

SECTION 15 WATER DISTRIBUTION

15.01 DESCRIPTION

This work shall include the furnishing of all the labor, materials, tools, incidentals and equipment to construct and complete in an efficient and workmanlike manner the installation of the water lines and appurtenances in accordance with the approved plans, these specifications and the Standard Details. All references to AWWA Standards in these specifications shall refer to the latest revision currently available.

15.02 MATERIALS

A. Mains and Services (4 inches and larger)

1. Pipe

- a. Polyvinyl Chloride Pipe (PVC) shall conform to AWWA C900 "Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water Distribution" and shall be Class 200 or Class 150.
- b. Polyvinyl Chloride Pipe (PVC) shall conform to AWWA C905 "Polyvinyl Chloride (PVC) Water Transmission Pipe, nominal diameter 14 inches through 36 " inches and shall have a minimum rated pressure of 165 psi.
- c. Ductile Iron Pipe (DIP) shall be AWWA C151 for a minimum working pressure of 150 psi with cement mortar lining conforming to AWWA C104 and with 8-mil polyethylene encasement conforming to AWWA C105.

2. Fittings

Fittings shall be push-on, mechanical, or flanged type ductile iron or cast iron and shall conform to AWWA C153 or AWWA C111. Coating and lining shall conform to AWWA C104, and shall have 8-mil polyethylene encasement. 10 mil wrapping tape shall be used on all 8 mil polyethylene encasement.

3. Valves and Valve Boxes

- a. All distribution valves in sizes from 4 inch up to, but excluding 12 inch shall be of the iron body, non-rising stem, resilient seat type gate valve as per AWWA Standard C509 or C515 and shall meet the following requirements:
 1. Valves shall open left and be provided with 2-inch square wrench nuts with the word "open" and an arrow cast in the metal to indicate direction to open.
 2. Valves shall have full opening flow-way of equal diameter as the nominal size of connecting pipe.
 3. The valve body and bonnet shall be epoxy coated, inside and out, with fusion bonded epoxy. Coatings shall conform to AWWA C550.

4. Valves shall have two (2) O-ring stem seals. The two (2) O-rings shall be replaceable with the valve fully open and with the valve subjected to full rated working pressure.
 5. All valves adjoining tees and crosses shall have flanged connections to the tee or cross.
 6. Valves shall be so designed that complete ZERO leakage may be affected with flow in either direction at pressures up to 200 psi, which shall be the working water pressure rating of the valves, and they shall be suitable for throttling, if required.
 7. Gate valves shall be Mueller A2360, American Flow Control series 2500, U.S. Pipe, or approved equal.
- b. All valves in sizes 12 inches and larger shall be butterfly valves and shall be of the rubber-seated, tight-closing type conforming to AWWA C504, latest revision Class 150B for buried service and shall meet the following requirements:
1. Valves shall be short body and the valve ends shall be flanged unless approved otherwise by the City Engineer.
 2. Valve body shall be constructed of cast iron ASTM A-126 Class B.
 3. Valve discs shall be cast iron ASTM A-126 Class B or ductile iron in conformance with ASTM A-536.
 4. Valve shafts shall be 18-8 type 304 stainless steel conforming to ASTM A-276.
 5. Valve seats shall be on the valve disc edge or in the valve body and shall be retained by positive mechanical means with corrosion resistant hardware. The valve seat shall be a minimum of 300 series stainless steel.
 6. Valve bearings shall be of the sleeve type and shall be self-lubricating and all bearings and bushings on the valve and operator shall be enclosed in watertight housings.
 8. Operators shall be the traveling nut type designed for an input torque of a minimum of three hundred (300) feet-pounds to the operating nut and shall include a standard AWWA two (2) inch wrench nut.
 9. Butterfly valves shall be Mueller, Lineseal III, Pratt Ground Hog, or approved equal.
 9. Valve body and accuator housing shall be coated with fusion-bonded epoxy inside and out.
- c. Valve boxes for gate and butterfly valves shall be Christy Concrete Products, Inc. No G5 or approved equal.

