



Standard Specifications for Potable Water,  
Recycled Water and Sewer Facilities

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## **WATER AGENCIES' STANDARDS**

### **STANDARD SPECIFICATIONS**

#### **SECTION 09910 FIELD PAINTING AND COATING**

##### **PART 1 GENERAL**

###### **1.01 DESCRIPTION**

This section includes materials and field application of painting and coating systems for exposed surfaces.

###### **1.02 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C 210	-	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C 218	-	Liquid Coating Systems for the Exterior of Aboveground Steel Water Pipelines and Fittings
SSPC	-	Steel Structure Painting Council

###### **1.03 RELATED WORK SPECIFIED ELSEWHERE**

WAS Standard Drawings  
WAS Standard Specifications 01000, 02223, 09915, 15000, 15041, 15044, 15056, 15061, 15064, 15065, 15074, 15102, 15108, 15112, and 15300.

###### **1.04 RESTRICTION ON CONTACT WITH POTABLE WATER**

- A. Under no circumstances shall paint materials specified in this Section be used where they may come in contact with the public water supply or for buried installations. These products are intended for exposed exterior use only.
- B. Painting and coating materials in contact with potable and recycled water or for buried installations shall be in accordance with Section 15000.

###### **1.05 QUALITY CONTROL**

- A. Notify the District 48 hours in advance of field operations involving surface preparation and coating application.
- B. The District will inspect shop-and field-prepared surfaces. The Contractor shall not proceed with paint application until the surface preparation has been approved by the District Engineer.

- C. The District will inspect application of all prime, intermediate, finish, and touch-up coatings to verify the integrity of the coating and compliance with the specifications. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

**1.06 SURFACES NOT TO BE FIELD PAINTED**

- A. Generally, the following items or materials are not to be field painted unless specifically required elsewhere in the specifications:
1. Buried mortar-coated pipe and fittings.
  2. Stainless steel.
  3. Interior surfaces of valves, fittings and pipe.
  4. Nameplates.
  5. Grease fittings.
  6. Brass, copper, bronze, or galvanized items except as required for recycled water system identification.
  7. Buried pipe and appurtenances except as required in the piping specifications.

**1.07 COLOR AND PAINT SYSTEM SCHEDULE**

The following tables designate the color and paint system that shall be used on the District's various potable water and recycled water facilities.

Potable Water:

ITEM	COLOR	PAINT SYSTEM
Fire Hydrant	Safety Yellow	Acrylic or Epoxy/Urethane
Blow Off Box Lids	Safety Yellow	Acrylic Traffic Paint
Gate Well Lids	Safety Yellow	Acrylic Traffic Paint
Gate Well Lids - Fire Hydrant Valves	White	Acrylic Traffic Paint
Gate Well Lids - Normally Closed Valves	Safety Red	Acrylic Traffic Paint
Air/Vac Assemblies	Safety Yellow	Acrylic or Epoxy/Urethane
Air/Vac Enclosures	Chocolate Brown	Fusion Bonded Polyester (Section 09915)
Water Test Station Enclosures	Chocolate Brown	Fusion Bonded Polyester (Section 09915)
Protector Posts	Safety Yellow	Acrylic or Epoxy/Urethane
Vault Piping	Per Agency	Acrylic or Epoxy
Above Ground Piping	Per Agency	Acrylic or Epoxy/Urethane

Recycled Water:

ITEM	COLOR	PAINT SYSTEM
Gate Well Lids	Safety Purple	Acrylic Traffic Paint
Gate Well Lids – Normally Closed Valves	Safety Red	Acrylic Traffic Paint
Air/Vac Assemblies	Safety Purple	Acrylic or Epoxy/Urethane
Air/Vac Enclosures	Safety Purple	Fusion Bonded Polyester (Section 09915)
Water Test Station Enclosures	Safety Purple	Fusion Bonded Polyester (Section 09915)
Protector Posts	Safety Yellow	Acrylic or Epoxy/Urethane
Vault Piping	Safety Purple	Acrylic or Epoxy
Above Ground Piping	Safety Purple	Acrylic or Epoxy/Urethane

## **PART 2 MATERIALS**

### **2.01 GENERAL**

- A. Coating products and colors shall be selected from the tables above and the Approved Materials List.
- B. All materials of a specified paint system(s), including prime, intermediate, finish, and touch-up coats shall be provided by the same manufacturer.
- C. Thinners, cleaners, driers and other additives shall be as recommended by the coating manufacturer for the specified paint system(s) and shall be approved by the District Engineer.
- D. All coating products shall be delivered to the job site in original and unopened containers.

### **2.02 EPOXY PAINT SYSTEM**

Prime, Intermediate, Finish and Touch-Up Coats: VOC-compliant, two-component, chemically cured epoxy.

### **2.03 EPOXY/URETHANE PAINT SYSTEM**

Prime and Intermediate Coats: Field-applied, VOC-compliant, surface tolerant, two-component, chemically cured epoxy.

Finish and Touch-Up Coats: Field-applied, VOC-compliant, two-component, chemically cured aliphatic urethane semi-gloss enamel.

### **2.04 ACRYLIC PAINT SYSTEM**

Acrylic Paint System may be either solventborne or waterborne as described below:

- A. Solventborne Acrylic Paint System:

1. Prime, Intermediate, Finish and Touch-Up Coats: Field-applied, VOC-compliant, solventborne acrylic paint.
- B. Waterborne Acrylic Paint System:
  1. Prime, Intermediate, Finish and Touch-Up Coats: Field-applied, VOC compliant, waterborne acrylic paint.

## **2.05 ACRYLIC TRAFFIC PAINT SYSTEM**

Prime and Finish Coats: Field-applied, VOC-compliant, rapid-drying, weather and abrasion resistant waterborne acrylic paint containing 100% solids by volume.

## **2.06 PAINT COLORS**

- A. Safety Yellow, Safety Purple and Safety Red paint colors shall be as specified in Federal OSHA regulations.
- B. White paint color shall be as specified by the California Department of Transportation for striping.
- C. Chocolate Brown paint color shall be as specified in Section 09915.
- D. Successive coats of each paint color shall be of a slightly different shade, as directed by the District Engineer, to facilitate the inspection of surface coverage of each coat. The true colors specified above shall be used for all Finish and Touch-up coats.

# **PART 3 EXECUTION**

## **3.01 LIMITATIONS TO THE APPLICATION OF COATINGS**

- A. Apply coatings in accordance with the manufacturer's recommendations. Do not apply coatings under adverse weather conditions. If any of the following minimum conditions are present, the application of coatings shall be delayed or postponed until conditions are favorable.
  1. During rain, fog, or mist, or when the relative humidity exceeds 80 percent.
  2. When the surface to be coated is wet, moist, or contaminated with any foreign matter.
  3. When the surrounding air temperature or the temperature of the surface to be coated is below 13° C (55° F).
  4. When the temperature of the surface to be coated is more than 2.8° C (5° F) below the air temperature or when the surface temperature is 49 C (120° F) or above.
  5. When the surface temperature is less than 2.8° C (5° F) above the dew point or is expected to be so within twelve hours after application of coating.

- B. If a change in weather conditions results in damage to a newly applied coating, restore the affected coatings to their specified condition as directed by the District Engineer.

**3.02 PROTECTION OF SURFACES NOT TO BE PAINTED**

Remove, mask, or otherwise protect hardware, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, nameplates and other surfaces not intended to be painted. Protect working parts of mechanical and electrical equipment from damage during surface preparation and the painting process. Provide drop cloths or masking to prevent paint materials from dripping or accumulating on adjacent surfaces.

**3.03 FIELD TOUCH-UP OF SHOP-APPLIED PRIME COATS**

- A. Prior to field touch-up, prepare the surface in accordance with the manufacturer's recommendations and as directed by the District Engineer.
- B. Reapply primer as required to cover all scratched, abraded, or deficient areas.

**3.04 SURFACE PREPARATION**

- A. Do not prepare more surface area than can be coated in the same workday.
- B. Surface preparation shall conform to the SSPC specifications as follows:

Solvent Cleaning	SP-1
Hand Tool Cleaning	SP-2
Power Tool Cleaning	SP-3
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Pickling	SP-8
Near-White Blast Cleaning	SP-10
Power Tool Cleaning to Bare Metal	SP-11
- C. Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", "blast cleaning" or similar words are used in these specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC Surface Preparation Specifications listed above.
- D. Surface preparation shall be as specified herein, or as directed by the District Engineer.
- E. Unless otherwise directed by the District, do not blast-clean items that have previously been factory primed or painted.

