SECTION 02646 - PVC PRESSURE PIPE

City of San Diego, CWP Guidelines

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NTS: This Section is coordinated with Section 02600 such that it requires inclusion of that Section in the Contract Document.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing polyvinyl chloride (PVC) pressure pipe and all appurtenant work, complete in place.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, also apply to the extent required for proper performance of this WORK.

1. Section 01530 Protection of Existing Facilities
2. Section 02140 Dewatering
3. Section 02200 Earthwork
4. Section 02600 Pipeline Construction
5. Section 02666 Water Pipeline Testing and Disinfection
6. Section 03310 Cast-In-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01090 - REFERENCE STANDARDS.

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current additions of the following apply to the WORK of this Section:

1. ANSI/AWWA C104/A21.5 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings 3-in Through 48-in for Water and Other Liquids

3. ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
4. ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Appurtenances
5. ANSI/AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe 4-in Through 12-in for Water Distribution
6. ANSI/AWWA C905	Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch Through 36-inch
7. ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins
8. PPI Technical Report TR 3/4	Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
9. AWWA Manual M23	PVC Pipe - Design and Installation

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300 - Contractor Submittals:

1. Shop drawings and laying diagrams of all pipe, joints, bends, special fittings, and piping appurtenances.

2. Shoring and bracing drawings in accordance with Section 02200.

3. Manufacturer's technical data and installation instructions plus samples of all materials proposed for use on the WORK. Samples shall be clearly marked to show the manufacturer's name and product identification.

4. Test Reports from:

a. Hydrostatic proof testing

b. Sustained pressure testing

c. Burst strength testing

1.6 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:

1. Manufacturer's certificates of compliance indicating that all materials provided under this Section meet the requirements of the Contract Documents.

1.7 FACTORY INSPECTION AND TESTING

A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for two OWNER-designated inspectors for [ ] days required to complete such inspections or observations exclusive of travel days, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400.

B. **Inspection:** All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The CONTRACTOR shall notify the CONSTRUCTION MANAGER in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture.

C. During the manufacture of the pipe, the CONSTRUCTION MANAGER shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

D. **Tests:** Except as modified herein, pipe shall be tested in accordance with the requirements of this Section and AWWA C900 and C905, as applicable.

E. The CONTRACTOR shall perform said material tests in accordance with the requirements of the Contract Documents. The CONSTRUCTION MANAGER will witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR'S schedule will not be delayed for the convenience of the CONSTRUCTION MANAGER.

F. All expenses incurred in obtaining samples for testing shall be borne by the CONTRACTOR at no increased cost to the OWNER.

G. In addition to those tests specifically required, the CONSTRUCTION MANAGER may request additional samples of any material for testing by the OWNER. The additional samples shall be furnished at no additional cost to the OWNER.

PART 2 -- PRODUCTS

2.1 GENERAL

A. PVC pressure pipe in sizes 4 through 12 inches shall conform to the applicable requirements of ANSI/AWWA C900 and pipe in sizes 14 through 24 inches shall conform to ANSI/AWWA C905. Pipe in both pipe size ranges shall also be subject to additional requirements indicated herein.

2.2 PIPE DESIGN CRITERIA

A. Pipe wall thickness for internal pressure shall be the greater of those calculated for the pressure type and safety factor combination below.

1. Pipe in sizes from 4 inches to 12 inches shall be designed for a minimum wall thickness, t, or dimension ratio, DR, in accordance with paragraph A3 in Appendix A of ANSI/AWWA C900. Safety factors of [3.0] for sustained working pressures and

[4.0] for total system pressure shall be considered. Working pressures and total system pressures are [ ] and [ ] psi, respectively.

2. Pipe in sizes from 14 inches to 24 inches shall be designed for a minimum wall thickness, t, or dimension ratio, DR, in accordance with paragraph A3 of Appendix A of ANSI/AWWA C905. Safety factors of [3.0] for sustained working pressures and [4.0] for total system pressure shall be considered. Working pressures and total system pressures are [ ] and [ ] psi, respectively.

B. **Determination of Earth Loads:** Earth loads on pipe from 4 inches to 24 inches shall be computed using the prism formula:

$$W_c = HwB_c$$

Where:
W_c = Earth load in pounds per linear foot
H = Depth of cover, feet
w = [120] lb/ft^3
B_c = Outside diameter of pipe, feet

C. **Determination of Live Loads:** In lieu of the method in paragraph A.4 of both standards, the truck live loads shall be determined using the method recommended by AASHTO in "Standard Specifications for Highway Bridges." For depths of cover less than 10 feet HS-20 live loads shall be added to the earth loads to determine the total load. For depths of cover 3 feet or less, HS-20 live load plus impact shall be included.

