



American Samoa Power Authority

Engineering Services Division
Water Department

VAILOA ACP REPLACEMENT PROJECT MATERIALS TECHNICAL SPECIFICATIONS

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POLYVINYL CHLORIDE (PVC) WATER PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 This section specifies polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling and storage.

1.2 PIPE DESCRIPTION

1.2.1 Pipe supplier shall furnish PVC pipe as manufactured by Certaineed, Diamond Plastics, Johns Manville or approved equal conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.

PART 2 - QUALITY ASSURANCE

2.1 REFERENCES

2.1.1 ANSI/AWWA C110/A21.10 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.

2.1.2 ANSI/AWWA C111/A21.11 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

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

2.1.4 AWWA C651 Standard for Disinfecting Water Mains

- 2.1.5 AWWA C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution.
- 2.1.6 AWWA C905 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm Through 1200mm), for Water Distribution and Transmission.
- 2.1.7 AWWA M23 AWWA Manual of Supply Practices PVC Pipe- Design and Installation, Second Edition
- 2.1.8 ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
- 2.1.9 ASTM D1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
- 2.1.10 ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
- 2.1.11 ASTM D2152 Test Method for Degree of Fusion of Extruded Poly vinyl Chloride (PVC) Pipe and Molded Fittings by Acetone Immersion
- 2.1.12 ASTM D2241 Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)

2.1.13	ASTM D2665	Polyvinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
2.1.14	ASTM D3034	Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
2.1.15	ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
2.1.16	ASTM F679	Standard Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
2.1.17	ASTM F1057	Standard Practice for Estimating the Quality of Extruded Polyvinyl Chloride (PVC) Pipe by the Heat Reversion Technique
2.1.18	ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
2.1.19	UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
2.1.20	UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
2.1.21	NSF-14	Plastics Piping System Components and Related Materials
2.1.22	NSF-61	Drinking Water System Components--Health Effects
2.1.23	PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

2.2 MANUFACTURER REQUIREMENTS

2.2.1 All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

2.2.3 Recommended Manufacturer: Certainteed, Diamond Plastics, Johns Manville or approved equal.

2.3 WARRANTY

2.4.1 A one-year warranty for the pipe shall be included from the Contractor, and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.

2.4.3 Unless otherwise specified, the warranty periods shall begin after the Certificate of Acceptance is issued for the contract.

2.4 PRE-CONSTRUCTION SUBMITTALS

2.4.1 The following product data is required from the pipe supplier and/or fusion provider:

2.4.1.1 Name of pipe manufacturer

2.4.1.2 Pipe diameter

2.4.1.3 Dimension Ratio (DR 14 or as per plans)

2.4.1.4 Pressure Class per applicable standards

2.4.1.5 Color

- 2.4.1.6 Confirmation/ Recommended minimum bending radius and 20 feet length pull offset distance.
- 2.4.1.7 Confirmation/ Recommended maximum safe pull force
- 2.4.1.8 Fusion technician qualification indicating conformance with this specification

PART 3 ó PRODUCTS

3.1 Polyvinyl Chloride (PVC) Pipe

- 3.1.1 Manufacturers: Certainteed, Diamond Plastics, Johns Manville or approved equal.
- 3.1.2 PVC Pipe: AWWA C900, elastomeric-gasket couplings, Class 100, 150, or 200 as shown on the drawings or bid schedule.
 - 3.1.2.1 Fittings: AWWA C111, rubber-gasket joints, Ductile-Iron Joints: ASTM D3139 compression gasket ring.
 - Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with öWater Lineö in large letters.
- 3.1.3 PVC Pipe: ASTM D2241, SDR-21 or 26 as shown on the drawings or bid schedule:
 - 3.1.3.1 Fittings: ASTM D2466, PVC.
 - Joints: ASTM D2855, solvent weld.
 - Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with öWater Lineö in large letters.
- 3.1.4 Ductile Iron Pipe: AWWA C151, pressure class 350, centrifugally cast in metal molds or sand-lined molds, or C104, cement-mortar lining, as shown on the drawings or bid schedule.
 - 2.1.4.1 Fittings: Ductile iron, standard thickness.
 - 2.1.4.2 Joints: AWWA C111, rubber-gasket joints with rods.
 - 2.1.4.3 Jackets: AWWA C105 polyethylene encasement, double layer, half lapped, ½-inch polyethylene tape.
- 3.1.5 Joint Thrust Restraint

3.1.5.1 Concrete Thrust Blocks:

- 3.1.5.1.1 One part Portland cement, 2 ½ part of fine aggregate, 3 ½ parts coarse aggregate and just enough water for a workable consistency.
- 3.1.5.1.2 #4 Epoxy coated rebars.