### **3.05 PROCEDURES FOR APPLICATION**

- A. Conform to the requirements of SSPC-PA 1, Shop, Field, and Maintenance Painting. Follow the recommendations of the coating manufacturer, if more restrictive, including the selection of spray equipment, brushes, rollers, mixing, drying time, temperature and humidity limitations during application, and safety precautions. The Engineer will review procedures for the application of coatings. The Engineer's decision will be final as to interpretation and/or conflict between these Specifications and the recommendations of the coating manufacturer.
- B. Stir, strain, and keep coating materials at a uniform consistency during application. Where the Engineer permits thinning, do not reduce the coating material more than is necessary to obtain the proper application characteristics and to obtain the specified dry film thickness. Do not exceed the maximum thinning rate allowed by the manufacturer. Stir coating materials at all times when adding thinner.
- C. Apply each layer of coating evenly, free from brush marks, sags, runs, bridges, shiners, laps or other imperfections or other evidence of poor workmanship. Visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications. Finished surfaces shall be free from defects and blemishes prior to final acceptance.

### **3.06 EPOXY PAINT SYSTEM APPLICATION**

- A. Surface preparation for the Epoxy Paint System shall be in accordance with SSPC-SP-6, Commercial Blast Cleaning. If Commercial Blast Cleaning is not feasible, prepare surfaces in accordance with SSPC-SP-11, Power Tool Cleaning to Bare Metal.
- B. The Epoxy Paint System shall consist of an epoxy prime coat, an epoxy intermediate coat, and epoxy finish coat(s) to provide a total dry film thickness of 9 mils to 15 mils. Apply the coatings in accordance with the manufacturer's recommended film thickness, adding finish coats as necessary to meet the minimum total dry film thickness specified above.
- C. Observe minimum and maximum re-coat times and specified by the manufacturer. If these times are exceeded, the surface shall be re-prepared as recommended by the manufacturer and as directed by the District Engineer prior to receiving additional coats.

### **3.07 EPOXY/URETHANE PAINT SYSTEM APPLICATION**

- A. Surface preparation for the Epoxy/Urethane Paint System shall be in accordance with SSPC-SP-6, Commercial Blast Cleaning. If Commercial Blast Cleaning is not feasible, prepare surfaces in accordance with SSPC-SP-11, Power Tool Cleaning to Bare Metal.
- B. The Epoxy/Urethane Paint System shall consist of an epoxy prime coat, an epoxy intermediate coat, and compatible urethane finish coat(s) to provide a total dry film thickness of 9 mils to 15 mils. Apply the coatings in accordance with the manufacturer's recommended film thickness, adding finish coats as necessary to meet the minimum total dry film thickness specified above.
- C. Observe minimum and maximum re-coat times and specified by the manufacturer. If these times are exceeded, the surface shall be re-prepared as recommended by the manufacturer and as directed by the District Engineer prior to receiving additional coats.

### **3.08 ACRYLIC PAINT SYSTEM**

- A. Surface preparation for the Acrylic Paint System shall be in accordance with SSPC-SP-6, Commercial Blast Cleaning. If Commercial Blast Cleaning is not feasible, prepare surfaces in accordance with SSPC-SP-11, Power Tool Cleaning to Bare Metal.
- B. The Acrylic Paint System shall consist of an acrylic prime coat, an acrylic intermediate coat, and acrylic finish coat(s) to provide a total dry film thickness of 9 mils to 15 mils. Apply the coatings in accordance with the manufacturer's recommended film thickness, adding finish coats as necessary to meet the minimum total dry film thickness specified above.
- C. Observe minimum and maximum re-coat times and specified by the manufacturer. If these times are exceeded, the surface shall be re-prepared as recommended by the manufacturer and as directed by the District Engineer prior to receiving additional coats.

### **3.09 ACRYLIC TRAFFIC PAINT SYSTEM**

- A. Surface preparation for the Acrylic Traffic Paint System shall be in accordance with SSPC-SP-6, Commercial Blast Cleaning. If Commercial Blast Cleaning is not feasible, prepare surfaces in accordance with SSPC-SP-11, Power Tool Cleaning to Bare Metal.
- B. The Acrylic Traffic Paint System shall consist of a rapid-drying acrylic prime coat and a rapid-drying acrylic finish coat to provide a total dry film thickness of 6 mils to 10 mils.
- C. Observe minimum and maximum re-coat times and specified by the manufacturer. If these times are exceeded, the surface shall be re-prepared as recommended by the manufacturer and as directed by the District Engineer prior to receiving additional coats.

END OF SECTION

## **WATER AGENCIES' STANDARDS**

### **STANDARD SPECIFICATIONS**

#### **SECTION 13110 CATHODIC PROTECTION AND JOINT BONDING**

##### **PART 1 GENERAL**

###### **1.01 DESCRIPTION**

This section includes materials, testing and installation of corrosion protection and monitoring systems for metallic pipes including insulating flange kits, test stations, copper/copper sulfate reference electrodes, sacrificial anodes, wiring, and exothermic welds.

###### **1.02 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C217 -	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines
ASTM D 1248 -	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable
NACE RPO286 -	The Electrical Isolation of Cathodically Protected Pipelines
NACE RPO375 -	Application and Handling of Wax-Type Protective Coatings and Wrapper Systems for Underground Pipelines

###### **1.03 RELATED WORK SPECIFIED ELSEWHERE**

WAS Standard Drawings  
WAS Standard Specifications 01000, 02222, 02223, 03000, 15000, 15056, 15057, and 15061.

###### **1.04 SUBMITTALS**

Submit manufacturer's catalog data on wire and cable, copper sulfate reference electrodes, test stations, conduit, exothermic weld molds and charges, pipe flange insulation kits, pipe flange internal coating, wax tape system, plastic warning tape, sacrificial anodes, and any other required materials.

###### **1.05 MANUFACTURERS**

All materials furnished under this specification shall be standard products from manufacturers regularly engaged in the manufacture of such products and shall be the manufacturer's latest design that complies with the specification requirements.

## **1.06 PIPE JOINT BONDING CABLES**

Electrical continuity bonding cables shall be installed across all buried or submerged metallic inline valves, flexible couplings, grooved couplings, pipe joints that are not circumferentially welded, and all other pipe joints except flange joints equipped with insulation gaskets. Where shown on the drawings, bonding cables shall be installed in vaults.

## **1.07 GALVANIC ISOLATION**

All threaded outlets shall incorporate the use of an insulated ball valve for galvanic isolation of stray current.

Threaded outlets may incorporate the use of a nylon isolation bushing for galvanic isolation only with the approval of the District Engineer. Where the use of nylon bushings is required, the threaded outlet shall be increased in size to accept the bushing.

## **1.08 WARNING/IDENTIFICATION TAPE**

All cathodic protection test wires, cables and conduit shall include Warning/Identification Tape in accordance with Section 15000.

# **PART 2 MATERIALS**

## **2.01 GENERAL**

Items in this section shall be selected from the Approved Materials List in accordance with the Standard Drawings.

## **2.02 TEST STATION BOXES**

Cathodic test station boxes shall be circular precast concrete boxes with ductile-iron covers selected from the Approved Materials List

## **2.03 PREPACKAGED COPPER SULFATE REFERENCE ELECTRODE**

- A. Copper sulfate reference electrodes shall be constructed with an ion trap to prevent contamination. The reference electrode shall have a design life of 15 years and a stability of +/- 5 millivolts under a 3.0 microampere load.
- B. Provide reference electrodes with minimum No. 10 AWG HMW/PE (yellow) insulated wire. Each lead wire shall be long enough to extend to the corrosion monitoring test box plus 450mm (18") of slack without splices.
- C. Reference electrodes shall be prepackaged in a permeable cotton cloth bag with low resistivity backfill mixture to protect against the "drying out" type of failure. The backfill mixture shall be composed of 50% Gypsum and 50% Powdered Bentonite.

