

The following standard specification is intended to be edited according to the specifics of the project. Brackets [ ] and areas shaded in gray [e.g. format] indicate requirements that are optional depending upon the type of system being provided or per instructions associated with the [ ] and project requirements. Consult with University's Representative and campus stakeholders.

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## SECTION 33 11 00 WATER UTILITY DISTRIBUTION PIPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe and fittings for site domestic and utility water lines.

#### 1.2 RELATED SECTIONS

- A. Section 01 33 23 Shop Drawings, Product Data and Sample
- B. Section 01 43 00 Quality Assurance
- C. Section 01 57 23 Storm Water Pollution Prevention
- D. Section 09 99 00 Painting and Coating
- E. Section 31 23 33 Trenching and Backfilling
- F. Section 33 05 26 Utility Line Signs, Markers, and Flags
- G. Section 33 12 16 Water Distribution Valves
- H. Section 33 13 00 Disinfection of Water Utility Distribution
- I. Section 33 08 10 Commissioning of Water Utilities

#### 1.3 REFERENCES

- A. American Water Works Association (AWWA) C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems
- C. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings
- D. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- E. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- F. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water
- G. AWWA C153/A21.53 - Ductile-Iron Compact Fittings for Water Service
- H. AWWA C600 - Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
- I. AWWA C800 - Underground Service Line Valves and Fittings
- J. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution
- K. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 Inches Through 48 Inches, for Water Transmission and Distribution
- L. The American Society of Mechanical Engineers (ASME) B16.1 - Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250)
- M. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
- N. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

- O. American Society for Testing and Materials (ASTM) A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature of High Pressure Service and Other Special Purpose Applications
- P. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- Q. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- R. State of California, Department of Health Services, "Criteria for the Separation of Water and Sanitary Sewer"

#### 1.4 SUBMITTALS

- A. See Section 01 33 23 Shop Drawings, Product Data and Samples for submittal procedures.
- B. Product Data: Provide data acknowledging that products meet requirements of standards referenced.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Restraint Calculation: Provide calculations for mechanical restraint distances for all pipe joints. Provide data acknowledging that calculations provided conform to manufacturer's recommendations for size of pipe, type of pipe, and site soil type.
- F. Project Record Documents:
  - 1. Record location of pipe runs, connections, valves, thrust restraints and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- G. Results of testing.

### PART 2 - PRODUCTS

#### 2.1 PVC PIPE

- A. All pipe shall be continuously and permanently marked with manufacturer's name, pipe size, class or pressure rating in pounds per square inch (psi) units.
- B. Pipe, 4 inch through 12 inch: PVC pipe shall be bell and spigot type of materials specified in ASTM D1784, Class 12454, minimum Pressure Class 200, conforming to AWWA C900. Outside diameter pipe dimension shall be manufactured to cast iron pipe equivalent. Underwriters' Laboratories, Inc. (UL) listed, Factory Mutual and National Sanitation Foundation (NSF) approved. Pipe shall be furnished in minimum standard lengths of 20 feet.
- C. Pipe, 14 inch and larger: PVC pipe shall be bell and spigot type minimum Pressure Class 165, conforming to AWWA C905. Outside diameter pipe dimension shall be manufactured to cast iron pipe equivalent. Underwriters' Laboratories, Inc. (UL) listed, Factory Mutual and National Sanitation Foundation (NSF) approved. Pipe shall be furnished in minimum standard lengths of 20 feet.
- D. Joints: Joints shall be cast iron mechanical joint type, bell and spigot, or push-on type, 250 pound working pressure. Bell and spigot type shall have elastomeric rubber ring joints, conforming to AWWA C111. Elastomeric ring shall be factory bonded into bell groove and meet requirements of ASTM F477.
- E. Fittings: Fittings shall be ductile iron pipe conforming to AWWA C153, size 3 through 24 inch, and AWWA C110 greater than 24 inch, and shall be 350 psi working pressure rated. Couplings,

sleeves, and accessories shall be manufactured by U.S. Pipe TrimTyte, Union Foundry, Tyler; or equal.

- F. Mechanical Joint Restraints: Pipes shall be restrained using a wedge action, self-actuating lug type restraint device. PVC pipe mechanical restraints shall be manufactured by EBAA Iron Sales, StarGrip, or equal.
- G. Flanged outlets shall conform to ASME B16.1, 125 pounds. Bolts and nuts for flanges shall be Type 304 stainless steel, ASTM A193, Grade B8M hex head bolts and ASTM A194, Grade 8M, hex head nuts. Washers shall be of the same material as the bolts. Unless otherwise noted, flanges on all DIP spools shall conform to AWWA C115.
- H. Miscellaneous nuts and bolts shall be Type 304 stainless steel.

