

STANDARD SPECIFICATION  
SECTION 15240 DUCTILE IRON PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, installation, and testing of ductile iron pipe and fittings. Size range is 4- to 24-inch nominal pipe size.

1.02 PIPE IDENTIFICATION SYMBOLS

Interpret pipe identification symbols used on the Drawings as follows: DI-12"-350 or DI-12"-53 designates type of pipe (ductile iron); nominal pipe size (12 inches); and pipe wall thickness (pressure Class 350 or special thickness Class 53).

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Standard Drawings.
- B. Record Drawings and Submittals: STD SPEC 01300.
- C. Trenching, Backfilling, and Compacting: STD SPEC 02223.
- D. General Concrete Construction: STD SPEC 03000.
- E. Miscellaneous Metalwork: STD SPEC 05121.
- F. Glass Linings and Coatings: STD SPEC 09870.
- G. Painting and Coating: STD SPEC 09900.
- H. Cold Applied Wax Tape Coating: STD SPEC 09952.
- I. Polyethylene Sheet or Tube Encasement: STD SPEC 09954.
- J. Corrosion Control for Buried Piping: STD SPEC 13110.
- K. General Piping Requirements: STD SPEC 15050.
- L. Miscellaneous Piping Specialties: STD SPEC 15080.
- M. Flexible Pipe Couplings: STD SPEC 15122.
- N. Disinfection of Piping: STD SPEC 15141.
- O. Pressure Testing of Piping: STD SPEC 15144.

1.04 SUBMITTALS

- A. Submit submittal packages in accordance with Standard Specification Section 01300.

- B. Provide affidavit of compliance with standards referenced in this specification, e.g. AWWA C151. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 5.5, is met.
- C. Submit manufacturer's data sheets on ductile iron pipe, joints, and fittings including dimensions, wall thickness, weight, coating, lining, and deflections at push-on and mechanical joints.
- D. Submit tabulated layout schedule and drawing showing location and dimensions of pipe and fittings including:
  - 1. Pipe station and top of pipe or centerline elevation at each change of grade and alignment.
  - 2. Elements of curves and bends, both in horizontal and vertical alignment, including elements of the resultant true angular deflections in cases of combined curvature.
  - 3. The limits of each reach of pipe pressure class or thickness class and of restrained joints.
  - 4. The limits of each reach of concrete encasement or encasement in casing.
  - 5. Locations and details of bulkheads for field hydrostatic testing of the pipeline.
  - 6. Locations of closures for length adjustment and for construction convenience.
  - 7. Locations of manholes and other points of access for placement of mortar lining at field joints and removal of test bulkheads.
  - 8. Locations of valves and other mechanical equipment.
- E. Submit calculations and test data proving that the proposed restrained joint arrangement can transmit the required forces with a minimum safety factor of 1.5.
- F. Submit certificate that cement for mortar lining complies with ASTM C 150, designating type.
- G. Submit test report on physical properties of rubber compound used in the gaskets.
- H. Submit weld procedure specification, procedure qualification record, and welder's qualifications prior to any welding to ductile iron pipe.
- I. Submit manufacturer's catalog data and descriptive literature on marking tape.

#### 1.05 INSPECTION AND FIELD VERIFICATION

- A. The District's Representative or his authorized representative may inspect materials, production, and testing of pipes, fittings, and special pieces at manufacturer's plant.
- B. Where new pipelines are to be connected to existing waterlines of the District, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside

diameter, and any other characteristics of the existing waterline before proceeding with the installation. This field verification shall be performed in the presence of the District's Representative. Adjust and align the new piping as necessary to meet the field conditions and provide all required material, labor, and equipment to make the connection.

**PART 2 - MATERIALS**

**2.01 DUCTILE IRON PIPE**

Pipe shall be ductile iron conforming to AWWA C151. Provide pipe in nominal 18- or 20-foot laying lengths.