## **2.04 PREPACKAGED MAGNESIUM ANODES**

Prepackaged magnesium anodes shall be used in low current demand applications. The amount and size of magnesium anodes shall be as shown on the Approved Plans, and shall be installed in accordance with the Standard Drawings.

- A. Prepackaged magnesium anodes shall have galvanized steel rod cores encased in magnesium ingots. The ingot portion of anodes shall be of the weight as required on the Approved Plans.
- B. Provide magnesium anodes with minimum No. 8 AWG HMW/PE (black) insulated wire. Each lead wire shall be long enough to extend to the corrosion monitoring test box plus 450mm (18") of slack without splices.
- C. Magnesium anodes shall be prepackaged in a permeable cloth bag with low resistivity backfill mixture and shall be selected from the Approved Materials List.

## **2.05 SACRIFICIAL ANODES FOR COPPER TUBING**

Prepackaged zinc sacrificial anodes shall be installed and connected to copper tubing where indicated on the Approved Plans. Anodes shall be selected from the Approved Materials List and shall be installed in accordance with the Standard Drawings.

- A. Prepackaged zinc sacrificial anodes shall include a zinc-alloy ingot with galvanized steel core weighing not less than 6.8 kg (15 lbs.) and shall be packed in cloth bags filled with a mixture of gypsum and bentonite.
- B. Prepackaged zinc sacrificial anodes shall include an integral anode lead connected to the galvanized steel core of the ingot consisting of No. 12 AWG stranded copper wire with (black) THW insulation. Anode lead wires shall be a minimum of 7.62 m (25') long.

## **2.06 TEST CABLE AND BONDING CABLE**

All test cable and bonding cable shall be stranded copper wire with insulation rated at 600 volts. Cable with cut or damaged insulation is not acceptable. All cable shall be of sufficient length to extend from the point of connection to the appropriate corrosion monitoring test box without splices.

The cable shall have a 2.8mm (7/64") thick, high molecular weight polyethylene (HMW/PE) insulation specifically designed for cathodic protection service and suitable for direct burial in corrosive soil or water, conforming to ASTM D 1248, Type I, Class C, Category 5 (HMW/PE Type CP) Grade E-5 or J-1. Test cable shall have at least 450mm (18") of slack in the test box. Cable size shall be in accordance with the Standard Drawings.

## **2.07 PIPE FLANGE INSULATING KITS**

All pipe flange-insulating materials shall be of the type designated by the manufacturer as suitable for service at the operating temperatures and pressures of the pipeline.

- A. Insulating gaskets shall be full-face dielectric neoprene-faced phenolic.
- B. Insulating sleeves shall be full-length phenolic
- C. Insulating washers shall be phenolic.
- D. Steel bolts, nuts, and washers shall be in accordance with Section 15000.

## 2.08 ADDITIONAL SMOOTH EPOXY LINING AT INSULATED PIPE FLANGES

In addition to the cement mortar lining, the interior of the pipe at all insulated flanges shall be coated with a two-part smooth white liquid epoxy consisting of 100 percent solids.

## 2.09 TAPE WRAP FOR ABOVEGROUND INSULATED PIPE FLANGES

All aboveground insulated pipe flanges shall be wrapped with minimum 0.36mm (14 mil) thick general utility pipeline tape in accordance with the Approved Materials List.

## 2.10 WAX TAPE COATING FOR BURIED INSULATED PIPE FLANGES

All buried insulated pipe flanges shall be coated with a three-part, cold-applied wax tape coating system as described by NACE RPO375 and AWWA C217 in accordance with the Approved Materials List. Wax tape is also required where indicated on the Approved Plans.

- A. Primer: Primer shall be a blend of petrolatums, plasticizers and corrosion inhibitors having a paste-like consistency. The primer shall have the following properties:

Color	Brown
Pour Point	37.8° C - 43.3° C (100° - 110° F)
Flash Point	176.7° C (350° F)
Coverage	0.41 L/M <sup>2</sup> (1 gal/100 sq. ft.)

- B. Wax Tape: Wax tape shall consist of a plastic-fiber felt, saturated with a blend of petrolatums, plasticizers, and corrosion inhibitors, forming a tape coating that is easily formable over irregular surfaces. The tape shall have the following properties:

Color	Brown
Saturant Pour Point	46.1° C - 48.9° C (115° - 120° F)
Thickness	1.27 - 1.78 mm (50 - 70 mils)
Tape Width	150mm (6")
Dielectric Strength	170 volts/mil

- C. Tape Outerwrap: Wrapper shall be a polyvinylidene chloride plastic with three 50-gauge plies wound together as a single sheet. The wrapper shall have the following properties:

Color	Clear
Thickness	0.0381 mm (1.5 mils)
Dielectric Strength	2000 volts/mil
Tape Width	150mm (6")
Water Absorption	Negligible

## 2.11 EXOTHERMIC WELD MOLDS AND WELD CHARGES

Wire-to-pipe connections shall be made using exothermic welds. Weld charges and mold sizes for various surface configurations and materials shall be in accordance with the manufacturer's recommendations.

## 2.12 REPAIR GROUT FOR EXOTHERMIC WELDS

Repair grout shall be in accordance with cement-mortar grout described in Section 15061.

### **2.13 BRASS IDENTIFICATION TAGS**

All wires terminating in CP Test Boxes shall be identified with brass tags securely attached to the wires with nylon fasteners. The tags shall be 38mm (1½") in diameter, 1.6mm (1/16") thick, and shall be die-stamped with identifying letters and numbers 6.4mm (¼") high.

### **2.14 WARNING/IDENTIFICATION TAPE**

Warning/Identification tape materials shall be in accordance with Section 15000 and the Approved Materials List.

### **2.15 CONCRETE**

Concrete shall be in accordance with Section 03000.

## **PART 3 EXECUTION**

### **3.01 CORROSION MONITORING TEST STATIONS**

All test stations shall be installed behind existing or proposed curbs or otherwise out of traffic lanes to allow safe access for personnel during testing in accordance with the Standard Drawings. A utility marker post shall be installed, in accordance with the Standard Drawings, when indicated on the Approved Plans.

### **3.02 EXOTHERMIC WELDS**

All cable-to-pipe connections shall be made using exothermic welds in accordance with the Standard Drawings.

- A. Preparation of Cable: Cut cable with a wire cutter to prevent deforming the cable ends. Remove only enough insulation from the cable to allow the weld connection to be made.
- B. Preparation of Pipe: The surface of the steel or ductile-iron pipe shall be ground or filed to a bright, shiny, clean and dry surface before welding the cable connection. For cement-mortar coated pipe, a nominal 75mm x 75mm (3" x 3") area of cement mortar shall be chipped off.
- C. Attachment of Cable to Structure: The attachment of the cable to the structure shall be made using an exothermic weld. The cable shall be held at a 30° to 45° angle to the surface when welding. Only one cable shall be attached with each weld. All cable-to-pipe welds shall be a minimum of 75mm (3") apart. All weld slag shall be removed from the weldment with a wire brush.
- D. Weldment Test: After the exothermic weld has cooled, the weld shall be tested by the Contractor for strength, in the presence of the District Engineer, by striking the weldment a sharp blow with a 0.91 Kg (2 lb.) hammer while pulling firmly on the cable. All unsound welds shall be re-welded and retested.
- E. Repair Grout: The area to be repaired shall be thoroughly clean and dry. Cement-mortar coating shall be repaired or replaced to original condition by hand-placing cement-mortar repair grout as directed by the District Engineer.

### **3.03 PIPE FLANGE INSULATING KITS**

Pipe flange insulating kits shall be installed at the locations shown on the Approved Plans and in accordance with the Standard Drawings and the manufacturer's recommendations. Insulation shall also conform to the National Association of Corrosion Engineers' Recommended Practice RPO286 "Electrical Isolation of Cathodically Protected Pipelines". Particular attention shall be paid to properly align the pipe flanges prior to inserting the bolts with insulating sleeves to prevent cutting of the sleeves and creating an electrical path when the bolts are tightened. Care shall be taken to prevent any moisture, soil, or other foreign matter from contacting any portion of the two mating pipe flanges or gaskets prior to or during installation. If any foreign matter contacts any portion of the insulated pipe flange, the entire pipe joint shall be disassembled, cleaned with a suitable solvent and dried prior to reassembly. Strictly follow the manufacturer's recommendations regarding the torque pattern of the bolts and the amount of torque to be used when installing the pipe flange insulating kit. Conductive grease shall not be used on the flange bolts or any other flange components under any circumstances. Refer to Field Testing below for testing of the flange insulation kits.

