



# **SPECIFICATION 339001: RECLAIMED WATER MAINS AND APPURTENANCES**

## **PART 1.0 GENERAL**

### **1.1 DESCRIPTION**

- 1.1.1 The following specification covers the design, installation, inspection, testing, and acceptance of reclaimed water systems. Construction consists of furnishing all labor, equipment, tools, appliances and materials for performing all operations necessary for the construction and installation of reclaimed water mains and service lines, including all piping, valves, valve boxes, casings, service lines, appurtenances, complete and ready for operation, as indicated on the construction drawings and described herein.
- 1.1.2 The Developer/Contractor must furnish to the County a two-year warranty on the materials, fabrication, and workmanship of any and all pipe and fittings furnished and installed. The Developer/Contractor must guarantee all work and rectify any defects due to faulty materials or workmanship during the warranty period. The Developer/Contractor must also pay for damage to other work resulting from faulty materials or workmanship which occurs within said period. Warranty periods typically commence upon written acceptance of the component or appurtenance by the County for ownership and operation. Section 1.6.4 of the Hillsborough County Public Utilities Water Resources Department (WRD) Technical Manual describes the requirements and duration of a Warranty Bond for all contributed assets.
- 1.1.3 All Construction plans, project submittals and record drawings must comply with the requirements of Section 1 and Section 2 of the Hillsborough County Public Utilities Water Resources Department (WRD) Technical Manual.

### **1.2 REFERENCE DOCUMENTS**

- American Association of State Highway & Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- American Society of Sanitary Engineers (ASSE)
- American Society for Testing Materials (ASTM)
- American Water Works Association (AWWA)
- Florida Administrative Code, Chapter 62-555 & 62-610
- Florida Department of Transportation (FDOT)
- Florida Statutes, Water Resources Act, Chapter 373
- The Hillsborough County Cross Connection Control Program, approved August 6, 1993, in accordance with Rule 62-610.469, F.A.C., with legal authority established in the Hillsborough County Code of Ordinances, Chapter 121 Cross Connection Control and Backflow Prevention.
- Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- Occupational Safety and Health Administration (OSHA)

### **1.3 SHOP DRAWINGS AND SUBMITTALS**

- 1.3.1 For County run projects, shop drawings and related manufacturer's product certification must be



made in accordance with the General and Special Conditions of the Contract Documents for approval prior to purchase or fabrication of the material by the manufacturer. Additional shop drawings may be required by the Contract, but the following items that will require shop drawings are brought to the Contractor's attention:

- 1.3.1.1 Detail drawings of all classes of pipe, joints, and fittings.
  - 1.3.1.2 Detail drawings of restrained and flexible joints, including test reports to confirm thrust restraint capacities and restraining mechanism application.
  - 1.3.1.3 Pipeline laying schedule, for pipelines greater than 12-inch in diameter, tabulated and referenced to construction line and grade controls shown on plans, with station, offset and elevations. References must be provided for pipe, fittings, valves, service connections and other important features of the pipeline.
  - 1.3.1.4 Detail drawings showing location/plan views of all Jack and Bore pits (Specification 330524) and all Horizontal Directional Drill pits (Specification 330523).
  - 1.3.1.5 Service Connections
  - 1.3.1.6 Valves and Valve Boxes
  - 1.3.1.7 All Appurtenant Items
  - 1.3.1.8 Contractor's plan to record and electronically monitor every fusion joint for all fusible PVC installed. The plan must include the names of the fusion technicians and certification(s), a description of the equipment to be used, and logged information for each joint must include the proposed heat plate temperatures and fusion heating/cooling times and pressures, etc.
  - 1.3.1.9 Contractor's flushing and testing plans for all reclaimed water system piping supplied.
- 1.3.2 Certification and test reports for the materials, manufacturing, and testing of the types of pipe supplied must be performed and furnished by the pipe manufacturer/supplier in accordance with the latest standards of the industry as referenced in Part 1.2 herein.
- 1.3.3 Shop drawing submittals for items listed in Appendix B, the Pre-Approved Products List, do not require material certification.
- 1.3.4 Submit a copy of any design exception prior to installation. Design exceptions are issued by the Utility Design Section Manager. Any deviation from the specifications requires a design exception.

## **1.4 RELATED WORK**

- All Specifications of Division 03
- All Specifications of Division 33
- Hillsborough County Public Utilities Water Resources Department Technical Manual
- Hillsborough County Utility Accommodation Guide and Rights of Way Use Procedures Manual (UAG)
- Hillsborough County Transportation Technical Manual

## **PART 2.0 DESIGN**

### **2.1 LINE SIZING CRITERIA**

- 2.1.1 Criteria for sizing the distribution system piping is included in Part 5 herein; however, the design engineer must be responsible for obtaining any additional or updated design criteria from the WRD Reclaimed Water Planning Team.



- 2.1.2 Pipes must be sized to maintain a minimum distribution main pressure of 45 psi during peak conditions. County staff will provide the pressure reading at the point(s) of connection.
- 2.1.3 The minimum size of distribution system mains must be four inches.