**2.02 PIPE MARKING**

Plainly mark each length of straight pipe to identify the design pressure class or thickness class, the wall thickness, and date of manufacture. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

**2.03 PIPE WALL THICKNESS**

- A. Minimum wall thickness for pipe having push-on or mechanical joints, restrained joints, plain ends, or cast flange ends shall be Pressure Class 350, unless otherwise shown on the Drawings.
- B. Minimum wall thickness for pipe having threaded flanges shall be Special Thickness Class 53 per AWWA C151.
- C. Minimum wall thickness for pipe having grooved end joints shall be as shown in the following table unless otherwise noted on the Drawings:

Pipe and Fitting Size (inches)	Special Thickness Per AWWA C151
16 and Smaller	Class 53
18	Class 54
20	Class 55
24	Class 56

**2.04 FITTINGS**

- A. Provide ductile iron push-on or mechanical joint fittings conforming to AWWA C110 with a rated working pressure of 350 psi.
- B. In lieu of paragraph 2.04, A., provide ductile iron fittings conforming to AWWA C153 with a minimum rated working pressure of 350 psi. Provide fittings constructed of Grade 70-50-05 ductile iron having a minimum weight equal to the weight tabulated in AWWA C153. Use mechanical joint fittings or fittings with bells and gasket ends conforming to the dimensional values of AWWA C111. Mechanical joint glands shall be Grade 70-50-05 ductile iron and cast in one continuous ring. Fittings with repaired defects are not acceptable and will be rejected.

- C. For mechanical joint fittings with glands, use tee-head or non-hex head bolts and head nuts for joint makeup and gasket seating. Bolts and nuts shall be carbon steel and coated with a corrosion inhibiting fluoropolymer composite material. Provide Tripac 2000 Blue Coating System, or District approved equal.
- D. For grooved end fittings, use ductile iron fittings conforming to AWWA C110 or C153. Grooves or shouldered ends shall conform to AWWA C606.
- E. Material for fittings with welded on bosses shall have a Charpy notch impact value of minimum 10 ft-lbs under the conditions defined in AWWA C151. Test completed welds by the liquid penetrant method per ASTM E 165.

## 2.05 FLANGES

- A. Flanges on ductile iron fittings shall conform to AWWA C110 or ASME B16.42 Class 150 with a minimum rated working pressure of 250 psi.
- B. For flanged fittings with working pressures greater than 250 psi, use ductile iron fittings conforming to ANSI B16.42 Class 300.
- C. Threaded flanges shall be solid back, flat faced, Class 125 per AWWA C115.
- D. Flanged pipe shall be either cast or threaded. Flanged pipe shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115. Flanges shall be individually fitted and machine tightened in the shop, then machined flat and perpendicular to the pipe barrel. Flanges shall be backfaced parallel to the face of flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket.
- E. Material for blind flanges shall be ductile iron.

## 2.06 LINING AND COATING FOR PIPE AND FITTINGS

- A. Line interior of potable or recycled water pipe and fittings with cement mortar per AWWA C104. Provide double thickness lining and use cement conforming to ASTM C 150, Type II. Also, line interior of bells and pipe spigots in contact with water per Standard Specification Section 09900, System No. 5, and be holiday free. Apply linings in shop.
- B. Line interior of sewer pipe and fittings with glass lining per Standard Specification Section 09870. Coat blind flanges the same. Glass lining and coating shall be holiday free.
- C. Coat exterior of buried pipe and fittings with an asphalt material per AWWA C151. Apply coating in shop.
- D. Coat blind flanges per Standard Specification Section 09900, System No. 5, and be holiday free. Apply coating in shop.
- E. Coat the grooved and shouldered ends of pipe to be in contact with mechanical clamp-type couplings per Standard Specification Section 09900, System No. 5, and be holiday free. Apply coating in shop.

- F. Coat the ends of plain end pipe where flexible pipe couplings are to be installed per Standard Specification Section 09900, System No. 5, and be holiday free. Apply coating in shop.

#### 2.07 BOLTS, NUTS AND GASKETS FOR FLANGES

See Standard Specification Section 15050.

#### 2.08 INSULATING FLANGE KITS

See Standard Specification Section 13110.

