatibility with deck insert and roller hanger requirements. No couplings or bushings will be allowed.
- h. An anti-seizing lubricant shall be applied to the bolt/nut to prevent galling during tightening, as recommended by the manufacturer.
- i. Contractor is responsible for proper installation of hangers including verification of contact with the pipe saddle and the roller support.
- j. Deck inserts, if required, shall be as indicated on the plans, be compatible with the selected hanger assembly, and shall have a minimum of the following:
 - 12" diameter steel water pipe - 3,000 lbs for the maximum load
- k. Deck inserts to be installed per manufacturer recommendation for achieving the Safe working load. The inset shall be 1/2" unless otherwise recommended by the manufacturer.
- l. The contractor is responsible for proper installation of deck inserts for correct alignment of water main.

III. SUBMITTALS

- A. **Certification by Manufacturer:** The vendor or furnishing contractor shall submit manufacturer's certification data in accordance with Section 5.2.2.4 of AWWA C200 representing each pipe length furnished. The certifications shall be submitted in duplicate to the Superintendent of Milwaukee Water Works and shall include the following:

Pipe, Steel, Seamless Carbon Steel
Sizes 6" through 24"

1. Hydrostatic Test: The hydrostatic test requirements in accordance with Section 5.2.1 of AWWA C200.
2. An affidavit of compliance certifying that the pipe furnished complies with all provisions of AWWA C200.
3. Certification of the type of material being supplied.
4. An affidavit of compliance certifying that all coatings and linings applied to the steel pipe complies with all of the provisions of the associated AWWA Standard referenced within this specification.

B. Submittals After Award of Contract: Shortly after the award of the contract the successful bidder shall submit one (1) set of certified drawings for all steel pipe and each accessory product being furnished to the Superintendent of Milwaukee Water Works for approval. The drawing submittal shall show the following information:

1. Construction details and overall dimensions.
2. Material specifications for all components.
3. Manufacturer's name and recommended installation instructions.

One set of drawings will be returned to the furnishing contractor marked "Reviewed – No Exceptions Taken", "Reviewed – Returned with Comments", "Reviewed – Revise and Resubmit", or "Rejected". All materials shall be furnished in accordance with these approved drawings.

Contractor shall transmit submittals in the following sections:

- A. Steel Water Main
- B. Mechanical Couplings and groove details
- C. Steel Water Main Coating and Lining
- D. Transition Couplings
- E. Insulation – Identify Field vs Factory
- F. Insulation accessories (Jacket, coating, seals, etc)
- G. Hangers and Hanger Hardware (anchor, rods, nuts, bolts, washers, protection saddles)
- H. Other

Submittals shall identify the following

- Contractor
- Project number/Contract Number
- The Applicable section identified above

Any submittals not conforming to these requirements will be returned without review for the contractor to resubmit.

IV. INSPECTION BY CITY

- A. All certifications required under Section III shall be submitted before any pipe will be inspected.
- B. The Water Engineering Division shall be notified at least four (4) working days prior to installation for material inspection.
- C. The Superintendent of Milwaukee Water Works or a duly authorized representative will inspect all materials furnished under this specification. (Milwaukee Water Works reserves the right to inspect the material being furnished at the manufacturer's plant as per Section 5.1.2 of AWWA C200.)
- D. Material Safety Data Sheets, specifications, and recommended installation techniques shall be provided for all products supplied.
- E. Any material found not conforming to this specification will be rejected.
- F. Replacement materials shall conform to all the requirements of this specification.