## 2.2 LINE ROUTING

- 2.2.1 The primary feed for the reclaimed water distribution system for a residential or commercial subdivision must be routed within County road right-of-way. A secondary feed may be routed within a utility easement that is dedicated to the County (design exception), only if there is no road right-of-way available.
- 2.2.2 Points of Connection to existing transmission mains (line sizes greater than 16 inches in diameter) require special review and consideration. Refer to Part 4.19 listing requirements for all connections to existing reclaimed water mains
- 2.2.3 The Engineer of Record must utilize Level “A” SUE work (locate) for all points of connection. Level “A” SUE must comply with the definition by ASCE 38-02 and adopted by FDOT.
- 2.2.4 When the point of connection is an asbestos line, the WRD Utility Coordination Team must be contacted to work out the details at the connection point.
- 2.2.5 The County requires a project’s off-site infrastructure to be extended beyond the point(s) of connection in the right-of-way to the extent of the development's property. This facilitates future system interconnections. As a minimum, at the entrance to the project, the off-site main extension must be extended within the right-of-way with a valve and one length of pipe with a restrained cap.
- 2.2.6 Lines crossing arterial roads, collector roads, and any single access entry to a subdivision, traditional neighborhood development, or commercial driveway must be cased. The casing must extend two feet beyond the back of curb, or eight feet from the edge of pavement including paved shoulders. Refer to the Hillsborough County Utility Accommodation Guide and Right of Way Use Procedures Manual (UAG).
- 2.2.7 All crossings of arterial and collector roads must be jack and bore unless an alternate installation method is approved by right-of-way permitting, or the Jurisdictional Authority for the road.
- 2.2.8 For projects where the proposed improvement is over existing lines, all pipe material not meeting the currently approved specifications will require replacement and relocation of the existing lines.
- 2.2.9 Minimum reclaimed water line clearance from the property line is five feet. If the line is within an easement, it must be installed in the center of the easement. See Public Utilities Technical Manual Section 2.2.4 for additional design requirements for easement installations.
- 2.2.10 Where inverted crown roads are installed the utility infrastructure will be private.

## 2.3 DEPTH OF COVER

- 2.3.1 Cover as measured from finished grade to top of the pipeline must be a minimum 36 inches for pipe diameters up to and including 12 inches. Depth of cover for pipes 16 inches or greater in diameter must be a minimum of 48 inches. For pipe in FDOT right-of-way, or on County arterial



roads the minimum depth of cover must be 48 inches.

- 2.3.2 When automatic air release valves are required for pipe diameters up to and including 12 inches, the depth of cover of the entire line must be increased to a minimum of 48 inches (enough to maintain the valve vault flush with the existing or proposed grade). See Specification 339002, Exhibit R-6A through R-6D for ARV details and required depths of bury.
- 2.3.3 For road improvement projects (road widening, turn lane additions, and storm water improvements, etc.) where the road is currently built, or will be built, over existing reclaimed water lines, the depth of cover must be 48 inches (minimum) from top of pipe to the finished road surface. If depth cannot be maintained, or if the existing pipe material does not meet the currently approved specifications, the line must be replaced or relocated as determined by the County.

## **2.4 SEPARATION OF RECLAIMED WATER, POTABLE WATER, AND SEWER LINES**

### 2.4.1 General

- 2.4.1.1 Reclaimed water mains must not be installed in the same trench with potable water mains.
- 2.4.1.2 Reclaimed water mains should be installed on the opposite side of the street from potable water mains and should be installed in the grassed area between the sidewalk and the pavement.
- 2.4.1.3 When the following required horizontal and vertical separations cannot be maintained, a design exception must be obtained from the Utility Design Section Manager prior to construction.

2.4.2 Horizontal Separation: A minimum horizontal separation of three feet (face to face) must be maintained between reclaimed water mains and all other utilities (UAG Section 5.4). In addition, for single family residences this separation must be maintained between all potable water and reclaimed water service lines and meter boxes.

2.4.3 Vertical Separation: Reclaimed water mains must cross below water mains and above storm water lines, sanitary sewers or sanitary force mains. Where a reclaimed water main crosses another pipeline, a minimum of 18 inches vertical clearance must be maintained. The crossing must be arranged so that the reclaimed water joints will be equidistant and as far as possible from the other pipeline joints.

## **2.5 CROSS-CONNECTION CONTROL**

### 2.5.1 General

- 2.5.1.1 Backflow prevention is required in accordance with PL93-523, the Federal Safe Drinking Water Act, and subsequent amendments; and Florida Administrative Code (FAC) 62-555.360 for the protection of the potable water system.
- 2.5.1.2 Cross Connections between the reclaimed water and the potable water systems, other pressurized systems, sources, mechanical apparatus, or equipment within the private property footprint is prohibited.

2.5.2 At all locations where reclaimed water service is provided, the public potable water supply must be protected by installation of an approved backflow prevention device.



- 2.5.3 All rules, regulations and procedures necessary to administer and enforce the provisions of cross-connection control are established in the Hillsborough County Code of Ordinances, Part B, Public Utilities, Chapter 121 Cross Connection Control and Backflow Prevention, which is incorporated herein and made a part hereof.
- 2.5.4 Residential Cross-Connection Control: Prior to receiving reclaimed water service, a dual check valve backflow prevention device, as a minimum, will be installed downstream of each residential customer's potable water meter in order to protect the potable water system. Refer to Part 2.5.3 above for final determination of required backflow protection.
- 2.5.5 Multi-family and Commercial Property Cross-Connection Control
  - 2.5.5.1 Multi-family complexes and commercial properties with master-metered potable water service and master-metered reclaimed water service must be required to install a Reduced Pressure Principal type backflow prevention device downstream of the master potable water meter.
  - 2.5.5.2 Backflow prevention assembly installations must be in accordance with Exhibits W-1A through W-1F as shown in Specification 331002.
  - 2.5.5.3 Reduced Pressure Principle backflow prevention devices must comply with Specification 331001 Part 3.9.