#### 2.09 OUTLETS

- A. For outlets 2 inches and smaller with working pressures 200 psi or less, drill the pipe and attach a service saddle to the pipe except for sewer applications. Provide service saddles with full width, cast bronze bodies conforming to ASTM B 62, O-ring gaskets, and iron pipe threads. Provide Type 304 stainless steel double band straps with four bolts or a single wide strap with four bolts. All stainless steel shall be fully passivated for enhanced corrosion resistance. Service saddles shall be Ford Style 202BS, Romac Industries Style 202BS, Smith-Blair Model 393, or District approved equal.
- B. For outlets 2 inches and smaller with working pressures greater than 200 psi and all sewer applications, use a ductile iron tee with a flanged outlet. Install a ductile iron reducing flange with iron pipe threads and insulating bushing on the outlet.
- C. For outlets 3 inches and larger, use a ductile iron tee with a flanged outlet.

#### 2.10 MECHANICAL CLAMP-TYPE COUPLINGS AND ADAPTER FLANGES

- A. Mechanical clamp-type couplings and flange adapters for grooved end pipe shall be ductile iron, ASTM A 536 Grade 65-45-12. Bolts shall conform to ASTM A 183, 110,000 psi tensile strength. Gaskets shall be EPDM (ethylene propylene diene monomer) for water and Buna-N for sewer and shall conform to ASTM D 2000.
- B. Couplings for pipe, 24 inches and smaller, shall conform to AWWA C606 for flexible radius ductile iron pipe, except where rigid radius couplings are required to connect to fittings. Couplings shall be Victaulic Style 31 or District approved equal.
- C. Grooved end flange adapters for piping having an operating pressure of 150 psi and less shall be Victaulic Style 341 or 342, or District approved equal. Flange dimensions shall conform to ASME B16.1 Class 125.

#### 2.11 FLEXIBLE PIPE COUPLINGS

See Standard Specification Section 15122.

#### 2.12 TYPE OF PIPE JOINTS

- A. Joints in aboveground piping or piping located in vaults and structures shall be flanged, unless mechanical clamp-type couplings or adapter flanges are shown on the Drawings.

- B. Joints in buried piping shall be of the restrained push-on, push-on, or mechanical joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment. Provide unrestrained buried joints except where restrained joints are specifically shown on the Drawings. Restrained push-on joints shall be American Cast Iron Pipe Company "Flex-Ring," "Lok-Ring," or "Lok-Fast," U.S. Pipe "TR Flex," or District approved equal. All weldments for restrained joints shall be tested by the liquid penetrant method per ASTM E 165. Push-on joints shall be American Cast Iron Pipe Company "Fastite," U.S. Pipe "Tyton," or District approved equal.
- C. Provide plain end pipe where flexible pipe couplings are to be used.

#### 2.13 MECHANICAL JOINT RESTRAINT SYSTEM

The restraining mechanism shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be constructed of ductile iron conforming to ASTM A 536, Grade 60-42-10. The wedges shall be ductile iron, heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with mechanical joint bells conforming to AWWA C111 and AWWA C153. The design shall use torque limiting twist-off nuts to provide actuation of the restraining wedges. The mechanical joint restraint shall be available in the size range of 4 through 24 inches. Minimum rated pressure shall be 350 psi for sizes 16 inches and smaller and 250 psi in sizes 18 inches and larger. Mechanical joint restraint shall be EBAA Iron, Inc. Megalug Series 1100, or District approved equal.

#### 2.14 DUCTILE IRON PIPE WELDMENTS

- A. All welding to ductile iron pipe, such as for bosses or joint restraint shall be done at the place of manufacture of the pipe. Perform welding by skilled welders who have experience in the method and materials to be used. Welders shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.
- B. Welds shall be of uniform composition, neat, smooth, full strength, and ductile. Completely grind out porosity and cracks, trapped welding flux, and other defects in the welds in such a manner that will permit proper and complete repair by welding.
- C. Completed welds shall be inspected at the place of manufacture by the liquid penetrant method. Conform to the requirements specified in ASTM E 165, Method A, Type I or Type II. The materials used shall be water washable and nonflammable.

