PART 1 GENERAL

* 1. SUMMARY
		1. Section Includes:
			1. Pipe and fittings for site domestic water line.
			2. Valves.
			3. Backflow preventers.
			4. Underground pipe markers.
			5. Bedding and cover materials.
		2. Related Sections:
			1. Section 31 23 13 – Excavating and Compaction for Structures
			2. Section 31 23 15 – Excavating, and Compaction for Pavement
		3. Provisions of Division 1 to apply to this section.
	2. UNIT PRICE - MEASUREMENT AND PAYMENT
		1. Pipe and Fittings:
			1. Basis of Measurement: By the linear foot. Basis of Payment: Includes hand trimming excavation, pipe and fittings, bedding, concrete thrust restraints, laterals to five (5) feet away from buildings, and connection to municipal utility water source.
		2. Valves:
			1. Basis of Measurement: By the unit.
			2. Basis of Payment: Includes valve, fittings and accessories and thrust blocks.
		3. Backflow Preventers:
			1. Basis of Measurement: By the unit.
			2. Basis of Payment: Includes backflow preventer, fittings and accessories.
	3. REFERENCES
		1. [Water District] Design and Construction Manual.
		2. American Association of State Highway and Transportation Officials:
			1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
		3. American Society of Mechanical Engineers:
			1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
			2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
		4. American Society of Sanitary Engineering:
			1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
			2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.
		5. ASTM International:
			1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
			2. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
			3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
			4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
			5. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
			6. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure- Rated Pipe (SDR Series).
			7. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
			8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
			9. ASTM D2922 - Standard Test Method for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).
			10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
			11. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR- PR) Based on Controlled Outside Diameter.
			12. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
		6. American Welding Society:
			1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
		7. American Water Works Association:
			1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile- Iron Pipe and Fittings for Water.
			2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
			3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile- Iron Pressure Pipe and Fittings.
			4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
			5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
			6. AWWA C502 - Dry-Barrel Fire Hydrants.
			7. AWWA C504 - Rubber-Sealed Butterfly Valves.
			8. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
			9. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
			10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
			11. AWWA C606 - Grooved and Shouldered Joints.
			12. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
			13. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
			14. AWWA C702 - Cold-Water Meters - Compound Type.
			15. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
			16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
			17. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
			18. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
		8. Standard Specifications for Public Works Construction (SSPWC).
		9. California Building Code, Current Edition.
	4. SUBMITTALS
		1. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
		2. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
	5. CLOSEOUT SUBMITTALS
		1. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
		2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
	6. QUALITY ASSURANCE
		1. Conform to the [Water District] Design and Construction Manual.
		2. Sustainable Design Requirements:
			1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
		3. Perform related work in accordance with SSPWC and CBC-10.
		4. Maintain one (1) copy of each document on site.
	7. DELIVERY, STORAGE, AND HANDLING
		1. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

All products shall conform to the [Water District] Design and Construction Manual.

* 1. WATER PIPING
		1. Ductile Iron Pipe: AWWA C151:
			1. Fittings: Ductile iron, standard thickness.
			2. Joints: AWWA C111, rubber gasket with rods (ANSI A 21.11).
			3. Jackets: AWWA C105 polyethylene jacket, double layer, half lapped, 10 mil polyethylene tape.
			4. Manufacturers:
				1. Pacific States.
				2. Tyler Pipe.
				3. Union Foundry.
				4. U.S. Pipe.
		2. Copper Tubing: ASTM B88, Type K:
			1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
			2. Joints: Compression connection or AWS A5.8, BCuP silver braze.
			3. Manufacturers:
				1. Cerko.
				2. Halsead.
				3. Muellow.
				4. Streamline.
		3. PVC Pipe: AWWA C900 Class 150:
			1. Fittings and Joints: Class 350, ductile iron conforming to AWWA C110, C111 and C153 (ANSI A 21.10, A 21.11 and A 21.23 respectively). Shall be push on joint conforming to AWWA C111 (ANSI A 21.11). Fittings shall have an asphaltic outside coating in accordance with AWWA C110 or C153; and cement mortar lining in accordance with AWWA C104.
			2. Manufacturers:
				1. JM Pipe.
				2. PW Pipe.
				3. Vinyl Tech.
		4. PVC Pipe: Schedule 80 PVC, per ASTM D - 1784
			1. Fittings: Solvent weld.
			2. Manufacturers:
				1. Spears
				2. Harrison Plastic
				3. US Plastic
				4. Or Approved Equal
	2. BALL VALVES
		1. Shall be “Apollo” Valves 94ALF-A Series Full Port Brass, made in the USA or approved equal.
	3. BACKFLOW PREVENTER ASSEMBLIES
		1. Assembly shall be provided with flanged connections, ductile iron with fusion bonded epoxy coated construction, bronze, or stainless steel.
		2. Backflow preventer shall be suitable for cold water working pressure of 175 psi.
		3. Internal parts shall be designed for replacement without removing valves from line.
		4. Double check backflow preventer assembly shall consist of two independently acting spring cam or poppet style check valves, 2 shut-off valves and 4 test cocks. Check valve shall be designed to provide drip tight closure against reverse flow, low pressure drop at maximum flow capacity. Spring-loaded checks shall cause valve to seal against a higher inlet pressure than outlet pressure when there is no flow.
		5. Double check backflow preventer assembly shall meet AWWA Standard C510-89.
		6. Assembly shall be:
			1. Ames, Maxim Series M2000 or approved equal
		7. Backflow prevention assemblies (devices), shall be tested and certified by a certified backflow tester, and a test report shall be provided to the water agency having jurisdiction. Testing shall be performed in the presence of the IOR.
	4. UNDERGROUND PIPE MARKERS
		1. Plastic Ribbon Tape: Bright colored, continuously printed, minimum six (6) inches wide by four (4) mil thick, manufactured for direct burial service.
		2. Trace Wire: Magnetic detectable conductor imprinted with "Water