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NTS: The Design Consultant must develop appropriate valves of E' in conjunction with the geotechnical subconsultant.

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D. **Deflection Control:** With reference to paragraph A.5 in both standards, the deflection of the pipe after installation shall not exceed 0.03 times the outside diameter. If the calculated deflection exceeds 0.03 times the outside diameter, the pipe class shall be increased or the quality of the pipe zone backfill shall be improved to achieve a higher modulus of soil reaction, E'. For purposes of calculation, values of E' shall be [1100 psi] at 90 percent Standard Proctor; [1500 psi] at 95 percent Standard Proctor; and [2500 psi] at 100 percent Standard Proctor. Similarly, the deflection lag factor for dead loads shall be 1.5 and the bedding constant shall be 0.1.

2.3 PIPE

A. The pipe shall be of the diameter and pressure class or pressure rating indicated, shall be provided complete with rubber gaskets, and all specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for Dimension Ratios shall conform to the requirements of AWWA C900 or AWWA C905, as appropriate.

B. **Additives and Fillers:** Unless otherwise required in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin). If requested by the CONSTRUCTION MANAGER,

the additive and filler content shall be determined using the pyrolysis method as specified in ASTM D 2584.

C. **Joints:** As indicated, all joints for the pipe shall be either an integral bell manufactured on the pipe or a restrained joint employing a harness, coupling, or gland type restraint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.

D. **Joint Deflection:** Deflection at the joint shall not exceed 1.5 degrees or one-half the maximum deflection recommended by the manufacturer, whichever is less. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.

2.4 FITTINGS

A. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110, Class 350. Fittings shall be mechanical joint.

B. Fittings shall be lined with cement mortar of double thickness as defined in ANSI/AWWA C104. Fittings shall be coated with two 8 to 10 mil field coats (min. total DFT = 16 mils) of **Carboline Kopcoat Bitumastic Super Tank Solution - High Solids**, or equal.

2.5 MARKING

A. Pipe shall be identified in conformance with ANSI/AWWA C900 or C905, as appropriate, and the following additional requirements:

B. Pipe used for reclaimed water distribution systems shall be identified by one of the following methods:

1. PVC compounds are colored by addition of a purple colored agent.

2. Pipe is either embossed or stamped or printed with "Caution: Reclaimed Water - Do Not Drink" and "Peligro: Agua Impura - No Beber."

3. Pipe will be laid under a continuous, full length, 3-inch wide, polyethylene or vinyl tape imprinted with the warnings in English and Spanish above. Tape shall be purple with black lettering.

PART 3 -- EXECUTION

3.1 GENERAL

A. All laying, jointing, and testing for defects and for leakage shall be performed in the presence of the CONSTRUCTION MANAGER, and shall be subject to approval before acceptance.

B. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, ASTM D 2321, SSPWC Subsection 306-1.2.13 and Supplement Amendments, and to the supplementary requirements or modifications specified herein. Wherever the requirements of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.2 PIPE STORAGE

A. Storage: Pipe should be stored at the job site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe shall be stored in such a way as to prevent sagging or bending and shall be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Sections 02200 and 02600 and as specified herein.

3.4 INSTALLATION OF BENDS, TEES, AND REDUCERS

A. Ductile iron fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into the trench by means of rope, cable, chain, or other acceptable means without damage to the fittings or linings or coating. Cable, rope, or other devices used for lowering fittings into trench shall be attached around the exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the interior for handling. Fittings shall be carefully connected to the pipe or other facility, and joints shall be checked to insure a sound and proper joint. Recoat damaged coatings.

3.5 COMPACTION OF PIPE BEDDING AND BACKFILL

A. Compaction of pipe bedding and backfill material shall conform to the requirements of Sections 02200 and 02600.

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3.6 INSTALLATION OF TAPE

A. Purple warning tape shall be placed on the backfill above reclaimed water distribution pipelines, 2 feet below finished grade. Tape shall be continuous and shall not deviate outside the horizontal profile of the pipe.

3.7 FIELD TESTING AND DISINFECTION

A. Field testing and disinfection shall conform to the requirements of Section 02666 - Water Pipeline Testing and Disinfection.

- END OF SECTION -