### **3.04 ADDITIONAL SMOOTH EPOXY LINING AT INSULATED PIPE FLANGES**

At all insulated pipe flanges, an additional two-part smooth epoxy lining shall be applied. The interior of the pipe and flanges shall be coated with the two-part smooth epoxy for a distance of two pipe diameters in each direction away from the insulated pipe flange.

- A. Surface Preparation: The surface preparation shall consist of wire brushing to remove all rust and scale and to provide a suitable surface for adhesion of the coating in accordance with the manufacturer's recommendations.
- B. Mixing the Coating: The two-part epoxy paint shall be mixed per the manufacturer's recommendations. The two-part epoxy shall be mixed thoroughly for at least two minutes by hand or with a mechanical mixer before being applied by brush.
- C. Applying The Coating: The application of the undiluted coating shall be made by brushing until a minimum dry film thickness (DFT) of 0.51mm (20 mil) is achieved. Each subsequent coat shall be applied before the preceding coat cures, which is normally within 3-6 hours. The application of the coating shall be per the guidelines and at the rate recommended by the coating manufacturer.

### **3.05 WAX-TAPE COATING FOR BURIED INSULATED PIPE FLANGES**

After continuity testing, all flange and pipe surfaces shall be clean and free of all dirt, grease, water or other foreign material prior to the application of the primer, wax tape, and tape outerwrap.

- A. Apply primer by hand or brush to all surfaces of the flanges. Work the primer into all crevices, around bolts and nuts, and completely cover all exposed metal surfaces. Extend the primer a minimum of 75mm (3") onto adjacent surfaces of the pipe or valve.
- B. Apply the wax tape immediately after the primer application. Cut short lengths of tape and place completely around each bolt head and nut. Work the tape into the crevices around the bolts and nuts. Wrap the wax tape spirally around the pipe and across the flanges to the other pipe or valve. Cover the entire primed area with wax tape using a minimum overlap of 55% of the tape width. Work the tape into the crevices and contours of the irregular shaped surfaces and smooth out so that there is a continuous protective layer with no voids or spaces under the tape.
- C. Apply the tape outerwrap to the completed wax tape installation. Wrap spirally around the pipe and across the flanges. Extend the plastic wrap 75mm (3") past the wax tape using a minimum overlap of 55% of the plastic material width to apply two layers of overwrap.

### 3.06 PREPACKAGED MAGNESIUM ANODES

Prepackaged magnesium anodes shall be placed a minimum of 1.5m (5') below the pipe in the trench or an augured hole. Soaking of the anode is not required. Backfill material around the prepackaged anodes shall be as specified for the pipeline trench. Installation shall be in accordance with the Standard Drawings.

### 3.07 SACRIFICIAL ANODES FOR COPPER TUBING

Prepackaged zinc sacrificial anodes shall be installed in accordance with the Standard Drawings.

#### A. Anode Location:

1. Anodes to be attached to new copper tubing installed by trenching shall be installed horizontally, and shall be located within the paved roadway approximately 1.52m (5') to 3.05m (10') from the edge of the roadway. New copper tubing trench shall be over-excavated at anode location to a depth necessary to provide 600mm (24") minimum vertical separation between new copper tubing and anode.
2. Anodes to be attached to existing copper tubing or to new copper tubing to be installed by boring shall be installed vertically in a 1.22m (4') deep, 200mm (8") minimum diameter augured hole located adjacent to the meter box.
3. Anodes to be attached to existing copper tubing in conjunction with the replacement of existing pipelines shall be installed horizontally, and shall be located within the new water main trench below the new water main. New water main trench shall be over-excavated directly below locations where new water main is to be connected to existing copper tubing to a depth necessary to provide 600mm (24") minimum vertical separation between copper tubing and anode.

B. Anodes shall be hand-placed into over-excavated trenches or augured holes. Anodes shall be handled with care and shall not be carried, suspended or dropped by holding the attached lead wire.

#### C. Anode Attachment:

1. Anodes to be installed within new copper tubing trenches or within augured holes as described above and intended for the protection of service laterals shall be attached to copper tubing within meter boxes. Anode lead wire shall be securely attached to the copper tubing between anode and meter box, 600mm (24") of excess wire shall be coiled above ground within the meter box and remaining wire shall be cut. 50mm (2") of insulation shall be removed from end of anode lead wire and bare wire shall be clamped to the vertical portion of the copper tubing lying immediately below the angle meter stop. Clamp shall be entirely brass or copper, selected from the Approved Materials List. Connection point must be waterproof and shall be securely wrapped with dielectric tape selected from the Approved Materials List.
2. Anodes to be installed within new copper tubing trenches or within augured holes as described above and intended for the protection of copper tubing for air valves shall be attached to copper tubing within air valve enclosures. Anode lead wire shall be installed through concrete air valve slab within 25mm (1") PVC sleeve, and 600mm (24") of excess wire shall be coiled and placed within the sleeve. 50mm (2") of insulation shall be removed from end of anode lead wire and bare wire shall be clamped to copper tubing 75mm (3") above concrete slab. Clamp shall be entirely brass or copper, selected from the Approved Materials List. Connection point must be waterproof and shall be securely wrapped with dielectric tape selected from the Approved Materials List.

3. Anodes to be installed within new water main trenches as described above and intended for the protection of existing copper tubing shall be clamped to copper tubing at a point approximately 25mm (3") from the corporation stop. Connection point shall be backfilled along with the new water main, and no excess wire is required. Clamp shall be entirely brass or copper, selected from the Approved Materials List. Connection point must be waterproof and shall be securely wrapped with dielectric tape selected from the Approved Materials List.
- D. Over-excavated trenches or augured holes in which anodes are placed shall be backfilled with select native material from which rock or other materials larger than 25mm (1") in diameter have been removed. Over-excavated trenches shall be backfilled with native materials up to the bottom of the new water main or copper tubing trench, which shall then be backfilled with select material in accordance with these Standard Specifications. Anode and native backfill shall be thoroughly wetted after installation.

### **3.08 COPPER SULFATE REFERENCE ELECTRODES**

Reference electrodes shall be placed 300mm (12") away from the pipe at spring line. Electrodes shall be placed opposite side of the pipe from anodes. Saturate packaged electrode in 18.9 liters (5 gallons) of water prior to installation. Backfill material around the electrode shall be as specified for the pipeline trench. Installation shall be in accordance with the Standard Drawings.

### **3.09 TEST CABLE**

All buried test cable requiring trenching to the test station box location shall be installed, without splices, in a conduit in the trench at a minimum depth of 600mm (24"). Trenches shall be compacted in accordance with Section 02223. Care shall be taken when installing wire and backfilling trench to prevent damage to the installation. Damaged wire shall be replaced in entirety.

### **3.10 WARNING/IDENTIFICATION TAPE**

Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings

### **3.11 BRASS IDENTIFICATION TAG**

Brass identification tags shall be used to identify all cables in all test boxes. Care shall be taken to accurately maintain the wire identities. The tags for all test cables shall be stamped with the District or Agency name, the pipeline size, the contents of the pipeline, and the direction of the connection point along the pipe, in accordance with the Standard Drawings. Copper sulfate reference electrode tags at cathodic test boxes shall be stamped "CuSO<sub>4</sub>". The tags shall be securely attached to each wire with nylon fasteners prior to pipe backfilling operations.

### **3.12 FIELD TESTING**

The Contractor shall test the cathodic protection installations in the presence of the District Engineer. Contractor shall notify District Engineer of proposed test dates and times a minimum of 48 hours in advance. As a practical approach, the Contractor may choose to verify pipe continuity and flange isolation (described in Items A and B below) prior to backfilling as an unofficial test. Official testing shall occur after the backfilling and installation of the test boxes..