## 2.6 GOLF COURSES AND OTHER MAJOR USERS

- 2.6.1 Golf courses and other major water users (over 100,000 gallons per day annual average) are required to install a meter and equipment to monitor and control the flow entering the property. Prior to connection to the reclaimed water system, the golf course owner must enter into a service agreement with WRD. A copy of the standard golf course service agreement will be provided upon request from the Reclaimed Water Planning Team.
- 2.6.2 The following is a general description of each of the required components.
  - 2.6.2.1 Meters must comply with the design requirements listed in Part 2.7.
  - 2.6.2.2 Receiving Pond Level Sensor: The golf course owner is responsible for installing and maintaining, in good operating condition, one or more pond level sensors. The type of sensor must be approved by WRD. See Specification 339002, Exhibit R-1E.
  - 2.6.2.3 Control Valve Operator, and Electronic Controller: A control valve must be installed at the metering station and must be configured to sustain upstream pressure and must shut off when commanded from a remote location. In conjunction with an electronic controller, the valve must maintain a flow rate set point.
  - 2.6.2.4 Pressure Gauges and Pressure Transmitters: Pressure gauges must be installed on the supply side and distribution side of the metered connection as shown in Specification 339002, Exhibits R-1C and R-1D.
  - 2.6.2.5 Real-time Monitoring and Control Panel with PLC: The real-time monitoring and control field panel must be installed at the metering station as shown in Specification 339002, Exhibit R-1D. The field panel must contain all components necessary for both local and remote monitoring and control of the metering stations, including a programmable logic controller (PLC), radio, operator interface unit (OIU), electronic interface controller, open/close/remote hand switch, power supplies to control circuitry, and surge suppression. Provide all programming necessary for operating system.
  - 2.6.2.6 Spare Parts: Provide spare parts in accordance with the detailed specifications, prepared on a case-by-case basis for each metering station.



- 2.6.2.7 Radio Survey: Conduct a radio survey for each site in which the County elects to communicate via a radio link. The objective of the radio survey is to demonstrate that radio signal strength is sufficient to support reliable communications. The radio survey must consist of two parts -- a radio propagation computer model and a field survey, where actual radios are used. The radio propagation computer model must include a path profile that clearly shows terrain and obstructions between both the remote and central sites.
- 2.6.2.8 Power Requirements: Provide all conduit and conductors as necessary for a complete operating system, including grounding, grounding systems inspection, and electrical testing.

## 2.7 METERS AND METERING ASSEMBLIES

- 2.7.1 All meters and meter boxes must be compliant with the existing Hillsborough County AMI System.
- 2.7.2 Meter size must be dependent upon flow characteristics. The design engineer will size the meter or meters subject to approval by the Reclaimed Water Planning Team of WRD.
- 2.7.3 Test ports: For meters three inches and larger a capped tee with a two-inch threaded plug must be installed immediately downstream of the meter for use as a test port.
- 2.7.4 Bypass Loops: Although bypass loops are typically not required because reclaimed water delivery is not essential to the public health and safety, the County reserves the right to request a bypass design on a case-by-case basis.
- 2.7.5 Meters three inch and larger shall have a manufacturer recommended strainer installed.
- 2.7.6 A master meter assembly must be directly accessible by boom truck off the County right-of-way or by an interior access road/driveway that is not blocked by a wall or gate. The access road/driveway must be a minimum width of 12 feet. All access roads must comply with Hillsborough County Transportation Technical Manual, and FDOT requirements. The access road must allow the County to drive a truck alongside the length of the meter assembly.
- 2.7.7 The elevation of the concrete meter slab will be higher than the immediate surrounding area (2 inches minimum). The meter assembly must be located so there is no sheet flow over the slab.
- 2.7.8 A five-foot “landscape free” buffer must be maintained around the meter slab. Do not mulch around the slab. Do not plant any landscape that will hinder access in the future to the meter assembly.
- 2.7.9 Meter assemblies located above ground within vehicle traffic area (parking lot, driveway, or within 15 feet of the edge of pavement or back of curb) must be protected by a minimum of four bollards.
  - 2.7.9.1 For meter assemblies three inches and larger, bollards must be six-inch diameter **steel** pipe filled with Type I Portland cement, 28 day, 3000 psi concrete. Refer to Specification 339002, Exhibit R-1C for details.
  - 2.7.9.2 Bollards must be painted with one coat of rust prohibitive primer and one coat of Safety Yellow (Fed-Std-595C #13591) or Ultra White (Fed-Std-595C #27925) high grade enamel.
- 2.7.10 The meter assembly must be painted above ground with an approved paint for above grade piping, fittings, and valves found in Appendix B (for NACE Classified C5-I Environment) per the paint



manufacturer's recommendations to ensure a service life of five years. The assembly must be color-coded purple as specified in Part 2.11.1.

2.7.11 Metering for Single-Family Residences

2.7.11.1 Where service is available, a meter must be installed on a reclaimed water service connection for each single-family residence that applies to WRD for residential hook-up.

2.7.11.2 Prior to final connection, the homeowner is required to have an approved backflow prevention device installed on their potable water service per the requirements of Part 2.5.

2.7.12 Meters for Commercial Class and Master-Metered Multi-Family Properties

2.7.12.1 All commercial customers and multi-family properties with a common area irrigation system will be metered.

2.7.12.2 All meters must be appropriately sized and approved per 2.7.2. Meters sized two inches or smaller will be installed by the County; meters larger than two inches must be installed by the customer, although all connections to the reclaimed water main will be made in accordance to Part 4.19.

2.7.12.3 All reclaimed water meters sized three inches and larger for commercial customers, including multi-family common area connections, must be installed above ground. The entire meter assembly, including valves and pipes, must be color-coded purple as specified in Part 2.11.1.

2.7.13 Meters for Golf Courses and Other Major Users: The meter must be selected from the pre-approved meters listed in Appendix B and meet the requirements of Part 3.7. See Specification 339002 Exhibit R-1D.

## 2.8 SERVICE CONNECTIONS

2.8.1 Reclaimed water service connections, two inch and smaller, must be included as part of the distribution system and consist of: the service line, the corporation stop or a tapping valve, the curb stop, and (for dual service connections) a dual service wye. A typical service layout is shown in Specification 339002, Exhibit R-2A.

2.8.2 All near-side residential services must be one-inch polyethylene (HDPE) tubing for both single and dual services. See Specification 339002, Exhibits R-2B and R-2C.

2.8.3 Reclaimed water service connection taps/service saddles must be at least 18 inches apart. Service connections 2-inch in size are considered commercial size and require a 2-inch isolation/tapping valve at the point of connection.

2.8.4 All far-side residential services must be single one-inch HDPE tubing with individual service connections. See Specification 339002, Exhibits R-2A & R-2F.

2.8.5 Far-side service lines (one-inch HDPE tubing) crossing under pavement must be installed in a two-inch PVC or HDPE purple sleeve at a minimum depth of three feet below pavement. A single three-inch purple sleeve may be used to encase two one-inch service lines. The sleeve must extend a minimum of 24 inches beyond edge of curb and gutter, where present.

2.8.6 Service lines that serve a common area irrigation system are considered non-residential and must



utilize a 2-inch tap and tapping gate valve. The EOR can downsize the service line to 1-inch as determined by their flow calculations. For irrigation service lines, the purple sleeve crossing under the pavement must be PVC, 4-inch in diameter. Irrigation lines larger than 2-inch are considered and must be treated as commercial connections.

- 2.8.7 A four-inch PVC purple sleeve must be used for a two-inch service line, or where far-side services are required across a cul-de-sac (extra-long sleeve exceeding 50 feet in length).
- 2.8.8 Service connections must utilize a tapping or service saddle. Direct taps onto lines is not allowed.
- 2.8.9 Services two-inch and smaller must use polyethylene (HDPE) tubing one inch or two inches in diameter.
- 2.8.10 No trees or shrubs must be planted within five feet of a service meter.

## 2.9 SYSTEM VALVES AND VALVE LOCATION

- 2.9.1 Valves and roadway boxes must be provided for all branch connections (three valves on a tee, four valves on a cross) or other locations as required to facilitate operation of the distribution system. All valves must be installed at the tee, cross, or point of connection.
- 2.9.2 Valves must be placed so that the maximum allowable length of reclaimed water main required to be shut down for repair work must be no more than 1,000 feet in commercial, industrial, multi-family, or residential districts. Valves must be placed so that the maximum allowable length of reclaimed water main required to be shut down for repair work must be no more than 2,000 feet on off-site transmission mains.
- 2.9.3 The design should consider and incorporate maintenance considerations when placing isolation valves. Isolation valves must be gate valves per Part 3.6 herein. The County reserves the right to require additional isolation valves where necessary for efficient operation and maintenance.
- 2.9.4 Valves must be readily accessible and located in an area not subject to flooding. Valves must not be located below the top of bank, within a storm water ditch, or within a swale.
- 2.9.5 Valve boxes must not be located in ADA (American with Disabilities Act) ramps, or in curbs.
- 2.9.6 If a valve falls in a driveway or pavement the valve box cover must be a “long skirt” design to prevent the valve cover from flipping should anyone, or any vehicle, land on it. The valve box must be set so it is not a tripping hazard and must be flush with the concrete/pavement. The valve box must be set to ensure that the operating nut is accessible and will operate.
- 2.9.7 All valves must be permanently tagged with stainless steel tags that differentiate reclaimed water valves from potable water valves.
- 2.9.8 Butterfly valves are not acceptable for use in reclaimed water service.
- 2.9.9 Pressure Reducing Valves: Pressure Reducing Valves must be certified by a Professional Engineer licensed in the State of Florida and will be reviewed by the County on a case-by-case basis.





- 2.9.10 Pressure Sustaining Valves: Pressure Sustaining Valves must be certified by a Professional Engineer licensed in the State of Florida and will be reviewed and approved by the County on a case-by-case basis.

## **2.10 PIPE, FITTINGS, AND APPURTENANCES**

- 2.10.1 Distribution mains outside of residential subdivisions (within the right-of-way or within an easement), or along a collector or arterial road must be constructed of ductile iron pipe (DIP).
- 2.10.2 All transmission reclaimed water mains (defined as pipe sizes greater than 16 inches) must be constructed of ductile iron pipe.
- 2.10.3 Distribution systems, within a subdivision, pipe sized 12 inches and less, must be either polyvinyl chloride (PVC) or DIP.
- 2.10.4 No 10-inch or 14 -inch pipe must be used.
- 2.10.5 All fittings must be ductile iron and comply with the requirements of Part 3 herein.
- 2.10.6 All buried ductile iron pipe (including pipe inside of casing), valves, and fittings must be polywrapped.
- 2.10.7 The reclaimed water system is a closed system. The end of pipes must be capped or plugged.
- 2.10.8 Aerial crossing pipe must be ductile iron. Above grade piping must be Class 53 (minimum).
- 2.10.9 Restrained Joints
- 2.10.9.1 Restrained Joints must be installed wherever reclaimed water main pipe alignment changes direction.
- 2.10.9.2 The length of pipe to be restrained and actually restrained must be noted on the design and record drawings, respectively. Restrained joints must be designed with a trench type (per ANSI/AWWA C600 or C605) no higher than Type 3, a safety factor no less than 1.5, and a design pressure no less than 150 psi. When designing for length of restraint, valves must be considered as a “dead end plug”.
- 2.10.9.3 Shop drawings from the manufacturer must be submitted to and approved by the Engineer of Record prior to actual construction. Refer to Part 1.3.
- 2.10.9.4 Thrust blocks are not allowed in the Hillsborough County reclaimed water system.
- 2.10.9.5 When Exhibit R-5A is used the Design Engineer of Record must fill out the entire restraint table as applicable for their project
- 2.10.10 Air Release Valves (ARV)
- 2.10.10.1 Air release valves must be specified at high points where air can accumulate in new or altered water mains.
- 2.10.10.2 Manual ARVs are preferred, over automatic ARV’s. For Transmission Mains and Limited Access Mains a locate ball and above grade locate signage is to be installed so the manual ARV’s can be readily located.
- 2.10.10.3 Automatic air release valves must not be used in situations where flooding of the ARV manhole may occur.
- 2.10.10.4 Air release valves must not be placed in, or adjacent to driveways.



- 2.10.10.5 Construction plans and record drawings must include air release valve stationing on both the plan and profile view.
- 2.10.10.6 Where automatic ARVs are required, the depth of bury for the line must be increased. It is incumbent upon the Engineer of Record to ensure the ARV assembly fits within the valve vault, and the vault is installed flush with grade. See Specification 339002, Exhibits R-6B through R-6E
- 2.10.11 Blow-off Assembly
  - 2.10.11.1 A blow-off assembly must be installed on dead-end mains and at the end of cul-de-sac distribution mains. See Specification 339002, Exhibits R-4A and 4B for details.
  - 2.10.11.2 Temporary Blow-off Assembly: Reclaimed water main extensions at a project phase line must include a valve and no more than one additional standard length of pipe with a cap and a temporary blow-off assembly. The temporary blow-off may use a full sized inline valve. Mark plans appropriately for locations.
  - 2.10.11.3 Construction plan and record drawings must include blow-off assembly stationing on both the plan and profile views.
  - 2.10.11.4 Blow-offs must not terminate in driveways, sidewalks, or any paved surface.

## 2.11 SYSTEM IDENTIFICATION AND SIGNAGE

### 2.11.1 General

All reclaimed water piping and appurtenances must be clearly identified as reclaimed water facilities. The standard color is Pantone Purple 522C (Fed-STD-595C #27160 for paint) for all reclaimed water system piping and aboveground appurtenances including valves, meter assemblies, and backflow prevention devices. All identification and signage must be in accordance with F.A.C. 62-610.469(7) (f).

### 2.11.2 Piping and Appurtenances

- 2.11.2.1 Valves installed below ground must be identified with a stainless tag and purple curb markers to differentiate reclaimed water valves from potable water valves.
- 2.11.2.2 Covers for all valve boxes, meter and service boxes, and other below-ground devices on the reclaimed water system must comply in color with item 2.11.1. above, and must be permanently embossed “RECLAIMED WATER” and bear the words in English and Spanish “DO NOT DRINK, NO BEBER,” together with the equivalent standard international symbol.
- 2.11.2.3 Above ground piping must be painted with one coat of rust prohibitive primer and one coat of Reclaimed Purple (Fed-Std-595C #27160) high grade brushing enamel complying with 2.11.1.

### 2.11.3 Signage

- 2.11.3.1 The public must be notified of the use of reclaimed water by posting advisory signs designating the nature of the reuse project area where reuse is practiced. Advisory signs are available from WRD.
- 2.11.3.2 Signage must be placed, as appropriate, at entrances to residential neighborhoods where reclaimed water is used for landscape irrigation and at prominent locations at all commercial sites, including: multi-family developments, office parks, schools, churches, condominiums, residential common areas, recreational developments, and golf courses. A notification method for golf courses, for example, would be to post advisory signs at the entrance to a golf course and at the first and tenth tees as well as notes on scorecards.



- 2.11.3.3 Advisory signs must be color-coded Pantone Purple 522C and include the following text in English and Spanish "RECLAIMED WATER" and "DO NOT DRINK, NO BEBER," together with the equivalent standard international symbol. A schematic of a typical advisory sign is shown in Specification 339002, Exhibit R-3.
- 2.11.3.4 Advisory signs must be posted adjacent to lakes or ponds used to store reclaimed water and at decorative water features that use reclaimed water.
- 2.11.3.5 Advisory signs at storage ponds or decorative water features must include the following text in English and Spanish "DO NOT DRINK, NO BEBER" and "DO NOT SWIM, NO NADAR," together with the equivalent standard international symbols, in addition to "RECLAIMED WATER".
- 2.11.3.6 Tags or labels for all reclaimed water valves and outlets must be provided, bearing the words in English and Spanish: "Do not drink" together with the equivalent standard international symbol. Curb markers (das type) must be used when appropriate.

**2.12 HOSE BIBB ASSEMBLY**

Hose Bib connections are allowed for hand watering of lawns and other limited outdoor activities. These connections may be used independently or in conjunction with an in-ground irrigation system. The Hose bibb must be located in a locked box below ground level.

**PART 3.0 PRODUCTS**

**3.1 PIPE MATERIAL**

3.1.1 The following table lists the allowable pipe materials for various sizes of reclaimed water main pipe:

Diameter	Material	General Specification
2" and less (Service lines only)	HDPE	ANSI/AWWA C901, CTS SDR 9
2" and 3" (Service sleeve only)	HDPE	ANSI/AWWA C901, IPS SDR 17
2" - 4" (Service sleeve only)	PVC	ASTM D2241, Class 1120 or 1220, SDR 21 (minimum)
4" to 12"	PVC	ANSI/AWWA C900 DR 18
4" and greater	DIP	ANSI/AWWA C151/A 21.51, CL 50 (minimum)

3.1.2 All pipe, fittings and appurtenances must be supplied in accordance with the pre-approved material list in Appendix B.

3.1.3 Alternative materials may be submitted to Hillsborough County for review by and approval from the Public Utilities Department Product Review Committee (with proper testing documentation, performed by recognized industry authorities) prior to commencement of design. Refer to Section 1 of the Public Utilities Technical Manual for submittal procedures. Tests on alternative materials should be at least as rigorous as testing conducted by ASTM, AWWA and ANSI. A letter of variance must be issued by Public Utilities Department prior to commencement of design of any



alternative material.

## 3.2 DUCTILE IRON PIPE AND FITTINGS

- 3.2.1 Ductile iron (DI) pipe must conform to the requirements:
- 3.2.1.1 Pipe must conform to ANSI/AWWA C151/A21.51, *Ductile-Iron Pipe, Centrifugally Cast, For Water*, Class 50 (minimum).
  - 3.2.1.2 Joints for ductile iron pipe must be mechanical or push-on joints, unless otherwise specified herein.
  - 3.2.1.3 Pipe interior must have a cement mortar lining with an asphaltic seal-coat conforming to ANSI/AWWA C104/A21.4, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water*. Buried pipe must have an exterior asphaltic coating in accordance with ANSI/AWWA C151/A21.51.
- 3.2.2 The weight, class designation, size, material, manufacturer's code, and identifying number (serial number or batch number) shall be included on the mill certification sticker affixed to the exterior surface of every pipe and fitting by the manufacturer at its place of production or cast into the pipe or fitting during production. Absence or alteration of the mill certification sticker or cast information may be cause for rejection upon delivery.
- 3.2.3 DIP must be marked with purple stripe/tape in accordance with FAC 62-610.469(7) (f). Adhesive tape must be two-inch wide vinyl at least 4.5 mil thick.
- 3.2.4 Fittings
- 3.2.4.1 All ductile iron fittings must be mechanical joint, and restrained, with a minimum pressure rating of 250 psi. Fittings must conform to the requirements of ANSI/AWWA C153/A21.53, *Ductile-Iron Compact Fittings for Water Service*.
  - 3.2.4.2 All fittings must be coated and lined as specified in Part 3.2.1 for ductile iron pipe.
- 3.2.5 Mechanical Joints
- 3.2.5.1 Mechanical joints (MJ) consisting of bell, socket, gland, gasket, bolts and nuts must conform to ANSI/AWWA C111/A21.11, *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*.
  - 3.2.5.2 Bolts must be high strength low alloy steel, T-head type having hexagonal nuts.
  - 3.2.5.3 Bolts and nuts must be machined true and nuts must be tapped at right angles to a smooth bearing surface.
- 3.2.6 Push-On Joints: Single seal gasket push-on type joints must conform to the requirements of ANSI/AWWA C111/A21.11 and must be as approved in Appendix B for ductile iron pipe.
- 3.2.7 Restrained Joints
- 3.2.7.1 Restrained joints (RJ) must be of the types fabricated by the various pipe manufacturers and not the type that requires field welding or grooves cut into the pipe barrel for restraint.
  - 3.2.7.2 The restraining joints for mechanical joint (MJ) fittings and valves must conform to the requirements of ANSI/AWWA C111/A21.11 and Appendix B. See Specification 339002 Exhibit R-5A and R-5B.
  - 3.2.7.3 Restrained joints (both manufacturer supplied and field lock gaskets) must have the bell of the pipe marked in red.



- 3.2.8 Aerial Crossing Pipe, hangers, and Accessories
- 3.2.8.1 Pipe designated for use in aerial crossings and/or attachment to bridge or drainage structures must comply with the requirements of ANSI/AWWA C151/A21.51, Class 53(minimum).
  - 3.2.8.2 Pipe length must correspond to "Long Span Pipe", DIP restrained joint.
  - 3.2.8.3 Pipe joints must consist of a mechanical joint-flange (MJ-FLG), or flange-plain end (FLG-PE), and flange-restrained joint (FLG-RJ). The flange joint end must be equipped with O-ring gasket.
  - 3.2.8.4 Flanged joints to be lined as per ANSI/AWWA C115/A21.15, *Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges*. Exterior coating must be field applied, color coded purple (Fed-Std-595C #27160), and comply with the pre-approved products specified in Appendix B. All exposed threads are to be coated with paint.
  - 3.2.8.5 Hangers and Accessories
    - a) Anchor bolts must be Grade 316 stainless steel, installed in accordance with the construction drawings, utilizing non-shrink grout.
    - b) Roller Stands: Roller stands and roller axles must be Grade 316 stainless steel.
    - c) Insulated Pipe Rollers: Pipe support rollers must be constructed of dielectric synthetic resin.
    - d) Link seal and sleeve seals must be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links must be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut.
    - e) Hangers must be made in accordance with MSS SP-58 and ANSI/ASME pressure piping code B31.1.
- 3.2.9 Polywrap/Polyethylene Encasement: All buried ductile iron pipe and fittings must be encased in polyethylene in accordance with ANSI/AWWA C105/A21.5, *Polyethylene Encasement for Ductile-Iron Pipe Systems*. Polyethylene must be eight mils thick.

### 3.3 POLYVINYL CHLORIDE PIPE AND FITTINGS

- 3.3.1 PVC Pipe color must be an integral part of the pipe material and must comply with Part 2.11.1, herein.
- 3.3.2 PVC pressure pipe (four inches through 12 inches in diameter) must conform to the requirements of ANSI/AWWA C900, except that the pipe does not have to be NSF approved.
- 3.3.2.1 It must have the same O.D. as ductile iron pipe and be compatible for use with ductile iron fittings.
  - 3.3.2.2 The pipe must have a dimension ratio (DR) of 18, must have a minimum working pressure of 200 psi, and a nominal laying length of 20 feet.
- 3.3.3 All PVC must be formulated for sunlight exposure and must pass the impact strength test as described by ASTM D2444, latest revision, using TUP A with impact level of 94 ft.-lbs.
- 3.3.4 Fittings: Fittings for PVC pipe must be ductile iron with mechanical joints and comply with the requirements of Part 3.2.
- 3.3.5 Joints
- 3.3.5.1 All PVC pipe must have provisions for expansion and contraction provided in the joints.



- 3.3.5.2 All non-fused joints must be designed for push-on makeup connection. A push-on joint must be an elastomeric gasket bell end coupling manufactured as an integral part of the pipe barrel consisting of an integral wall-thickened section with an expanded bell with a ring groove to retain an elastomeric sealing ring of uniform cross-section as pre-approved in Appendix B for PVC pipe.
- 3.3.5.3 Restrained Joints: See Exhibits R-5A & R-5B in Specification 339002 for restrained joint details. See Appendix B for pre-approved products. The length of pipe to be restrained must be noted on the Construction Drawings.
- 3.3.6 Fusible PVC
  - 3.3.6.1 Pipe must be provided with plain ends. The ends must be square to the pipe and free of any bevel or chamfer. There must be no bell or gasket of any kind incorporated into the pipe.
  - 3.3.6.2 Fusible PVC must be manufactured in a standard 20 foot, 30 foot or 40 foot nominal lengths.
  - 3.3.6.3 Fusible PVC pipe lengths must be assembled in the field with butt-fused joints. The Contractor must follow the pipe supplier's written guidelines for this procedure, using only demonstrated qualified fusion technicians

### 3.4 GASKETS

Pipe and fitting gaskets must conform to the requirements of ANSI/AWWA C111/A21.11; and must be made of fluorocarbon elastomer (viton), ethylene propylene diene monomer (EPDM) or vulcanized styrene-butadiene rubber (SBR). Material selection must be dependent upon service/soil conditions.

### 3.5 POLYETHYLENE (HDPE) SERVICE PIPE AND TUBING

- 3.5.1 Extrusion compound must comply with the applicable requirements for PE 4710, very high molecular weight polyethylene plastic material, as specified in ANSI/AWWA C901, and a cell classification of 445574C (or E) as specified in ASTM D3350, Refer to Appendix B for a listing of pre-approved products.
- 3.5.2 Tubing must be 200 psi (min), Type CTS (copper tubing size).
- 3.5.3 Standard Dimension Ratio (SDR):
  - 3.5.3.1 The standard dimension ratio for polyethylene tubing provided in Copper Tubing Sizes must be nine (9). The average outside diameter, minimum wall thickness and respective tolerances for any cross section must be specified in ASTM D2737.
  - 3.5.3.2 The standard dimension ratio for two and three-inch diameter pipe (used as casing pipe) must be seventeen (17) for IPS pipe sizes. The average inside diameter, minimum wall thickness, and respective tolerances for any cross-section must be as specified in ANSI/AWWA C901
- 3.5.4 Environmental stress cracking resistance testing must be performed in accordance with ASTM D1693, Condition C, and must have no failures during a 5000-hour test period.
- 3.5.5 Pipe identification: All HDPE reclaimed water service pipe or tubing must be purple (Pantone Purple 522C) or identified with a purple stripe with the words *Reclaimed Water* at eight-inch intervals. A list of pre-approved materials are given in Appendix B.





## 3.6 VALVES AND APPURTENANCES

### 3.6.1 General

- 3.6.1.1 All valves must be the manufacturer's standard design for the service intended, must be cast on the body with the manufacturer's distinctive marking or name, the year the valve casting was made, the pressure rating, and if applicable the valve type, size, and flow direction arrow.
- 3.6.1.2 Valves must open by turning the operating unit (operating nut or hand wheel) to the left, or counterclockwise, when viewed from the top. The operating nut, or hand wheel, must have an arrow cast in the metal indicating the direction of opening.
- 3.6.1.3 Only valve types listed are acceptable for use in Hillsborough County. See Appendix B for pre-approved valves

### 3.6.2 Check Valves

- 3.6.2.1 Check valves must conform to ANSI/AWWA C508, and must be iron body, swing non-slam type, and equipped with removable inspection covers for normal horizontal installation in reclaimed water service.
- 3.6.2.2 The check valve must be rated for 175 psi for valves with diameters of two inches through 12 inches, and 150 psi minimum working pressure for valves 14 inches through 24 inches in diameter.
- 3.6.2.3 Check valves must permit full flow area equal to that of the connecting pipe.
- 3.6.2.4 Valve ends must be flanged for above ground installation.
- 3.6.2.5 Check valves four-inch and larger in diameter must be equipped with an external backflow actuator & mechanical indicator or equipped with an outside lever and adjustable weight operator (OLW).
- 3.6.2.6 Check valves smaller than four inches in diameter must be bronze body, bronze mounted, horizontal swing, y-pattern, threaded ends, 125 psi WOG.
- 3.6.2.7 OLW valve designs 12 inches and less must be metal to metal seat (bronze to bronze). OLW valves 14 inches and greater must incorporate a rubber-faced bronze clapper disc seated by a bronze clapper arm against a bronze seat ring (resilient to metal). The clapper arm must be secured to a stainless hinge pin which turns in bronze bushings. The bushings must be provided with "O"-ring seals.