Service“ in large letters.

* 1. BEDDING AND COVER MATERIALS
		1. Bedding: Conforming to Section 32 90 00 Landscape Planting and as specified by the [Water District)
		2. Cover: Conforming to Section 32 90 00 Landscape Planting and as specified by the [Water District)
	2. ACCESSORIES
		1. Concrete for Thrust Restraints: Concrete type specified in Section 03 30 00.

PART 3 - EXECUTION

Conform to by the [Water District] Design and Construction Manual

3.01 EXAMINATION

 A. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

* 1. PREPARATION
		1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
		2. Remove scale and dirt on inside and outside before assembly.
		3. Prepare pipe connections to equipment with flanges or unions.
	2. BEDDING
		1. Excavate pipe trench in accordance with Section 31 23 13 for Work of this Section.
		2. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide sufficient thrust restraint bearing area on subsoil as specified by [Water District].
		3. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding eight (8) inches compacted depth; compact to 95 percent, conforming to ASTM D1557.
		4. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent, with material approved by Architect/Engineer.
		5. Maintain optimum moisture content of fill material to attain required compaction density.
	3. INSTALLATION – PIPE
		1. Project site water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.
		2. Unless otherwise indicated, install pipe and fittings as specified and in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, “Installation”.
		3. Maintain separation of water main from sewer piping in accordance with [Water District] and the State Department of Health Services.
		4. Install pipe to indicated elevation to within tolerance of 5/8 inches.
		5. Route pipe in straight line.
		6. Install pipe to allow for expansion and contraction without stressing pipe or joints.
		7. Install access fittings to permit disinfection of water system performed under Section 3.8 of this specification.
		8. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.
		9. Establish elevations of buried piping with not less than 42 inches of cover, unless otherwise approved by [Water District] and Engineer.
		10. Install trace wire (Type No. 14AWS insulated copper) continuous next to pipe in the location designated [Water District] held in place by looping the pipe at 20 feet intervals maximum.
		11. Install Work in accordance with [Water District] Design and Construction Manual coordinating with Section 31 23 13.
		12. Remove fins and burrs from pipe and fittings.
		13. Clean piping, fitting, valves, and accessories before installing. Maintain items in a clean condition.
		14. Provide proper facilities for lowering sections of pipe into trenches. Do not drop into piping, fittings, or other materials into trenches. Accurately cut pipe and install without springing or forcing. Replace any piping or fitting that does not provide sufficient space for proper installation of joining material.
		15. Blocking or wedging between bells and spigots is not permitted. Install bell and spigot pipe with bell end pointing in the direction of flow.
		16. Install piping to the lines and grades indicated or required. Low points and dips are not permitted. Support piping at proper elevation and grade with secure and uniform supports. Wood support blocking is not permitted.

Where sand cement slurry will not be furnished for backfill, install piping so that full length of each section of pipe and each fitting will solidly rest on pipe bedding. Excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated or required for installation. Provide proper allowances and devices for expansion and contraction of piping and systems.