- A. Pipeline Electrical Continuity Testing: Test the electrical continuity of all sections of pipe to be monitored between each pair of adjacent corrosion monitoring test stations or between the ends of pipe sections less than 152.4m (500') apart. Each pipe section shall be considered electrically continuous when the measured longitudinal resistance of each pipe section is no greater than 20% higher than the theoretical resistance of that section of pipe. If testing indicates inadequate electrical continuity, the Contractor shall excavate to investigate and locate improperly bonded pipe joints and make repairs until electrical continuity is accomplished to the satisfaction of the District Engineer.
- B. Insulated Pipe Flange Testing: Each insulated pipe flange will be tested for effective electrical isolation of the two mating pipe flanges. The insulated pipe flange shall be judged for effectiveness in accordance with NACE RPO286, Section 7, Field Testing and Maintenance." The Contractor shall replace or repair any insulated pipe flange assembly until electrical discontinuity is accomplished.
- D. Initial Reference CP Potential Measurements: The entire metallic piping system shall be tested to establish the base CP Potential measurement readings. The base data will be used for comparative purposes with future monitoring data. The baseline data shall include voltage measurements (+/- 1mV) between any permanent copper sulfate reference electrodes (+ voltmeter correction) and a reliable portable copper sulfate reference electrode (- voltmeter correction) placed directly in the CP test box.
- E. Sacrificial Anode Connectivity Testing: After installation of sacrificial anodes for copper tubing, the copper tubing and sacrificial anode lead wire shall be tested for connectivity to insure that the lead wire and the brass or copper clamp has been securely connected to the copper tubing. Test method shall be as directed by the District Engineer.

### **3.13 CATHODIC TESTING REPORT**

At the completion of the testing, a report of the results will be prepared and presented to the District Engineer. The report shall be typed and shall include, at a minimum, test locations, date of tests, name of technician, testing methods, voltage measurements, and theoretical and calculated resistance.

END OF SECTION

## WATER AGENCIES' STANDARDS

### STANDARD SPECIFICATIONS

#### SECTION 15000 GENERAL PIPING SYSTEM AND APPURTENANCES

##### PART 1 GENERAL

###### 1.01 DESCRIPTION

This section describes the requirements and procedures for piping systems (pressure pipe and gravity sewer pipe) and appurtenances that apply to a number of other complimentary Specification Sections. The items are listed in this section to avoid repetition in sections elsewhere. This section includes, but is not limited to, temporary pipelines, wet taps, flexible pipe couplings, grooved and shouldered end couplings, joint restraint systems, field touch up, bolts, nuts, polyethylene wrap, warning/identification tape, tracer wire, gate well and extension stems, meter boxes, abandonment and removal of existing facilities, salvage, and disposal.

###### 1.02 REFERENCE STANDARDS

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C105	- Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C111	- Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C200	- Steel Water Pipe – 6 In. (150mm) and Larger
AWWA C203	- Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot-Applied
AWWA C213	- Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines
AWWA C606	- Grooved and Shouldered Joints
AWWA C900	- Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100mm Through 300mm), for Water Transmission and Distribution
AWWA M11	- Steel Pipe - A Guide for Design and Installation
AWWA	- Guidelines for Distribution of Non-Potable Water
ASTM A 36/A 36M	- Standard Specification for Carbon Structural Steel
ASTM A 47/A 47M	- Standard Specification for Ferritic Malleable Iron Castings
ASTM A 53	- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 108	- Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
ASTM A 183	- Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A 283/A 283M	- Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A 307	- Standard Specification for Carbon Steel Bolts and Studs
ASTM A 325/A 325M	- Standard Specification for High-Strength Bolts for Structural Steel Joints
ASTM A 510/A 510M	- Standard Specification for General Requirements for Wire Rods and Course Round Wire, Carbon Steel

ASTM A 512	- Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A 536	- Standard Specification for Ductile Iron Castings
ASTM A 568/A 568M	- Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality and Cold Rolled
ASTM D 2000	- Standard Classification System for Rubber Products in Automotive Applications
ASTM F 593	- Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F 594	- Specification for Stainless Steel Nuts
ANSI B1.1	- Unified Inch Screw Threads
ANSI B1.2	- Gages and Gauging for Unified Inch Screw Threads
NSF	- National Sanitation Foundation
SSPWC	- Standard Specifications for Public Works Construction ("Greenbook")
California Administrative Code, Title 22	

### **1.03 RELATED WORK SPECIFIED ELSEWHERE**

WAS Standard Drawings

WAS Standard Specifications 02223, 03000, 13110, and all of Division 15.

### **1.04 LINING CONTAMINATION PREVENTION**

Volatile organic compounds present in the linings of items in contact with potable water or recycled water shall not exceed concentrations allowed by the latest requirements of the State Office of Drinking Water and Department of Health Services. Some products and materials may also require proof of NSF certification on the lining materials to be used.

### **1.05 TEMPORARY PIPELINES**

Temporary pipelines, where shown on the Approved Plans or required by the District Engineer, provide temporary service to customers during construction.

### **1.06 PIPE TAPPING (WET TAP)**

All pipe tap (wet tap) connections to existing pipelines, whether for mainline extension or service laterals, shall be performed by the District. The Contractor shall provide materials and labor to excavate, pour thrust block, backfill, compact, and repair pavement as indicated in this Section. With specific prior approval of the District Engineer or when directed by the District Engineer, the Contractor may perform wet taps in accordance with Appendix D.

### **1.07 JOINT RESTRAINT SYSTEMS**

Joint Restraint Systems may be used for PVC or ductile-iron pipe when shown on the Approved Plans or with prior approval of the District Engineer. Contractor shall submit shop drawings and catalog data for joint restraint systems in accordance with Section 01000.

## **1.08 POLYETHYLENE ENCASEMENT**

Polyethylene encasement shall be used for all ferrous metal materials not otherwise protectively coated.

- A. Polyethylene wrap or sleeves shall be used for the protection of buried ductile-iron pipe, appurtenances, and valves.
- B. Purple-colored polyethylene wrap or sleeves may also be installed around buried pipe for recycled water identification.

## **1.09 WARNING/IDENTIFICATION TAPE**

Warning/identification tape shall be installed to identify location of underground utilities and to act as a warning against accidental excavation of buried utilities. Warning/identification tape shall be used on all underground water and recycled water mains, potable and recycled water irrigation systems, sewer mains, and all related appurtenances. Warning/identification tape shall also be used on cathodic protection wiring systems and tracer wire brought into and out of access ports.

## **1.10 TRACER WIRE**

Tracer wire shall be installed on all buried water and recycled water mains for the purpose of providing a continuous signal path used to determine pipe alignment after installation. Tracer wire is not required in installation of sewer mains.

## **1.11 GATE WELLS**

Gate Wells shall be used for buried valves 50mm (2") and larger, unless otherwise indicated on the Standard Drawings. Gate well lids shall be used on all gate wells.

## **1.12 VALVE STEM EXTENSIONS**

Valves 100mm (4") and larger require valve stem extensions to be installed when the valve-operating nut is more than 1.5m (5') below grade or as required by the District Engineer. All valves 50mm (2") and smaller requiring the installation of a gate well shall include a valve stem extension in accordance with the Standard Drawings.

## **1.13 METER BOXES**

Meter boxes shall be used for 25mm (1") and 50mm (2") water meters and other appurtenances as shown on the Standard Drawings.

## **1.14 RECYCLED WATER IDENTIFICATION**

Facilities installed for the use of recycled water shall be identified with purple color coating, identification labels, or signs in accordance with Section 15151.

### **1.15 CURB IDENTIFICATION MARK FOR SERVICES**

The Contractor shall mark the location of all potable water, recycled water and sewer laterals at the curb crossing by stamping the face of the curb in 50mm (2") high letters as described below:

- A. Potable water laterals shall be stamped with a letter "W".
- B. Recycled water laterals shall be stamped with the letters "RW".
- C. Sewer laterals be stamped with a letter "S".

### **1.16 FIELD REPAIR OF DAMAGED COATINGS**

All surfaces of metallic appurtenances in contact with potable water and not protected from corrosion by another system shall be shop-coated by the manufacturer. Appurtenances with damaged coatings shall be repaired or replaced as directed by the District Engineer. Touch-up of damaged surfaces, when allowed by the District Engineer, shall be performed in accordance with the manufacturer's recommendations.

