

General

Cross Connection Control

There shall be no physical connection between a potable water supply and a reclaimed water supply or any other system, which could allow questionable water to enter any system. An approved backflow preventing device shall be provided on potable water services serving any property using or installing reclaimed water.

Florida Administrative Code

Systems shall be designed and constructed in accordance with these Criteria and Chapter 17-610 Florida Administrative Code. Where these Criteria and Chapter 17-610 F.A.C. conflict, the more restrictive requirements shall apply.

Calculations

Calculations verifying the adequacy of the existing and proposed systems shall be provided by the engineer. The calculations shall be clear, logical and understandable.

Pipe Identification

Markings on piping, valve and meter box covers shall accurately describe the use of the facility.

Applications

Reclaimed water will not be provided to sites utilizing an on-site well for potable water supply. All applications shall include the name and address of owners of developed property within 100 feet of the wetted surface to confirm the presence or absence of potable water supply wells.

All applications for reclaimed water service must execute the hold harmless agreement for reclaimed water service.

Signs

Public notice signage identifying the site as using reclaimed, non-drinking water, for irrigation shall be provided.

Fire Protection

Reclaimed water shall not be designated as the source of fire protection without a specific, independent agreement between City of Rockledge and the applicant. Said agreement shall include verification of compliance with the provisions of 17-610.477.

Other Uses

Reclaimed water to be used for purposes other than urban landscape irrigation requires specific written authorization from the Wastewater Treatment Department Director.

Design and Construction Standards

Minimum Cover

Minimum cover to finished grade over a reclaimed water main shall be thirty-six (36) inches, unless otherwise provided herein.

Pipe Materials

SDR-21 polyvinyl chloride (PVC) or DR-18, AWWA C-900 PV pipe or approved equal shall be used for reclaimed water mains (purple only).

Minimum Pipe Size

The minimum size of the water or reuse main shall be four (4) inches.

Wells

Plans for subdivisions and commercial sites that include provisions for reclaimed water service shall include a survey of all surrounding property for the purpose of identifying the existence of potable water wells within 200 feet of the boundary of any potential reclaimed water wetted surface.

No reclaimed water system application shall be considered or permitted within 100 feet of an existing or FDEP/FDHRS permitted future potable water supply well. (Ref. 17-610.471 {1}).

Reclaimed water cannot be applied to the ground within 100 feet of a potable water well.

No new potable water wells can be constructed within 100 feet of a reclaimed water irrigation area.

Reclaimed water transmission facilities shall be set back 75 feet from any public water supply well (Ref. 17-610.471 {3}).

Dwellings

Reclaimed water shall not enter any residential dwelling.

Above Ground Connections

There shall be no hose bibs or other above ground connections to the reclaimed water system. All reclaimed water irrigation systems shall be permanent, in-ground systems.

Pressure

Reclaimed water mains and fittings, including reaction blocking, shall be designed to withstand normal pressure and pressure surges (water hammer).

Friction Losses

Friction losses through mains shall be based on the Hazen and Williams' formula or other acceptable methods. A "C" factor of 120 shall be used to calculate friction losses.

Tank Trucks

Requests to fill tank trucks with reclaimed water must be accompanied by a written verification from the vehicle owner that the truck is not used for the transport of potable water or any other product intended for human consumption.

Thrust Blocks

All valves, bends, tees, crosses and dead ends shall be constrained with adequate reaction or thrust blocks but not poured in place.

Joint Restraints

Joint restraints may be utilized in lieu of thrust blocking. Nappco Uni-Flange Series 1350 or approved equal shall be used to restrain PVC pipe joints.

Valves

Valving of all systems shall be designed to facilitate the isolation of each section of pipeline between intersections of the grid system. The number of valves at an intersection shall be one less than the number of pipes forming the intersection.

Valves shall be installed at intervals of not more than 1,000 linear feet (LF) on transmission mains, at intervals of not more than 700 LF on main distribution loops and feeders, and on all primary branches connected to these lines. In high density areas, valves shall be installed as necessary to minimize the number of persons affected by a break.

In all instances, effectiveness of valve placement shall be the primary criterion in determining valve location.

Service Lines and Taps

Minimum reclaimed water service size is $\frac{3}{4}$ inch for a single service and 1 $\frac{1}{2}$ inch for a double service.

Service lines for reclaimed water shall be purple polyethylene (copper tube size) in accordance with ASTM D2566. All meter boxes shall be purple with minimum size, 17" long, 12" wide, 12" deep. (with readers)

All reclaimed water service lines shall include a lockable curbstop with a non-corroding tag/label with the words "Reclaimed Water DO NOT DRINK."

Service taps on the main shall be spaced at a minimum distance of 18 inches. If two or more taps are required at the minimum spacing, they shall be offset 45 degrees alternately to each side of the centerline of the crown of the water main. Service taps are prohibited with 18" of pipe joints.

All service line taps shall be supplied with corporation stops and saddles approved by the City. All service lines shall be installed in accordance with the construction details. Ball valve curbstops and service wyes shall be pack joint for plastic pipe.

Meter Installation

All connections to the reclaimed water system shall be below ground, through the standard "reclaimed water meterbox".

All connections to the reclaimed water system will have an isolation valve, labeled with a stainless steel, brass or plastic tag stating "Reclaimed Water DO NOT DRINK."

Construction drawings shall include a typical reclaimed water meter installation for each size meter to be installed.

Reclaimed water meters where required and boxes shall be installed by the City of Rockledge.

Reclaimed water meters shall be placed at the property line. In developments where the property line is not clearly defined (condominiums) the meter shall be placed for ready access. Services crossing under parking tracts shall have their meters placed prior to the crossing so that the City is not responsible for these lines.

Special Construction

In the following instances the reclaimed water main shall be AWWA C900 DR 18 PVC:

- a. Subaqueous crossings. The pipe shall be concrete encased at least two (2) feet past the toe of slope for canal and ditch crossings.
- b. Less than three (3) feet of cover over the pipe.
- c. Within fifteen (15) feet of buildings, structures, canals or lakes or other water bodies

Reclaimed water mains shall be flanged D.I..P. with stainless steel bolts when installed in an aerial crossing.

Horizontal and Vertical Separation

Where reclaimed water and potable water mains cross with less than eighteen (18) inches vertical clearance, either main shall be twenty (20) feet of either ductile iron pipe, or SDR-14 PVC pipe centered on the point of crossing.

Where reclaimed water and raw sanitary gravity sewer or force mains cross with less than eighteen (18) inches vertical clearance, either main shall be twenty (20) feet of either ductile iron pipe or SDR-14 PVC pipe centered on the point of crossing.

Maximum obtainable separation of reclaimed water mains and domestic water mains shall be maintained. Where a horizontal separation of five (5) feet cannot be maintained between reclaimed water mains and potable water mains, the reclaimed water main shall be either ductile iron pipe, or SDR-14 PVC pipe.

A minimum horizontal separation of five (5) feet center to center or three (3) feet outside to outside shall be maintained between reclaimed water mains and gravity sewer mains or force mains. Where a horizontal separation of five (5) feet cannot be maintained between reclaimed water mains and gravity sewer mains or force mains, either main shall be either ductile iron pipe or SDR-14 PVC pipe.

Should local conditions exist which would prevent the specified horizontal separation, a gravity sewer, force main or water main may be closer than five (5) feet to a reclaimed water main, provided that the reclaimed water main invert is at least eighteen (18) inches above the crown of the force main or gravity sewer or is at least eighteen (18) inches below the crown of the potable water main and is either in a separate trench or in the same trench with the higher pipe on an undisturbed earth shelf located to one side or the lower pipe.

If it is not possible to obtain proper horizontal and vertical separation as described above, the gravity sewer shall be designed and constructed equal to water pipe and shall be pressure tested to assure water tightness prior to backfilling.

Where storm sewers cross over reclaimed water mains with less than two (2) feet of vertical separation between the bottom of the storm sewer and the top of the reclaimed water main, support cradles shall be constructed under the storm sewer on each side of the crossing to transfer the load of the pipe to the surrounding soil and prevent point loading of the reclaimed water main.

Electronic Disks and Wire

Electronic disks shall be provided at fittings, valves, crosses, tees and changes in direction. Disks shall also be provided at the termination of water services. Disks shall be full range APC 1253 by Automated products Co., Austin, Texas. An insulated continuous copper wire #14 UF shall lay on top of the pipe for location purposes. Wire ends are to be spliced together with a wire nut. Wire should be brought up in each valve box with an excess of 4 feet in length.

Concrete

All cement used in the work shall be a well-known brand of true Portland Cement and shall conform to the Standard Specifications for Portland Cement, ANSI/ASTM Designation C150. Unless otherwise permitted, the Contractor shall use only one brand of cement in the work and under no condition shall he use more than one brand of cement in the same structure. Cement, which for any reason has become partially set or contains lumps or cakes will be rejected and shall be removed from the site. Concrete shall be of Type I cement.

The cement shall be mixed with potable water and washed masonry sand (and coarse aggregate if applicable) in an approved batch machine or mixer. Measuring boxes or other approved measuring apparatus shall be such that the proportions can be accurately determined. The quantity of water to be added, which will vary with the degree of dryness of the material and with the weather conditions, shall be accurately measured for each batch of concrete.

Means shall be provided by which a measured quantity of water can be introduced at any stage of the process. The mixing shall be done in a thorough and satisfactory manner and shall continue until every particle of aggregate is completely covered with cement past. The mixing time for each batch shall not be less than one minute after the materials are in the mixer. The entire contents of the drum shall be discharged before recharging. Retempering of concrete which has partly hardened will not be permitted.

Castings

Castings for valves, vaults and other appurtenances shall conform to, and be tested in accordance with the specifications for Gray Cast Iron. ANSI/ASTM A48, Class 30.

Castings that are to be located with dedicated public right-of-way, or any other locations subject to vehicular traffic, shall have all bearing surfaces machined so that fitting parts will not rattle or rock under traffic. All castings shall be subject to a hammer test before installation.

Excavation

Machine excavation shall be carried to the depth above the final pipeline grade that will allow the final grading, using hand tools. If excavation is carried below the required depth, the overcut depth shall be backfilled with Type "B" backfill material or bedding material compacted to provide pipe support at least equal to that of the original material.

Contractor may, at his option, elect to overcut the trench using machine excavators and backfill with Type "B" backfill or bedding material, as above, to minimize the hand excavation. If Contractor so elects, the depth of overcut shall be such that a minimum of two inches of compacted backfill material will result under the lowest projection of the pipe bell.

Type "B." This material shall be a select granular material free from organic matter and of such size and gradation that the desired compaction can be readily attained.

Type "D." This material shall be unclassified material obtained from the Contractor's excavations. The material shall be substantially free from wood, roots, and other organic matter. The maximum size of stone shall not exceed three (3) inches.

Trees, stumps and roots within the limits of the trench excavation shall be removed to a depth of at least 12 inches below the bottom of trench. Stump and root holes shall be refilled to existing grade and compacted by water puddling or tamping. No stumps, roots, or organic matter of any description shall remain under concrete slabs or footings.

The trench shall be excavated so that the pipe can be laid to the alignment and grades shown on drawings.

The trench shall be dry when the bottom is prepared. A continuous trough shall be excavated by hand to receive the bottom 120 degrees of the pipe barrel. In addition, bell holes shall be excavated so that after placement only the barrel of the pipe receives bearing pressure from, and is uniformly supported by, the bottom of the trench.

Preparation of the trench bottom and placement of the pipe shall be such that the final position of the pipe is true to line and grade and uniformly supported throughout the barrel of each pipe length. When pipe is placed in backfill over rock or other material, additional backfill of the same material shall be tamped on each side of the barrel to the height of the spring line, thus forming a trough of firm bedding.

Wherever excavation of the trench exposes unsuitable materials such as peat, soft clay, quicksand or other unstable material in the bottom of the trench which, in the opinion of Developer's Engineer, is unsuitable foundation upon which to lay or support the pipe backfill and expected superimposed loads, such unsuitable materials shall be removed to a depth necessary to reach material having adequate bearing capacity and a width of trench at least equal to the minimum trench width as specified.

The spaces created by removal of this unsuitable material shall be backfilled using Type "B" backfill or bedding material. The backfill material shall be placed in 8-inch layers and compacted, using mechanical compaction equipment, to a dry density equal to 98 percent under roads, curb and gutter, and 95 percent in all other places, of the maximum dry density as determined by the Standard Proctor Compaction Test, AASHTO T-99, each layer being compacted to the required density prior to placing the next layer.

After the pipe has been properly laid and inspected, Type D backfill shall be carefully placed around the pipe to a depth of six inches over the pipe. The backfill material shall be carefully placed in horizontal layers not exceeding twenty-four inches in loose depth, equally on both sides of the pipe, and shall be spaded, "walked-in" and compacted with mechanical hand tampers to obtain a firm, dense support for the pipe. When one such layer is completed on both sides of the pipe, a second layer shall be started. The backfill material shall not be obtained from the trench walls within one foot above top of pipe. No further backfilling will be permitted until the initial backfill has been accomplished by an approved method.

Above the level of the initial backfill, the trench shall be filled with material placed in accordance with one of the following classifications:

1. **Compacted Backfill:** Materials for compacted backfill shall be Type "D" except as otherwise shown on drawings or specified. The backfill material shall be placed in horizontal layers not exceeding twenty-four inches in loose depth and compacted by power operated tampers, rollers, or vibratory equipment to a specified dry density as determined by AASHTO T-99. Each layer shall be compacted to the specified density prior to placing subsequent layers. The thickness of the loose layer may be increased when in-place densities show that the specified density can be obtained. Compacted backfill shall be used in all street and road rights-of-way.

2. **Plain Backfill:** Material for plain backfill shall be Type "D". Plain backfill shall be placed where compacted backfill is not required. The backfill material may be placed in layers, each layer being compacted as necessary so that a depression does not form along the trench. Any depression formed by settlement of the backfill shall be immediately filled by Contractor.

The Developer shall hire a testing laboratory approved by the City to perform density testing of backfill. One set of density tests shall be performed at 200 foot intervals along the reclaimed water main. The City reserves the right to require density tests at other locations as the inspector may deem necessary.

Each set of density tests shall consist of one test 2 feet above the crown of the pipe and one test for each one foot interval up to the bottom of the subgrade or to the ground.

The minimum required field densities are as follows: 98% of the maximum density determined by the Standard Proctor Compaction Test, AASHTO T-99, under roads, curb and gutter: 95% of the maximum density per AASHTO T-99 in shoulders and outside road rights-of-way.

Street Restoration

Backfill, base, pavement, driveways, shoulders, curb, etc. shall conform with the latest revisions of the requirements of the City of Rockledge Public Works Department. An application for permits shall be submitted to the Public Works Engineering Division prior to construction within the street.

Pipelaying and Joining

Each pipe shall be laid true to line and grade so as to form a close concentric joint with the adjoining pipe, preventing offsets in the flow line. The interior of the pipe shall be cleaned of all dirt and superfluous materials prior to joining the next section.

Water Control

Contractor shall furnish, install and operate all necessary machinery, appliances and equipment to keep the excavations reasonably free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public. Contractor shall at all

times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, and shall have available at all times competent personnel for the operation of the pumping equipment.

The control of ground water shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" shall be prevented. Dewatering systems shall be designed and operated so as to prevent the removal of the natural soils. Well point holes shall be backfilled and compacted to grade with existing sand. Sand shall be graded from fine to coarse, free from objectionable material.

The static water level shall be drawn down to 6 inches below the bottom of the excavation so as to maintain the undisturbed state of the natural soils and allow the placement of backfill to the required density. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

Material Handling

Every precaution shall be taken to prevent injury to pipe and piping materials during transportation and delivery to the worksite. Under no condition shall pipe be dropped, bumped or dragged. If in the process of transportation, unloading or handling, any pipe or fitting is damaged, it shall be rejected by the Utility Inspector and immediately removed from the site. Pipefittings and specials shall be stored in a manner, which will assure the protection of the material from damage and kept clean. All materials shall be stored in a suitable fashion such that the quality shall not be degraded.

Cross Connection Tests

All reclaimed water connections will be tested to help detect the presence of a cross-connection.

Upon activation of the reclaimed water system, the City's Reclaimed Water inspector shall request permission to test the separation of the potable and reclaimed water systems. Said test shall include the "turn-off" of the potable supply valve and the opening of hose bibs and faucets. Any noted flow of water from any such faucet shall result in the immediate disconnection of their reclaimed water system. The reclaimed water system shall not be reactivated without demonstration that the cross connection has been eliminated.

No reclaimed water service shall be activated in the absence of a backflow prevention device.

Hydrostatic Tests

The newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic pressure test in which test pressure shall be maintained for a period of two (2) hours. The test pressure of 150 psi shall be maintained within 5 psi throughout the duration of the test. Leakage during the test shall not exceed the allowable leakage specified in ANSI/AWWA C600, Section 4, Equation 1. The test procedures of ANSI/AWWA C600, Section 4 shall be observed.

The pressure test shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City's Inspector and by the Contractor at the Contractor's expense.

Any defects discovered during this test shall be remedied by the Contractor at the Contractor's expense and the test repeated before final acceptance.

Contractor shall give Developer's Engineer and City forty-eight hours advance notice of the time when the installation is ready for hydrostatic tests. Tests shall be run in the presence of the City's Inspector.

Pipe

Polyvinyl chloride (PVC) pipe two and a half (2 ½) inches through twelve (12) inches in diameter shall conform to the requirements of ASTM D2241 and shall be SDR-21, 200 psi, as made by J – M Pipe or approved equal. Minimum pressure rating shall be 200 psi.

PVC pipe fourteen (14) inches and larger shall be UNI-B11 (latest version) approved cast iron O.D. DR-25 with factory installed gaskets meeting cell classification specified by ASTM D-1784 or approved equal.

PVC pipe two (2) inches and smaller shall be Schedule 40 with solvent weld joints and shall conform to the requirements of ASTM D1785, Class 1120 or 1220.

Fittings for Schedule 40 plastic pipe shall be Schedule 40 and conform to ASTM D2466 for solvent weld socket joints. PVC material shall conform to 45TM D1784. Solvent cement shall be of the type recommended by pipe and fittings manufacturers.

PVC pipe shall have integral wall-thickened bell ends and shall be joined using one-piece elastomeric gaskets. Solvent cement joining will not be permitted for pipes and fittings larger than two (2) inches.

PVC pipe shall be connected to cast or ductile iron fittings with mechanical joints. Use of PVC fittings will not be permitted. Fittings shall be double poly wrapped.

All PVC reclaimed water main pipe shall be a solid purple color.

Ductile Iron Pipe (DIP)

Ductile iron pipe (DIP) three (3) inches in diameter and larger shall be poly lined Class 50 and shall conform to and be tested in accordance with the current American National Standard Specification for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined molds for Water or Other Liquids, ANSI/AWWA C151/A21.51. Ductile iron pipe less than three (3) inches in diameter shall conform to the manufacturer's standards, either centrifugally or statically cast with a minimum thickness of 0.25 inches. The ductile iron (nodular cast iron) shall conform to the Standard Specification for Ductile Iron Castings, ANSI/ASTM A536, with physical properties of Grade 60-42-10. Length of joints shall be either eighteen or twenty feet.

Ductile iron pipe and fittings shall be protected from deterioration on the outside of the pipe. Soil studies shall be conducted to determine if a bituminous coat and polyethylene sleeve outside are sufficient for protection of the pipe.

Ductile iron pipe and fittings shall be jointed with any of the end types as specified below, unless a particular end type is specified. Flanged ends shall be used only where specifically noted on the drawings except that the valve connection end of all tapping sleeves shall be flanged.

Mechanical joints and push-on joints shall conform to and be tested in accordance with the American National Standard for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings, ANSI/AWWA C111/A21.11.

The American National Standard for Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances, AWWA C-600 shall govern the installation, as applicable. If the paint is damaged, the pipe and/or valve shall be cleaned by wire brushing and given two coats of black asphalt paint.

Ductile iron reclaimed water pipe shall be marked by the following method:

Adhesive-backed underground utility marking tape shall be applied to the top of the pipe after the pipe has been laid in the trench. Adhesive-backed tape shall be 8 mil minimum thickness, 6 inches minimum width, and have a purple background color with black lettering reading, "CAUTION; NON-POTABLE RECLAIMED WATER LINE BURIED BELOW; DO NOT DRINK," or similar wording approved by the City of Rockledge. Tape shall be Terra-Tape by Reef Industries, Houston, Texas, or approved equal.

Fittings and Valves

Ductile Iron fittings and poly lined shall conform to and be tested in accordance with either the American National Standard for Ductile Iron Fittings, 3-inch through 48-inch for Water and Other Liquids, ANSI/AWWA C110 or the American National Standard for Ductile Iron Compact Fittings, 3 inch through 12 inch, for Water and Other Liquids, ANSI/AWWA C153/A21.53-84. Pressure rating for fitting shall be 250 psi minimum. Fittings and valves shall be flanged or mechanical joint.

Gate Valves

Gate valves shall be resilient seat and they shall conform to and be tested in accordance with "AWWA standard for Resilient Seated Gate Valves, for Water and Sewerage Systems," ANTI/AWWA C509. The valve shall be bubble tight from either direction at a rated design working pressure of 200 psi. The valve shall have a single disc gate with synthetic rubber seat bonded or mechanically attached to the disc; non-rising stem with 2" AWWA operating nut: counter clockwise opening, O-ring stem seals, corrosion resistant interior coating acceptable for potable water.

Acceptable manufacturer of resilient seated gate valves is Mueller or approved equal.

Where flanges are specified on resilient seated gate valves, they shall be ANSI B16.1, Class 125, cast iron flanges.

Tapping Sleeves and Valves

Tapping sleeves shall have a full-face rubber gasket or O-ring and shall conform to and be tested in accordance with ASTM A-285. A pressure testing port shall be provided. Sleeve shall be shop coated and epoxy bonded to an average thickness of 12 Mil, tapping valve shall have a cast iron flanged inlet, class 125, ANSI B16.1 and a 2 inch square wrench nut. In instances where a full sleeve is not necessary, sleeve bands shall be stainless steel. Mechanical joint sleeve shall be used when tapping asbestos cement pipe size-on-size.

Acceptable manufacturers of tapping sleeves and valves are Mueller, American, and Kennedy, Smith-Blair, or approved equal.

Ball Valves

Ball valves shall conform to and be tested in accordance with the AWWA Standard for Ball Valves, ANSI/AWWA C507. Where ball valves are specified or required, they shall be double-seated with natural or synthetic rubber, bronze, or monel metal seats: designed for 150 psi working pressure: flanged end: o-ring rotor bearing seats: constructed of high-tensile strength cast iron: equipped with totally enclosed manual operators, with open-closed indicator and hand wheel with standard AWWA 2-inch operating nut for one-man operation at 150 psi, unbalanced across the valve. Valves shall be tested by, and shall withstand without leak, a hydrostatic pressure of: (1) 250 psi: on the valve body with rotor in the open position: and (2) 150 psi on the side of the valve with the opposite side open to atmosphere.

Where flanges are specified on ball valves, they shall be ANSI B16.1, Class 125, cast iron flanges.

Acceptable manufacturers of ball valves are Allis-Chalmers, Henry Pratt, Williamette Iron and Steel or approved equal.

Butterfly Valves

Butterfly Valves shall be of the tight-closing, rubber-seat type, shall have a rated pressure of 150 psi, and shall be bubble-tight at this pressure with flow in either direction. The valves shall conform to and be tested in accordance with the AWWA Standard for Rubber-seated Butterfly Valves, ANSI/AWWA C504, Class 150B. The valve body shall be of the short-body flange type, constructed of cast iron conforming to either ASTM A126, Class B, or ANSI/ASTM A48, Class 40 or ductile iron ANSI/ASTM A536, Grade 65-45-12. Flanges shall be ANSI B16.1 Class 125, cast iron flanges. Valve discs shall be constructed of alloy cast iron conforming to ANSI/ASTM A436, Type 1, or cast iron conforming to ANSI/ASTM A48, Class 40, or ductile iron ANSI/ASTM A536 Grade 65-45-12. Valve shafts shall be constructed of 18-8, Type 304 or 316 stainless steel, ANSI/ASTM A296, Grade CF8, or monel. Valve seats shall be body or disc mounted, and shall be of natural or synthetic rubber compound with mating seat surfaces of 18-8, Type-304, or 316 stainless steel, or alloy cast iron conforming to ANSI/ASTM A436, Type1, or bronze Grade A, D, or E. Valve bearings shall be corrosion resistant and self lubricating.

Manual butterfly valve operators shall be totally enclosed, permanently lubricated, suitable for buried service, and equipped with an open-closed indicator, handwheel, and standard AWWA 2-inch operating nut for one-man operation at 150 psi, unbalanced across the valve. The handwheel shall be mounted in the horizontal position.

Interior and exterior surfaces of the butterfly valve, except seating surfaces, shall be thoroughly cleaned and coated with asphalt varnish conforming to Federal Specification TT-V-51C. For non-buried service, exterior surfaces shall be coated with two (2) coats of zinc chromate. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C504.

Acceptable manufacturer of butterfly valves is Pratt or approved equal.

Backflow Prevention Device

Backflow prevention devices shall conform to and be tested in the following: AWWA C-506 (latest version) (R-83) Reduced Pressure Principle Backflow Prevention Device.

Acceptable manufacturers of backflow prevention devices are Watts or Febco or approved equal or as designated by the owner of the potable water system.

Check Valves

Check valves shall conform to and be tested in accordance with the AWWA standard for Swing-Check valves for Ordinary Water Works Service, AWWA C508. They shall be horizontally mounted, single disc, swing type with a full diameter passage providing minimum pressure loss.

Valves shall be of the non-slamming type designed for the future installation of outside lever and spring. Disc faces and seat rings shall be bronze.

Acceptable manufacturers of check valves shall be the following: Crane, American, Dresser, Mueller, US Pipe, Clow, and Kennedy, or approved equal.