- d. The two (2) inch square operating nut on all gate and butterfly valves shall be installed at a minimum depth of four (4) feet measured from the top of the operating nut to finished grade. All operating nuts installed at a depth of greater than four (4) feet measured from finished grade shall include a valve extension. All valve extensions shall include a steadying plate.
 - e. Valve risers shall be PVC, SDR-35, eight (8) inches in diameter and shall extend from the top of the valve housing to the valve box. Valve risers shall include a notch at the top of the riser to accommodate water main tracer wire as shown on the Standard Details.
4. Fire Hydrants
- a. Fire hydrants shall be the wet barrel type conforming to AWWA C503, and shall meet the following requirements:
 - 1. Fire hydrants shall be either Clow Valve Company F800 series Model No. 860, Long Beach Iron Works, Inc. 400 series Model No. 430, or James Jones Company Model No. J4060.
 - 2. Fire hydrant outlets shall include one 4-1/2 inch pumper connection or outlet and two (2), 2-1/2 inch hose connections and each shall include “National Standard” threads.
 - 3. Hydrant risers shall be manufactured with localized break-off scoring.
 - 4. Fire hydrant mounting bolts shall be stainless steel type 304, of the break-off type, hex head, American Standard.
 - 5. Fire hydrants shall be spray painted with one primer coat and two finish coats of Lifemaster Pro Interior/Exterior Waterborne Acrylic Semi-Gloss Enamel, #4208-9400, “Safety Yellow” as manufactured by ICI Devoe Coatings or approved equal. For private fire hydrants, the color shall be #4200-9000, “Safety Red” as manufactured by ICI Devoe Coatings or approved equal. Private hydrants are defined as any hydrant not located within the City right-of-way and/or located beyond the backflow prevention device on a fire private service.
 - 6. All hydrant outlets shall have original caps with chains.
5. Air and Vacuum and Air Release Valves
- a. Air and vacuum and air release valves shall be Val-Matic Valve and Manufacturing Corporation Model 201C, Crispin UL10 or approved equal.
 - b. When required by the City Engineer, air and vacuum and air release valve boxes shall include locking bolts and/or washers to secure the steel lid in order to prevent the bolts from loosening after repeated traffic loading.
- B. Services (3/4 inch thru 2 inch)
- 1. Pipe
 - a. Service pipe shall be polyethylene pressure pipe meeting the requirements of AWWA C901 and designated PE 3406 or PE 3408, with a minimum rated pressure of 200 psi and furnished in iron pipe size (IPS.)

- b. Copper service pipe, if required by the City Engineer, shall be copper tubing conforming to ASTM Designation B88, Type K, soft tempered.
2. Corporation Stops
 - a. Corporation stops for $\frac{3}{4}$ and 1-inch polyethylene services shall be Ford FB-1101, James Jones J-1936, Mueller B-25029, or approved equal, for compression connection outlet and inlet threaded into a service saddle.
 - b. Corporation stops for 1-1/2 and 2-inch services shall be Ford FB1101, James Jones J-1957, Mueller B-25029, or approved equal, for compression connection outlet and inlet threaded into a service saddle.
 - c. Corporation stops for $\frac{3}{4}$ inch and 1 inch copper service lines shall be Mueller B-25028, James Jones J1935, Ford FB1100, or approved equal, for flared copper connection outlet and inlet threaded into a service saddle.
 - d. Corporation stops for 1-1/2 inch and 2 inch copper service lines shall be Mueller B-25028, James Jones J-1935, Ford FB1100, or approved equal for flared copper connection outlet and inlet threaded into a service saddle.
 3. Service Saddles

AWWA C900 PVC Mains (4 inch through 12 inch)

 - a. Service saddles shall be Mueller H13000 series, Ford S90 series, Jones 996, or approved equal.
 - b. Service saddles for polyvinyl chloride (PVC) pipe shall be designed specifically for cast iron O.D. PVC C905 pipe. Saddles employing a U-bolt type of strap or saddle not fully contoured to the outside diameter of the pipe will not be permitted.