## **PART 2 MATERIALS**

### **2.01 TEMPORARY PIPELINES**

Temporary piping layout, materials and appurtenances shall be as indicated on the approved submittal.

### **2.02 FLEXIBLE PIPE COUPLINGS**

Flexible pipe couplings shall be in accordance with the Approved Materials List and as described below:

- A. Steel Couplings shall have middle rings made of steel conforming to ASTM A 36/A 36M, A 53 (Type E or S), or A 512 having a minimum yield strength of 207 MPa (30,000 psi). Follower rings shall be ductile-iron per ASTM A 536, or steel per ASTM A 108, Grade 1018 or ASTM A 510, Grade 1018. Minimum middle ring length shall be 175 mm (7") for pipe sized 150 mm (6") through 600 mm (24").
- B. Sleeve bolts shall be made of stainless steel per ASTM A193 and shall have a minimum yield strength of 276 MPa (40,000 psi), an ultimate yield strength of 414 MPa (60,000 psi), and shall conform to AWWA C111.

### **2.03 GROOVED END OR SHOULDERED COUPLINGS FOR DUCTILE IRON OR STEEL PIPE**

Grooved end or shouldered couplings shall be in accordance with the Approved Materials List and as described below:

- A. Use square-cut shouldered or grooved ends per AWWA C606. Grooved-end couplings shall be malleable iron per ASTM A 47, or ductile iron per ASTM A 536. Gaskets shall be per ASTM D 2000.

- B. Bolts for exposed service shall conform to ASTM A 183, 69 MPa (10,000 psi) tensile strength.

#### **2.04 JOINT RESTRAINT SYSTEMS**

Joint Restraint Systems shall be ductile-iron and shall consist of a split-ring restraint with machined (not cast) serrations on the inside diameter and connecting bolts, and shall be selected from the Approved Materials List.

#### **2.05 BOLTS AND NUTS**

Bolts and nuts shall be as indicated below and shall be selected from the Approved Materials List.

- A. Zinc-plated or fluoropolymer coated bolts and nuts shall be used for the installation of pipelines up to 500mm (20") diameter and shall be carbon steel conforming to ASTM A307, Grade A, unless otherwise indicated on the approved drawings. Bolts and nuts shall have standard ANSI B1.1, Class 2A coarse threads.
- B. Stainless steel bolts and nuts shall be used for the installation of pipelines 600mm (24") diameter and larger and for submerged flanges. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts, and Grade 8M for nuts.
- C. All bolt heads and nuts shall be hexagonal, except where special shapes are required. Bolts shall be of such length that not less than 6.4mm (¼") or more than 12.7mm (½") shall project past the nut in tightened position.

#### **2.06 POLYETHYLENE ENCASEMENT**

Polyethylene encasement shall be as indicated below and shall be selected from the Approved Materials List. Polyethylene materials shall be kept out of direct sunlight exposure.

- A. Polyethylene wrap and sleeves shall be a minimum 0.203mm (0.008" or 8 mil) thick linear low-density polyethylene film in accordance with AWWA C105.
- B. Polyethylene wrap and sleeves shall be clear for use with potable water and purple for use with recycled water.
- C. Polyethylene encasement shall be secured with 50mm (2") wide polyethylene or vinyl adhesive tape or with plastic tie straps.

#### **2.07 WARNING/IDENTIFICATION TAPE**

Warning/identification tape shall be as indicated below and in accordance with the Approved Materials List.

- A. Tape shall be an inert, non-metallic plastic film formulated for prolonged underground use that will not degrade when exposed to alkalis, acids and other destructive substances commonly found in soil.
- B. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.

- C. Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows:

<u>Printed Message</u>	<u>Tape Color</u>
Caution: Waterline Buried Below	Blue
Caution: Recycled Waterline Buried Below	Purple
Caution: Sewerline Buried Below	Green
Caution: Cathodic Protection Cable Buried Below	Red
Caution: Electric Line Buried Below	Red

Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

- D. Tape shall be minimum 0.102mm (0.004" or 4 mil) thick x 150mm (6") wide with a printed message on one side. Tape used with the installation of onsite potable and recycled water irrigation systems shall be a minimum of 75mm (3") wide.

## 2.09 TRACER WIRE

Tracer wire shall be as indicated below and shall be selected from the Approved Materials List.

- A. Tracer wire shall be #14 AWG solid copper UF type wire with cross-linked polyethylene insulation. The insulation shall be white or yellow in color.
- B. Wire splices (at pipe tees, crosses and laterals) shall be accomplished using a direct bury silicone-filled capsule tube with standard wire nut or silicone-filled wire nut connectors of the appropriate size selected from the Approved Materials List.

## 2.10 GATE WELLS

- A. Gate wells for valves 50mm (2") and smaller shall be 100mm (4") diameter SDR-35 PVC sewer pipe selected from the Approved Materials List.
- B. Gate wells for valves larger than 50mm (2") shall be 200mm (8") diameter Class 305 C900 PVC pipe selected from the Approved Materials List.
- C. Gate wells for use in potable water system applications shall be white or blue. Gate wells for use in recycled water system applications shall be purple or shall otherwise be identified in accordance with Section 15151.
- D. Gate well lids shall be circular ductile-iron selected from the Approved Materials List and shall include a skirt for a close fit inside the upper portion of the gate well. Lids shall be cast with the District's name and the word "WATER" for use on potable water systems or the word "RECYCLED" for use on recycled water systems.
- Gate well lids for valves 50mm (2") and smaller shall be 100mm (4") diameter with 64mm (2-1/2") long skirt.
  - Unless otherwise indicated on the Approved Plans or directed by the District Engineer, gate well lids for valves larger than 50mm (2") shall be Type I in accordance with Standard Drawing WV-01 and selected from the Approved Materials List.

3. When indicated on the Approved Plans or when directed by the District Engineer, gate well lids for valves larger than 50mm (2") shall be Type II in accordance with Standard Drawing WV-02 consisting of a two-piece machined ductile-iron frame and lid selected from the Approved Materials List.

## 2.11 VALVE STEM EXTENSIONS

Stem extensions shall be complete with operating nut, location ring, and lower socket to fit valve-operating nuts. The configuration of the extension stem socket shall match that of the valve it operates.

- A. Valve stem extensions for valves 50mm (2") or smaller shall be in accordance with Standard Drawing WV-05.
- B. Valve stem extensions for valves 100mm (4") or larger extensions may be round or square hot-dipped galvanized steel tubing of solid design (no pinned couplings permitted) with guides in accordance with Standard Drawing WV-04.

## 2.12 METER BOXES

Meter boxes shall be selected from the Approved Materials List.

- A. Meter box sizes shall be as follows:

<u>Meter box size</u>	<u>Meter box uses</u>
250mm x 500mm (10" x 20")	25mm (1") water services
325mm x 600mm (13" x 24")	25mm (1") dual domestic/fire water services
425mm x 750mm (17" x 30")	50mm (2") water services and 50mm (2") through 150mm (6") blowoff assemblies

- B. Meter box lids for use in potable water system applications shall be gray.
- C. Meter box lids for use in recycled water system applications shall be purple.

## 2.13 RECYCLED WATER IDENTIFICATION

Pipe and appurtenances used for recycled water shall be manufactured in purple color or shall otherwise be identified in accordance with Section 15151.

# PART 3 EXECUTION

## 3.01 TEMPORARY PIPELINES

- A. All temporary piping, fittings, and service connections shall be furnished, installed, and maintained by the Contractor, and the Contractor shall make connections to a water source designated by the District Engineer.

- B. All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, clean, and suitable for conveying potable water in the opinion of the District Engineer.
- C. The temporary pipe shall be installed in such a manner that it will not present a hazard to traffic and will not interfere with access to homes and driveways along its route.
- D. Valves shall be installed at 60m (200') intervals or as directed by the District Engineer. The use of pressure reducing valves (PRV) may be required as directed by the District Engineer.
- E. The Contractor shall be responsible for disinfecting all pipe, connections, flushing, and assisting the District in taking water samples for bacteriological testing in accordance with Section 15041.
- F. Following disinfection and acceptance of the temporary pipe as a potable water system, the Contractor shall maintain continuous service through the temporary piping to all consumers normally served both directly and indirectly by the pipeline.
- G. Upon completion of the work, the Contractor shall remove the temporary piping and appurtenances and shall restore all surfaces to the satisfaction of the District Engineer..
- H. If repairs to temporary piping are necessary, Contractor shall make such repairs in a timely manner as directed by the District Engineer. If progress in making repairs is inadequate, or in the event of emergency, the District Engineer may take immediate corrective measures, which may include the performance of repair work by District forces or another contractor. All costs for corrective measures shall be borne by the Contractor.

