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 City 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, four (4) inch through twelve (12) inch, for Water Distribution" and shall be DR-18 unless otherwise shown on the plans or required by the City Engineer.
      b. Polyvinyl Chloride Pipe (PVC) shall conform to AWWA C900 "Polyvinyl Chloride (PVC) Water Transmission Pipe, nominal diameter fourteen (14) inches through thirty-six (36) inches and shall have a minimum rated pressure of one hundred sixty-five (165) psi.
      c. Ductile Iron Pipe (DIP) shall be AWWA C151 for a minimum working pressure of one hundred fifty (150) psi with cement mortar lining conforming to AWWA C104 and with eight (8) mil polyethylene encasement conforming to AWWA C105.
   2. Fittings - Fittings shall be mechanical or flanged type ductile iron and shall conform to AWWA C153 or AWWA C111. Coating and lining shall conform to AWWA C104 and shall have eight (8) mil polyethylene encasement. Ten (10) mil wrapping tape shall be used on all eight (8) mil polyethylene encasement. Where bolts are required for mechanical couplings or fittings, all bolt hardware shall be Grade 304 Stainless Steel. Bold threads shall be coated with anti-seize compound prior to installation.
   3. Valves and Valve Boxes
      a. All distribution valves in sizes from four (4) inch up to, but excluding sixteen (16) inch or greater, 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:
         i. Valves shall open left and be provided with two (2) inch square wrench nuts with the word "open" and an arrow cast in the metal to indicate direction to open.

ii. Valves shall have full opening flow-way of equal diameter as the nominal size of connecting pipe.
iii. The valve body and bonnet shall be epoxy coated, inside and out, with fusion bonded epoxy. Coatings shall conform to AWWA C550.
iv. 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 subject to full-rated working pressure. All valves adjoining tees and crosses shall have flanged connections to the tee or cross.
v. Valves shall be so designed that complete ZERO leakage may be affected with flow in either direction at pressures up to two hundred (200) psi, which shall be the working water pressure rating of the valves, and they shall be suitable for throttling, if required.
vi. Gate valves shall be Mueller A2360, American Flow Control series 2500, U.S. Pipe, or approved equal.

b. All valves in sizes sixteen (16) 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:
i. Valves shall be short body, and the valve ends shall be flanged unless approved otherwise by the City Engineer.
ii. Valve body shall be constructed of cast iron ASTM A-126 Class B.
iii. Valve discs shall be cast iron ASTM A-126 Class B or ductile iron in conformance with ASTM A-536.
iv. Valve shafts shall be 18-8 type 304 stainless steel conforming to ASTM A-276.
v. 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.
vi. 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.
vii. 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.
viii. Butterfly valves shall be Mueller, Lineseal III, Pratt Ground Hog, or approved equal.
ix. Valve body and actuator 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 G05T (traffic rated) 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 pipe, SDR-35 or C900, 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:
      i. 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 or approved equal.
      ii. Fire hydrant outlets shall include one (1), four and one half (4-1/2) inch pumper connection or outlet and two (2), two and one half (2-1/2) inch hose connections and each fire hose connection shall include "National Standard" threads.
      iii. Hydrant risers shall be manufactured with localized break-off scoring.
      iv. Fire hydrant mounting bolts shall be stainless steel type 304, of the break-off type, hex head, American Standard. Bolts shall be pointed down with nuts on the bottom.
      v. New Fire hydrants shall be factory spray painted with one primer coat and two finish coats of Waterborne Acrylic Semi-Gloss Enamel, "Safety Yellow" or approved equal. For private fire hydrants, the color shall be "Safety Red" 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. For hydrant rehabilitation, hydrants shall be sprayed with Sherwin-Williams Pro Industrial DTM with semi-gloss finish or approved equal.
      vi. All hydrant outlets shall have original caps with chains.
      vii. All hydrant locations shall be identified with a blue reflective marker within the roadway as detailed in Standard Detail #516.
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 or approved equal. See City Standard Detail 510 for additional information.
   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. WATER SERVICES (THREE QUARTERS (3/4) INCH THROUGH THREE (3) INCH DIAMETER)
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 two hundred (200) psi and furnished in Iron Pipe Size (IPS.) Stainless steel inserts shall be required at fitting joints and pipe splices.