AWWA C905 PVC Transmission Mains

 - a. Service saddles shall be James Jones J969 (14 inch through 16 inch), Mueller BR2S, Ford 202BS (14 inch through 30 inch) or approved equal.
 - b. Service saddles for polyvinyl chloride (PVC) shall be designed specifically for cast iron O.D. PVC C905 pipe. Saddles employing a U-bolt type of strap or saddle not fully contoured to the outside diameter of the pipe will not be permitted.
 4. Angle Meter Stops

Polyethylene (PE) Service Pipe

 - a. $\frac{3}{4}$ and 1 inch: Ford BA 63-332W ($\frac{3}{4}$ " inch) BA 63-444W (1" inch); James Jones J-1962W, Mueller B-24259, or approved equal.
 - b. 1-1/2 and 2 inch: Ford BFA13-666W (1-1/2" inches), BFA13-777W (2" inches), James Jones J-1975W, Mueller B-24286, or approved equal.
 - c. 1-1/2 and 2 inch angle meter stops shall have compression adapters as necessary.
 5. Copper Service Pipe
 - a. $\frac{3}{4}$ " inch and 1" inch: Ford BFA 43-332W ($\frac{3}{4}$ " inch), BFA 43-44W (1" inch), James Jones J-1963W, Mueller H14255 or B24258, or approved equal.
 - b. 1-1/2" inch and 2" inch: Ford FV23-666W (1-1/2" inch), FV23-777W (2" inch), James Jones J-1525-F, Mueller H-14276, or approved equal.

6. Service Pipe Splice

A maximum of one (1) splice shall be permitted for each service installation.

Polyethylene (PE) Service Pipe

- a. Couplings shall be Ford C66 series, James Jones J-2609, Mueller H 1540 ($\frac{3}{4}$ " inch and 1" inch), or approved equal.
- b. Connections of polyethylene pipe shall be constructed using stainless steel inserts for reinforcement.

7. Service Taps of Water Main

- a. Adjacent taps of a water main shall not be closer than two (2) feet and shall be staggered. Curved pipes shall not be tapped if the radius of the bend is less than 300 times the pipe outside diameter. Taps will not be allowed within two (2) feet of a pipe joint.

C. Tracer wire

- a. Tracer wire shall be required on all non-ferrous water mains and services.
- b. Tracer wire shall be solid copper wire with U.S.E. rated insulation and minimum size of AWG #10.
- c. Tracer wires shall be interconnected at all pipe tees, pipe crosses and pipe services. Splices shall be "KURNEY" (split bolt) or "KUPLETAP". Installation tape shall be vinyl, electrical with two (2) coats of "Scotch Kote".
- d. Tracer wire shall be placed outside of the valve riser pipe and shall be placed in the notch at the top of the valve riser pipe as shown on the Standard Details.
- e. Tracer wire shall be taped to the top of the pipe at 10' feet intervals, and at all crosses, tees and elbows. When taping tracer wire to pipe, wrap the tape once around the tracer wire before securing it to the pipe.
- f. After backfill and compaction, but prior to paving, continuity testing of the tracer wire will be required. Any detected damages to the tracer wire shall be repaired before paving will be allowed.

D. Hot Taps - Tapping Tees

- a. Four (4) inch and larger tees shall not be cut into existing mains but "hot-tapped" using one of the following stainless steel AWWA 207 sleeves: Powerseal 3490, Romac SST III, Mueller H-304, or approved equal.
 1. All tapping sleeves shall be a drop bolt design with 304 (18-8) stainless steel including the body, side outlet and outlet flange, nuts and bolts, $\frac{3}{4}$ " inch test plug and all clamping elements. All welds on the 304 stainless steel tapping sleeves shall be fully passivated.
 2. The threads of the stainless steel clamping bolts shall be fluorocarbon coated. The bolts shall be five-eighths inch ($\frac{5}{8}$ " inch) diameter with National Coarse (NC) threads. Washers composed of Nylatron GS or approved equal shall be provided with the heavy hex stainless steel nuts.
- b. Two (2) inch and smaller services installed on existing mains shall be "hot-tapped" using service saddles and corporation stops as shown on the plans and/or specified herein.