### **3.02 CONNECTION TO EXISTING FACILITIES (WET TAPS AND CUT-IN INSTALLATIONS)**

Unless otherwise indicated on the Approved Plans or specifically directed by the District Engineer, all connections to existing facilities, including wet taps on active pipelines and cut-in installations, shall be performed by District personnel. When the Approved Plans indicate wet taps or cut-in installations are to be performed by Contractor, or when Contractor has the specific written permission of the District Engineer to perform wet taps or cut-in installations, such work shall be performed in strict accordance with the following procedures. In addition, wet taps shall be performed in accordance with Appendix D. The District Engineer must approve all work performed by Contractor prior to allowing access to the work site by District personnel.

The Contractor shall furnish the tapping sleeve or tee, valves and all other materials as called for in the Standard Specifications in accordance with the Approved Materials List. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including but not limited to thrust blocks, backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck or temporary piping as part of the equipment for making the connections. In addition, the Contractor shall assist the District in alleviating any hardship incurred during a shutdown for connections. Emergency standby equipment or materials may be required of the Contractor by the District Engineer.

Wet taps or cut-in tee and valve installations shall be performed as follows:

- A. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The District Engineer shall inspect the pothole prior to Contractor's repair of trench. Refer to Section 01000 for protection of existing facilities. Contractor shall record the following information on as-built drawings:

1. Pipe size, outside diameter.
  2. Pipe type such as ACP, PVC, Ductile-Iron or Steel.
  3. Pipe class and/or pressure rating.
  4. Elevation, grade, and alignment.
  5. Location of collars, pipe bells, fittings or couplings, if found.
  6. Potential conflicts with existing utilities.
- B. To facilitate the proposed connection and allow for slight adjustments in alignment, the Contractor shall leave a minimum 3.0m (10') gap between the new pipe installation and the proposed connection point at the existing water main. The Contractor shall leave a gap longer than 3.0m (10') if conditions warrant, or if directed by the District Engineer.
- C. The new pipeline shall have successfully passed pressure testing in accordance with Section 15044 and disinfection and bacteriological testing in accordance with Section 15041 prior to proceeding with the connection to the existing pipeline.
- D. After the District Engineer has given approval to proceed with the connection, the Contractor shall schedule with the District Engineer for the wet tap or cut-in installation.
1. Shutdowns will be scheduled at the convenience of the District. Shutdowns may be scheduled for nights or weekends if required.
  2. The Contractor shall give the District Engineer a minimum of five (5) working days notice prior to any proposed excavation or shutdown of existing mains or services. Scheduling shall be subject to approval by the District Engineer.
  3. The District Engineer may postpone or reschedule any shutdown operation if, for any reason, the District Engineer believes that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with the connection.
  4. If progress in completing the connection within the time specified is inadequate, the District Engineer may order necessary corrective measures. Corrective measures may consist of directing District personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.
- E. Contractor may proceed with excavation only when pothole has been completed, materials have been approved and delivered, wet tap or cut-in installation has been scheduled and a copy of the approved traffic control plan has been supplied to the District Engineer.
1. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.
  2. The Contractor shall provide lights, barricades and traffic control in accordance with the agency of jurisdiction and as deemed necessary for the excavation by the District Engineer.

3. The Contractor shall de-water existing mains where cut-in installations are required in the presence of the District Engineer and in accordance with Section 15041 and 02223. The Contractor shall be prepared to deal with leaking valves and water from those valves to complete the shutdown. Only District personnel are authorized to operate existing valves. The Contractor shall be responsible for any and all damage resulting from unauthorized operation of existing District facilities.
4. In areas where cut-ins are to be performed the Contractor shall line the bottom of the trench with 300 to 450mm (12" to 18") of 19mm ( $\frac{3}{4}$ ") rock and install a 300 to 400mm (12" to 16") deep sump for dewatering the trench bottom.
5. The District shall perform the following work for wet taps and cut-in installations:
  - a. Wet taps: Disinfect and install the tapping saddle and tapping valve and perform tapping operations in accordance with Appendix D.
  - b. Cut-ins: Cut and remove portions of existing mains, and disinfect and install tees, valves, couplings, and appurtenances required to complete the closure. The Contractor shall discard pipe and appurtenances removed from service in accordance with this Section.
6. After the District has performed tapping or cut-in operations, and the District Engineer has given approval to proceed, the Contractor shall complete the installation as shown on the Approved Plans in accordance with the Standard Specifications including, but not limited to:
  - a. Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.
  - b. Installing and setting the valve gate well(s) in accordance with the Standard Drawings.
  - c. Installing thrust and anchor blocks in accordance with Section 03000.
  - d. Completing all backfill and compaction of the trench in accordance with Section 02223.
  - e. Repairing or replacing pavement as necessary in accordance with agency of jurisdiction requirements.

### **3.03 FLEXIBLE PIPE COUPLINGS**

Flexible pipe couplings shall be installed in accordance with the manufacturers recommendations and as described below:

- A. Use plain-end pipe with flexible couplings per AWWA C200. Provide joint harnesses per AWWA M11 for aboveground applications or where indicated on the Approved Plans.
- B. Flexible couplings may be used only where indicated on the drawings
- C. Clean oil, scale, rust, and dirt from the pipe ends and touch up the epoxy coating and allow time for curing before installing the coupling. Clean the gaskets before installing.

- D. Follow the manufacturer's recommendations for installation and bolt torque using a properly calibrated torque wrench.
- E. Lubricate the bolt threads with graphite prior to installation.

### **3.04 GROOVED-END OR SHOULDERED COUPLINGS FOR DUCTILE-IRON OR STEEL PIPE**

Grooved-end or shouldered couplings shall be installed in accordance with the manufacturer's recommendations and as described below:

- A. Grooved-end or shouldered joint couplings shall be installed per AWWA C606 and the manufacturer's recommendations.
- B. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove and touch up the epoxy coating as necessary, allowing time for curing before installing the coupling.
- C. Clean the gasket before installation. Apply a lubricant selected from the Approved Materials List to the gasket exterior including lips, pipe ends, and housing interiors.
- D. Fasten the coupling alternately and evenly until the coupling halves are seated. Follow the manufacturer's recommendations for bolt torque using a properly calibrated torque wrench.

### **3.05 JOINT RESTRAINT SYSTEMS**

Joint Restraint Systems shall be installed as shown on the Approved Drawings, in accordance with the manufacturers' recommendations and as described below:

- A. Split ring restraint shall be installed on the spigot end of pipe, connected to a back-up ring which seats behind the bell of the adjoining pipe or fitting or directly to the fitting. All joint restraint devices shall be installed in accordance with the manufacturers' instructions
- B. Restraint devices may be installed prior to lowering pipe into the trench only with the approval of the District Engineer.

### **3.06 BOLTS AND NUTS**

- A. All bolts and nuts shall be new and unused. Bolts shall not be reused once tightened. Used bolts and nuts shall be discarded and removed from the job site.
- B. Bolts and nuts shall be cleaned, if needed, by wire brushing and shall be lubricated prior to assembly.
- C. Tighten nuts uniformly and progressively in a "star" pattern.
- D. Buried bolts and nuts shall receive a heavy coat of protective grease selected from the Approved Materials List prior to being wrapped with polyethylene.
- E. All stainless steel bolts shall be coated with an anti-seize compound selected from the Approved Materials List.

### **3.07 POLYETHYLENE ENCASEMENT**

- A. Polyethylene encasement shall completely encase and cover all metal surfaces.

Pipe and pipe-shaped appurtenances: All ductile-iron pipe and pipe-shaped appurtenances such as bends, reducers and offsets shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C105, or with polyethylene wrap in accordance with Method C described in AWWA C105.