#### 2.15 POLYETHYLENE ENCASEMENT

See Standard Specification Section 09954.

#### 2.16 WAX TAPE COATING

See Standard Specification Section 09952.

## 2.17 CORROSION CONTROL COMPONENTS

See Standard Specification Section 13110.

## 2.18 CEMENT MORTAR

Cement mortar for buttering and pointing the inside joints shall consist of one part cement to 1-1/2 parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. Cement shall conform to ASTM C 150, Type II. Sand shall conform to ASTM C 144 for masonry sand.

## 2.19 MARKING TAPE

Use detectable marking tape consisting of one layer of aluminum foil laminated between two colored layers of inert plastic film. The lamination bond should be strong enough that the layers can not be separated by hand. Tape shall be a minimum of 5 mils thick and 6 inches wide. Tape shall bear a continuous, printed message every 16 to 36 inches warning of the installation buried below. Tape shall be Terra Tape, Linetec, or District approved equal.

## 2.20 MARKER POSTS

Provide marker posts for buried pipelines at 500 feet on center except where pipeline is located in a paved street or as directed by the District's Representative. Use construction heart garden grade redwood per Standard Specifications for Grades of California Redwood Lumber issued by the Redwood Inspection Service. Provide seasoned redwood, 4 inches by 4 inches, and surfaced on four sides.

## PART 3 - EXECUTION

### 3.01 PRODUCT MARKING

Plainly mark each length of straight pipe to identify the ductile iron wall thickness and date of manufacturer. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

### 3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE

- A. Limit onsite pipe storage to a maximum of one week. Place the pipe alongside the trench in the order in which it is to be installed and secure it from rolling. Support the pipe on wooden blocks, sandbags, mounds of sand, or other suitable supports. Do not roll or drop the pipe on the ground or allow the pipe to fall from the pipe trailer trucks.
- B. Avoid cracking of the cement mortar lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep lining moist.
- C. Do not install pipe or fittings with damaged linings. Patch damaged areas in the field with material similar to the original. Where damage can not be repaired in the field, replace the defective pipe or fittings.

### 3.03 HANDLING OF PIPE

Lift pipes with mechanical equipment using wide belt slings. Do not use cable slings or chains. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel.

### 3.04 SANITATION OF PIPE INTERIOR

- A. During laying operations, do not place tools, clothing, or other materials in the pipe. Keep the interior of the pipe clean as the pipeline construction progresses. The purpose of maintaining a clean interior is to aid in the passage of the bacteriologic quality testing after disinfection for potable water pipelines.
- B. When pipelaying is not in progress, including the noon hour, close the ends of the installed pipe with a plug to deter entry of vermin, children, dirt, storm water, or foreign material.

### 3.05 INSTALLING PIPE IN TRENCH

- A. See Standard Specification Section 02223 for earthwork requirements.
- B. Inspect each pipe and fitting before lowering into the trench. The District's Representative will inspect all pipe prior to installation for damage to the interior protective coatings. Patch damaged areas in the field with material similar to the original. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
- C. Handle pipe in a manner to avoid any damage to the pipe. Do not drag pipe over the ground, drop it onto the ground, or drop objects on it. Do not drop or dump pipe into trenches.
- D. Laying tolerances for the installed pipe shall not vary greater than 0.3-foot horizontally, or greater than 0.1-foot vertically from the alignment and elevations shown on the Drawings.
- E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid. Remove hard spots that would prevent a uniform thickness of pipe base material (imported sand). Before laying each section of the pipe, check the grade and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of pipe handling slings.
- F. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint and to prevent the pipe from being supported by the bell end or fitting.
- G. Keep the trench in a dewatered condition during pipelaying. Removal of water shall be in conformance with Standard Specification Section 02223.
- H. For pipes 24 inches in diameter, the amount of pipe to be laid and assembled in a trench shall be limited to a distance of approximately 320 feet. No additional pipe will be allowed to be installed in the trench until the other related operations of pipeline construction are completed. Other operations include, but are not limited to, bond wires, backfilling and



compacting, completion of interior joints, and inspection of the interior by the District's Representative. The intent of this limitation is to provide a safe environment for the construction and inspection of the pipeline. The interior of the pipeline is considered a confined or enclosed space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.