E. Locating Service Lines

A two (2) inch x two (2) inch “W” shall be stamped, chiseled, cut, etc. on the top of the existing concrete curb on all water services directly above the location where the service crosses the flow line of the concrete gutter.

15.03 INSTALLATION

A. Handling of Materials

Water pipe, fittings, hydrants and valves must be carefully handled at all times. Only safe, suitable and proper equipment and appliances shall be used for the loading, hauling, unloading, handling and placing of materials. Special care shall be exercised so that the coating on pipe, valves and fittings will not be damaged. If such damage should occur, the coating shall be repaired to the satisfaction of the City Engineer. Chain slings will not be permitted. Pipe loaded on trucks or stacked one upon another shall be supported on wooden blocking. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

B. Laying Pipe

Each section of pipe and each fitting shall be thoroughly cleaned out before it is installed. All pipe, fittings, valves, etc. shall be carefully lowered into the trench by suitable tools or equipment, in such a manner as to prevent damage to the pipe, lining, coating, fitting or other appurtenances. Under no circumstances shall pipe accessories be dropped into the trench. Bevels shall be cut off ends of C900 pipe whenever pipe is being installed using mechanical joint fittings.

The pipe shall be laid true to line, with no visible change in alignment at any joint, unless curved alignment is shown on the plans.

When a curved alignment is shown on the plans the maximum deflection at any joint shall not exceed the manufacturer’s recommendation for the type of pipe and joint being used.

Thrust blocks of Class “A” concrete shall be cast-in-place at all bends, behind each tee, or each cross, which is valved in such a manner that it can act as a tee, and at the back of fire hydrants unless designated otherwise on the plans. The thrust block shall extend from the fitting to undisturbed soil, shall be kept clear of the joints, and shall be of such bearing areas as to assure adequate resistance to the force to be encountered. Class “A” concrete for thrust blocks shall conform to Section 90-10 Minor Concrete of the State Standard Specifications. A certificate of compliance shall be submitted to the City Engineer prior to the placement of any Class “A” concrete for thrust blocks, stating that the concrete to be furnished meets all contract requirements including minimum cement content specified. The Contractor shall insure that the nuts and bolt heads of bolted connections are not covered by concrete or form materials. Thrust blocks shall be installed in conformance with the Standard Details.

Whenever pipe laying is discontinued for short periods, or when work is stopped at the end of the day, the open ends of all mains shall be closed with water-tight plugs or water-tight bulkheads. The plug or bulkhead shall not be removed unless or until the trench is dry.

Valves shall be set plumb and properly fitted to the adjacent sections of the main. A valve box shall be installed over each valve.

Pipe joints for water main pipe shall be made only with the couplings and gaskets specified herein, aligned and constructed in the trench in accordance with the manufacturer's instruction manual.

After assembly, the ends of the water main pipe within the coupling shall be separated a minimum of ¼ inch to allow for expansion and contraction. The final location of the gasket within each coupling shall be checked with a gauge.

Pipe joint restraints shall be used as shown on the plans and/or as approved by the City Engineer. Joint restraint devices for Polyvinyl Chloride (PVC) pipe shall be EBAA Iron, Inc. Series 2000PV for mechanical joints, Series 1600 and Series 2800 for bell and spigot joints or approved equals.

Joint restraints shall have 8-mil polyethylene encasement conforming to AWWA C105. Such encasement shall be secured using 10 mil wrapping tape.