Odd-Shaped Appurtenances: Odd-Shaped Appurtenances such as tees and crosses shall be encased with polyethylene wrap in accordance with AWWA C105.

Valves: Valves shall be encased with polyethylene wrap in accordance with AWWA C105 such that only the stem and operating nut are exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

- B. Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps in a manner that will hold the wrap securely in place during backfill.

### **3.08 WARNING/IDENTIFICATION TAPE**

Warning/Identification Tape shall be installed as described below and in accordance with the Standard Drawings.

- A. Tape shall be placed at the top of the pipe zone 300mm (12") above and centered over the utility intended for identification. Tape used with onsite potable and recycled water irrigation systems shall be installed at 150mm (6") above the pipe.
- B. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blowoffs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 600mm (24") for continuous coverage.
- C. Tape shall be installed prior to placement of the Trench Zone Backfill.

### **3.09 TRACER WIRE**

Tracer wire shall be installed as described below and in accordance with the Standard Drawings.

- A. Tracer wire shall be installed with all water and recycled water mains.
- B. Wire shall be placed on the top centerline of the pipeline and shall run continuously along the entire length of pipe prior to placement of trench backfill. Wire shall be mechanically and electrically continuous throughout the pipeline, including within pipe casings.
- C. Tracer wire shall be secured to the pipe at 1.8m (6') intervals with plastic adhesive tape, duct tape or plastic tie straps. The wire may alternately be secured to the pipe by looping the tracer wire around itself such that tracer wire remains continuous atop the pipe during backfill operations.



- B. Valves 100mm (4") and larger require valve stem extensions to be fabricated and installed in accordance with the Standard Drawings when the valve-operating nut is more than 1.5m (5') below grade. Stem extensions shall be of sufficient length to bring the operating nut to a point between 300mm (12") and 450mm (18") below the gate well lid.

### **3.12 METER BOX INSTALLATIONS**

Meter boxes shall be installed at the elevations and locations shown on the Approved Plans and in accordance with the Standard Drawings. Near the completion of the project, a final meter box adjustment to finish grade may be required. Water meters shall not be installed until final adjustments are made to the meter box and are approved by the District Engineer.

### **3.13 INSTALLATION OF TEMPORARY END CAPS TO MAINTAIN SERVICE**

Before excavating for new mains that are to replace existing pipes or services, it may be necessary to install temporary end caps on existing pipes that are later to be abandoned or connected to in order to maintain service to customers or fire protection during construction. When indicated on the Approved Plans or when directed by the District Engineer, Contractor shall install and maintain such temporary end caps as indicated below and in accordance with the Standard Drawings.

- A. For existing water mains 350mm (14") or less in diameter, the existing pipe shall be cut cleanly and fitted with a rubber-gasketed ductile-iron solid end cap specifically designed for the size and type of pipe being temporarily capped. The temporary end cap shall be adequately braced with a concrete thrust block poured against undisturbed material or as otherwise required to insure that no movement or leakage occurs.
- B. Temporary end caps shall be fitted with 50mm (2") tapped outlets in accordance with the Standard Drawings to provide temporary 50mm (2") blowoffs or connections to temporary water sources if indicated on the Approved Drawings or if directed by the District Engineer.
- C. Existing pipes 400mm (16") or larger shall not be fitted with temporary end caps.

### **3.14 PERMANENT ABANDONMENT OF PIPELINES AND APPURTENANCES**

When indicated on the Approved Plans or when directed by the District Engineer, existing pipelines to be abandoned shall be disconnected from all source pipelines and shall remain in place in accordance with the Standard Drawings and the modifications and instructions listed below:

- A. All above-ground appurtenances connected to pipelines to be abandoned shall be removed and disposed of or salvaged in accordance with this Section.
- B. All piping and appurtenances buried at a depth of 600mm (24") or less and connected to pipelines to be abandoned shall be removed and disposed of or salvaged in accordance with this Section. Remaining pipe ends, gate wells and other appurtenances cut at a depth of 600mm (24") shall be removed entirely or filled with concrete. Excavated areas shall be replaced with compacted backfill and surfaces shall be repaired in accordance with these Standard Specifications.

- C. Pipe 100mm (4") and smaller to be abandoned shall be excavated at intervals of 60m (200'), short sections of pipe shall be removed, and pipe ends shall be encased in concrete.
- D. Pipe 150mm (6") through 350mm (14") to be abandoned shall be excavated at intervals of 60m (200'), and pipe shall cut and plugged with concrete in accordance with the Standard Drawings or shall be entirely filled by pressure-grouting.
- E. When existing pipe 350mm (14") or less is excavated for abandonment, each excavation is considered as a single "cut-and-plug."
- F. Abandoned pipe 400mm (16") and larger shall be entirely filled by pressure-grouting or by blown sand.
- G. Ends of all pipe segments to be abandoned shall be filled with concrete in accordance with the Standard Drawings.
- H. All valves on pipelines to be abandoned shall be turned to the closed position.
- I. Water services to be abandoned that are connected to pipelines that will remain in service shall be abandoned in-place and deactivated at the corp stop in accordance with the Standard Drawings. Water services connected to pipelines to be abandoned shall be abandoned in-place and cut ends shall be crimped.
- J. Sewer laterals shall be cut and plugged with concrete at the main as directed by the District Engineer for the specific circumstance and material type identified.
- K. Sewer manholes shall have the cover and frame, concrete ring, grade rings and cone section removed. Inlet and outlet piping shall be plugged with concrete, manhole void shall be filled with sand, and a 300mm (12") thick, reinforced concrete slab shall be poured over the top of remaining manhole. The Contractor shall backfill hole to ground surface with compacted select fill.

### **3.15 REMOVAL OF PIPELINES AND APPURTENANCES**

- A. Existing pipe and appurtenances shall be completely removed when indicated on the Approved Plans or as directed by the District Engineer. All materials removed during construction operations shall be salvaged or disposed of in accordance with this Section.
- B. When fittings, appurtenances, or pipe segments are removed from pipelines that are to remain in service, the removed portions shall be replaced with straight segments of pipe and appropriate couplings selected from the Approved Materials List.
- C. Contractor shall provide measures that allow for the removal of existing sewer mains and appurtenances with no leakage of raw sewage. Transportation of sewer mains and appurtenances removed from service shall be in waterproof trucks to prevent raw sewage from leaking on public streets.
- D. Removal of asbestos-cement pipe (ACP) and sewer mains and appurtenances shall be in accordance with all applicable State and Federal requirements, and disposal shall be in accordance with the requirements of this Section.
- E. Backfill, compaction, and surface repair of all excavations for removal of pipe and appurtenances shall be made in accordance with the Approved Plans, these Standard Specifications, and in accordance with the requirements of the agency of jurisdiction or as directed by the District Engineer.

### **3.16 RECONNECTIONS**

Existing service laterals or appurtenances shall be connected to new pipelines as shown on the Approved Plans or as directed by the District Engineer. Contractor may encounter unused service laterals or piping appurtenant to an existing pipeline being replaced. Laterals and appurtenant piping that will not be connected to new pipelines shall be abandoned in accordance with the requirements of this Section.

### **3.17 SALVAGE**

When the Contractor is required to remove existing pipe and appurtenances, such materials may, when shown on the Approved Plans or directed by the District Engineer, be considered salvage. All materials identified as salvage are considered property of the District. The Contractor shall temporarily stockpile all material identified as salvage in a location that will not disrupt traffic or otherwise create an unsafe condition and shall deliver such materials as directed by the District Engineer.

### **3.18 DISPOSAL**

All materials removed during construction operations and not identified by the District Engineer as salvage shall be legally disposed of in accordance with all applicable Local, State, and Federal requirements.

Disposal of asbestos-cement pipe requires special handling and attention, including but not limited to, encapsulation within airtight packaging, submittal of certification letters and/or waste profile statements, and the use of a Cal-OSHA registered asbestos abatement contractor to transport and dispose of such wastes. The District Engineer shall be provided with copies of all applicable documentation regarding the transportation and disposal of asbestos-cement pipe. Contractor shall comply with all applicable regulations and all requirements of the disposal site. Contractor is responsible for all costs associated with disposal of materials, specifically including any materials that may contain asbestos.

END OF SECTION