

DIVISION 33 – UTILITIES
SECTION 33 12 00 – RECLAIMED WATER UTILITY DISTRIBUTION EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Gate Vales and accessories
 - 2. Valve Boxes
 - 3. Manual Valve Operators
 - 4. Service Connection Components
 - 5. Fire Hydrants
 - 6. Backflow Prevention Valves
 - 7. Pressure Reducing Valves
 - 8. Air Release Valve
 - 9. Yard Hydrant
 - 10. Meters

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM A36, Standard Specification for Structural Steel.
 - 2. ASTM A48, Standard Specification for Gray Iron Casting.
 - 3. ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 4. ASTM A536, Standard Specification for Ductile Iron Castings.
 - 5. ASTM A307, Carbon Steel Externally and Internally Threaded Fasteners.
 - 6. ASTM D2657, Standard Practice for Heat Joining of Polyolefin Pipe and Fittings.
 - 7. ASTM D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
 - 8. ASTM D3035, Standard Specification for Polyethylene plastic Pipe Based on Controlled Outside Diameter.

9. ASTM D3261, Butt Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing.
 10. ASTM D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Material.
 11. ASTM F714, Standard Specification of Polyethylene Plastic Pipe Based on Outside Diameter
 12. ASTM F1055, Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
- B. American Nation Standard Institute:
1. ANSI A21.4, Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 2. ANSI A21.10, Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids.
 3. ANSI A21.11, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
 4. ANSI A21.50, Thickness Design of Ductile Iron Pipe
 5. ANSI A21.51, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- C. American Water Works Association:
1. AWWA C104, Cement Mortar Lining for Ductile-Iron.
 2. AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems
 3. AWWA C110, Ductile-Iron and Gray-Iron Fittings, 3 in., Through 48 in., for Water and Other Liquids.
 4. AWWA C111, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
 5. AWWA C150, Thickness Design of Ductile Iron Pipe
 6. AWWA C151, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
 7. AWWA C153, Ductile Iron Compact Fittings for Water Service.
 8. AWWA C502, Dry-Barrel Fire Hydrants
 9. AWWA C509, Resilient-Seated Gate Valves for Water and Sewerage Systems.
 10. AWWA C600, Installation of Ductile Iron Water Mains and their Appurtenances
 11. AWWA C605, Underground Installation of PVC Pressure Pipe and Fittings for Water
 12. AWWA C800, Underground Service Line Valves and Fittings

13. AWWA C900, PVC Pipe and Fabricated Fittings, 4 inch through 12 inch, for Water Transmission and Distribution
 14. AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, ½ inch through 3 inch, for Water Service
 15. AWWA C906, Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch for Water Distribution and Transmission
- D. American Welding Society:
1. AWS D1.1, Structural Welding Code.
- E. National Electrical Manufacturers Association:
1. NEMA Standard Specifications.
- F. NSF International:
1. NSF-61 Listings.
- G. Plastic Pipe Institute
1. PPI TR-3, Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.
 2. PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings.

1.03 SYSTEM DESCRIPTION

- A. The Contractor shall furnish and install to the required line and grade, all equipment and appurtenances, required for a complete installation to support intended functionality of each component individually and systematically.
- B. The Contractor shall furnish and install fittings, couplings, connections, sleeves, adapters, harness rods and closure pieces as required to connect or incorporate equipment into the overall project where connecting to piping or assemblies.
- C. The Contractor shall furnish all labor, materials, equipment, tools, and services required to procure, install and test all equipment required for the project.
- D. Water meters shall be adequately sized to yield accuracy between 98.5-101.5% over the normal operating range. Adjacent piping design shall be in accordance with the manufacturer's recommendations to optimize performance. Consult with the Authority regarding the style of meter (i.e. turbine-type or electromagnetic).
- E. Pressure reducing valves shall be sized appropriately based on flow and pressure reduction to prevent long-term damage due to cavitation.
- F. The Authority will, at a minimum, provide access to the existing facilities for determination of design information. At all times, existing facilities will be operated by the Authority's

personnel.