## 2.2 DUCTILE IRON PIPE

- A. Pipe: DIP pipe shall be Class 350 conforming to AWWA C151 with cement mortar lining in accordance with AWWA C104. Pipe shall be furnished in minimum standard lengths of 20 feet.
- B. Joints: Joints shall be either bell and spigot end, push-on type or cast iron mechanical joint type, 250 pound working pressure, with elastomeric rubber ring joints, conforming to AWWA C111.
- C. Fittings: Fittings shall be ductile iron pipe conforming to AWWA C153, size 3 through 24 inch, and AWWA C110 greater than 24 inch, and shall be 350 psi working pressure rated. Couplings, sleeves, and accessories shall be manufactured by U.S. Pipe TrimTyte, Union Foundry, Tyler; or equal.
- D. Mechanical Joint Restraints: Pipes shall be restrained using a wedge action, self-actuating lug type restraint device. DIP pipe mechanical restraints shall be EBAA Iron Sales, StarGrip, or equal.
- E. Flanged outlets shall conform to ASME B16.1, 125 pounds. Bolts and nuts for flanges shall be Type 304 stainless steel, ASTM A193, Grade B8M hex head bolts and ASTM A194, Grade 8M, hex head nuts. Washers shall be of the same material as the bolts. Unless otherwise noted, flanges on all DIP spools shall conform to AWWA C115.
- F. Miscellaneous nuts and bolts shall be Type 304 stainless steel.
- G. All ductile iron pipe and fittings shall be wrapped in polyethylene per AWWA C105.

## 2.3 COPPER PIPE, LESS THAN 4 INCHES

- A. Piping, 1.5 inches and under: Seamless copper tubing conforming to AWWA C800, Type K, soft tempered
- B. Piping, 2 inches to 4 inches: Seamless copper tubing conforming to AWWA C800, Type K, hard temper
- C. Joints: Silfoss connections
- D. Fittings: Cast copper ASME B16.18 or wrought copper ASME B16.22
- E. Threaded connections shall be soft soldered.

## 2.4 ACCESSORIES

- A. Pipe Supports, Rods and Clamps: Socket clamps shall be stainless steel, four bolt type, equipped with stainless steel socket clamp washers and nuts Anvil Fig. 595 and 594, Elcen Fig. 37 and 37X, or equal.
  - 1. Rods shall be stainless steel, 3/4 inch diameter.
- B. All underground water piping shall be accompanied by a tracer wire and line marker as specified in **Section 33 05 26, Utility Line Signs, Markers, and Flags.**

### PART 3 - EXECUTION

#### 3.1 HANDLING AND STORAGE

- A. Handling: Pipe fittings and accessories shall be carefully inspected before and after installation and those found defects shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.
- B. Storage: Pipe should be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Should the green color fade during storage to a point where, in the opinion of the University's Representative the color would not be clearly evident to a person uncovering a small portion of the pipe, the faded pipe shall be rejected. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

#### 3.2 INSTALLATION

- A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints and couplings. Anchors, thrust blocks, and supports shall be provided where necessary and where indicated on the Drawings for fastening work into place. Fittings shall be independently supported.
- B. Have on hand all installation manuals, brochures, and procedures for the equipment and materials concerned.
- C. Follow manufacturer instructions, where such are provided, in all cases that cover points not shown on the Drawings or specified herein. Manufacturer's instructions do not take precedence over the Drawings and Specifications. Where manufacturer's instructions are in conflict with the Drawings and Specifications, submit the conflicting instructions to the University's Representative for clarification before performing the work.
- D. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. No wedge type roller cutters shall be permitted.
- E. Remove scale and dirt on inside and outside before assembly.
- F. Prepare pipe connections to equipment with flanges or unions.

**Note To Specifier: coordinate with Section 31 23 33.**

- G. Bedding and Cover shall be as specified in **Section 31 23 33 Trenching and Backfilling**.
- H. Hand trim excavation for accurate placement of pipe to elevations indicated.
- I. Buried pipe shall have at least 36 inches of cover (for pipes sizes up to 8 inches), 40 inches of cover (for 10 inch pipe), 44 inches of cover (for 12 inch pipe), or 48 inches of cover (for pipe sizes 16 inches and greater), and 6 inches of clearance from other utilities. Horizontal and vertical separation of domestic water lines must conform to the State of California, Department of Health Services, "Criteria for the Separation of Water and Sanitary Sewer".
- J. Use fittings to make all changes in direction and size unless otherwise indicated on the Drawings.