### 3.06 INSTALLING POLYETHYLENE ENCASEMENT

Wrap buried pipe, fittings, and flanged joints with polyethylene material per Standard Specification Section 09954. Use only tube type for pipe. Complete the wrap prior to placing concrete anchors, collars, supports or thrust blocks per Standard Specification Section 02223. Repair polyethylene material damaged during construction.

### 3.07 ASSEMBLING PIPE JOINTS

- A. The spigot and integral bell shall be dirt free and slide together without displacing the rubber ring gasket. Lay the pipe section with the integral bell facing the direction of laying. "
- B. Clean the groove of the bell of all foreign materials. Insert the gasket into the groove of the bell prior to installation. Observe the correct direction of the shaped gasket. Feel that the gasket is completely and evenly seated in the groove.
- C. Lubricate the exposed gasket surface and the beveled spigot up to the full insertion length with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.
- D. Insert the spigot into the bell and force it slowly into position.
- E. Check that the rubber ring gasket has not left the groove during assembly by passing a feeler gage around the completed joint.
- F. Assemble restrained joints per manufacturer's instructions.

### 3.08 INSTALLING BURIED FITTINGS

- A. The District's Representative will inspect all fittings prior to installation for damage to the interior protective coatings. Coating shall be holiday free on interior surfaces. Patch damaged areas in the field with material similar to the original.
- B. For mechanical joint fittings, clean the bell socket and the plain end of the pipe of all foreign material and dirt. Place the gland on the pipe spigot with the lip extension toward the plain end. Lubricate the pipe spigot and gasket. Use the same lubricant as supplied by the pipe manufacturer. Install the gasket on the pipe spigot with the narrow edge of the gasket toward the plain end. Insert the pipe into the bell socket and press the gasket firmly into the gasket recess. Keep the joint straight during assembly. Push the gland towards the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make joint deflection after assembly but before tightening nuts. Uniformly tighten bolts and nuts in a progressive diametrically opposite sequence, and torque nuts to 75- to 90-foot pounds with a calibrated torque wrench. Coat exposed surfaces of tee-head bolts and nuts after tightening with primer for wax tape coating per Standard Specification Section 09952.

- C. For push-on joint fittings, clean the bell ends of the fitting of all foreign material and dirt. Insert the gasket in the groove of the bell and make sure the gasket faces the correct direction. Feel that the gasket is completely and evenly seated in the groove. When pipe is cut in the field, bevel the plain end prior to installation. Lubricate the exposed gasket surface and the beveled pipe spigot with the same lubricant supplied by the pipe manufacturer. Insert the spigot into the bell and force it slowly into position. Keep the joint straight while pushing. Make joint deflection after the joint is assembled.

3.09 JOINT DEFLECTIONS FOR BURIED PIPE

- A. When necessary to deflect pipe from a straight line in either the horizontal or vertical plane, do not exceed the following joint deflection angles for unrestrained buried pipe or fittings. The angles shown are for each joint and are maximum deflections.

Nominal Pipe Size (inches)	Non-Restrained Mechanical Joint (degrees)	Push-On Joint (degrees)
4	6-1/2	4
6	5-1/2	4
8	4	4
10	4	4
12	4	4
14	3	2-1/2
16	3	2-1/2
18	2-1/2	2-1/2
20	2-1/2	2-1/2
24	2	2-1/2

- B. For restrained joints, do not exceed 80% of the manufacturer's recommended maximum deflection.

3.10 INSTALLING PIPE IN VAULTS

- A. Install pipe in vaults without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Provide temporary supports and place the assembled piping at the correct grade and position in the vault.
- B. Provide pipe supports per Standard Specification Section 05121.