C. Installation of Service Lines

The water service line shall be considered as a part of the main for the purpose of hydrostatic test. Water services may be bored upon approval of the City Engineer.

D. Installation of Fire Hydrants

Fire hydrants shall be installed per these specifications and Standard Details No. 515, 516 and 517. All newly installed fire hydrants shall be fully covered with burlap or black plastic and secured until such time that they are to be put into service. All existing fire hydrants, which are abandoned and not immediately removed shall be fully covered with burlap or black plastic and secured until such time that they are removed. The Contractor shall notify the City Fire Administration office at (916) 373-5807 during normal business hours from 8:00 a.m. to 5:00 p.m. Monday through Friday immediately after a new fire hydrant is put into service and immediately after an existing fire hydrant is removed from service. If a new hydrant is put into service or an existing fire hydrant is removed from service outside of normal business hours, the Contractor shall immediately notify the Fire Captain at Fire Station No. 1. The telephone number for Fire Station No. 1 is (916) 373-5808.

All fire hydrants shall have a minimum clearance of four (4) feet measured from the center of the hydrant to any obstruction, including, but not limited to, fences, trees, signs, street light poles, and utility poles. Fifteen (15) linear feet of curb on each side of the hydrant location shall be painted red with an approved water-based traffic paint.

E. Connection to Existing Mains

The Contractor shall make connections to existing mains where indicated on the plans. The newly installed facilities are to be kept isolated from the City system until bacteriologically acceptable.

Service in existing mains can be interrupted only upon authorization by the City Engineer who will specify the time and duration of the outage. The Contractor shall notify all affected users in writing at least 48 hours in advance of service interruption, using printed forms approved by the City.

Manipulation of existing valves shall only be done by or under the direction of the City Utility Maintenance Division personnel.

A work plan shall be developed for the new water main tie-in and reconnection of all services and appurtenances in accordance with the plans and specifications. The work plan shall include, but not be limited to, details of positive separation of the newly installed water mains from the existing water mains during chlorination, bacteriologic and hydrostatic testing, personnel, equipment and materials to be used together with a detailed work schedule of all connections shown in chronological order. Non-compliance with any stipulation of this section will be justification for the City to stop work.

The work plan complete with schedule and narrative shall be submitted to the City Engineer seven (7) days prior to commencement of work and shall be approved by the City Engineer prior to commencement of work.

All scheduled shutdowns to the water system shall be performed by the City's Utility Maintenance Division. To coordinate shutdowns, contact the Utility Maintenance Superintendent between 7:00 a.m. and 3:30 p.m., Monday through Friday a minimum of two (2) working days in advance of the required shutdown.

All water services shall be connected to the existing water main as shown on the plans and/or specified herein.

F. Water Service Interruption

Water service interruption of residences or businesses shall not exceed four (4) hours and shall be preceded by notification to residents or businesses a minimum of two (2) working days (48 hours) prior to shutdown of service. The notification of water service interruption shall be in a form approved by the City Engineer and shall be submitted to the City Engineer for approval a minimum of five (5) days prior to water service interruption.

G. Salvaging Water Mains and Appurtenances

Prior to delivery of salvaged valves, fire hydrants, etc. as specified on the plans and in the Contract documents, the Contractor shall coordinate with the Utilities Maintenance Superintendent for the delivery location within the City Corporation Yard. Asbestos cement pipe shall be properly disposed of by the Contractor.

To coordinate deliveries, contact the Utilities Maintenance Superintendent between 7:00 a.m. and 3:30 p.m. Monday through Friday at (916) 373-5850. The City Corporation Yard is located at 1951 South River Road in the City of West Sacramento.

H. Air Reliefs and Blowoffs

Air Relief Valve and Blowoff Assemblies shall be installed in accordance with the Standard Details.

I. Testing of Water Mains

After the pipe has been backfilled at least 24 inches over the top, each section of the pipe to be tested shall be slowly filled with water and all air shall be expelled from the pipe. Any connection to the existing water system shall be protected with an approved double check valve assembly. The release of the air can be accomplished by opening hydrants and service line cocks at the high points of the system and the blowoffs at the dead ends. The valves controlling the admission of water into the section of the pipe to be tested should be opened wide before shutting the hydrants or blowoffs. After the system has been filled with water and all air expelled, all valves controlling the section to be tested shall be closed and the line be allowed to set for a period of not less than 24 hours.

The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than 150 pounds per square inch or the service pressure plus 50 pounds, whichever is greater, for a period of two hours. The Contractor shall provide the necessary pump and clean calibrated container for measurement of make-up water required to replace leakage during this two (2) hour period. The two (2) hour hydrostatic test shall be conducted in the presence of the City Engineer.

All exposed pipe, fittings, valves, hydrants and joints shall be carefully examined during the pressure test. Any cracks or defective pipe, fittings, valves, or hydrants discovered during the test shall be removed and replaced with sound material and the test repeated until the system is proved satisfactory.

For a two (2) hour hydrostatic test, the allowable leakage in gallons shall be calculated using the following factor:

<u>Pipe Diameter</u>	<u>Factor</u>	<u>Allowable Leakage in Gallons</u>
2"	0.000474 x linear ft.=	
4"	0.000947 x linear ft.=	
6"	0.001420 x linear ft.=	
8"	0.001894 x linear ft.=	
10"	0.002367 x linear ft.=	
12"	0.002841 x linear ft.=	
14"	0.003314 x linear ft.=	
16"+		= 1 gal/mile/inch diameter

Any excavation required for testing or repairs shall be backfilled with aggregate base compacted to 95% relative compaction.

J. Sanitizing

All lines, mains, and branches shall be disinfected in accordance with AWWA Standard C651 "Disinfecting Watermains".

15.04 EXISTING WATER MAINS AND SERVICE

The City Utility Maintenance Division will make repairs to all water service laterals, water mains and related water system appurtenances damaged by the Contractor during the course of construction unless directed otherwise by the City Engineer. The Contractor/Developer shall be required to pay all labor, materials and equipment costs incurred by the City Utility Maintenance Division for the repairs made to damaged water service laterals, water mains, etc. provided that these existing water system appurtenances are properly "marked" during the Underground Service Alert (USA) notification period.

The City will bill the Contractor for the repairs and the bills will be paid by the Contractor/Developer prior to either the next monthly progress payment, prior to the final payment, or prior to final acceptance of the public improvement(s) by the City Council, whichever comes first. The Contractor/Developer shall provide to the City Engineer proof of payment of the repair bills prior to the issuance of either the monthly progress payment, final payment, or prior to final acceptance of the public improvement(s) by the City Council. The current labor and equipment rates for the City Utility Maintenance Division will be made available to the Contractor/Developer. The City shall have the right to deduct the total amount of any unpaid City repair bill from the money due or to become due the Contractor on any City Public Improvement Contract.

For private development projects, all utility repair bills must be paid by the Contractor/Developer prior to permit final, or before a Certificate of Occupancy will be issued by the City.

15.05 MEASUREMENT AND PAYMENT

Water main shall be measured horizontally by the linear foot through valves and fittings. Valves shall each be measured as one completed installed unit in operable condition including valve, anchor block, valve box and riser. Fire hydrants shall each be measured as one complete installed unit in operable condition including hydrant, break-off riser, hydrant bury thrust block, gate valve, valve box, concrete pad, paint and piping from main to bury. Air relief and blowoff assemblies shall each be measured as one complete unit in operable condition including valve, valve box, curb stop, corporation stop, service clamp and any other necessary fittings. Fittings, anchors, joint restraints and thrust blocks shall not be measured for payment.

The Contract price for water main and appurtenances shall constitute full compensation for all labor, materials, tools, equipment, incidentals and testing necessary to furnish and install the main and appurtenances in accordance with the plans and specifications.