b. Brass service pipe, if required by the project plans or the City Engineer, shall be brass pipe conforming to ASTM Designation B43. Pipe fittings shall also be of brass equal in quality and service pressure. Anti-seize compound shall as part of the joining process with fittings. Anti-seize compound material shall be approved by the City Engineer.
c. Three (3) inch ductile iron service pipe or shall be minimum 175 psi ductile iron pipe conforming to ASTM Designation B43. Pipe fittings shall also be of ductile iron equal in quality and service pressure. Anti-seize compound shall as part of the joining process with fittings. Anti-seize compound material shall be approved by the City Engineer.

2. Corporation Stops
   a. Corporation stops for three quarters (3/4) inch and one (1) inch polyethylene services shall be Ford FB-1101, James Jones E-1936, Mueller E-25029N, or approved equal, for compression connection outlet and inlet threaded into a service saddle. All corporation stops and fittings shall contain no lead.
   b. Corporation stops for one and one half (1-1/2) inch and two (2) inch services shall be Ford FB-1101, James Jones E-1936, Mueller E-25029, or approved equal, for compression connection outlet and inlet threaded into a service saddle. All corporation stops and fittings shall contain no lead. Larger corporation stops shall be approved by the City Engineer.
3. Service Saddles

   AWWA C900 PVC Mains (four (4) inches through twelve (12) inches.

   a. Service saddles shall be Mueller H-13000 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 C900 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 C900 PVC Transmission Mains (greater than twelve (12) inch diameter).

   a. Service saddles require two strap saddle and shall be James Jones J969W (fourteen (14) inch through sixteen (16) inch), Ford 202BS (fourteen (14) inch through thirty (30) inch) or approved equal. Services on pipes sixteen (16) inches or greater require written City approval.
   b. Service saddles for polyvinyl chloride (PVC) shall be designed specifically for cast iron O.D. PVC C900 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. Three quarters (3/4) inch and one (1) inch: Ford BA 63-332W (three quarters

(3/4) inch) BA 63-444W (one (l) inch); James Jones E-1962W, Mueller E-24259N, or approved equal. Angle meter stops shall contain no lead.

b. One and one half (1-1/2) inch and two (2): Ford BFA13-666W with Ford C86-66 NL coupling (one and one half (l-l/2) inches), F o r d BFA13-777W with Ford C86-77 coupling (two (2) inches); James Jones E-1527F with James Jones E-2026 coupling (both diameter); Mueller B-24286 with Muller E-15429N coupling (both diameters); or approved equal. Angle meter stops and couplings shall contain no lead.

c. One and one half (1-1/2) inch and two (2) inch angle meter stops shall have compression adapters as necessary.

5. 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 C66-33-NL, James Jones J-2610, Mueller H- 15404N (three quarters (3/4) inch through two (2) inch or approved equal. Couplings shall contain no lead.
   b. Connections of polyethylene pipe shall be constructed using stainless steel inserts for reinforcement.
6. Service Taps of Water Main
   a. Adjacent taps of a water main shall not be closer than two (2) feet from closest edge of tap to closest edge of adjacent tap and shall be staggered. Curved pipes shall not be tapped if the radius of the bend is less than three hundred (300) times the pipe outside diameter. Taps will not be allowed within two (2) feet of a pipe joint from closest edge of tap.

C. TRACER WIRE AND WATER MAIN CAUTION TAPE
1. Tracer wire shall are required for all water mains and services.
2. Tracer wire shall be solid copper wire with U.S.E. rated insulation and minimum size of AWG #10. Color or insulation shall be blue.
3. Tracer wires shall be interconnected at all pipe tees, pipe crosses and pipe services. Splices shall be “KEARNEY” (split bolt) or “KUP-L-Tap.” Wrap splice with 3M Electrical Tape with “Scotchkote” Electrical Coating FD or approved equal. 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.
4. Tracer wire shall be taped with ten (10) mil tape to the top of the pipe at five (5) foot 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.
5. After trench backfill and compaction but prior to paving, continuity testing of the tracer wire will be required. Any detected damage to the tracer wire shall be repaired before paving will be allowed.
6. Caution Tape shall be required on all water mains and services. The Caution Tape shall be five (5) mil, twelve (12) inch wide, blue detectable tape continuously imprinted with “CAUTION BURIED POTABLE WATERLINE,” or approved equal wording. Caution Tape shall be placed above the initial backfill or a minimum of

eighteen (18) inches above the water main or service line. Subsequent repair shall require replacement of the Caution Tape, if damaged.

D. HOT TAPS - TAPPING TEES
   1. Three (3) inch and larger tees shall not be cut into existing mains but "hot- tapped" using one of the following stainless-steel AWWA 207 sleeves: Mueller H-304 or approved equal.
      a. 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, three quarters (3/4) inch test plug and all clamping elements. All welds on the 304 stainless steel tapping sleeves shall be fully developed.
      b. The threads of the stainless-steel clamping bolts shall be fluorocarbon coated. The bolts shall be five-eighths (5/8) inch diameter with National Coarse (NC) threads. Washers composed of Nylatron GS or approved equal shall be provided with heavy hex stainless steel nuts.
      c. Twp (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. The location of the tap shall be in accordance with Section 15.02 B.6 above.

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 coatings on the pipe, valves and fittings will not be damaged. If such coating 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.

   All water pipe, fittings, hydrants, and valves must be protected from the weather with suitable covering or other protection at the Contractor's expense. All flexible (not-rigid) pipe shall be delivered and handled by means which will provide adequate support to the pipe and does not subject it to undue stress or damage. When handling and placing pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal surface or rocks). The manufacturer's special handing requirements shall be strictly observed. Special care shall be taken to avoid impact when the pipe is handled at a temperature of forty (40) degrees or less. Pipe shall be

stored on a relatively flat surface so that the full length of the pipe is evenly supported. The pipe, fittings, and gaskets shall be covered with opaque material when outdoors for a period of fifteen (15) days or longer. Any pipe, fittings, or gaskets found to be damaged by weather or handling by the City Inspector shall be removed and replaced by the Contractor at their expense. The City Inspector has the sole authority to make such determination. Any materials found to be damaged or discolored by the weathering process shall be removed at the sole discretion of the City Engineer and replaced in a timely manner at the Contractor's expense.

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. Pipe shall be laid such that the manufacturer's label on the pipe is pointed up. Bevels shall be cut off ends of C900 pipe to a vertical cut with all burrs removed whenever pipe is being installed using mechanical joint fittings.

   The shortest allowable section of pipe to be used is five (5) feet in length, unless otherwise specifically approved by the City Inspector.

   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 4,000-psi minimum 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 joint bolting hardware, and shall be of such bearing areas as to assure adequate resistance to the force to be encountered. 4,000-psi minimum concrete for thrust blocks shall conform to Section 90-2 Minor Concrete of the State Standard Specifications. A certificate of compliance shall be submitted to the City Engineer prior to the placement of any 4,000-psi minimum concrete for thrust blocks, stating that the concrete to be furnished meets all contract requirements including minimum cement content specified. The Contractor shall ensure 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 free of standing water and the pipe laying process continues.

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 bell and spigot coupling shall be separated in accordance with the manufacturer's installation requirements 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 City Engineer. Joint restraint devices for Polyvinyl Chloride (PVC) pipe shall be EBAA Iron, Inc. Series 2000PV for mechanical joints, (four (4) inches through twenty-four (24) inches) and Series 2200 (thirty (30) inches through fifty-four (54) inches); Series 1600 and Series 2800 for bell and spigot joints; or approved equals.

Joint restraints shall have an eight (8) mil polyethylene encasement conforming to AWWA C105. Such encasement shall be secured using ten (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 Department Administration office at (916) 617-4600 and City Inspector during normal business hours from 8:00 a.m. to 5:00 p.m. Monday through Friday five (5) working days prior to a new fire hydrant is put into service and five (5) working days prior to 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 the City Fire Department Administrative Office.