- K. Maintain factory plastic end covers on the pipe during storage. Caps shall be removed upon installation of pipe to insure cleanliness.

**Note To Specifier: Coordinate Item "L." With Section 31 23 33.**

- L. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, and then complete backfilling.

**Note To Specifier: Coordinate Item "M." With Section 31 23 33.**

- M. Lay piping on a bed of the specified sand, at least 6-inches thick, on firm undisturbed earth. Remove loose rock, clods, and debris from the trench before placing bedding sand and before laying any pipe.
- N. The piping shall be made up with the pipe barrel bearing evenly along its full length on the sand bed on the bottom of the trench.
- O. In the case of steel or other rigid joint piping, excavate holes under joints and connections for access for making up, welding, testing and wrapping joints.
- P. Thoroughly clean out each section of pipe and fitting before lowering into the trench. Clean each pipe or fitting by swabbing-out, brushing-out, blowing-out with compressed air, washing-out with water, or by any combination of these methods necessary to remove all foreign matter.
- Q. If cleaned pipe sections and fittings cannot be placed in the trench without getting dirt into the open ends, tie tightly woven canvas or other type of approved cover over the ends of the pipes and fittings until they have been lowered into position in the trench. After removal of the covers in the trench, completely remove foreign matter from the pipe ends and fittings. Under no circumstances shall pipe be dropped or dumped into trench.
- R. Do not lower any pipe or fitting into a trench that contains water. Pump water from wet trenches, and keep the trenches dry until the joints have been completed and the open ends of the pipes have been closed with watertight plugs or bulkheads. Do not remove the plug or bulkhead unless the trench is dry.
- S. Assemble lengths of PVC pipe such that centerline of two pipes being joined do not form an angle exceeding 3 degrees in any plane.
- T. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water and shall not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated, clean applicator brushes.
- U. Transition plastic pipe to ductile iron when within 10 feet of a steam line. Provide 6 inches minimum thickness of powdered insulation around ductile iron sewer pipe when within 5 feet of steam line. Insulation shall be DriTherm, Gilsulate, or equal and installed according to manufacturer's recommendations.
- V. Install tracer wire on top of non-metallic pipe as specified in **Section 33 05 26 Utility Line Signs, Markers and Flags.**
- W. Install continuous line marker above top of pipe as specified in **Section 33 05 26 Utility Line Signs, Markers and Flags.**
- X. Polyethylene wrap on DIP shall be installed per manufacturer's recommendations.
- Y. Install air release valves on all pipeline high points. Refer to **Section 33 12 16 Water Distribution Valves** for valve installations.
- Z. Installation shall comply with requirements of **Section 01 57 23 Storm Water Pollution Prevention.**

### 3.3 CONNECTIONS TO EXISTING WATER SYSTEM

Note to specifier: Hot taps into existing lines shall conform to University Standard Detail DW-6, tee connection into existing main. Coordinate specifications with information provided in DW-6.

- A. Utility interruption shall be in accordance with [Section 01 14 00 Work Restrictions](#).
- B. In preparation for tie-ins to utility systems, the Contractor shall coordinate with the University's Representative before draining and/or blowing the existing piping prior to start of tie-in work by the Contractor. In all cases, the University will close the appropriate valves to isolate the area of work.

#### 3.4 TESTING

- A. Water piping shall be hydrostatically tested at 150 psi pressure for two hours. Provide all instruments, facilities, and labor to conduct testing and placing in operation. Leakage rate shall not exceed 0.02 gallon per hour per inch diameter per 100 feet of buried piping.
- B. Piping shall be tested in sections. Testing under this Section shall be done before final connections to existing utility piping are made. Connections at existing utilities shall be visually inspected for leaks and all leaks repaired.
- C. Any part of the system, including all accessories, that shows failure during testing shall immediately be repaired or replaced with new materials. The system shall be completely retested after repair for replacement. This procedure shall be repeated, if necessary, until all parts of the system withstand the specified tests. No additional compensation will be provided for retesting.
- D. Tests shall be witnessed by the University's Representative. At least 48 hours notice of tests shall be given.
- E. Perform field inspection and testing in accordance with [Section 01 43 00 Quality Assurance](#).

#### 3.5 FLUSHING AND DISINFECTION

- A. All domestic water piping shall be flushed and disinfected upon installation. Refer to Specification [Section 33 13 00 Domestic Water Piping Disinfection](#).

#### 3.6 COMMISSIONING

- A. Prior to putting a water line in service, the Contractor shall conduct an acceptance checklist as required in [Section 33 08 10 Commissioning of Water Utilities](#).

END OF SECTION 33 11 00