3.1.5.2 Spatial Anchoring Retainer Glands for Mechanical Joints:

- 3.1.5.2.1 PVC: Equal to
 - 2.1.5.2.1.1 EBAA Iron Series 2000PV
 - 2.1.5.2.1.2 Romac Industries Grip Ring

PART 4 - EXECUTION

4.1 Delivery and Off-Loading

- 4.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- 4.1.2 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- 4.1.3 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- 4.1.4 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed

- 4.1.5 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
- 4.1.6 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
- 4.1.7 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

4.2 Handling and Storage

- 4.2.1 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.
- 4.2.2 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.
- 4.2.3 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.
- 4.2.4 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

- 4.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
- 4.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

4.5 PREPARATION PRIOR TO MAKING INTER-CONNECTIONS

- 4.5.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:
 - 4.5.1.1 Field verify location, size, piping material, and piping system of the existing pipe.
 - 4.5.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
 - 4.5.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.
 - 4.5.1.4 Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

4.6 PIPE SYSTEM CONNECTION

- 4.6.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

4.7 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

4.7.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. **NO DIRECT TAPPING WILL BE PERMITTED.** Tapping shall be performed in accordance with the applicable sections for saddle tapping as per Uni-Pub-8: Tapping Guide for PVC Pressure Pipe by Uni-Bell PVC Pipe Association.

4.7.2 All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

4.7.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

4.7.3.1 Tapping bits shall be slotted shell style cutters, specifically made for PVC pipe. Hole saws made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

4.7.3.2 Taps may be performed while the pipeline is filled with water and under pressure (wet tap,) or when the pipeline is not filled with water and not under pressure (dry tap).

4.8 TESTING

4.8.1 Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

4.8.2 Hydrostatic Testing and Leakage Testing for Pressure Piping

All hydrostatic and leakage testing shall be in accordance to ASPA's Pressure and Leakage Tests in accordance to AWWA standards. (Refer to section 14000 of this Specifications).

4.9 METHOD OF MEASUREMENT AND PAYMENT

4.9.1 Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

END OF SECTION

PVC PIPE: SCHEDULE 80 FOR SERVICE CONNECTION

1.1 PART 1- PIPE APPLICATION:

Corrosion resistant pressure pipe, IPS sizes 1/8" through 24", for use at temperatures up to and including 140°F. Pressure rating (210 psi to 1230 psi) varies with schedule, pipe size, and temperature. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens.

Pipe exhibits excellent physical properties and flammability characteristics (independently tested flame and smoke characteristics-ULC).

Typical applications include: chemical processing, plating, high purity applications, potable water systems, water and wastewater treatment, irrigation, agricultural, and other industrial applications involving corrosive fluid transfer.

This pipe will be used for Potable Water Systems application and must meet all Local and Federal regulations pertaining to potable water applications.

1.2 PART-2 SCOPE:

This specification outlines minimum manufacturing requirements for Polyvinyl Chloride (PVC) Schedule 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F. This pipe meets and or exceeds the industry standards and requirements as set forth by the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation (NSF International).

1.3 PART 3- PVC MATERIALS:

The material used in the manufacture of the pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784, trade name designation H707 PVC. This compound shall be gray in color as specified, and shall be approved by NSF International for use with potable water (NSF Std 61).

1.4 PART 4 - DIMENSIONS:

PVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785. All belled-end pipe shall have tapered sockets to create an interference-type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672. All PVC Schedule 80 pipe must also meet the requirements of NSF Standard 14 and CSA Standard B137.3 rigid PVC pipe for pressure applications, and shall bear the mark of these Listing agencies. This pipe shall have a flame spread rating of 0-25 when tested for surface burning characteristics in accordance with CAN/ULC-S102-2-M88 or equivalent.

1.5 PART 5- MARKING:

Product marking shall meet the requirements of ASTM D1785 and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in psi for water @ 73°F; the ASTM designation D1785; the independent laboratory's seal of approval for potable water usage; and the date of manufacturing.

END OF SECTION

WATER PIPE AND FITTINGS (DUCTILE/CAST IRON)

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 This specification includes but is not limited to Ductile Iron Pipes, fittings, Valves, and appurtenances for the Water Storage Tank's supply, distribution and overflow lines.

1.2 REFERENCES

- 1.2.1 ANSI/AWWA C104/A21.4 ó Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- 1.2.2 AWWA C105 ó Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
- 1.2.3 ANSI/AWWA C110/A21.10 ó Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids.
- 1.2.4 ANSI/AWWA C111/A21.11 ó Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- 1.2.5 ANSI/AWWA C150/A21.50 ó Thickness Design of Ductile Iron Pipe.
- 1.2.6 ANSI/AWWA C151/A21.51 ó Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
- 1.2.7 ANSI/AWWA C153/A21.53 ó Ductile Iron Compact Fittings, 3 Inch through 16 Inch, for Water and Other Liquids

1.3 PRODUCTS

1.3.1 FABRICATED DUCTILE IRON PIPES FLG X FLG

- 1.3.1.1 AWWA C151, pressure class 350, centrifugally cast in metal molds or sand-lined molds, or C104, cement-mortar lining, as shown on the drawings or bid schedule.
- 1.3.1.2 All Flanged Fabricated Pipe is Class 53 per AWWA C115 unless otherwise noted.
- 1.3.1.3 **GASKETS:** AWWA C111 Standards specify the use of **1/8" Full Face rubber gaskets** on all factory fabricated flanged ductile Iron Pipes. Please note that Gaskets must be cut to the **OLD STYLE** Dimensions.