- G. Hydrants shall be located as directed by the Authority based on current and projected building and population densities.
- H. A backflow prevention device shall be installed at all potential cross-connections to prevent the backflow of polluted water into the reclaimed water system. Consult with the Authority to determine if the application requires a double check valve assembly or a reduced pressure zone assembly. Reduced pressure zone assemblies shall be installed at each potential health hazard location.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, catalog cut sheets or other data as required to provide a complete description equipment specified.
- B. Certificates:
 - 1. The Contractor shall furnish to the Engineer, a Material Certification stating that the equipment provided under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.
- C. Operation and Maintenance Data: Furnish operation and maintenance manuals for all equipment.

1.05 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. Use only one manufacturer and model for each component unless conditions prevent model consistency throughout the project.
 - 2. Use equipment designed to withstand imposed trench loadings and conditions at the various locations.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle equipment and related products in accordance with specifications and manufacturer's recommendations.
- B. Equipment and related materials shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Do not drop or skid equipment against other products or items.
- C. Handle equipment and related materials at all times with care to avoid damage. Keep interior of equipment and operating mechanisms free from dirt and foreign matter. All equipment and appurtenances being incorporated into the work shall be carefully lowered or raised into place with suitable equipment in a manner that will prevent damage. Do not drop or dump equipment or accessories.

- D. Thoroughly equipment and all related materials for defects prior to being unloaded and again prior to installation. Repair or replace any defective, damaged, or unsound material, as determined by the Authority, at no cost to the Authority.
- F. Store all valves with rubber seats out of sunlight with discs or plugs opened slightly off seat (3 to 5 degrees).
- G. Exercise each manual valve operator through at least two (2) full open and close cycles at least once every two (2) months.

1.07 SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Keep trenches dewatered until initial bedding has been placed, pipe joints have been made, and initial bedding and concrete cradle and encasement, if any, have cured.
 - 2. Under no circumstances lay pipe in water or on bedding containing frost.
 - 3. Do not lay pipe when weather conditions are unsuitable, as determined by the Engineer, for pipe laying work.

PART 2 – PRODUCTS

2.01 RESILIENT WEDGE GATE VALVES

- A. All gate valves 3" and larger shall conform to AWWA C509 or AWWA C515 (latest revisions), and be NSF Standard 61 certified, with a working pressure rating of 250 psi. All valves shall be ductile iron body, non-rising bronze stem, and resilient seated wedge type.
- B. The wedge shall be cast iron, completely encapsulated with resilient material. The resilient sealing material shall be permanently bonded to the cast iron wedge with a rubber tearing bond to meet ASTM D429.
- C. All internal parts shall be accessible without removing the body from the line.
- D. Nut operators shall have standard 2-inch square AWWA operating nuts. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.
- E. Gate valves shall be supplied with either mechanical joint or restrained joint connections as applicable.
- F. Each buried valve shall also be supplied with a valve box and lid as specified in this Section.
- G. Gate valves shall be provided with extension stems, stem guides, and other miscellaneous items required for a complete installation, shall be provided in accordance with the requirements and recommendations of the valve manufacturer. One tee handle valve operating wrench shall be provided, length of which shall insure that all valves are accessible.

- H. All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded epoxy coating, complying with ANSI/AWWA C550, applied prior to assembly.
- I. Valves installed at a depth greater than 5'-0" (as measured from the top of the operating nut to finished grade) shall be provided with a stem extension installed to a height of 3 feet below finished grade.

2.02 VALVE BOXES

- A. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The trench base on which the valve boxes rests shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. Valve boxes shall be hot bituminous coated, inside and out, with a coal tar or asphaltic compound.
- B. All valve boxes shall be 2-piece cast iron, screw type, 5-1/4" shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: RECLAIMED WATER).
- C. All valve box covers shall be painted purple and shall be provided with a bronze tag or suitable marking that shall be permanently attached to the underside of the cover and shall identify the valve type, size, number of turns, and direction to open.