* + 1. Maintain trenches free of standing water until pipe joints have been installed.
		2. At the end of each day close open ends of pipe with temporary wood blocks or bulkheads.
		3. Do not install piping when trench or weather conditions prevent proper installation.
		4. Jointing:
			1. Provide push on joints with elastomeric gaskets specified for this type of joint, furnishing either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push on joint connections, provide pipe with push on joint ends furnished with factory installed bevel; for push on joint connections to metal fittings, valves and other accessories, square cut spigot end off pipe end.
			2. Provide push on joint lubricant recommended by manufacturer.
			3. Install push on joints for pipe-to-pipe connections in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, "Installation."
			4. Install push on joints for connection to fittings, valves, and other accessories in accordance with requirements of UBPPA Uni-B-3 and with applicable requirements of AWWA C600.
			5. Compression-type joints/mechanical-joints with gaskets, glands, bolts, nuts and internal stiffeners shall be installed in accordance with the requirements of UBPPA UNI-B-3 and AWWA C600 and Appendix A to AWWA C 111/A21.11.
			6. Square cut spigot off end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.
			7. Sleeve-type mechanical couplings shall be provided in strict accordance with coupling manufacturer’s recommendations using internal stiffeners as specified for compression-type joints.
	1. CLEARANCES OF WATER LINE
		1. Building or Structures: 2 feet.
		2. Parallel to Sewer Line:
			1. Water line 4 inches or less in diameter shall not be installed in a common trench with the building sanitary drain unless the bottom of the water line is at least 12 inches above the top of the building sanitary drain or where the water line is installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the building sanitary drain.
			2. Water mains 6 inches and larger in diameter shall be separated from the Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, in accordance with the requirement of the State of California, Human and Welfare Agency, Department of Health Services.
		3. Crossing Sewer Line:
			1. A water main shall be separated from sanitary sewer in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2), unless modified herein.
			2. Install water main a minimum of 12 inches clear, above or below a sanitary sewer.
			3. A water main 6 inches or greater in diameter, crossing under a Project site sanitary sewer line, shall be installed with all their joints located at least 10 feet away from each side of the sanitary sewer line.
			4. A water main 6 inches or greater in diameter, crossing over a Project site sanitary sewer line, shall be installed with all their joints located at least 4 feet away from each side of the sanitary sewer line.
			5. Install all water mains no closer than 10 feet horizontally clear from the edge of sewage leach fields, seepage pits, and septic tanks.
	2. INSTALLATION OF TRACER WIRE AND PIPE MARKERS
		1. Tracer Wire: Install continuous length of tracer wire for full length of each run of nonmetallic pipe. Fasten wire to top of pipe in such a manner that it will not be displaced during construction operations. Wire shall be fastened to pipe at not greater than 20-foot intervals. Wire shall terminate above finished grade with a 12 inch lead taped around each riser. Provide a tracer wire to grade under a permanent marker where straight- line transitions of metallic to non-metallic pipe are installed.
		2. Underground Pipe Markers: Provide markers at grade where non-metallic pipe is installed and for each horizontal change in direction.
	3. INSTALLATION - VALVES
		1. Conform to requirements of [Water District].
		2. Set valves on solid bearing or compacted soil.
		3. Center and plumb valve box over valve. Set box cover flush with finished grade.
	4. CONNECTIONS TO EXISTING WATER LINES
		1. After IOR has inspected installation, perform connections to servicing water lines. Schedule service shutdown for connecting new system at a time causing minimum disruption.
		2. Use a tap or drilling machine with valve and mechanical joint type sleeves for connections to waterlines under pressure, only if all other means of scheduling a shutdown time have been unsuccessful, and with the approval of the responsible engineer, and IOR.
		3. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to branch. Open valve, attach drilling machine, perform tap, close valve, and remove drilling machine, without interruption of service. Notify the IOR in writing at least 5 days prior to the date of scheduled connections.
	5. INSTALLATION OF BACKFLOW PREVENTERS
		1. Install in accordance with manufacturer’s recommendations.
	6. SERVICE CONNECTIONS
		1. Install water service in accordance with [Water District].
		2. Install backflow preventer in enclosure located on site.
		3. Install water service to 5 feet of building. Cap for future building connection.
		4. Install Work in accordance with [Water District] Design and Construction Manual.
	7. DISINFECTION OF DOMESTIC WATER PIPING SYSTEM
		1. Contractor shall furnish all equipment, labor and materials for the proper disinfection (chlorination and flushing) of all pipelines and appurtenances. As part of the Work, and unless specified otherwise, Contractor shall install, at no cost to the District, top outlets (service taps) or temporary Blow offs for required disinfection and sampling. Testing and disinfection must be completed before any pipelines are connected to the existing system.
		2. The Contractor will disinfect pipelines and appurtenances after they have been subjected to hydrostatic and leakage tests.
		3. Disinfection shall conform with provisions of AWWA C651. The chlorinating agent, liquid chlorine gas, shall be applied or injected as approved by [Water District] at locations no more than 10 feet from existing water system as selected by or designated by [Water District]. Concentration of the dosage applied to the water within the pipeline shall be at least 50 ppm and it shall not exceed 200 ppm.