1.3.2 JOINT THRUST RESTRAINT

1.3.2.1 Concrete Thrust Blocks: One part Portland cement, 2 ½ part of fine aggregate, 3 ½ parts coarse aggregate and just enough water for a workable consistency using epoxy coated re bars.

1.3.2.2 Spatial Anchoring Retainer Glands for Mechanical Joints:

(a) EBAA Iron Series 2000PV

(b) ROMAC Industries Grip Ring

1.3.3 GATE VALVES

1.3.3.1 FOR UNDERGROUND INSTALLATION:

(a) Manufacturer: American Darling, Mueller, Clow or Waterous or equal

(b) Meet or exceed either AWWA C509 or C515, resilient seated gate valves 2 inch through 12 inch NPS, ductile iron body, trim, non-rising stem with square nut, single wedge, mechanical joint, flanged, or slip-on ends as specified in drawings, control rod, and extension box

1.3.4 GATE VALVE BOX ASSEMBLY

1.3.4.1 Manufacturer: Tyler Pipe, Rich or equal.

1.3.4.2 Box Style: Two piece slip style valve box.

1.3.4.3 Nominal diameter of Gate Valve Box fits Gate Valve to be used.

1.3.4.4 Length: Sufficient for depth of bury indicated on plans.

1.3.4.5 Cover: Locking with pentagon nut and clearly marked as "waterö."

1.3.4.6 Acceptable Products: Equal to the following:

(a) Tyler Pipe 6855 valve box and lid.

(b) Rich 920 or 925 valve box and lid.

1.3.4.7 Cast iron and of the sliding type, sized for use with the appropriate valve. Box shall extend from the body of the valve to the finished grade

1.3.5 TRANSITION COUPLING HDPE PIPE TO AC PIPE:

1.3.5.1 Manufacturer: ROMAC Industries, Inc. STYLE 501 Transition Coupling Series meet or exceed either AWWA C219, coupling specification or ASPA approved equal.

1.3.5.2 CASTINGS: The end rings and center rings are cast from ductile (nodular) iron, meeting or exceeding ASTM A536.

- 1.3.5.3 GASKETS: are made from virgin Styrene Butadiene Rubber (SBR) compounds available for petroleum, chemical, or high temperature service.
- 1.3.5.4 BOLTS AND NUTS: 5/8 inch, high strength low alloy steel trackhead bolts. National coarse rolled thread and heavy hex nuts. Steel meets AWWA C111 composition specifications.
- 1.3.5.5 COATINGS: Shop coating applied to cast parts for corrosion protection in transit. Fusion bonded epoxy, liquid epoxy or other coatings may be applied.
- 1.3.5.6 PRESSURE: when properly installed on a pipe that is within the correct outside diameter range, couplings in the ROMAC Style 501 line can be used up to 260 psi.
- 1.3.5.7 SIZES AND RANGES: Must be 6ö nominal size DIPS for the HDPE pipe end and 6ö AC pipe OD range of the product. Manufacture will provide the ranges and tolerances as approved by ASPA.

END OF SECTION

AIR RELEASE VALVE ASSEMBLY

PART 1 **GENERAL**

1.1 SECTION DESCRIPTION

1.1.1 This specification includes but is not limited to Air Release Valve Assembly of the size and type shown on the plans, as an appurtenance to domestic water mains. These requirements include the type of valves and materials to be used, methods and requirement for installation.

1.2 REFERENCES

1.2.1 AWWA C512 standard Specifications.

1.3 GENERAL

1.3.1 Conforms to EPA-AIS (American Iron and Steel) Certification.

1.3.2 Lay-out and configurations shall be in accordance to the specified drawings provided by ASPA-ESD

1.3.3 All Materials such as but not limited to 1ö PVC pipe and fittings and appurtenances shall be NPT.

1.3.4 All materials such as but not limited to fittings and other parts or appurtenances shall be made of Bronze or Copper. Galvanized Iron or Galvanized coating or lead content materials **ARE STRICTLY PROHIBITED.**

1.3.5 Valve Material: Top Quality Thermoplastics and Elastomers.

1.3.6 Valve Type: Normally-open air release/air vacuum valve.

1.3.7 Recommended Product:

1.3.7.1 **AIR RELEAS VALVE: PLAST-O-MATIC Thermoplastic Air Release Valve Model ARV100EPI-PV** manufactured by Plas-O-Matic Valves, Inc. in Cedar Grove, New Jersey, USA or ASPA approved equal.

1.3.7.2 **FIBERGLASS ENCLOSURE BOX: VENT –GUARD Flip-Top Fiberglass Air Valve Enclosure Model LV018018024** manufactured by HOTBOX Enclosures in Jacksonville, Florida or ASPA approved equal.

ATTACHMENT B
TECHNICAL SPECIFICATIONS

END OF SECTION

FIRE HYDRANT

PART 1 **GENERAL**

1.1 SECTION DESCRIPTION

1.1.1 This specification includes but is not limited to Fire Hydrant suitable for firefighting and water emergencies.

1.2 REFERENCES

1.2.1 AWWA C502, standards and specifications for Dry Barrel Hydrants.

1.2.2 AWWA C503, standards and specifications for Wet Barrel Hydrants.

1.3 GENERAL

1.3.1 Conforms to AWWA C502 for dry-barrel or C503 for wet-barrel, as specified in the drawings.

1.3.2 Bury length is to the nearest 6 inches from the bottom of the connecting pipe to the ground line of the hydrant.

1.3.3 Use two hose (2 ½ inch) and one pumper outlet (4 ½ inch) nozzles with threads conforming to National Fire Protection Association (NFPA) 1963 for National Standard Fire Hose Coupling Screw Threads.

1.3.4 The size of the Hydrant is designated by the nominal diameter of the main valve opening. In no case shall the diameter of the main valve opening be less than 4 inches.

1.3.5 Inlet connection is 6 inches flanged or hub connection.

1.3.6 The direction of rotation of the operating nut to open the hydrant is left (counterclockwise).

1.3.7 Paint the exterior of the hydrant in traffic or safety RED.

1.3.8 The outlet nozzle cap and chain is BRONZE.

1.3.9 Equipped with break off Flange and check valve (Model/LBI 400A).

1.3.10 Furnish **Two (2) hydrant wrenches** for this contract supplied by the Manufacturer of Fire Hydrant.

1.3.11 Furnish **One (2) Traffic Safety Flange Repair Kit** including but not limited to all couplings, gaskets and connections necessary to replace a broken safety flange, as supplied by the manufacturer of Fire Hydrant.

- 1.3.12 Recommended Product is **CLOW 960 Model** manufactured by The CLOW Valve Corona, California, USA or ASPA approved Equal.

END OF SECTION

SERVICE SADDLE

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 This specification includes but is not limited to Service Saddle suitable for Water Service Connections and Saddle requirements for Blow-off Valve Assembly.

1.2 MATERIALS & REFERENCES

- 1.2.1 **CASTING:** The Saddle body is cast from ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12.
- 1.2.2 **GASKET:** Gasket is made from Nitrile Butadiene Rubber (NBR) compounded for water and sewer service and a tolerance of petroleum products in accordance with ASTM D 2000 MNC 610. Other compounds available for special applications.
- 1.2.3 **STRAPS:** Type 304 (18-8) heavy gauge Stainless Steel, two (2) inches wide to spread out clamping forces on the pipe. GMAW and GTAW welds. Passivated for corrosion resistance. A double strap is required.
- 1.2.4 **BOLTS, NUTS:** For 3", 1/2" UNC roll thread Type 304 (18-8) Stainless Steel bolts with heavy hex nuts. 4" and above use 5/8" UNC roll thread Type 304 (18-8) Stainless Steel bolts with heavy hex nuts. All welds fully passivated for enhanced corrosion resistance. Nuts coated to prevent galling.
- 1.2.5 **WASHERS:** 1/2" or 5/8" flat, Type 304 (18-8) Stainless Steel and plastic washer to prevent galling.
- 1.2.6 **SPRING WASHERS:** 1/2" or 5/8" flat, Type 304 (18-8) Stainless spring washers manufactured from a special grade of Stainless Steel used in the making of springs.
- 1.2.7 **COATING:** Casting is coated with fusion bonded black nylon, 10-12 mils thick, with a dielectric strength of 1,000v/mil.
- 1.2.8 **PRESSURE RATING:** Working pressures up to 150 psi when properly installed on a pipe within the correct outside diameter range.

1.3 SIZES:

Nominal Pipe Size	Pipe OD	Tap Size	Strap Type
6ö	6.90ö	2ö I.P.	Double ó 2ö wide
8ö	9.05ö	2ö I.P.	Double ó 2ö wide
12ö	13.20ö	2ö I.P.	Double ó 2ö wide
8ö	9.05ö	1ö I.P.	Double ó 2ö wide
12ö	13.20ö	1ö I.P.	Double ó 2ö wide

1.4 GENERAL

1.4.1 **LIMITATIONS:** HDPE has a lower modulus of elasticity and higher coefficient of thermal expansion than other pipe materials. These properties cause HDPE pipe to expand and contract much more from changes in temperature and/or pressure than other piping materials. Because of these and other properties, great care must be taken in choosing fittings and repair products for use on HDPE Pipes. Thus, Service Saddle shall be designed to function within the following limitations:

1.4.1.1 HDPE Pipe must be manufactured in accordance with AWWA Standard ANSI/AWWA C906-90 / with respect to size of HDPE Pipe to be used.

1.4.1.2 Operating temperatures are limited to 85° F maximum and 32° F minimum.

1.4.1.3 Operating pressure is limited to 150 psi or the rating of the pipe, whichever is less.

1.4.1.4 Pipe system must be designed to compensate for Pipe movement so as to prevent fittings from migrating or rotating on the pipe.

1.4.1.5 Products are intended for use in underground service only.

1.4.1.6 Internal pipe stiffeners must be used when coupling HDPE pipeø ends.

1.4.1.7 Proper restraints must be used when coupling pipe ends to prevent pullout from hydraulic forces or temperature changes.

1.4.2 Recommended product is **ROMAC Service Saddle Type 202N-H Nylon Saddle with Stainless Steel Double Strap for use on HDPE (DIPS) Pipe or FORD Ductile Iron Epoxy Coated Saddle Model # FCD202-690-CC7** or ASPA approved equal.

END OF SECTION

BACTERIOLOGICAL SAMPLING STATION

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 This specification includes but is not limited to Bacteriological Sampling Station suitable for Water Sampling Activities.

1.2 MATERIALS

- 1.2.1 **SUPPORT STRUCTURE:** Shall be factory-equipped heavy gauge steel support structure coated with Thermoplastic Laminated Coating (TLC).
- 1.2.2 **BRACKET SUPPORT:** Shall be factory-equipped Custom fitted bracketry system for precision assembly and with 360° access to internal components and bracketry.
- 1.2.3 **INTERNAL COMPONENTS:** Pipes, fittings, appurtenances shall be made of Brass and sample port must be made of Copper.
- 1.2.4 **COVER:** Shall be constructed of high-impact Thermoplastic with UV Protected for extra-long life. Bury Depth line shall be reflected and visible. Base of Cover must have a stability features to eliminate the need for additional mounting stakes or concrete pad and re-enforced mounting brackets shall be part of the base.
- 1.2.5 **SECURITY LOCK FOR COVER:** A hex key locking Mechanism shall be included.
- 1.2.6 **IDENTIFICATION PLATE/TAG:** A Custom identification tag shall be included on the top portion of the cover, visible for water crew's identification.

1.3 FINISH

- 1.3.1 All Bacteriological Sampling Station must be colored BLUE (water).

1.4 DIMENSION: See drawings provided.

1.5 GENERAL

- 1.5.1 ALL Bacteriological Sampling Station shall **ONLY BE FACTORY FABRICATED**. NO Field/Site Fabrication is allowed.
- 1.5.2 Recommended product is **SAFETY GUARD Model #SG-BSS-01 with Enclosure Model #SG-77** or ASPA approved equal.

END OF SECTION

SERVICE CONNECTION ASSEMBLY

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 This specification includes but is not limited to Service Connection Assembly from PVC Mains to existing service water meter box.

1.2 MATERIALS & REFERENCES

- 1.2.1 6" x 2" SERVICE SADDLE: See material specifications under Service Saddle.
- 1.2.2 2" & 3/4" HDPE PIPE: See material specifications under HDPE Pipe.
- 1.2.3 2", 1" CORP. STOP WITH 2" PACK JOINT FOR PE PIPE: shall be designed and manufactured to conform to AWWA Standard C800.
- 1.2.4 2", 1" CURB STOP WITH REDUCING TO 3/4": shall be designed and manufactured to conform to AWWA Standard C800.
- 1.2.5 2" CURB STOP WITH METER NUT THREAD TO 5/8" WATER METER: shall be designed and manufactured to conform to AWWA Standard C800.

1.3 SIZES:

- 1.3.1 Sizes provided by the manufacturer as per standard plan and this specification.

1.4 PRODUCT:

- 1.4.1 6" x 2" SERVICE SADDLE: See material specifications under Service Saddle.
- 1.4.2 2" & 3/4" HDPE PIPE: See material specifications under HDPE Pipe.
- 1.4.3 2" CORP. STOP WITH 2" PACK JOINT FOR PE PIPE: Recommended product is **Model # FB-1001-7-IDR7-NL**, manufactured by FORD METER BOX COMPANY, INC. in Wabash, Indiana, USA or ASPA approved equal.

- 1.4.4 2" CURB STOP WITH REDUCING TO 3/4": Recommended product is **Model # B-66-773-G-NL**, manufactured by FORD METER BOX COMPANY, INC. in Wabash, Indiana, USA or ASPA approved equal.
- 1.4.5 2" CURB STOP WITH METER NUT THREAD TO 5/8" WATER METER: Recommended product is Model # B-63-332W-NL, manufactured by FORD METER BOX COMPANY, INC. in Wabash, Indiana, USA or ASPA approved equal.

END OF SECTION

MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVC-O) PIPE

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 This specification includes but is not limited to molecularly oriented polyvinyl chloride (PVC-O) pipe.

1.2 PIPE DESCRIPTION

- 1.2.1 Pipe supplier shall furnish PVCO pipe as manufactured by IPEX Inc. - BIONAX® PVCO conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.

PART 2 - QUALITY ASSURANCE

2.1 REFERENCES

- 2.1.1 AWWA C909-09 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe 4" through 24" (100 mm through 600 mm) for Water, Wastewater and Reclaimed Water Services
- 2.1.2 ASTM F1483 Standard Specification for Oriented Poly (Vinyl Chloride) (PVCO) Pressure Pipe.
- 2.1.3 ASTM D1784 Standard Specification for Rigid Poly (Vinyl

Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

2.1.4 ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

2.1.5 ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipes.

2.1.6 NSF-14 Plastics Piping System Components and Related Materials

2.1.7 NSF-61 Drinking Water System Components--Health Effects

2.2 MANUFACTURER REQUIREMENTS

2.2.1 All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

2.2.3 Recommended Manufacturer: IPEX Inc. - BIONAX®PVCO, or approved equal.

2.4 WARRANTY

2.4.1 A one-year warranty for the pipe shall be included from the Contractor, and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.

2.4.3 Unless otherwise specified, the warranty periods shall begin after the Certificate of Acceptance is issued for the contract.

2.5 PRE-CONSTRUCTION SUBMITTALS

2.5.1 The following product data is required from the pipe supplier and/or fusion provider:

2.5.1.1 Name of pipe manufacturer

2.5.1.2 Pipe diameter

2.5.1.3 Dimension Ratio (DR 14 or as per plans)

- 2.5.1.4 Pressure Class per applicable standards
- 2.5.1.5 Color
- 2.5.1.6 Confirmation/ Recommended minimum bending radius and 20 feet length pull offset distance.
- 2.5.1.7 Confirmation/ Recommended maximum safe pull force
- 2.5.1.8 Fusion technician qualification indicating conformance with this specification

PART 3 6 PRODUCTS

- 3.1 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe
 - 3.1.1 Manufacturers: IPEX Inc. - BIONAX®PVCO, or approved equal.
 - 3.1.2 PVC Pipe: AWWA C900, elastomeric-gasket couplings, Class 100, 150, or 200 as shown on the drawings or bid schedule.
 - 3.1.2.1 Mechanical Fittings: AWWA C111, rubber-gasket joints, Ductile-Iron Joints: ASTM D3139 compression gasket ring.
 - 3.1.2.2 Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with "Water Line" in large letters.
 - 3.1.3 Ductile Iron Pipe: AWWA C151, pressure class 350, centrifugally cast in metal molds or sand-lined molds, or C104, cement-mortar lining, as shown on the drawings or bid schedule.
 - 2.1.4.1 Fittings: Ductile iron, standard thickness.
 - 2.1.4.2 Joints: AWWA C111, rubber-gasket joints with rods.
 - 2.1.4.3 Jackets: AWWA C105 polyethylene encasement, double layer, half lapped, 1/2-inch polyethylene tape.
 - 3.1.5 Joint Thrust Restraint
 - 3.1.5.1 Concrete Thrust Blocks:
 - 3.1.5.1.1 One part Portland cement, 2 1/2 part of fine aggregate, 3 1/2 parts coarse aggregate and just enough water for a workable consistency.
 - 3.1.5.1.2 #4 Epoxy coated rebars.
 - 3.1.5.2 Spatial Anchoring Retainer Glands for Mechanical Joints:
 - 3.1.5.2.1 For C909 PVCO: Equal to
 - 2.1.5.2.1.1 EBAA Series 19MJ00
 - 2.1.5.2.1.2 Romac Industries:ROMA GRIP for

PVC (C909) Accessory Pack.

3.1.5.3 Bell Restraint Harness Series 1600 for C900 PVCO Pipe:

- 3.1.5.3.1 Manufactured by: EBAA Iron Inc., or approved equal
- 3.1.5.3.2 The restraint shall be manufactured of Ductile Iron conforming to ASTM A536.
- 3.1.5.3.3 The Restraints shall be coated with MEGA-BOND (visit www.ebaa.com).
- 3.1.5.3.4 A split ring shall be used behind the pipe bell and a split serrated ring shall be used to grip the pipe.
- 3.1.5.3.5 Hardwares: Sufficient number of bolts shall be used to connect the bell ring and the gripping ring. The combination shall have a minimum pressure ratings as shown on the table below:

Nominal Pipe Size	Series Number	A Pipe O.D.	B Maximum Bell O.D. Cleared	C Max. Restraint O.D. (Casing Clearance)	D Overall Length	Thrust Bolt (Number - Size)
4	1604	4.80	6.75	9.25	13	2 - ¾ x 13
6	1606	6.90	8.75	11.25	18	2 - ¾ x 18
8	1608	9.05	12.25	14.75	18	2 - ¾ x 18
10	1610	11.10	14.20	16.85	22	4 - ¾ x 22
12	1612	13.20	16.90	19.45	22	4 - ¾ x 22

NOTE: Dimensions are in inches and are subject to change without notice.

3.1.5.3.6 Installation Instruction:

- 3.1.5.3.6.1 Assemble the push-on joints as per the pipe manufacturer's instructions.
- 3.1.5.3.6.2 Install both halves of the non- serrated bell ring around the pipe behind the bell. Install the side bolts and tighten each to 60 ft-lbs (110 ft-lbs on 8, 10 and 12 inches diameters).
- 3.1.5.3.6.3 Slide the bell ring toward the bell so it fits snugly behind the bell.
- 3.1.5.3.6.4 Remove the side bolts from the serrated restraint ring. Use the tie bolts to determine the proper location of the restraint ring on the spigot Allow enough room on the tie bolt to fully engage the butts.
- 3.1.5.3.6.5 Install both half of the restraint ring at the proper location, tapping each half into place. Make sure that the complete ID is touching the pipe before

installing the side bolts evenly to 60 ft-lbs (110 ft-lbs on 8, 10 and 12 inches diameters).

- 3.1.5.3.6.5 Place nuts on the tie bolts and tighten until they are snug. Allow enough room on the tie bolt to fully engage the nut with several threads showing. Do not tighten these bolts to force the spigot into the bell of the joint.

PART 46 EXECUTION

4.1 Delivery and Off-Loading

- 4.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- 4.1.2 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- 4.1.3 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- 4.1.4 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.
- 4.1.5 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

- 4.1.6 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
- 4.1.7 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

4.2 Handling and Storage

- 4.2.1 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.
- 4.2.2 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.
- 4.2.3 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.
- 4.2.4 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.
- 4.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

- 4.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

4.5 PREPARATION PRIOR TO MAKING INTER-CONNECTIONS

- 4.5.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

4.5.1.1 Field verify location, size, piping material, and piping system of the existing pipe.

4.5.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.

4.5.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.

4.5.1.4 Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

4.6 PIPE SYSTEM CONNECTION

- 4.6.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

4.6.1 CURVATURE OF THE PIPELINE:

There are three common methods used to achieve changes in direction with PVC-O Pressure Pipe. They are: using PVC Fittings, deflecting the joint, and bending the pipe barrel.

4.6.1.1 Using PVC Fittings:

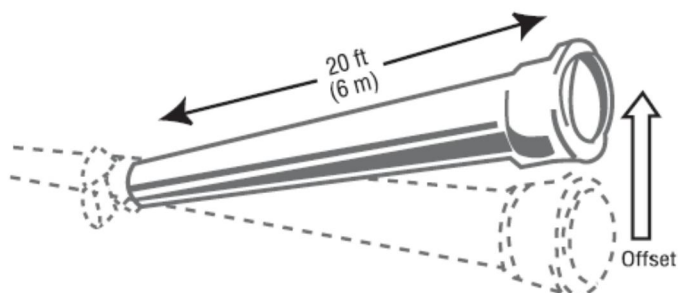
Pipeline Curvatures can be achieved by using PVC Fittings. Standard elbows for molded fittings include 22 1/2, 45 and 90 degrees. The cut lengths and radii are as follows:

Size		Cut Length		Radius	
in	mm	in	mm	ft	m
6	150	36	910	22	6.7
8	200	36	910	21	6.3
10	250	42	1070	26	7.9
12	300	48	1220	30	9.2
14	350	60	1520	40	12.2
16	400	72	1830	48	14.6
18	450	74	1870	49	14.8
20	500	82	2080	54	16.5
24	600	98	2480	67	20.3

4.6.1.2 Deflecting the Joint:

The procedure for offsetting pipe gasketed joint is shown below. **Warning: “DO NOT COMBINE THIS METHOD WITH BENDING THE PIPE BARREL”.**

1. Make a concentric assembly, but push the spigot into the bell only to a point about 1/2 inch (13 mm) short of the reference line (the first reference line if there are two). This incomplete assembly permits more movement of the end of the pipe at the bottom of the bell.
2. Without delay, shift the loose bell end of the assembled length by not more than the following recommended maximum offsets. Use only manual effort.



MAXIMUM RECOMMENDED OFFSETS, TO ACHIEVE MINIMUM CURVE RADUIS BY DEFLECTING A STRAIGHT LENGTH OF PIPE AT THE JOINT.

Pipe Size		Max Offset		Angle at One Bell	Resulting Radius of Curvature Using 20ft (6m) Lengths	
in	mm	in	mm		ft	m
4	100	12½	320	3°	382 ft	116 m
6	150	12½	320	3°	382 ft	116 m
8	200	12½	320	3°	382 ft	116 m
10	250	12½	320	3°	382 ft	116 m
12	300	10½	270	2.5°	458 ft	140 m
14 - 24	350 - 600	6¼	160	1.5°	764 ft	233 m
30 - 48	750 - 1200	4	100	1.0°	1146 ft	349 m
At Molded PVC Fittings (all sizes)		4	100	1.0°**	1146 ft	349 m

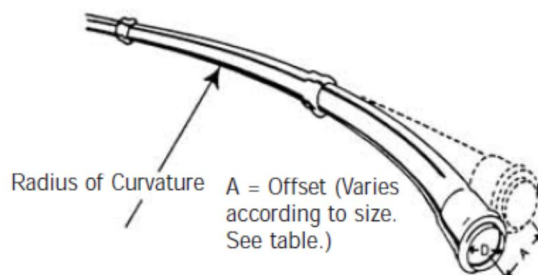
** *Bell-by-Bell fittings such as tees and couplings offer a total of 2° deflection per fitting.*

4.6.1.3 Bending the Pipe barrel:

Smaller diameters of PVC-O Pressure pipes can be laid to the line of the curved trench by bending the pipe barrel into curved shape. The procedure is as follows:

1. Make a concentric assembly in the usual way. Keep the spigot in straight alignment with the bell.
2. Place compacted backfill around the assembled joint to restrict its movement while the curvature is being made.
3. Place compacted backfill at the inside of the curve, at the midpoint of the pipe length, to form a fulcrum.
4. **Using only manual effort**, move the leading bell of the pipe length to be curved by no more than the offset distance shown in the following table below.
5. **Tapping bent PVC pipe is permitted BUT it is recommended to tap on straight or not bended pipe.**

NOTE: *Bent Pipes should be clearly marked along their length to avoid the possibility that they will be tapped in the future.*



MAXIMUM RECOMMENDED OFFSETS, TO ACHIEVE MINIMUM RADII OF CURVATURE BY BENDING THE BARREL OF 20 ft (6 m) LENGTHS.

CIOD Pipe – Blue Brute™ & Bionax® C909 Pipe						IPS OD Pipe – Cycle Tough™ F1483 Pipe							
Pipe Size D		Max Offset		Resulting Angle of Deflection	Resulting Radius of Curvature		Pipe Size D		Max Offset A		Resulting Angle of Deflection	Resulting Radius of Curvature	
in	mm	in	mm		ft	m	in	mm	in	mm		ft	m
4	100	24	600	5.7°	100	30	4	100	32	813	7.6°	75	23
6	150	17	430	4.0°	144	44	6	150	22	560	5.2°	111	34
8	200	13	300	3.0°	188	58	8	200	17	430	4.0°	144	44
10	250	10	254	2.5°	232	71	10	250	13	330	3.2°	179	55
12	300	8.7	221	2.1°	275	84	12	300	11	280	2.7°	213	65

NOTE: Minimum radius is approximately 250 times nominal OD

NOTE: Minimum radius is approximately 200 times nominal OD

* SDR and DR both refer to the outside diameter of the pipe divided by pipe thickness: $\frac{O.D.}{t}$

4.7 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

4.7.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for saddle tapping as per Uni-Pub-8: Tapping Guide for PVC Pressure Pipe by Uni-Bell PVC Pipe Association.

4.7.2 All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

4.7.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

4.7.3.1 Tapping bits shall be slotted shell style cutters, specifically made for PVC pipe. Hole saws made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

4.7.3.2 Taps may be performed while the pipeline is filled with water and under pressure (wet tap), or when the pipeline is not filled with water and not under pressure (dry tap).

4.8 TESTING

4.8.1 Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

4.8.2 Hydrostatic Testing and Leakage Testing for Pressure Piping

All hydrostatic and leakage testing shall be in accordance to ASPA's Pressure and Leakage Tests in accordance to AWWA standards. (Refer to Section 14000 of this Specifications).

4.9 METHOD OF MEASUREMENT AND PAYMENT

4.9.1 Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

END OF SECTION

NO LEAD BRASS FITTINGS & VALVES

PART 1 GENERAL

1.1 SECTION DESCRIPTION

1.1.1 This specification includes but is not limited to brass fittings used for this project.

1.1.2 All brass valves and fittings for service lines shall be provided under this contract.

PART 2 PRODUCT

2.1 All fittings and valves shall be manufactured in accordance with AWWA Standard C-800, latest revision, and as further specified in these technical specifications.

2.1.1 Exception: Any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass", defined for this specification as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C-800. This "No-Lead Brass" alloy shall not contain more than nine one hundredths of one percent (0.09% or less) total lead content by weight.

2.1.2 Any Brass part of the fitting or valve not in contact with potable water shall be made of 85-5-5-5 brass as defined for this specification as UNS Copper Alloy C83600 per ASTM B62, ASTM B584 and AWWA C-800.

- 2.2 All brass fittings and valves shall be certified by an ANSI accredited test lab per NSF/ANSI Standard 61, Drinking Water Components ó Health Effects, Section 8 or NSF/ANSI Standard 372, Drinking Water System Components ó Lead Content. Proof of certification is required.
- 2.3 Brass fittings and valves shall comply with the United States Of America Safe Drinking Water Act, and the U.S. Environmental Protection Agency.
- 2.4 All brass fittings and valves shall have the manufacturers name or trademark permanently stamped or cast on it. Another marking identifying the ñno leadñ brass alloy, e.g., "NL" shall be cast or permanently stamped on the fitting or valve.

PART 3 QUALITY CONTROL

- 3.1 If requested, an affidavit certifying compliance with these standards and specifications shall be signed and submitted by the manufacturing firm's Quality Assurance or Engineering Manager.

PART 4 MANUFACTURER

- 4.1 The brass fittings and valves shall be produced by a manufacturer in the United States of America.

ELECTRONIC MARKERS

PART 1 GENERAL

1.1 SECTION DESCRIPTION

- 1.1.1 Furnishing of electronic markers for ñlocatingñ purposes.

PART 2 MATERIAL

- 2.1 Electronic markers shall be "Omni Marker", manufactured by Tempo, or ASPA approve equal.

Application	Color	Frequency	Model Number	UPC Number
Potable Water	Blue	145.7 kHz	Model 161	60766

PART 3 REQUIREMENTS

- 3.1 Placement of electronic markers shall be hand placed in the trench, centered over the pipe and covered with sufficient base course material to prevent shifting prior to backfilling of the trench. Installation shall be at a minimum depth of two (2) feet and a maximum depth of three (3) feet from finish grade. Markers shall be detectable under typical concrete sidewalks and asphalt.

PART 4 PAYMENT

- 4.1 The Payment for ELECTRONIC MARKERS will be made at the Unit Price Bid based on the actual amount. The Unit Price Bid for ELECTRONIC MARKERS shall be full compensation for all materials, tools and equipment necessary for furnishing and installing ELECTRONIC MARKERS and all other incidentals required to complete the work.