3.11 INSTALLING FLANGED JOINTS

See Standard Specification Section 15050 for installation instructions.

### 3.12 INSTALLING INSULATING FLANGE KITS

Install insulating flange kits with coatings per Standard Specification Section 13110.

### 3.13 INSTALLING SERVICE SADDLES

- A. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench to the saddle manufacturer's recommended values.
- B. Connect a corporation stop to the saddle per Standard Specification Section 15080. Apply Teflon joint compound or tape to the male threads before installing the corporation stop. Make joints watertight.
- C. Mount a tapping machine on the corporation stop to cut a hole in the pipe with a shell type cutter made specifically for ductile iron pipe. Do not use other devices or hand equipment to bore through the pipe wall.
- D. Wrap service saddle including body, straps, bolts, nuts, and adjacent surfaces of the pipe with polyethylene material per Standard Specification Section 09954

### 3.14 INSTALLING MECHANICAL CLAMP-TYPE COUPLINGS OR ADAPTER FLANGES

- A. Install mechanical clamp type couplings and adapter flanges on grooved end pipe and fittings in accordance with the manufacturer's recommendations and the following.
- B. Clean oil, grease, and dirt from the grooved end pipe and fittings. Repair any damage or holidays in the shop applied coating before installing coupling or adapter. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
- C. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Uniformly tighten bolts and nuts alternately and evenly until coupling segments are seated. Use torques as recommended by the coupling manufacturer.

### 3.15 INSTALLING FLEXIBLE PIPE COUPLINGS

Install flexible pipe couplings per Standard Specification Section 15122.

### 3.16 INSTALLING CORROSION CONTROL COMPONENTS

Install bond wires, anodes, and test stations per Standard Specification Section 13110.

### 3.17 POINTING INSIDE JOINT RECESSES FOR PIPES 24 INCHES IN DIAMETER

- A. Backfill the trench before pointing the inside joint recesses with cement mortar. Joints shall be pointed immediately after backfilling and at no time shall the completion of the pointing be further than 320 feet behind pipe laying.
- B. Working inside the pipe, remove foreign substances from joint recesses and pack with cement mortar. Finish the surface with a steel trowel to match adjoining pipe.

- C. Remove excess mortar and other construction debris from the pipe interior. Sweep pipe clean of all foreign substances.

### 3.18 INSTALLING MARKING TAPE

After the pipe zone has been backfilled and compacted, place the marking tape on the compacted pipe zone material and center over the pipe. Run tape continuously along the trench and tie ends of tape together. Wrap marking tape around valve box extension pipes and continue along pipe.

### 3.19 SETTING MARKER POSTS

Locate marker posts on centerline of pipeline and space at 500 feet on center. Cut redwood post to a 5-foot length and chamfer the top. Paint post per Standard Specification Section 09900, System No. 60. Use white paint for the finish coats. For potable water, use blue paint for the top 4 inches of the chamfered end and stencil in 2-inch-high blue letters the word "WATER" on the post. For recycled water, use purple paint for the top 4 inches of the chamfered end and stencil in 2-inch-high purple letters the abbreviation "RW" on the post. For sewer, use green paint for the top 4 inches of the chamfered end and stencil in 2-inch-high green letters the word "SEWER" on the post. Excavate a hole 16 inches in diameter by 2 feet deep. Set the redwood post plumb, fill hole with concrete to 2 inches above finish grade, and crown to slope away from post. Concrete shall be Class C per Standard Specification Section 03000.

### 3.20 PAINTING AND COATING

- A. Coat exterior surfaces of bare ductile iron pipe in vaults per Standard Specification Section 09900, System No. 10. Apply coats in the field.
- B. Coat exterior surfaces of mechanical clamp-type couplings, adapter flanges, and flexible pipe couplings the same as the adjacent pipes.

### 3.21 PRESSURE TESTING

See Standard Specification Section 15144 for pressure testing requirements.

### 3.22 DISINFECTION

See Standard Specification Section 15141 for chlorination requirements.

END OF SECTION