2.03 MANUAL VALVE OPERATORS

- A. All valve operators shall be manual except where noted otherwise. All interior valves shall be hand wheel or lever operated if the centerline of the valve is 6 feet or less above the floor or platform from which it is to be operated and chain operated if the distance is greater than 6 feet.
- B. Nut operators shall have standard 2-inch square AWWA operating nuts and shall be provided where specified or as required by the Authority. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked. Valve operators shall be designed so that the force required to operate the hand wheel, lever, or chain does not exceed 80 pounds applied at the extremity of hand wheel or chain wheel operator. Nut operators shall be designed to produce the required operating torque with a maximum input of 150 ft.-lb. Hand wheels on valves 4 inches and larger shall not be less than 12 inches in diameter.
- C. Manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18-inch in diameter or larger which shall be worm gear, unless otherwise indicated in the individual valve specification.
- D. Quarter turn operators shall be equipped with adjustable AWWA input limit stops and shall require a minimum of 15 turns for 90° or full stem valve travel and shall be equipped with a valve position indicator.
- E. Manual operators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

- F. Manual operators on buried service valves shall be specially constructed for buried service. Buried service operators shall be permanently lubricated and watertight under an external water pressure of 10 psi. Unless otherwise shown or specified, buried service operators shall be furnished with Standard AWWA nut operator and valve box. Where required, a standard 2-inch AWWA nut operator and valve box shall be provided within 6-inches of grade with a steel extension stem-equal to or greater than the diameter of the manual activator shaft.

2.04 SERVICE CONNECTION COMPONENTS

- A. Corporation Stop
 - 1. Corporation stop to have tapered threaded inlet and threaded coupling on outlet for copper service pipe or copper tubing size O.D. Type K pipe connections.
 - 2. Corporation stop to meet or exceed all requirements of AWWA Standard C800-89.
 - 3. 300 psig working pressure, ball or ground key type, bronze body, double-stem o-rings, AWWA threaded inlet connections, compression style or Insta-tite outlet connections suitable for pipe or tubing used.
- B. Curb Stop
 - 1. Curb stop to meet or exceed all requirements of AWWA Standard C800-89.
 - 2. 300 psig working pressure, ball or curb type valve, bronze body and tee head, double-stem o-rings, compression style inlet and outlet connections suitable for pipe or tubing used.
- C. Curb Box
 - 1. Cast iron construction, adjustable, two (2) piece screw type, 2 1/2 inch shaft with flush fit cover and bolt down lid marked "RECLAIMED WATER".
 - 2. Length of box and base shall be as required for the actual field conditions encountered.
 - 3. Interior and exterior of boxes shall be hot bituminous coated.
- D. Service Saddles
 - 1. Ductile Iron Pipe: Epoxy coated ductile iron saddles with stainless steel straps shall be used for ductile iron pipe. Ductile iron body shall conform with ASTM A536. All straps, nuts and washers shall be Type 304 stainless steel. The body shall be coated with a fusion bonded epoxy coating. A Buna-N rubber gasket shall be integral with the unit.
 - 2. PVC Pipe: Brass saddles shall be used for PVC pipe. Saddle shall be suitable for use on the given pipe material. Saddle body shall be made of 85-5-5-5 brass alloy as per ASTM B-62 and AWWA C800. Strap shall be made of 85-5-5-5 brass alloy as per ASTM B-62 or Type 304 stainless steel. All nuts and washers shall be made of Type 304 stainless steel. A Buna-N rubber gasket shall be integral with the unit.

3. Saddle shall carry a pressure rating greater than the water main.
 4. Saddles to be used for ¾" through 2" connections.
- E. Meter Pit (Service Lines 2" Diameter and Less)
1. Meter pits shall be PVC.
 2. Pit shall have a minimum interior diameter of 20 inches. Pit shall be supplied with an angle ball valve on the inlet, and an angle dual check valve on the outlet. Copper piping supplied inside the meter pit shall be in accordance with these specifications. Interior piping shall be located a minimum of 2-inches from the inside pit wall. All brass components shall conform to AWWA C800.
 3. Meter and pressure reducing valve shall be firmly held in place inside the meter pit with a PVC support.
 4. Double lid meter box cover shall be provided with each meter pit. Frame, barrel and lid shall be cast iron per ASTM A48, Class 25.
 5. The meter pit shall incorporate a copper tandem setter to allow for the installation of a pressure reducing valve and water meter in the pit.
- F. Meter Pit (Service Lines Larger than 2" Diameter)
1. Meter pits shall be concrete vaults in accordance with Section 03 40 00.

2.05 FIRE HYDRANT

- A. Fire hydrants shall meet or exceed the requirements of AWWA C502 (latest revision). Rated working pressure shall be 250 psig, test pressure shall be 500 psig and hydrant
- B. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure.
- C. Hydrant shall open counterclockwise.
- D. The nozzle section, upper and lower standpipes and hydrant base shall be ductile iron. The nozzle caps, pumper caps and weather shields shall be cast or ductile iron.
- E. The hydrant's upper and lower stem, as well as its break coupling and internal pins and clips shall be manufactured of stainless steel. External bolting shall also be manufactured of stainless steel.
- F. The hydrant shall have two hose nozzles and one pumper nozzle. Hose nozzles to be 2-1/2". Pumper nozzle to be 4-1/2" (friction loss to not exceed 3.5 psi at 1,000 gpm). Nozzles shall have national standard threads matching existing hydrants on reclaimed water system. Each nozzle shall be bronze and secured using a ¼ turn locking mechanism with a threaded retainer ring.
- G. The hydrant shall have a bronze seat that is to be threaded into bronze mating threads. The seat diameter shall be 5 ¼"
- H. All working parts of the hydrant shall be removable without excavation.

- I. Hydrant shall have an internal travel stop nut located in the top housing.
- J. Fire hydrants shall be provided with a breakaway traffic flange and allow 360-degree rotation.
- K. There shall be a sealed lubrication chamber with triple O-rings to seal operating threads from the waterway and accommodate an anti-friction thrust washer.
- L. The draining system of the hydrant shall be bronze and be positively activated by the main operating rod. Hydrant drains shall close completely after no more than three turns of the operating nut. There shall be a minimum of three internal ports and four drain port outlets to the exterior of the hydrant. Drain shut off to be by direct compression closure.
- M. External surface above grade shall be factory coated with an epoxy primer and a two-part polyurethane top coating. The standpipe shall be bitumen coated internally and externally with a bury line present below the break flange to indicate proper installation depth. Bury depth shall be clearly stenciled on the standpipe section.
- N. All fire hydrants shall be painted reclaimed water purple.

2.06 BACKFLOW PREVENTION VALVE

- A. Double Check Valve (1/2" through 3")
 - 1. The valve shall meet the requirements of AWWA C510 and have a lead free cast copper silicon alloy body. The assembly shall consist of two positive seating check modules with captured springs and rubber seat discs. The check module seats and seat discs shall be replaceable.
 - 2. The assembly shall include two resilient seated isolation valves; four top mounted, resilient seated test cocks.
 - 3. Assembly to incorporate an upstream strainer.
 - 4. Maximum Pressure: 175 psi
- B. Double Check Valve (2-1/2" through 10")
 - 1. The valve shall meet the requirements of AWWA C510-92. Valve shall feature modular check assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through bolted cover plate.
 - 2. Valve shall be a complete assembly included tight-closing resilient seated shutoff valves, test cocks, and a strainer.
 - 3. Valve bodies shall be epoxy coated cast iron (lead free)
 - 4. Seats shall be stainless steel.
 - 5. Maximum Pressure: 175 psi
- C. Reduced Pressure Zone Assemblies (1/2" through 3")
 - 1. The valve shall meet the requirements of AWWA C511 and have a lead free cast copper silicon alloy body. The assembly shall consist of an internal pressure

differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. The check module and relief valve seats and seat discs shall be replaceable. There shall be no threads or screws in the waterway exposed to line fluids.

2. The assembly shall include two resilient seated isolation valves; four top mounted, resilient seated test cocks.
 3. Assembly to incorporate an upstream strainer.
 4. Maximum Pressure: 175 psi
- D. Reduced Pressure Zone Assemblies (2-1/2" through 10")
1. The valve shall meet the requirements of AWWA C511-92. Valve shall feature modular check assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through bolted cover plate. The assembly shall contain an internal pressure differential relief valve located in a zone between two positively seating check modules. There shall be no threads or screws in the waterway exposed to line fluids.
 2. Valve shall be a complete assembly included tight-closing resilient seated shutoff valves, test cocks, and a strainer.
 3. Valve bodies shall be epoxy coated cast iron (lead free).
 4. Test cocks shall be lead free copper silicon alloy.
 5. Seats shall be stainless steel.
 6. Maximum Pressure: 175 psi

2.07 PRESSURE REDUCING VALVE

- A. Pressure Reducing Valve shall maintain a constant downstream pressure regardless of changing flow rate and/or inlet pressure.
1. Provide PRV's in accordance with project design requirements.
 - a. Flow Range: As required for application
 - b. Pilot Adjustment Ranges: As required for application
 - c. Pressure Rating: 250 psi
 - d. End Connections: Flanged (ANSI 150 lb)
- B. The valve shall be hydraulically operated, single diaphragm-actuated, globe or angle pattern. The valve shall consist of three major components: the body, with seat installed; the cover, with bearings installed; and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

- C. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.
- D. The diaphragm assembly shall contain a non-magnetic 303 stainless steel stem with sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.
- E. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully opened or fully closed position.
- F. The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6" and smaller size valves shall be threaded into the cover and body. The valve seat in 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline.
- G. The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment, provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one year warranty.
- H. The valve manufacturer shall be able to supply a complete line of equipment from 1 1/4" through 24" sizes and a complete selection of complementary equipment. The valve manufacturer shall also provide a computerized cavitation chart which show flow rate, differential pressure, percentage of valve opening, Cv factor, system velocity, and if there will be cavitation damage.
- I. The pressure reducing pilot control shall be a direct-acting, adjustable, spring-loaded, normally open, diaphragm valve designed to permit flow when controlled pressure is less than the spring setting. The pilot control is held open by the force of the compression on the spring above the diaphragm and it closes when the delivery pressure acting on the underside of the diaphragm exceeds the spring setting. The pilot control system shall

include a fixed orifice. No variable orifices shall be permitted. The pilot system shall include an opening speed control on all valves 3" as standard equipment.

- J. The pilot control shall have a second downstream sensing port which can be utilized to install a pressure gauge.
- K. A full range of spring settings shall be available in ranges of 0 to 450 psi.
- L. A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

2.08 AIR RELEASE VALVE

- A. Bodies and covers shall be cast iron (ASTM A126, Class B, or ASTM A48, Class 35) or ductile iron (ASTM A536, Grade 65-45-12). Cover bolts and nuts shall be stainless steel.
- B. Valve Connections: Flanged-end dimensions and drilling for cast-iron bodies and covers shall conform with ASME B16.1, Class 125 or Class 250. Flanged-end dimensions and drilling for ductile-iron bodies and covers shall conform with ASME B16.42, Class 150 or Class 300. Flanges shall be flat-faced unless otherwise specified by AW. Threaded-end connections shall conform with the requirements for tapered pipe threads for general use, per ASME B1.20.1.
- C. Floats: Float balls and guides shall be stainless steel. For valves with inlet sizes less than 4 inches, the float shall be capable of withstanding a collapse pressure of 1,000 psig. For valves with inlet sizes 4 inches and larger, the float shall be capable of withstanding collapse pressures of 750 psig.
- D. Venting: Air release valves and the air release mechanism of combination valves shall be designed to open positively and vent air to the atmosphere at system pressures up to the maximum working pressure. Orifices shall be sized accordingly.

2.09 YARD HYDRANT

- A. Non-freeze yard hydrant shall be suitable for exterior installation and shall include a drainage hole at the bottom of the unit to ensure drainage of water from the hydrant assembly when not in use.
- B. Hydrant shall be suitable for use with potable water.
- C. Hydrant shall have the following characteristics:
 - 1. Inlet: 3/4" brass valve body, FPT.
 - 2. Casing: 1" galvanized steel pipe.
 - 3. Operating Rod: 1/4" stainless steel rod.
 - 4. Head/Lever: Epoxy coated heavy duty cast iron head with a cam-type operating control lever for full or variable flow and a one piece plunger. Lever shall be lockable.
 - 5. Outlet: 3/4" brass male hose connection

- D. Acceptable Manufacturers: Josam Co., 71450 Series, Watts HY-800, or equal.

2.10 RECLAIMED WATER METER

A. Reclaimed Water Meter (5/8" through 1")

1. Meter shall consist of a solid state, battery operated electromagnetic flow measurement system with hermetically sealed, glass covered, electronic register with a programmable 9-digit display. Meter shall conform to AWWA C-700 and C-710 and be NSF/ANSI Standard 61, Annex F and G compliant.
2. The register shall be an electronic device encapsulated in glass with 9 programmable digits utilizing a liquid crystal display (LCD). The display shall contain indicators for flow direction, empty pipe, battery life and unit of measurement. The register shall be hermetically sealed with a heat tempered glass cover and be tampering resistant. The register shall not be removable from the measuring sensor. It shall utilize magnetic coupling technology to connect to a touch read, radio read or fixed base meter reading system in either a an inside or pit set installation.
3. The measuring element shall be made of a non-corrosive, lead-free glass fiber reinforced, composite alloy. A battery powered magnetic flow sensor utilizing silver/silver chloride electrodes shall be used to measure the velocity of the water. The measuring element shall have not moving parts.
4. The register and measuring element shall be an integrated unit housed within a thermal plastic external casing. This integrated unit shall not be removable from the external housing. The housing shall contain the water flow direction and size.
5. Meter systems shall operate up to a working pressure of 200 psi, without leakage or damage to the components. The accuracy shall not be affected by variation of pressure up to the maximum working pressure.

B. Reclaimed Water Meter (1-1/2" and Larger): Turbine Type

1. Meter shall be a turbine-type cold water meter suitable for measurement of low flow usage for typical billing purposes.
2. Meter package shall meet or exceed all requirements of ANSI/AWWA C701 for Class II turbine meter assemblies. Each meter shall be performance tested to ensure compliance.
3. Meter package shall meet or exceed all requirements of NSF/ANSI 61, Annex F and G.
4. The main case shall be epoxy coated ductile iron. Epoxy coating shall be fusion-bonded and adhere to NSF for non-lead.
5. The meter assembly shall be capable of continuous operation up to the rated maximum flows without long-term accuracy impacts and without causing undue component wear. The meter assembly shall provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands.
6. The measuring chamber shall consist of a measuring element, removable

housing, and an all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring element shall come integrate with the advanced Floating Ball Technology design.

7. The meter shall be equipped with a direct magnetic drive system, occurring between the motion of the measuring element blade position and the electronic register.
8. The meter's register shall be all-electronic without mechanical gearing and include the following features:
 - a. AMR resolution units fully programmable
 - b. Pulse output frequency fully programmable
 - c. Integral data logging
 - d. Integral resettable accuracy testing feature
 - e. Large, easy-to-read LCD display
 - f. 10-year battery life guarantee
9. Meter assembly shall operate properly without leakage, damage, or malfunction up to 200 psi.
10. A meter strainer shall be integral and cast as part of the meter's maincase. The strainer screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration. The strainer body shall be of the same material and contain the same coating as the maincase. All fasteners shall be stainless steel.
11. A straightening vane assembly shall be positioned directly upstream of the measuring element and be an integral component of the measuring chamber.

C. Reclaimed Water Meter (1-1/2" and Larger): Electromagnetic Type

1. Electromagnetic type meters shall meet or exceed the requirements of AWWA C701, Class 11 and conform to NSF/ANSI Standard 61, Annex F and G. Each meter shall be performance tested to ensure accuracy compliance.
2. The meter shall have no restrictions as to sustained flow rates within its continuous operating range. The measuring tube shall allow for flows up to the meters rated maximum capacity without undue wear and accuracy degradation.
3. The metering tube shall consist of a polyurethane coated steel housing and a nonmagnetic alloy tube with an obstruction-less cross section and a homogenous magnetic field. The liner of the measuring tube shall be made of polyamide and shall be resistant to corrosion, aging and abrasion.
4. Provide an electronic register either attached to the meter or remotely mounted as directed by the Authority for the specific project application. The large character LCD shall display AMR, tantalization and a resettable test totalizer. Features shall include AMR resolution units that are fully programmable, pulse output units that are fully programmable, integral resettable accuracy testing, and flow direction. Register shall be cable of more than 10 years of operation before

battery replacement.

D. Radio Read Unit

1. Each meter shall be equipped with a radio transmitter. Transmitter shall function to transmit an encoded serial number, water consumption, leak detection information and status data via radio frequency to the Authority's radio reading equipment.
2. The transmitter shall be unaffected by prolonged submergence under water or operation in a cyclical high humidity (100% relative humidity in temperature ranges of 32 °F to 105 °F) condensing atmosphere.
3. Transmitters shall be factory sealed and waterproof as supplied by the manufacturer.
4. Transmitters shall have a typical minimum reading range of up to 1,200 feet.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Carefully examine each piece of equipment with the inspection requirements of the appropriate referenced standard. No piece of equipment shall be installed which is known to be cracked, damaged, or otherwise defective.
- B. If any defective pieces are discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor and at his expense.

3.02 PREPARATION

- A. Clean equipment and mating surfaces before installation. Maintain clean until completed work is accepted.

3.03 SERVICE LINE AND FITTINGS

- A. Install reclaimed water service lines in accordance with detail. Unless otherwise approved, all water lines shall be installed at a minimum depth of 4 feet of cover over the top of the pipe.
- B. Clean and inspect each pipe and part of the fitting before installing and assemble to provide a flexible joint. Use joints or lubricants recommended by the manufacturers.
- C. Operate each valve before and after installation.
- D. When the work is not in progress and at the end of each work day, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the lines.
- E. Test and disinfect lines as specified in Division 33.
- F. Provide concrete thrust blocking or restrained joints at all bends, tees and changes in direction.

3.04 VALVES

- A. Except where noted otherwise herein, all valves shall be installing and tested in accordance with the latest revision of AWWA C500. Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under these Specifications. The valves shall be so located that they are easily accessible for operating purposes, and shall bear no stresses due to loads from the adjacent pipe.
- B. All valves shall be tested at the operating pressures at which the particular line will be used.
- C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.
- D. Install all valves and appurtenances in accordance with manufacturer's instructions. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.
- E. Valve boxes shall be set plumb, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Backfill material shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.05 FIELD QUALITY CONTROL AND TESTING

- A. As specified in Division 33.

3.06 DISINFECTION

- A. As specified in Division 33.

3.07 GRADE ADJUSTMENT

- A. Contractor shall adjust all valve covers, valve boxes and other piping accessories to meet the grade specified in the Contract Drawings.

END OF SECTION