* + 1. Chlorinated water must be retained in the pipeline long enough to destroy all non-spore- forming bacteria. Said period shall be at least 24 hours but not more than 72 hours. After the chlorine-treated water has been retained for the required time, the chlorine residual at the pipe extremities and at other representative locations shall be at least 25 ppm.
		2. Following chlorination, Contractor shall flush all pipelines and appurtenances in the manner and with the procedure prescribed or approved by [Water District]. Permission and permits from regulatory agencies for discharging water shall be obtained by the Contractor. During flushing, all valves shall be in full open free discharge position. Flushing shall continue until all chlorine, debris, and foreign materials have been removed from pipelines and appurtenances.
		3. If so directed by [Water District], Contractor shall remove portions of certain appurtenances such as air valve installations, blowoff installations, and service installations in order to accomplish complete flushing; Contractor shall replace same without adversely affecting disinfected pipelines and appurtenances.
		4. Following flushing, water shall be maintained in the pipeline for at least twenty-four hours, thereafter, bacteriological samples shall be taken and analyzed by a certified independent laboratory as approved by [Water District]. If initial treatment fails to produce satisfactory disinfection as evidenced by bacteriological analysis, chlorination and flushing shall be repeated until acceptable results have been obtained.
		5. Contractor shall arrange and pay for chlorine residual and bacteriological quality tests. Contractor shall obtain [Water District]’s prior approval of the times, places, locations, and numbers of samples or tests. [Water District] shall witness all sampling. Contractor shall provide an Affidavit of Compliance (in triplicate) to [Water District] evidencing satisfactory disinfection.
		6. Following disinfection, pipelines and appurtenances shall remain isolated from any operational water system facilities until evidence has been submitted to [Water District] demonstrating that said pipelines and appurtenances have been adequately and properly disinfected. Said evidence shall consist of aforementioned Affidavit of Compliance together with said bacteriological test results, as submitted by the approved certified laboratory. Normally, said pipelines and appurtenances shall be isolated for at least 48 hours, longer if so determined by [Water District].
	1. TESTS AND INSPECTIONS
		1. Provide labor, equipment, materials, test equipment and incidentals required for performing required field tests.
		2. Tests shall not be performed for 5 days after concrete thrust blocks have been installed.
		3. Testing Procedure: Water mains and service lines shall be tested in accordance with applicable specified standard.
		4. Test PVC plastic water system in accordance with UBPPA UNI-B-3 for pressure and leakage. The amount of leakage from PVC piping shall not exceed the amounts given in UBPPA UNI-B-3, except that no leakage is permitted for joints installed with sleeve type mechanical couplings.
		5. Test water service lines in accordance with applicable requirements of AWWA C 600. No leakage is permitted.
		6. Pressure testing: Before pressure test, fill portion of piping being tested with water for a minimum of 24 hours. Provide hydrostatic pressure of at least 50 psi greater than the maximum working pressure of tested system, but no less than 200 psi hydrostatic test pressure for system piping of 2 inches in diameter and larger. Provide and maintain hydrostatic test pressure for at least 2 hours to ensure no leakage of any portion of piping or appurtenances under pressure test.
	2. FIELD QUALITY CONTROL
		1. Perform pressure test on domestic site water distribution system in accordance with AWWA C600.
		2. Pressure test system to pressure required by [Water District]. Repair leaks and re-test.
			1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Architect/Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.
			2. Provide equipment required to perform leakage and hydrostatic pressure tests.
			3. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
			4. Conduct hydrostatic test for at least two-hour duration.
			5. 0No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
			6. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks removed and plug resulting piping openings.
			7. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
			8. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
		3. Perform pressure test on domestic site water distribution system in accordance with [Water District] Design and Construction Manual.
		4. Compaction Testing for Bedding: In accordance with ASTM D1557.
		5. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION