SECTION 800

WATER TRANSMISSION, COLLECTOR, DISTRIBUTION AND SERVICE LINES

800.1 GENERAL:

This section is related to linear water facilities which apply to the conveyance of water from the well site to reservoir, from pumping station to reservoir, and from reservoir to user.

800.2 CONTENTS

SECTION 801

INSTALLATION OF WATER TRANSMISSION, COLLECTOR, AND DISTRIBUTION LINES

801.1 GENERAL: The water facilities and materials, specified herein, are associated with water transmission, collector and distribution lines.

801.2 REFERENCES:

801.2.1 American Water Works Association (Latest Edition) (AWWA):

C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids

C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape-Hot-Applied

C206 Field Welding of Steel Water Pipe

C207 Steel Pipe Flanges for Waterworks Service Size 4-inch through 144-inch

C502 Dry Barrel Fire Hydrants

C504 Rubber-Seated Butterfly Valves

C509 Resilient-Seated Gate Valves for and Water Supply Service

C515 Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service

C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

C604 Installation of Steel Water Pipe – 4-inch (100 mm) and Larger

C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

C651 Disinfecting Water Mains

C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inch through 60-inch for Water Transmission and Distribution

M9 Concrete Pressure Pipe

M23 PVC Pipe-Design and Installation

801.2.2 This Publication

Section 18 Utilities

Section 121 Plastic Pipe

Section 127 Steel Water Pipe

Section 128 Concrete Cylinder Pipe

Section 129 Ductile Iron Pipe

Section 130 Gray Iron, Ductile Iron, and Steel Fittings

Section 161 Gray Iron Castings

Section 163 Ductile Iron Castings

Section 170 Electronic Marker Devices

Section 340 Portland Cement Concrete Curbs, Gutters, Walks, Driveways, Alley Intersections, Slope Paving, and Median Paving

Section 343 Removal and Disposal of Existing Pavement, Curbs, Gutters, Sidewalks, & Drivepads

Section 701 Trenching, Excavation, and Backfill

Section 1502 Submittals

801.2.3 American Association of State Highway and Transportation Officials (AASHTO)

M 245 Standard Specification for Corrugated Steel Pipe, Polymer-Pre-coated for Sewers and Drains

M 246 Standard Specification for Steel Sheet, Metallic-Coated and Polymer-Pre-coated, for Corrugated Steel Pipe

801.2.4 American Society for Testing and Materials (ASTM)

A 742 Standard Specification for Steel Sheet, Metallic Coated and Polymer Pre-coated for Corrugated Steel Pipe

A 762 Standard Specification for Corrugated Steel Pipe, Polymer Pre-Coated for Sewers and Drains

801.3 MATERIALS

801.3.1 GENERAL

801.3.1.1 The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe listed on the Water Authority Approved Product List shall be accepted unless otherwise approved in writing by the Water Authority Field Division Manager.

801.3.1.2 Main line pipe and fittings shall be as specified in the Reference Section in this publication as listed above or as specified in the Supplemental Technical Specifications and/or as authorized by the ENGINEER.

801.3.2 PIPE

801.3.2.1 Limitations of pipe materials versus pipe sizes will be as follows, unless otherwise specified on the plans or Supplemental Technical Specifications:

801.3.2.1.1
PIPE TYPE - SIZE
Ductile Iron - 4-inch to 64-inch
Concrete Cylinder - 24-inch and larger
Plastic (Blue - PVC-C900) - 4-inch to 24-inch
Plastic (Purple- PVC-C900) - 4-inch to 24-inch

801.3.2.2 The type of pipe used shall be approved by the ENGINEER. Steel pipe shall be used only where specified on the drawings. Unless otherwise approved by the ENGINEER, all pipe installed shall be identical from valve to valve.

801.3.3 GATE VALVES:

801.3.3.1 Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans or in the Supplemental Technical Specifications.

801.3.3.2 All gate valves shall be resilient seat valves and shall conform to AWWA C515. The valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall have a standard hub which opens counterclockwise. The valve ends shall be mechanical joints, unless otherwise specified on the plans. The "O" ring retainer shall be secured with nuts and bolts.

801.3.3.3 The resilient seat shall be mechanically retained or bonded on the valve gate (wedge disc).

801.3.3.4 All brass or bronze parts used on gate valves shall conform to AWWA C515.

801.3.3.5 The outside of the valve body shall be painted with a corrosion-resistant coating. The inside shall be protected with corrosion resistant coating, approved for potable water.

801.3.3.6 The valve stem shall comply with AWWA C515. The material for the valve stem shall be brass or bronze, and shall have a minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi.

801.3.3.7 Gate valves shall have a 2-inch square operating hub nut. Gate valves in vaults with valve covers at ground level shall have a handwheel with the 2-inch nut welded to the center. For a 4-inch, 6-inch, 8-inch, 10-inch, and 12-inch valve, the minimum outside diameter of the handwheel will be 10-inch, 12-inch, 14-inch, 16-inch, and 16-inch respectively. Handwheel diameters shall not be less than those stated in AWWA C509, Table 5.

801.3.3.8 Maximum input torque to open and/or close the valve shall be 200 foot-pounds for a 4-inch valve and 300 foot-pounds for 6-inch through 12-inch under a working pressure of 200 psi.

801.3.3.9 No project shall be accepted by the OWNER until all valves are operational and accessible.

801.3.3.10 Before the work will be accepted, water valve GPS coordinates shall be provided on the Record Drawings. GPS coordinates obtained by a Professional Surveyor licensed in the state of New Mexico shall be taken at the valve operating nut. Use the NAD 1983 NM STATE PLANE CENTRAL ZONE for x and y coordinates and NAVD 1988 for z coordinate.

801.3.4 RUBBER SEATED BUTTERFLY VALVES:

801.3.4.1 Butterfly valves shall be used for sizes of 14 inches and larger, and shall comply with AWWA C504.

801.3.4.2 Only short body, Class 150B or 250B valves are acceptable. Wafer type valves are not acceptable. Valve ends may be either mechanical joint or flanged.

801.3.4.3 The rubber seat shall be field replaceable on valve sizes 24 inches and larger. The rubber seat may be mechanically retained or bonded on the disk or valve body.

801.3.4.4 Butterfly valves shall have a 3-inch square operating hub nut. Butterfly valves in vaults with valve covers at ground level shall have a hand wheel with the 3- inch nut welded to the center.

801.3.4.5 The valve shaft and disk shall be installed horizontally. The valve disc shall pivot and rotate on the horizontal axis.

801.3.4.6 The maximum input torque to open and/or close the valve shall not exceed 150 ft-lb on the wrench nut and 80 lbs. on the handwheel under a minimum working pressure of 150 psi. The butterfly operator shall be compatible with the pressure. Manual actuators shall be provided from the same manufacturer as the valve. Maximum operating torques shall be in accordance with AWWA C504.

801.3.4.7 No project shall be accepted by the OWNER until all valves are operational and accessible.

801.3.4.8 Before the work will be accepted, water valve GPS coordinates shall be provided on the Record Drawings. GPS coordinates obtained by a Professional Surveyor licensed in the state of New Mexico shall be taken at the valve operating nut. Use the NAD 1983 NM STATE PLANE CENTRAL ZONE for x and y coordinates and NAVD 1988 for z coordinate.

801.3.5 VALVE BOXES: Valve boxes shall consist of polymer coated steel pipe (CMP). The CMP pipe shall be polymer coated and conform to AASTO M 246 or ASTM A 742. Pipe galvanized material shall have a minimum coating thickness of 3 mils. Acceptable coating material is Trenchcoat Protective Film (Dow) or approved equal. Valve box shall be cut to accommodate the required depth. No joints shall be allowed in boxes less than 10 feet in depth. The pipe shall be manufactured in accordance with the applicable

requirements of AASTO M 245 or ASTM A 762. Pipe material shall have a 12 gauge minimum thickness and be 12 inches in diameter to accommodate the cover and lid specified herein. The pipe shall be centered and placed true to vertical around the axis of the operating nut. Valve covers and lids for re-use water shall be as shown in Standard Drawings and shall be shown on project construction plans.

801.3.6 COMBINATION AIR AND VACUUM VALVES: Air and vacuum valves shall be the type and size shown on the plans. Only combination air and vacuum valves listed on the Water Authority Approved Product List shall be used.

801.3.7 FIRE HYDRANTS

801.3.7.1 Hydrants shall be limited to those on the Water Authority Approved Product List.

801.3.7.2 Fire hydrants and their extensions shall be in accordance with AWWA C502, traffic type. Fire hydrants shall have one (1) 5 ¼ -inch diameter valve opening; one (1) 6-inch mechanical joint inlet connection; two (2) 2 ½-inch hose nozzle connections; and one (1) 4 ½-inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads. Fire hydrants shall have a bronze or cast iron pentagon operating nut, be designed for 150 psi working pressure service, and have a normal bury of 4 to 4 ½ feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.

801.3.7.3 The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the water main, unless otherwise approved in writing by the Water Authority. Fire hydrants shall have no more than ½ -inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.

801.3.7.4 Hydrants shall be dry barrel, post-type with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring, or bronze or cast iron bushing.

801.3.7.5 Exterior of hydrant, below the ground line, shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer and one coat "safety yellow" enamel. The bonnet shall then be painted with a reflectorized paint using a color as close to "safety yellow" as possible.

801.3.7.6 The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6- inch mechanical joint connection and the inside shall be epoxy coated to prevent corrosion. The nozzle shall be threaded in place and retained by stainless steel locks. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.

801.3.7.7 Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.

801.3.7.8 To prevent loss of brass operating nuts due to theft or vandalism, the following shall be included in or on the fire hydrant:

801.3.7.8.1 The bonnet must be removed in order to remove the operating nut; or

801.3.7.8.2 Use a cast iron or bronze operating nut.

801.3.7.9 Fire hydrants shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.

801.3.7.10 Fire hydrants shall be fully restrained in accordance with Section 130.

801.3.7.11 All fire hydrant legs shall include an isolation valve.

801.3.7.12 Hydrants shall be functional and capable of being opened or closed without difficulty following application of an operating torque of 200-foot-pounds at the operating nut.

801.3.7.13 Removal of existing fire hydrants – Fire hydrants and appurtenances shall be removed and disposed of. The pipe from the main to the fire hydrant shall be removed back to the main and the tee capped per 801.12. The CONTRACTOR shall note this on the record drawings.

801.3.7.14 Before the work will be accepted, fire hydrant GPS coordinates shall be provided on the Record Drawings. GPS coordinates obtained by a Professional Surveyor licensed in the state of New Mexico shall be taken at the valve flange. Use the NAD 1983 NM STATE PLANE CENTRAL ZONE for x and y coordinates and NAVD 1988 for z coordinate.

801.3.8 PRESSURE REDUCING VALVE (PRV): Pressure reducing valves shall be limited to those on the Water Authority Approved Product List. Submittals for approval shall be made to the ENGINEER and approval must be received before installation. The following items are required in the PRV:

801.3.8.1 Materials

801.3.8.1.1 Main valve

801.3.8.2 Pilot Control System:

801.3.8.2.1 Adjustment from 20 psi to 105 psi

801.3.8.2.2 Shut-off lever on all pilot control system lines

801.3.8.2.3 Inlet flow strainer

801.3.8.2.4 Closing speed control

801.3.8.2.5 Opening speed control

801.3.8.2.6 Flow stabilizer

801.3.8.2.7 Tubing shall be stainless steel.

801.3.8.3 Sizing shall be approved by the Water Authority with calculations provided and sealed by a New Mexico Professional Engineer. Installation shall be as per the construction plans. The Water Authority shall adjust final settings on the PRV.

801.3.8.4 PRV operating criteria of elevation and normal downstream pressure setting shall be engraved on a stainless steel plate and mounted inside the vault. Numerical values shall be verified and approved by the Water Authority prior to installation of plate.

801.3.8.5 Before the work will be accepted, PRV GPS coordinates shall be provided on the Record Drawings. GPS coordinates obtained by a Professional Surveyor licensed in the state of New Mexico shall be taken at the PRV. Use the NAD 1983 NM STATE PLANE CENTRAL ZONE for x and y coordinates and NAVD 1988 for z coordinate.

801.3.9 TAPPING SLEEVES: (For other than Concrete Cylinder Pipe) Only approved, long body, fully-gasketed tapping sleeves shall be allowed. They shall be ROMAC SST Series, or JCM 432 Series, or approved equal. During installation of the tapping sleeve, the pipe shall be fully supported to support the weight of the tapping sleeve and tapping machine. Taps greater than 2/3 of the line size will not be allowed unless otherwise approved in writing by the Water Authority

801.3.9.1 Tapping sleeves of heavy welded steel bodies shall meet the following requirements:

801.3.9.1.1 Epoxy Coated

801.3.9.1.2 Bolts and nuts to be stainless steel and shall be Grade 8 minimum

801.3.9.1.3 Gaskets to be Buna-N rubber

801.3.9.1.4 Flange to be flat face steel and comply with AWWA C-207

801.3.9.1.5 Class D-ANSI 150 lbs. drilling

801.3.9.1.6 Designed to sustain an operating pressure of 150 psi

801.3.9.1.7 May be used on all water mains, 4-inch and larger

801.3.9.2 Tapping sleeves of cast iron bodies shall meet the following requirements:

801.3.9.2.1 Mechanical joint type with a working pressure of 200 psi

801.3.9.2.2 Outlet flange to be Class 125, ANSI B16.1

801.3.9.2.3 Sleeves to include side and end gaskets of Buna-N rubber

801.3.9.2.4 Eight high strength steel bolts and nuts to secure the halves of the sleeves to the pipe

801.3.9.2.5 May be used on all mains 4-inch and larger

801.3.9.3 Tapping sleeves of short sleeve cast iron shall meet the following requirements:

801.3.9.3.1 Working pressure of 150-psi

801.3.9.3.2 Outlet flange to be Class 125, ANSI B16.1

801.3.9.3.3 Outlet half to have an enclosed gasket in a groove for a pressure seal

801.3.9.3.4 Four high strength steel bolts to secure halves of tapping sleeve to pipe

801.3.9.3.5 May be used on all water mains, 4-inch and larger

801.4 CORROSION MONITORING STATIONS

801.4.1 When corrosion monitoring stations are encountered in the field or on the construction plans, the CONTRACTOR shall protect the station from damage.

801.4.2 The ENGINEER shall provide a design to the CONTRACTOR that will include relocations, if needed, adjustment to grade, and a testing plan to comply with the National Association of Corrosion Engineers (NACE) requirements.

801.4.3 The CONTRACTOR shall provide all materials, equipment, labor and supervision necessary for the completion of the installation, relocation, or adjustment, and testing. The CONTRACTOR shall employ a Corrosion Construction Supervisor, with experience in the installation of similar type systems, to supervise the corrosion monitoring facilities' installation, relocation, or adjustment. The Corrosion Construction Supervisor shall be under the direct supervision of a licensed professional Corrosion Engineer or a NACE certified Cathodic Protection Specialist. The Corrosion Construction Supervisor shall instruct the CONTRACTOR on site during the initial installation and shall revisit the site as required.

801.4.4 All construction projects within the vicinity of corrosion monitoring stations will coordinate with the Water Authority to ensure the integrity and functionality is preserved.

801.5 RECLAIMED WATER HYDRANTS

801.5.1 Any water hydrants on a reuse, reclaimed, or other non-potable water system shall be purple in color.

801.5.2 Under no circumstances shall water hydrants on reuse, reclaimed, or other non-potable water system in the public right-of-way be used for fire protection.

801.5.3 The purpose of water hydrants on the non-potable systems is for draining the waterlines and/or for water quality sampling.

801.6 WATER LINE CONNECTIONS

801.6.1 GENERAL: All new water line tie-ins to the existing water system shall be directly inspected and approved by the ENGINEER. This includes non-pressurized or pressurized connections that will result in extension of the existing system.

801.7 LOCATIONS OF WATER MAINS AND SEWER LINES

801.7.1 Unless otherwise authorized by the ENGINEER, parallel water and sewer lines shall be installed at least 10-feet apart horizontally, and the water line shall be at a higher elevation than the sewer. Separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 18-inches above the sewer. When water and sewer lines cross each other, the water line shall be at least 18-inches above the sewer. Otherwise, the sewer shall be of pressure class pipe extending between manholes, or concrete encased for 10-feet on each side of the water line as shown in the Standard Detail Drawings. The crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

801.7.2 Water mains shall not be constructed under walkways, sidewalks, curbs and gutters, drivepads, or similar concrete structures by tunneling underneath them. Trenchless technologies may be allowed with prior approval by the Water Authority. The CONTRACTOR may cut concrete structures or remove and replace the section of the concrete structure to the nearest full expansion joint or edge.

801.8 TRENCHING AND BACKFILLING

801.8.1 All trenching, bedding, and backfilling activities shall conform to Section 701. Compaction shall be no less than 95% of maximum density as defined by ASTM D 1557 modified proctor.

801.9 GENERAL INSTALLATION ITEMS

801.9.1 The minimum cover over distribution lines shall be 3 feet; and 4 feet of cover over transmission and well collector lines at finished grade.

801.9.2 Pipe and accessories shall be new and unused and shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. No other pipe or material of any kind shall be placed inside of a pipe or fitting after the factory coating has been applied.

801.9.3 The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during operations by plugging or other approved methods. When work is not in progress, open ends of pipes and fittings shall be securely closed so that no other substances will enter the pipes or fittings. Any section of the pipe found to be defective before or after laying shall be replaced with sound pipe without additional expense to the OWNER.

801.9.4 All nuts and bolts utilized in underground pipe connections shall be stainless steel, high strength cast iron or high grade, high strength steel. The full length of each section of pipe shall rest solidly upon the bed, with recesses excavated to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying shall be taken up and re-laid. Pipes shall not be laid in water or when trench or weather conditions are unsuitable for the work except by as authorized by the ENGINEER. All unconnected ends of pipes shall have a valve, plug, or cap installed on it.

801.9.5 Pipe shall be laid to line and/or grade shown on the plans or as staked in the field. Changes in horizontal or vertical alignment of the pipe at a joint shall not exceed the manufacturer's recommended deflection for the type and size pipe being laid. When the change required is more than the recommended deflection, a fitting or several short joints of pipe shall be used.

801.9.6 When new pipe is to be connected to an existing pipe or when crossing an existing pipeline, the CONTRACTOR shall excavate the existing lines well in advance of the laying of the new pipe line to enable the ENGINEER to verify their elevation and placement and to make any changes in grade and/or alignment of the new pipeline that may be required.

801.9.7 On all push-on-joints (e.g., bell and spigot, fluid-tite, and ring-tite) the rubber gasket shall be removed, cleaned, the groove cleaned, the gasket replaced, and the bell or plain end cleaned before jointing. The gasket and the bell or plain end of the pipe to be jointed shall both be lubricated with a suitable soft vegetable soap compound to facilitate jointing. Care shall be taken to insure that neither the bell or collar, or the pipe being jointed is damaged as it is being pushed securely into place.

801.9.8 Flanged and mechanical joints shall be made with machine bolts and nuts of the proper size only. All components of these types of joints shall be cleaned before jointing. Only one (1) gasket will be permitted in a flange joint. In a mechanical joint, the plain end pipe shall be fully seated before the gasket and gland is slipped up to the bell. Nuts on both types of joints shall be tightened by alternating nuts 180-degrees

apart. The CONTRACTOR shall be responsible for assuring that proper torque is achieved and shall have a torque wrench available for verification by the ENGINEER.

801.9.9 When laying pipe, a metalized detectable warning tape shall be installed a minimum of 1-foot above the top of pipe and 2 to 6 feet below the final surface. The tape shall be detectable with a standard metal pipe locator. The color of tape shall be safety precaution blue and will be inscribed at 10-foot intervals with the words, "CAUTION BURIED WATER LINE BELOW". Tape shall be two inches wide. The tape shall be constructed of material that is impervious to alkalis, acids, chemical reagents, and solvents found in the soils.

801.9.10 When laying pipe, Electronic Marker Devices (EMD's) shall be installed in accordance with Section 170.

801.9.11 TEMPORARY WATER MAIN

801.9.11.1 The CONTRACTOR may install a temporary water main (shoo-fly), if approved by the Water Authority, to provide a water service during replacement of the existing water main in a street or alley if authorized by the Water Authority. The shoo-fly shall be installed at locations as agreed with the Water Authority. The temporary water main size shall be determined by the ENGINEER and designed for traffic and above ground use. Access to all driveways shall be maintained. Cost shall be considered incidental to the work.

801.9.11.2 All temporary water mains shall be thoroughly cleaned and disinfected per 801.17 of this Section.

801.9.12 TRACE WIRE

801.9.12.1 GENERAL

801.9.12.1.1 Trace wire shall be installed on all public potable and non-potable water mains including water services, fire lines, and fire hydrant lines, sample station lines, and any other water line or portion considered public infrastructure that will be owned and maintained by the Water Authority.

801.9.12.1.2 Trace wire shall be installed in such a manner as to be able to properly trace all pipelines as applicable, without loss or deterioration of the signal.

801.9.12.2 MATERIALS: The CONTRACTOR shall submit the manufacturer's data on materials to be furnished that indicate compliance with the specifications regarding materials used. Only products or materials listed on the Water Authority Approved Product List shall be used.

801.9.12.2.1 For open trench installation, #12 AWG high strength copper clad steel wire with a minimum 450 pound break load and minimum 30 mil HDPE insulation thickness shall be used.

801.9.12.2.2 For directional drilling/boring installation, #12 AWG high strength copper clad steel wire with a minimum 1,150 pound break load minimum 45 mil HDPE insulation thickness shall be used.

801.9.12.2.3 For pipe bursting installation, high strength 7x7 stranded copper clad steel wire with 4,700 pound break load and minimum 50 mil HDPE insulation thickness shall be used.

801.9.12.3 CONNECTORS:

801.9.12.3.1 Tee Connections: Single 3-way locking waterproof connector for 12 AWG. Connectors shall be approved by the manufacturer for direct burial.

801.9.12.3.2 Cross Connectors: Two 3-way locking waterproof connectors for 12 AWG with a short jumper wire. Connectors shall be approved by the manufacturer for direct burial.

801.9.12.3.3 Necessary Splice Connections: Single 3-way direct bury lug locking connector rated up to 50 volts filled with dielectric silicone sealant to seal out moisture and corrosion and prevent uninsulated wire exposure. Connectors shall be approved by the manufacturer for direct burial. Splices shall only be used on the main line at the end of a trace wire spool or when a Tee Connection cannot be used. The CONTRACTOR shall not cut the main line trace wire.

801.9.12.3.4 Non-locking friction fit, twist on or taped connectors are prohibited.

801.9.12.4 TEST STATIONS

801.9.12.4.1 All trace wire test stations shall be made of corrosion-resistant materials and shall be equipped with two terminals, a roadway-rated flange to prevent the test station from sinking, and a locking cast iron cap with an encapsulated magnet for ease of locating the test station. The test station shall be specifically manufactured for trace wire access/testing.

801.9.12.4.2 All grade level/in-ground test stations shall be appropriately identified with "Test Station" and with "Water" for potable water installations, and "Test" for non-potable water system installations cast into the cap and color coded per Section 801.12.6.

801.9.12.4.3 All trace wire test stations must include a manually interruptible conducting/connection link (terminal jumper) between the terminal for the trace wire connection and terminal for the grounding anode wire connection.

801.9.12.5 GROUNDING ANODE: All grounding anodes shall be made of magnesium, with a pointed end to enable direct driving into the ground, specifically manufactured for this purpose. The anode shall come factory equipped with an HDPE cap and 20 feet of factory installed #12 AWG copper clad steel wire with 30 mil HDPE coating (red) rated for direct burial at 30 volts with 21% conductivity. The wire shall have a minimum 450 pound break load.

801.9.12.6 COLOR CODING: The insulation of the trace wire and the color of the test station caps shall be blue for potable water lines and purple for non-potable water lines.

801.9.12.7 INSTALLATION:

801.9.12.7.1 TRACE WIRE INSTALLATION:

801.9.12.7.1.1 The trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation.

801.9.12.7.1.2 The trace wire shall be securely bonded together at all wire joints with a locking waterproof connector that complies with this specification to provide electrical continuity.

801.9.12.7.1.3 Trace wire connectors shall be installed in a manner that prevents any uninsulated wire exposure.

801.9.12.7.1.4 Except for spliced-in repair or replacement connections, trace wire shall be continuous and without splices between each trace wire access point. For required splices, use splice connectors per this specification. Spliced wires must be knotted prior to being inserted in the connector to prevent separation from the connector in case the trace wires are stretched during backfilling operations.

801.9.12.7.1.5 Trace wire systems must be installed as a single continuous wire. No looping or coiling of wire is allowed.

801.9.12.7.1.6 No breaks or cuts in the trace wire or trace wire insulation shall be permitted.

801.9.12.7.1.7 Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512 Hz) signal for distances in excess of 1,500 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.

801.9.12.7.1.8 Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with connectors that comply with this specification. Taping and/or spray coating to repair trace wire or trace wire insulation shall not be allowed.

801.9.12.7.1.9 Trace wire shall be laid flat on top of the pipe and securely affixed in 6-foot intervals with tape or plastic ties to prevent shifting or damage during backfilling and excavation operations. Attach trace wire to PEXa (cross-linked polyethylene: peroxide process) service piping per the manufacturer's recommendations with plastic (zip) ties. Do not use adhesive tape on PEXa pipe.

801.9.12.7.1.10 In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using splice connectors that comply with this specification.

801.9.12.7.1.11 Trace wire shall be attached to all appurtenances on the north or east side.

801.9.12.7.1.12 At service saddles, the trace wire shall not be placed between the saddle and the main.

801.9.12.7.1.13 For manhole or vault type structures, lay mainline trace wire continuously, by-passing around the outside of manholes/structures on the north or east side.

801.9.12.7.1.14 For main line intersections and for service line connections, the main line trace wire shall not be cut.

801.9.12.7.1.15 All main line trace wires must be interconnected at intersections, at main line tees and main line crosses. At tees, the three wires shall be joined using a single 3-way locking connector. At crosses, the four wires shall be joined using two 3-way connectors with a short jumper wire between them.

801.9.12.7.1.16 All conductive and non-conductive water and reuse service lines shall include trace wire with 3 feet of excess/slack trace wire folded in the corner of the meter box. Do not coil.

801.9.12.7.1.17 All trace wire termination points shall be terminated with a grounding anode.

801.9.12.7.1.18 For repairs and rehabilitations, trace wire shall be installed on the new line per this specification. The ends of rehabilitated/replaced pipeline segments shall be connected if existing trace wire exists or shall be terminated with a grounding anode.

801.9.12.7.1.19 If repairs are made to a line with a trace wire, Contractor must ensure trace wire is connected with an approved splice connector per this specification and test the trace to the next existing test station.

801.9.12.8 TEST STATIONS

801.9.12.8.1 Test stations shall be installed at the following locations as outlined in the Standard Detail Drawings:

801.9.12.8.1.1 At all fire hydrants on waterlines. If hydrants do not exist on a waterline, test stations shall be installed at water valves or at the stand-alone test stations.

801.9.12.8.1.2 At valves and as stand-alone test stations approximately every 1,000 feet in locations where valve spacing exceeds 1,500 feet.

801.9.12.8.2 A minimum of 6 inches of excess/slack wire is required in all trace wire test stations after meeting final elevation. Group and zip-tie excess wire. Do not coil.

801.9.12.8.3 Test stations shall be spaced approximately every 1,000 feet and shall not be spaced greater than 1,500 feet apart. Test stations do not need to be installed at each location identified above provided that the spacing between test stations does not exceed 1,500 feet.

801.9.12.9 GROUNDING

801.9.12.9.1 Trace wire must be properly grounded at all termination points on the water main and at the edge of right-of-way for water lines.

801.9.12.9.2 Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod buried at the same depth as the trace wire.

801.9.12.9.3 Where the grounding anode wire will be connected to a trace wire test station, a minimum of 6 inches of excess/slack wire is required after meeting final elevation.

801.9.12.9.4 When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire nor the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and at the same depth as the trace wire. Do not coil excess wire from grounding anode. The grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a splice connector. Install with spliced connection to main trace wire at beginning or endpoints of pipe runs, only when there is no test station box present. If test station is nearby/available, red trace wire from magnesium grounding anode shall be continuous to the terminal in the test station (no other connections or splices).

801.9.12.10 TESTING REQUIREMENTS

801.9.12.10.1 Contractor shall provide equipment for trace test and shall perform a trace test on all trace wire in the presence of the ENGINEER and WATER AUTHORITY INSPECTOR. If the trace wire is found to be not continuous upon testing, the CONTRACTOR shall repair or replace the failed segment of the wire, and shall be responsible for the cost of any trenching, backfill, repaving and other improvements necessary to complete the trace wire repair. Contractor is encouraged to test trace wire prior to backfill so any issues can be addressed prior to backfill. Passing test results shall be provided for all pipe segments within the Engineer of Record's as-built data and plan set. To pass the continuity test, the following conditions must be met:

801.9.12.10.1.1 Trace test shall be performed by using a metallic locator with audible tone and numeric values for certification of the facility locations and shall be identifiable between access points.

801.9.12.10.1.2 The wire shall be accessible at all access points and be identifiable between access points.

801.10 SPECIFIC PIPE LAYING REQUIREMENTS

801.10.1 Ductile iron pipe shall be installed in accordance with AWWA C600 and as herein specified.

801.10.2 Steel pipe shall be installed in accordance with AWWA C604, AWWA C206 for welded joint and as herein specified. All field-welded joints shall have one coat of coal tar enamel of 3/32-inch thickness.

801.10.3 Plastic pressure pipe shall be installed in accordance with AWWA M23, C900, C605 and/or manufacturer's printed recommendations, whichever is applicable. Trenching, excavation and backfill is specified in Section 701. Compaction shall be no less than 95% of maximum density as defined by ASTM D 1557 modified proctor. A reference mark (a distinct circumferential line) is placed on the pipe's spigot by the manufacturer to indicate the correct depth of the spigot penetration into the pipe's gasket joint. If the pipe is seated too deep or too shallow, the pipe may buckle or separate due to thermal expansion / contraction, therefore particular attention shall be exercised when jointing pipe. The reference mark must be showing and not farther than ½-inch from the leading edge of the bell. The CONTRACTOR shall verify that the manufacturer's reference mark is correct per manufacturer's literature.

801.10.4 All concrete cylinder pipe shall have two small bond wires of low resistance, or other approved method, welded across the joint to make the joint electrically continuous. Where rigid joints are specified, they shall be provided as specified herein. The outside joint recess shall be completely filled with a rich low shrinkage cement grout. The concrete surface in contact with the joint mortar shall be moistened with water just prior to pouring the joint recess. The mortar shall be poured into the joint recess against a water proof paper or cloth diaper laid around and lapping the outside field joint. The diaper shall completely and snugly enclose the joint recess, being held in place by metal box strapping or wire. The mortar shall be poured into an opening slightly to one side on the top of the pipe and rodded by a flexible wire rod onto place until it appears on the opposite side completely. After the joint recess has been filled with mortar, adjoining pipe section shall not be disturbed. After the joint has been made, the concrete lining surfaces of the joint shall be moistened and the interior recess tightly jointed and troweled flush and smooth with the inside pipe surface. Grout for painting the interior joints shall be of a stiff consistency and shall have low shrinkage characteristics. In sizes of pipe smaller than 24 inches, the mortar shall be buttered all around the shoulder inside the bell before the spigot is entered. A backing-up tool, such as an inflated rubber ball wrapped with burlap, shall be pulled through the joint to compact the mortar, completely fill the inside annular space and wipe off the excess mortar. Each joint will be inspected by the ENGINEER for proper and complete closure prior to final acceptance. Flanges shall be protected by "cocoon" type protection coating of coal tar and felt in accordance with AWWA C203. When moving individual pipe section, the pipe shall be lifted using two web or belt type slings which support the pipe between the third and outside quarter points.

801.10.5 All fittings and valves shall be installed as per the type of joint as stated herein and/or as shown on the plans.

801.10.6 All couplings, clamps, sleeves, etc. shall be installed as per the manufacturer's printed recommendations and as approved by the ENGINEER. The CONTRACTOR shall properly restrain all appurtenances as necessary.

801.10.7 All water lines installed as part of a reuse, reclaimed, or other non-potable water system shall be purple in color or shall be encased in purple PVC wrap.

801.11 CUTTING: The cutting of any type of pipe shall be done as per the manufacturer's printed recommendations, as approved by the ENGINEER. Care shall be taken in cutting any pipe that has an internal and/or external lining or coating.

801.12 BLOCKING AND RESTRAINED JOINTS

801.12.1 All restrained joints shall be by mechanical means unless directed or approved otherwise by the ENGINEER.

801.12.2 All tees and bends shall be restrained by mechanical means. Valves in runs shall be mechanically restrained. Where rigid joints are called for on concrete cylinder pipe, the joints shall be flanged or field welded bell and spigot joints in accordance with the manufacturer's recommendation.

801.12.3 All caps and plugs on dead end lines shall be mechanically restrained when feasible. Blocking may also be required when adequate restrain length is not available.

801.12.4 Where restrained joints on ductile iron pipe or PVC pipe are called for on the plan, the mechanical restraining system employed shall conform to the recommendations of the pipe manufacturer.

801.13 RESTRAINING JOINTS FOR CONCRETE CYLINDER PIPE

801.13.1 Restrained joints in concrete cylinder pipe for thrust restraint shall be produced by continuous welding the pipe joints.

801.14 CONNECTIONS TO EXISTING CONCRETE CYLINDER PIPE

801.14.1 OBJECTIVE: The intent of this Subsection is to establish procedural and design criteria for making connections to existing concrete cylinder pipe for water distribution line extensions, and will be applicable to 4-inch and larger size connections.

801.14.2 NEW WATER LINES: Non-factory taps are prohibited.

801.14.3 EXISTING WATER LINES

801.14.3.1 New connections to existing concrete cylinder pipe must be approved in writing by the Water Authority Field Division Manager. Hot taps and service connections will not be allowed. The requester shall provide the following information:

801.14.3.1.1 Justification for the connection

801.14.3.1.2 Project name and number

801.14.3.1.3 Date connection to be performed (Minimum 30-day notice)

801.14.3.1.4 Name of the CONTRACTOR who will be installing the connection

801.14.3.1.5 Scheduling of connections is subject to the moratorium requirements of the Water Authority

801.14.3.2 The CONTRACTOR shall coordinate the work with the Water Authority Field Division before commencing work. The Water Authority Field Division shall inspect and approve the entire installation of the connection prior to backfilling and returning to service.

801.15 Not used

801.16 HYDROSTATIC TESTS:

801.16.1 The CONTRACTOR shall be required to perform hydrostatic tests in all water mains, laterals, dead ends, and service lines in accordance with AWWA C600. The test shall be conducted in the presence of the ENGINEER, or his authorized representative. The testing of the lines shall be done without being connected to existing lines. The CONTRACTOR shall provide all temporary plugs required. Water used for disinfecting may be used for hydrostatic testing. Leakage through connections to the existing system, leaks in the existing lines, or leaking existing valves under the test pressure will invalidate the test. The lines shall be tested at 150 psi, or 1.5 times the normal working pressure of the line, whichever is greater, for not less than two hours. All taps, gauges, and necessary equipment shall be provided by the CONTRACTOR as approved by the ENGINEER, however, the ENGINEER may utilize gauges provided by himself if he so elects. Each section of the new line between valves shall be tested to demonstrate that each valve will hold the test pressure. No installed pipe shall be accepted if the leakage is greater than that determined by the Hydrostatic Test sheet calculations. If the total leakage is less than the allowable, the line can be accepted. All visible leaks shall be repaired regardless of the amount of leakage and the test re-conducted.

801.16.2 The CONTRACTOR shall submit a testing plan to the ENGINEER for approval. In cases where a new main is being connected to an existing main without the installation of a new valve, the end of the new main shall be temporarily capped and restrained and a hydrostatic test performed. Hydrostatic tests should not be made such that an existing valve or existing main is included in the test section. The Hydrostatic Test Sheet in this Section is the standard form which must be completed at the time of the test, signed by the ENGINEER and delivered to the Water Authority prior to acceptance of the Project

801.17 DISINFECTING, FLUSHING, AND BACTERIA TESTING OF WATER LINES:

801.17.1 New water lines and temporary water

mains (shoo-fly) shall be installed in such a manner as to not require cleaning by flushing. This shall require capping stockpiled line, capping lines at night and any other time work is not in progress, visual inspection of interior of lines, and cleaning as necessary prior to placing in the trench. Every effort shall be made to prevent the entry of dirt and debris into pipelines under construction.

801.17.1.1 Mains shall be disinfected in accordance with AWWA C651 with chlorine liquid solution, which shall be added by an approved method at one end of the lines as water is drawn through the lines and service connections. The chlorine solution shall remain in the line for at least 24 hours. The lines shall then be flushed until the chlorine residual is equal to the normal residual in the existing system or at 0.5 parts per million for un-chlorinated water. Dry chlorine shall not be used for disinfection of water lines. The flushed water shall be disposed of by the CONTRACTOR appropriately. Should results of the bacteriological analysis be unsatisfactory, the disinfection procedure shall be repeated.

801.17.1.2 The CONTRACTOR shall be granted three free volumes of water for testing, disinfecting, and flushing the new installation. All water used for testing, disinfecting, and flushing shall be metered. If additional water is needed for these purposes, the water shall be paid for by the CONTRACTOR at the current water rates. An approved backflow prevention system shall be used when withdrawing water from any waterlines and hydrants. Unmetered connection to the water system shall not be used for providing water for disinfecting, testing, or flushing.

801.17.1.3 Water Authority or the ENGINEER will collect the water sample to test the water in the existing lines at the point of delivery for assurance of clean and potable water. The water in the existing lines will be used for testing and flushing.

801.18 INTERFERENCE WITH SERVICE AND SCHEDULE OR WORK

801.18.1 The CONTRACTOR shall obtain the permission of the ENGINEER before making any connections with existing mains. The required operation of existing valves will be performed by the Water Authority as per Section 18.

801.18.2 Work shall be started after authorization from the Water Authority and the ENGINEER and shall be completed in a prompt efficient manner in coordination and cooperation with other utilities concerned.

801.18.3 The CONTRACTOR shall be required to arrange his construction to maintain continuous service to water users, from existing facilities, to the fullest extent possible. CONTRACTOR shall, at all times, withhold construction work where any conflicts in the service requirements occur.

801.19 NOTIFICATION OF COMPLETION:

801.19.1 The CONTRACTOR shall notify the ENGINEER, in writing, when the CONTRACTOR has completed construction of a water line. This notification should be submitted immediately upon completion; the water line shall not be placed in service by the Water Authority before the sewer service and the paving, if applicable, are in place and until the Water Authority has received and accepted all adequate documentation submittals per 801.21. Water Authority inspection shall consider, on a case by case basis, exceptions for fire protection purposes.

801.20 VALVE BOX REHABILITATION

801.20.1 The rehabilitation of existing valve boxes as shown on the plans or as authorized by the ENGINEER shall include the following:

801.20.1.1 Removing and disposing the existing valve box, concrete collar, ring, and cover and installing the new type box, concrete collar, ring, and cover.

801.20.1.2 Installation of a new concrete collar is required in paved and unpaved areas. Main line pipe size and direction of the line shall be scribed on the collar.

801.20.1.3 Install a new electronic marker device.

801.20.1.4 Removal, disposal, and replacement of the pavement

801.20.1.5 Excavation, backfill, and compaction

801.20.1.6 All materials, labor, and equipment necessary to do the work

801.20.1.7 Trace wire test stations shall be protected in place from damage. Any damage to this system shall be repaired by the Contractor at no cost to the Water Authority.

801.20.2 The work under this item shall be constructed per the Standard Detail Drawings

801.21 DOCUMENTATION SUBMIITALS

801.21.1 At the time of the final inspection, the following documentation will be submitted to the ENGINEER and to the Water Authority:

801.21.1.1 Hydrostatic test data of the new water line system

801.21.1.2 Microbiological test reports which were taken at representative locations along the system

801.21.1.3 All valves at that time shall be in the open position, unless otherwise authorized by the ENGINEER and Water Authority

801.21.1.4 A marked-up set of construction drawings reflecting as-built conditions. This does not supplant the requirements for record or as-built drawings.

801.22 MEASUREMENT AND PAYMENT

801.22.1 PIPE: Payment for all sizes and types of pipe shall be made on the basis of measurement per linear foot, including the length of fittings, valves, etc. The contract unit price of pipe shall include all jointing and coupling materials necessary for its installation and connections to other sections of pipe, except for fittings, valves or other appurtenances. The cost of hydrostatic testing, flushing and disinfecting of new water lines shall be included in the contract unit price for the item in place. Electronic Marking Devices, Pipe locator tape, and trace wire system for pipe shall be included in the contract unit price of the pipe. Joint restraint shall be paid for separately.

801.22.2 DEPTH OF TRENCH:

801.22.2.1 The contract unit price for pipe and appurtenances in all cases shall include the trenching, installation, and compacted backfilling for trench cuts as specified in Section 701.

801.22.2.2 Payment for additional excavation deeper than the specified limits shall be made on the contract unit price per vertical foot per linear foot, and shall include trenching, installation of pipe and appurtenances, and compacted backfilling in the deeper trench.

801.22.3 REMOVAL AND DISPOSAL OF PIPE

801.22.3.1 The payment for removal shall be made on a unit price per linear foot; there shall be no additional cost to the OWNER for disposal.

801.22.3.2 The payments for removal and disposal shall include trenching and compacted backfilling.

801.22.4 CAST IRON AND DUCTILE lRON FITTINGS:

801.22.4.1 All cast iron and ductile iron fittings shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint ends fitting for the type and size of fitting used as specified in AWWA C110, regardless of the type of ends on the fitting installed. The contract unit price per pound of fittings shall include all gaskets, glands, bolts, and nuts required. No separate payment will be made for these items.

801.22.4.2 When the CONTRACTOR installs a Water Authority-furnished fitting and replaces that fitting in the Water Authority's inventory, the CONTRACTOR shall be paid the full contract unit price of that fitting as outlined above. If the CONTRACTOR does not replace the fitting in the Water Authority's inventory, the payment to the CONTRACTOR will be at the contract unit price of the fitting less the cost of the fitting itself.

801.22.4.3 Fitting Insertion: The insertion of a fitting into an existing pipeline shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint end fitting and if required on all mechanical joint connecting piece (coupling) of the type fitting and size used, as specified in AWWA C110, regardless of the type of ends on the fitting and coupling installed. This payment shall include all compensation for the excavation, cutting and removal of the existing pipe, installation of the fitting and coupling, if required, the re-cutting of the existing pipe or new pipe installed between the fitting and coupling, and backfill and compaction complete in place. In addition to the payment for the fitting insertion, the CONTRACTOR shall be paid for each non-pressurized connection and if pavement, curb and gutter, sidewalk, drive pad, etc., are removed, these items will be paid for as part of the appropriate item.

801.22.5 REMOVAL AND DISPOSAL OF PIPE AND APPURTENANCES:

801.22.5.1 The payment for removal and disposal shall include trenching and compacted backfilling.

801.22.6 CONCRETE CYLINDER FITTINGS: Concrete cylinder pipe fittings, such as flanged outlets, bends, reducers, etc., shall be considered as incidental to the contract unit price for installation of the pipe, as shown on the construction plans.

801.22.7 COUPLINGS: The measurement for steel or cast iron couplings shall include payment for all gaskets, bolts, and incidental materials as may be needed for its complete installation. Payment shall be made on the contract unit price per each size of coupling required.

801.22.8 STEEL FITTINGS: Steel fittings shall only be used when authorized by the ENGINEER and when needed to connect to an existing steel water line. Measurement and payment for steel fittings, when authorized, shall be made at the contract unit price per pound based on weights of an all mechanical joint ends fitting of the type fitting and size used, as specified in AWWA C110. This payment shall include all fabrication and welding required on the fitting.

801.22.9 VALVE AND VALVE BOXES:

801.22.9.1 Valves shall be measured and paid for at the contract unit price per each size of valve. The contract unit price for valves 24-inch and larger shall include the bypass valve, fittings and piping, complete in place.

801.22.9.2 Valve Boxes shall be measured and paid for at the contract unit price per each per type of valve box. Payment shall include the polymer coated corrugated metal pipe, new ring, cover, new concrete

pad, and new EMD complete in place.

801.22.10 FIRE HYDRANTS

801.22.10.1 Fire Hydrants shall be measured and paid for at the contract unit price per each per depth of bury. Payment shall include excavation, gravel drain pocket, mechanical restraining system, backfilling, and compaction complete in place.

801.22.10.2 Measurement and payment for removal of existing fire hydrant shall be per each and shall include excavation and salvage or disposal of the existing fire hydrant, valve and pipe back to the water main, capping the tee, backfilling and compaction as required for the location of the fire hydrant and appurtenances. Removal and replacement of existing paving, curb, gutter, and sidewalk will be covered under those bid items.

801.22.11 VALVE BOX ADJUSTMENTS:

801.22.11.1 Valve box adjustment using the adjustment collar and insert shall be measured and paid for per each complete in place including the concrete pad and EMD. If existing ring and cover do not match current approved standards, a new ring and cover that does comply with the Standard Specifications shall be installed and the cost shall be considered incidental to the valve box adjustment.

801.22.11.2 When the adjustment height required on a valve box exceeds the height of the adjustment collar or the valve box has been previously adjusted, the valve box shall be rehabilitated. Measurement and payment shall be made as specified under Valve Box Rehabilitation.

801.22.12 WATER LINE CONNECTIONS:

801.22.12.1 Non-pressurized Connections: Non-pressurized connections shall be measured and paid for at the contract unit price per each for any size or type of pipe, complete in place, which shall include any extra excavation required, shut-off coordination, the removal of any caps or plugs or the cutting of the existing pipe any number of times required to make the connection, drainage plan (if required), pumping or handling of the water, backfilling and compaction. Fittings shall be measured and paid for per pound as specified herein, including all types of couplings.

801.22.12.2 Pressurized Connections: Pressurized connections shall be measured and paid for at the contract unit price per each per location shown on the plans, complete in place, which shall include excavation, the cleaning or removal of existing pipe coatings and coverings, hydrostatic testing, the tapping, any grouting required, backfilling and compaction. The installation of the tapping sleeve and gate valve is to be paid under separate item or as indicated on the plans.

801.22.12.3 Connection to Steel Water Lines: All connections to existing steel water lines shall be made by using a transition coupling. The measurement and payment for this type of connection shall be made per pound of fitting for a Mechanical-Joint Connecting Piece of the size used based on the weights specified in AWWA C110.

801.22.12.4 Waterline Lowering: Where specified on construction drawings and provided on the project bid tab, a waterline lowering shall be a separate bid item and shall not be measured nor paid for as a non-pressurized or pressurized connection.

801.22.13 THRUST RESTRAINTS:

801.22.13.1 CONCRETE BLOCKING: When concrete blocking is used, as authorized by the ENGINEER, the blocking shall be measured and paid for at the contract unit price per cubic yard placed to the neat lines shown on the plans or per the Standard Detail Drawings.

801.22.13.2 RESTRAINING JOINTS FOR CONCRETE CYLINDER PIPE: Measurement and payment for this item shall be at the contract unit price per linear inch of circumferential welded, complete in place, including protective coating of the weld.

801.22.13.3 MECHANICALLY RESTRAINED JOINTS: Mechanically restrained joint assemblies shall be measured and paid for at the contract unit price per each assembly per size of the pipe per each type (pipe to pipe, pipe to mechanical joint, pipe to fitting, etc.) complete in place.

801.22.13.4 VALVE ANCHORAGE: No separate measurement nor payment shall be made for valve anchorage as per Standard Detail Drawing. The cost of this work shall be included with the cost of the valve.

801.22.14 PRESSURE REDUCING VALVE (PRV): Measurement and payment for furnishing and installing a PRV shall be made at the contract unit price per each per size, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, gauges, equipment and material required for the excavation, the PRV, all by-pass piping, fittings and valves both inside and outside the structure, the structure, backfilling and compaction.

801.22.15 AIR RELEASE VALVE (ARV): Measurement and payment for furnishing and installing an ARV shall be made at the contract unit price per each per size of ARV, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and materials required for the excavation, ARV, piping, fittings, gate valve, structure, backfilling, compaction, EMD, valve box, and concrete collar.

801.22.16 VALVE BOX REHABILITATION: Valve box rehabilitation shall be measured and paid for at the

contract unit price per each, complete in place which shall include the removal of the existing valve box, excavation, the new valve box installed, EMD, backfilling, compaction and the installation of the concrete collar. If existing ring and cover do not match current approved standards, a new ring and cover that does comply with the Standard Specifications shall be installed and the cost shall be considered incidental to the valve box rehabilitation.

801.22.17 CONCRETE STRUCTURES: The removal and replacement of concrete structures such as sidewalks, drive pads, wheelchair ramps, and curb and gutters, as required for the installation of water lines shall be measured and paid for as specified in Section 340 and 343.

801.22.18 BEDDING MATERIAL: No separate measurement nor payment shall be made for bedding material required when shown on the plans or when required due to the type of pipe supplied by the CONTRACTOR. The cost of the bedding material shall be included in the unit price of the pipe. If bedding material is not required by the conditions above, but is required due to the conditions encountered during construction, then the bedding material shall be measured and paid for as specified in Section 701.

801.22.19 SURPLUS MATERIALS: No separate measure nor payment will be made for the removal and disposal of surplus material generated by the pipe, bedding material or the use of lean fill.

801.22.20 CORROSION MONITORING STATION ADJUSTMENTS TO FINISHED GRADE

801.22.20.1 Corrosion monitoring station adjustments to grade shall be measured and paid per each complete in place including electrical connections or extensions needed, pea gravel, concrete collar, and traffic rated box and cover to comply with current standard detail drawings.

801.22.21 TRACE WIRE: All work associated with the installation of the trace wire and system shall be considered incidental to the installation cost of the pipeline being traced.

Test No.:_____ HYDROSTATIC TEST

PROJECT NAME: _____ DATE: _____

PROJECT NUMBER:_____CONTRACTOR:_____

Location:_____

PIPE MATERIAL: _____DIP ____PVC _____CCP _____Fabricated Steel

Test: Length (S)=_____ft.
Size (D) =_____inches
Pressure (P) = _____psi-gauge(averagetestpressureduringthehydrostatictest)
Leakage Allowed (L_{ALL}) = _____gal / hr ($L_{ALL} = SD\sqrt{P} / 133{,}200$ per AWWA C600-99)

Basis: Only resilient seated gate valves and/or rubber seated butterfly valves are used. No metal seated valves are allowed.

Total Leakage Allowed for 2 hour Test Period: L_{ALL} * 2 hours = _____gallons

Actual Amount of Water ADDED to maintain 150 psi ±5 psi for 2 hours = _____gallons

If actual amount of water added is LESS THAN total leakage allowed, test PASSED
If actual amount of water added is GREATER THAN total leakage allowed, test FAILED

_____Test Passed _____Test Failed

_____ _____ _____ _____
Contractor Date Inspector Date

_____ _____
Project Manager Date

COMMENTS:_____

_____

_____

Note: Sec Section 801.16 for the Specification for test procedures.

SECTION 802

INSTALLATION OF WATER SERVICE LINES

802.1 GENERAL: This section pertains to the water service line which extends from the distribution line to the water meter.

802.2 REFERENCES

802.2.1 American Society for Testing and Materials (Latest Editions) (ASTM):

A-536 - Specifications for Ductile Iron Castings

B-62 - Specifications for Composition Bronze or Ounce Metal Castings

B-88 - Specification for Seamless Copper Water Tube

D-2000 - Classification System for Rubber Products in Automotive Applications

F-876 – Specification for Crosslinked Polyethylene (PEX) Tubing

802.2.2 American Water Works Association (Latest Editions) (AWWA):

C-800 - Underground Service Line Valves and Fittings

C-904 – Crosslinked Polyethylene (PEX) Pressure Pipe, ½ inch through 3-inch, for Water Service

802.2.3 This publication:

Section 163 Ductile Iron Castings

802.3 MATERIALS

802.3.1 SERVICE LINE FITTINGS: All service line fittings shall be in full compliance with the latest version of AWWA Standard C-800, except as modified herein. Fittings shall be of the type required for the type of service line being installed. All stops shall be of the round, full opening type with no restriction in the opening less than the nominal size. Fittings incorporating a threaded plastic gripper and "O" ring seal may be utilized in lieu of the flared configuration. All service pipe and fittings shall be designed to sustain an operating pressure of 150-psi.

802.3.2a COPPER SERVICE PIPE: The ¾-inch to 2-inch copper service pipe shall conform to ASTM B-88 and shall be Type K, unless otherwise specified. Copper tubing shall be bent with approved tube benders without any kinks or sharp bends. Cutting of tubing will be performed with cutters designed for that purpose. Couplings used to join two pieces of tubing together shall not be installed anywhere on the service line between the water meter and the water main.

802.3.2b PEXa SERVICE PIPING: The ¾-inch to 2-inch PEXa service pipe shall be crosslinked and conform to ASTM F876 and AWWA C-904. The PEXa service piping shall utilize AWWA C-800 compression joint fittings, suitable for buried applications using stainless steel or plastic support liners inside the pipe at each joint. PEXa piping shall be limited to those on the Water Authority Approved Product List.

802.3.3 TAPPING SADDLES:

802.3.3.1 Service saddle bodies shall be of cast iron, ductile iron, or bronze. The type of saddle used must be listed on the current Water Authority Approved Products List. Straps, nuts, bolts, and washers shall be of stainless steel or bronze. Gaskets shall be vulcanized elastomeric rubber or synthetic rubber compound.

802.3.3.2 The saddles shall be tapped for the type of thread being used on the corporation stop.

802.3.3.3 Tapping saddles for PVC C900 pipe shall have bronze straps and shall be installed as per the manufacturer's printed recommendations.

802.3.4 METERS: Meters are furnished and installed by the Water Authority for new service installations. For replacement and relocation work, the existing meters shall be reinstalled by the CONTRACTOR.

802.3.5 METER

802.3.5.1 METER BOXES FOR ¾ -inch to 1-inch METERS:

802.3.5.1.1 Meter boxes with two meters shall be centered on adjacent property lines.

802.3.5.1.2 The meter box is to be part of an underground enclosure for water meters and shall have a ductile iron cover plate and lid.

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802.3.5.1.3 Meter box shall be cast in one piece to form a hollow rectangle and new material or recycled materials shall be used in its manufacture.

802.3.5.1.4 The box material shall have the following minimum mechanical properties at variable ambient temperatures of -20ºF to 120ºF, compressive strength equal to 10,000 psi, tensile strength equal to 1,500 psi and flexural strength equal to 7,500 psi.

802.3.5.1.5 Meter boxes to be installed shall have no visual cracking, crazing, checking, blistering, surface pitting, or deformation.

802.3.5.1.6 The finished meter box shall have the following physical properties:

802.3.5.1.6.1 Maximum wall deflection shall not exceed 1/8 of an inch at any one point when subject to earth pressures or forces created during backfilling.

802.3.5.1.6.2 Material used for making the box shall be non-biodegradable when buried and/or exposed to water. Life expectancy of the box shall be at least 20 years.

802.3.5.1.6.3 Overall weight of the box component shall not exceed 80 pounds.

802.3.5.1.6.4 Inside dimensions of the box shall conform to the current Standard Detail Drawings. This meter box is for one and two meter installations.

802.3.5.1.6.5 Inside and outside surfaces of the walls shall be reasonably smooth and free of burrs.

802.3.5.1.6.6 All materials used for box construction shall be approved for use in the domestic water supply system.

802.3.5.2 METER BOX COVER AND LID:

802.3.5.2.1 The size, dimensions, and details of the meter box cover and lid are as shown in the Standard Detail Drawings.

802.3.5.2.2 The casting shall conform to ASTM A536. The castings shall be true to pattern in form and dimensions and be free from pouring faults, sponginess, cracks, blowholes, or other defects. Castings shall be filleted boldly at angles and arises shall be sharp and true. Edges shall be rounded or chamfered. The castings shall be thoroughly cleaned and the parting lines, grates, and risers ground flush. The lid shall seat firmly in the cover without rocking. The lid top surface shall be flush with the top surface of the cover. The lid shall be easily removed from the cover.

802.3.5.2.3 The cover and lid shall have, integrated in the casting top, a corrugated design to provide a non-slip surface. The lid shall have, integrated in the top of the casting, the words "WATER AUTHORITY".

802.3.5.3 METER BOX FOR 1½-INCH AND 2-INCH METERS:

802.3.5.3.1 The meter box is to be part of an underground enclosure for water meters.

802.3.5.3.2 The meter box and cover with lid shall be selected from those on the Water Authority Approved Product List.

802.3.5.3.3 The material used for manufacturing the box, cover and lid shall be new or recycled materials and shall have the following minimum mechanical properties at ambient temperatures from -20ºF to 120ºF: Compressive Strength = 11,000 psi., Tensile Strength = 1,700 psi., and Flexural Strength = 7,500 psi.

802.3.5.3.4 Meter boxes to be installed shall have no visual cracking, crazing, checking, blistering, surface pitting, or deformation.

802.3.5.3.5 The finished meter box shall have the following physical properties:

802.3.5.3.5.1 Box, cover, and lid shall be rated for a load capacity of 1,000 lbs. over a 4-inch by 4-inch (4" x 4") area.

802.3.5.3.5.2 The overall weight of the box, cover, lid, and extension shall not exceed 80 lbs.

802.3.5.3.5.3 Maximum wall deflection shall not exceed 1/8 inch at any one point when subjected to earth pressures or forces created during backfilling.

802.3.5.3.5.4 The material used for making the box shall be non-biodegradable when buried underground and exposed to water.

802.3.5.3.5.5 The minimum dimensions of the box, cover, and lid shall conform to the current Standard Detail Drawings.

802.3.5.3.5.6 The walls inside and outside of the box shall be reasonably smooth and free of burrs.

802.3.5.3.5.7 The cover of the meter box shall have a non-skid surface and have "WATER AUTHORITY" inscribed on the top. The cover shall be secured to the box by bolts.

802.3.5.3.5.8 All materials used for constructing the box, cover, and lid, shall be approved for use in domestic water supply systems.

802.3.5.4 LOCATIONS OF METER BOXES: Meter boxes shall be located within the right-of-way as shown on the Standard Detail Drawings or within easements as approved by the Water Authority.

802.3.6 CORPORATION STOP: The corporation stop shall be AWWA thread inlet by compression-type outlet or Pack Joint to fit ¾-inch, 1 - inch, 1.5-inch, and 2-inch copper tubing, as allowed on the Water Authority Approved Product List.

802.3.7 TAILPIECE: The service shall be placed in the meter box with a copper tubing tailpiece for ¾-inch to 2-inch services, protruding from the standard concrete pad into the owner's property with a Pack Joint capped fitting to which the plumber can connect. Maintenance of the tailpiece is the responsibility of the customer.

802.3.8 COPPERSETTERS: Coppersetters shall have pipe connections for Type K Copper Tubing. The coppersetter shall be an assembly of brass and copper tubing with a bottom bar, shall have a bronze ball valve on the inlet side of the meter, and shall be furnished with coupling gaskets. The coppersetters shall be selected from the Water Authority Approved Product List. Coppersetters shall have temporary threaded plugs in the meter connections and shall be furnished free of excess grease. A stabilizer bar of 12-inches by ½-inch galvanized pipe shall be inserted in the yoke assembly as shown on the Standard Detail Drawings. A coppersetter with dual check valve shall be installed as per the Cross Connection Control section.

802.3.9 CROSS CONNECTION CONTROL:

802.3.9.1 Approved dual check valves shall be inserted on all services within pressure zones 0-W, 1-W, and 1-E. Water customers having private wells located within water pressure zones other than zones 0-W, 1-W, and 1-E, that connect to the municipal water system shall: a) agree to permanently abandon the use of private wells by plugging the wells in accordance with the State Engineer's procedures prior to connecting to the municipal water system; or b) agree to completely sever the private well from the premise's existing plumbing system and install a USC approved reduced pressure principal backflow prevention assembly at the water meter.

802.3.9.2 All customers connected to a non-potable water system and the public water system shall install a USC approved reduced pressure principal backflow prevention assembly approved by the Water Authority at the potable service connection.

802.3.9.3 All fire line services to fire protection systems shall be equipped with a USC approved reduced pressure principal backflow prevention assembly approved by the Water Authority and Fire Marshal having jurisdiction at each service connection.

802.3.9.4 A USC approved double check valve assembly approved by the Water Authority and Fire Marshal having jurisdiction may be installed instead of a reduced pressure backflow prevention assembly provided the fire protection system contains ANSI/NSF Standard 60 or 61 water piping throughout the entire fire protection system, the fire sprinkler drain discharges into atmosphere, and there are no reservoirs, fire department connections, connections from auxiliary water supplies, antifreeze nor other additives.

802.4 SERVICE LINE INSTALLATIONS

802.4.1 NEW ¾-INCH TO 2-INCH SERVICE LINES:

802.4.1.1 New service lines shall be completed in accordance with Standard Detail Drawings and shall include the following:

802.4.1.1.l Furnish and install tapping saddle,

EMD, corporation stop, tubing, trace wire, coppersetter, meter box, cover, lid, tailpiece, and concrete collar, complete in place, including excavation, backfill, and flushing.

802.4.1.2 Meters shall not be installed as part of this work. However, construction of the meter box and placement of the yoke shall be such that at a later date, the meter may be installed properly and easily.

802.4.1.3 The CONTRACTOR shall be responsible for proper vertical and horizontal location of the box over the meter yoke.

802.4.2 REPLACEMENT OF ¾-INCH TO 2-INCH SERVICE LINES:

802.4.2.1 Replacement service lines are essentially new services installed in conjunction with the replacement of the water main. Unless otherwise specified in the Contract Documents, all existing services shall be replaced with new material between the water main and the meter yoke.

802.4.2.2 Replacement service line work does not include any relocation or rehabilitation of the meter. The work shall consist of the following:

802.4.2.2.1 Furnish and install tapping saddle, EMD, trace wire, corporation stop, coppersetter and tubing, complete in place, including flushing.

802.4.2.2.2 Re-connection to the meter.

802.4.2.2.3 All necessary excavation, backfill, including sidewalk, curb, gutter, pavement removal and replacement.

802.4.3 3/4-INCH TO 2-INCH METER RELOCATION

802.4.3.1 A meter relocation is the relocation of an existing meter to a position closer to the water main. The meter relocation item is to be used when the service line is not replaced.

802.4.3.2 A new meter box and cover shall be furnished and installed.

802.4.3.3 A coppersetter shall be used in the reinstallation of the meter, for services sized ¾-inch through 2-inch, and shall be of a height to properly position the meter vertically within the box, as shown in the Standard Detail Drawings.

802.4.3.4 When moving the meter further from the water main, refer to section 802.4.1. The existing line shall be abandoned and the corporation stop shall be closed.

802.4.3.5 When determined by the Water Authority, the existing meter shall be replaced by the CONTRACTOR with a meter furnished by the Water Authority. Any 1¼-inch meters found in the field shall be replaced with 1-inch meters by the Water Authority.

802.4.3.6 The work and materials shall include the coppersetter, connector pieces, excavation, tubing, backfill, removal and replacement of meter, installation of new meter box, and concrete pad. The work shall also include all necessary disconnections, and connections of the house and meter box service lines, complete restoration of the affected site (including landscaping) and adjustment of the meter to the level shown in the Standard Detail Drawings.

802.4.4 Trace wire installation is required on all metered services as outlined in Section 801.

802.4.5 Water service lines shall only be tapped into water mains. Taps to fire hydrant legs are prohibited;

802.5 Meter boxes shall not be located or relocated in driveways or drivepads unless authorized by the ENGINEER.

802.6 3/4-INCH TO 2-INCH METER REHABILITATION AND REPLACEMENT

802.6.1 3/4 -INCH TO 2-INCH METER REHABILITATION:

802.6.1.1 Meter rehabilitation is applicable where the meter box deficiency exists. Deficiencies include obsolete, broken above or below grade, improperly sized, or existing location does not allow access to the meter, curb stop, or connector pieces (does not meet new installation standards). When any of these conditions exist, the meter box and meter installation shall be rehabilitated, as authorized by the ENGINEER.

802.6.1.2 The work and materials shall

include:

802.6.1.2.1 Furnish and install a new coppersetter, meter box, cover and lid, and concrete pad.

802.6.1.2.2 Furnish and install any reconnection pieces necessary for a complete service restoration.

02.6.1.2.3 Flushing out of the service line.

802.6.1.2.4 Site restoration (including any necessary landscaping) and cleanup.

802.6.2 3/4 -INCH THRU 2-INCH METER REPLACEMENT: Meters to be replaced under "Service Line Replacement" and "Meter Relocation" work shall be performed in accordance with the following procedure:

802.6.2.1 All existing meters involved with "Service Line Replacement" and "Meter Relocation" work shall be replaced by the CONTRACTOR with a meter provided by the Water Authority.

802.6.2.2 The replacement meter shall be requested, in writing by the CONTRACTOR, to the Water Authority, with documentation of address and meter size for each meter to be replaced, project name and number, and CONTRACTOR'S name.

802.6.2.3 The request shall be received at least seven days prior to issuance of meters.

802.6.2.4 A meter replacement worksheet must be filled out by the CONTRACTOR and submitted to the Water Authority which will include the date of installation, address of service, old meter brand, old meter serial number, old meter size, old meter reading, new meter brand, serial number, size, and reading.

802.6.2.5 The CONTRACTOR shall handle all meters so as not to damage them and shall be responsible for the meters from the time of receipt to turn in. Stolen or lost meters shall be replaced at the CONTRACTOR'S expense.

802.7 SERVICE LINE REMOVAL

802.7.1 When an existing service line is to be decommissioned, the CONTRACTOR shall remove and dispose the meter box and service line back to the main where the corporation stop will be turned to the closed position and buried.

802.8 MEASUREMENT AND PAYMENT

802.8.1 METERED SERVICE LINE INSTALLATIONS: For ¾-inch through 2-inch, new service line, service line replacements and transfer, meter relocation, meter replacement, and meter rehabilitation shall be measured and paid for as a completed unit of installation in accordance with the applicable items contained in the Bid Proposal, which payment shall include all materials, labor and equipment required to install, flush and place into service the applicable item.

802.8.2 SERVICE LINES: Unless otherwise authorized in the Contract Documents or by the ENGINEER, service line materials and fittings shall be considered incidental to the applicable pay item established in the Bid Proposal.

802.8.3 PAVEMENT REMOVAL AND REPLACEMENT: Unless otherwise authorized in the Contract Documents or by the ENGINEER, pavement removal and replacement shall be considered incidental to the applicable pay item established in the Bid Proposal.

802.8.4 SERVICE LINE REMOVAL

802.8.4.1 Service line removals shall be measured and paid for at the contract unit price per each, which shall include removal of the existing meter box, removal of the existing service line, and closing the corporation stop. Removal and replacement of any subgrade, landscaping, or asphalt is considered incidental to the removal.

802.8.5 TRACE WIRE: All work associated with the installation of the trace wire and system shall be considered incidental to the installation cost of the pipeline being traced.