   All fire hydrants shall have a minimum clearance of three (3) feet measured from the edge 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 tested and test results accepted by the City. 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 five (5) working days 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. Contact Utility Maintenance Supervisor at (916) 617-4850 three (3) working day in advance of required valve manipulation.

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 and as approved by the City Engineer. 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. The work plan shall also include notification of the City Fire Department and specific information related to the inactivation of building fire protection systems fire hydrants and any other fire protection system components, including the need for fire watch personnel. 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 three (3) working days in advance of the required shutdown. Contact number for the Utility Maintenance Superintendent is (916) 617-4850.

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 five (5) working days prior to shutdown of service. The notification of water service interruption shall be in a form approved by the City Engineer and City Fire Department. Written notification shall be submitted to the City Engineer and City Fire Department for approval a minimum of five working (5) days prior to issuing the notice of the water service interruption.

G. ABANDONMENT OF EXISTING WATER SERVICES

H. SALVAGING WATER MAINS AND APPURTENANCES - Prior to delivery of salvaged meters, 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) 617-4850. The City Corporation Yard is located at 4300 West Capitol Avenue in the City of West Sacramento.

I. RELIEFS AND BLOWOFFS - Air Relief Valve and Blowoff Assemblies shall be installed in accordance with the Standard Details.

J. TESTING OF WATER MAINS - After the pipe has been backfilled at least twenty-four (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 twenty-four (24) hours. If water services/appurtenances are to be tested with the Water Main, all services and appurtenances are to be set to final grade prior to starting test. Otherwise, services and appurtenances are to be tested separately.

   The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than one hundred fifty (150) pounds per square inch or the service pressure plus fifty (50) pounds, whichever is greater, for a period of two (2) 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's designated representative.

   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:

Pipe Diameter	Factor	Allowable Leakage in Gallons
	0.000474 x linear ft. =	
4 inch	0.000974 x linear ft. =	
6 inch	0.001420 x linear ft. =	
8 inch	0.001894 x linear ft. =	
10 inch	0.002367 x linear ft. =	
12 inch	0.002841 x linear ft. =	
14 inch	0.003314 x linear ft. =	
16+ inch		= 1 gal/mile/inch diameter

Any excavation required for testing or repairs shall be backfilled with aggregate base compacted to ninety-five (95) percent relative compaction.

K. SANITIZING AND BACTERIOLOGICAL TESTING - Contractor shall be responsible for sanitizing and bacteriological testing of all new and repaired water lines prior to City acceptance. All lines, mains, branches, and services (including repair work) shall be disinfected in accordance with AWWA Standard C651 "Disinfecting Water Mains" and any additional requirements, if required, by the City. Water used for disinfecting shall be potable and contain a minimum residual chlorine content of ten (10) ppm after standing twenty-four (24) hours in the pipe or as otherwise directed by the City Engineer. In addition to the disinfection process, bacteriological testing shall be completed and accepted by the City. The water mains shall be thoroughly drained and flushed before placed in public service.

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 PROCESS WATER

City water used for construction, testing, disinfection, and flushing of new water main improvements shall be diverted through a backflow prevention assembly. Such device shall be selected from the CA Department of Health Services' current approved list (a new list is issued annually). Connection to the existing City Water System prior City Engineer approval. Water trucks may be used as a water supply as long as there is no cross connection to the existing system. Fire hydrants may be used in conjunction with a backflow prevention assembly as a means to derive process water. Connection to a fire hydrant for supply requires a current and valid City fire hydrant permit. Contractors shall not contaminate the existing water system. The Contractor shall obtain a fire hydrant permit from the City prior to connection to an existing fire hydrant. All connections to fire hydrants shall include a gate valve. Fire hydrant assembly and gate valve must be removed each evening at the end of the workday.

Process water used in the flushing, testing, and disinfection process shall be disposed of in accordance with local and State requirements and as approved by the City Engineer.

15.06 MEASUREMENTS 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.