### 3.6.3 Gate Valves

- 3.6.3.1 Gate valves must be of the resilient seat type meeting the requirements of ANSI/AWWA C509 or C515, and coated per ANSI/AWWA C550, *Protective Interior Coatings for Valves and Hydrants*. Two-inch valves must comply with the "intent" of ANSI/AWWA C509/C515 and C550.
- 3.6.3.2 All gate valves must be iron body, bronze trimmed, solid wedge, resilient-seated, and must be equipped with O-Ring type stuffing boxes.
  - a) All gate valve stem nuts must be bronze.
  - b) All gate valve "gates" must be fully encapsulated with and fully bonded to the resilient seat material.
  - c) All gate valve resilient wedge, O-Rings, and gaskets in contact with the reclaimed water must be E.P.D.M. (Ethylene Propylene Diene Monomer) material.
- 3.6.3.3 All gate valve bolting materials, excluding joint accessories, must at a minimum be Grade 304 stainless steel, must be readily accessible for valve maintenance, must have square or hexagonal heads and must be in conformance with the requirements of Section 4.4 of ANSI/AWWA C509/C515.





- 3.6.3.4 All gate valves must be coated with a fusion bonded epoxy coating applied to both the exterior and the interior surfaces prior to assembly of the valves.
  - 3.6.3.5 All gate valves, when fully opened, must have an unobstructed waterway diameter equal to or larger than the full nominal diameter of the valve.
  - 3.6.3.6 Underground gate valves
    - a) These valves must have non-rising stems and must be furnished with two-inch square AWWA operating nuts.
    - b) Valves must have MJ-RJ ends and must be furnished complete with joint accessories.
  - 3.6.3.7 All gate valves intended to be located above ground and/or inside structures must be outside screw and yoke (OS&Y) or non-rising stem, hand-wheel operated types with flanged joint ends. The face-to-face dimensions and drilling must conform to ANSI B16.10 for Class 125, flanged joint-end gate valves.
  - 3.6.3.8 The minimum design working water pressure must be:
    - a) 200 psi for three-inch through 12-inch sizes,
    - b) 150 psi for 16-inch through 36-inch sizes.
  - 3.6.3.9 All gate valves, prior to shipment from the manufacturing facility, must be tested by subjecting it to a minimum hydraulic pressure equal to twice the specified working pressure.
  - 3.6.3.10 All gate valves must be warranted by the manufacturer for a minimum of 10 years.
- 3.6.4 Tapping Valves, Tapping Sleeves, & Services Saddles
- 3.6.4.1 Tapping sleeves, tapping crosses, and tapping valves used to make “wet” taps into existing mains must be provided and installed at locations shown on the Construction drawings.
  - 3.6.4.2 No size on size taps, or direct taps to pipe, are allowed.
  - 3.6.4.3 Tapping Valves
    - a) Tapping valves must be mechanical joint outlet, non-rising stem, resilient seat gate valves with O-ring seals meeting the applicable requirements of ANSI/AWWA C509/C515 and C550.
    - b) Tapping valves must be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.
    - c) Tapping valves must be manufactured with an integral tapping flange having a raised lip design in accordance with MSS SP60.
    - d) All tapping valves must be coated with a fusion bonded epoxy coating applied to both the exterior and the interior surfaces prior to assembly of the valves.
    - e) Tapping valves must be furnished with a combination flange and mechanical joint for connecting the branch to the main.
  - 3.6.4.4 Tapping Sleeves and Crosses
    - a) Tapping sleeves must be SS with wraparound gasket style, MJ split iron units, or fabricated carbon steel units with a fusion-bonded epoxy coating and outlet seal gaskets and must be pressure rated as listed in 3.6.3.8.
      - 1) SS with wraparound gaskets must be for use on all pipes up to 12 inches in diameter.
      - 2) MJ split iron units must be limited for use on PVC pipe up to 12 inches in diameter and must not be used on AC pipe.
      - 3) Fabricated carbon steel units with fusion bonded epoxy coating and outlet seal gaskets must not be used on AC pipe.
    - b) The Contractor must verify the outside diameter of the existing main before ordering the sleeve.



- c) Tapping sleeves must have an outlet flange per ANSI B16.1, Class 125 standard.
- 3.6.4.5 Service Saddles
  - a) Service saddles must have a ductile iron body, be equipped with double tie straps, and be suitable for either wet or dry installation. Service saddles must be as pre-approved in Appendix B.
  - b) The sealing gasket must be the O-ring type suitable for the applicable service. The outlet connection must be FIP threads, 2 inch or less.
  - c) Tie straps and bolts must be a corrosion resistant alloy steel.
  - d) Above grade service saddles must be color-coded purple (Pantone 522C).
- 3.6.5 Service Connections
  - 3.6.5.1 Corporation Stops
    - a) Corporation stops from one inch to two inches in diameter must be brass with machined fitting surfaces rated at 150 psi (min) working pressure in accordance with ANSI/AWWA C800, Underground Service Line Valves and Fittings.
    - b) The inlet connection must be male Iron Pipe Thread (MIP).
    - c) The outlet connection must be a pack joint or compression joint outlet for copper or plastic tubing (CTS). All seats and seals must be made of an elastomeric material that has verifiable experience in water systems that use chloramines for disinfection. See Appendix B for a list of pre-approved materials and products.
  - 3.6.5.2 Curb Stops and Meter Valves
    - a) The curb stops must comply with the requirements of ANSI/AWWA C800. The curb stops must be ball valve, round way, with check, with lock wing cast on stop body and operating tee cap to provide for locking the stop in closed position. All seats and seals must be made of an elastomeric material that has verifiable experience in water systems that use chloramines for disinfection.
    - b) The meter valves must comply with the requirements of ANSI/AWWA C800. They must be ball valves, with check, with lock wing cast on stop body and operating tee cap to provide for locking the stop in closed position. All seats/seals must be made of an elastomeric material that has verifiable experience in water systems using chloramines for disinfection.
    - c) Meter valves for use with copper or plastic one-inch service lines must have an inlet connection with a compression joint and an outlet connection with a meter swivel nut, aka spud connection. See Appendix B for a list of pre-approved products.
    - d) Curb stops for a two-inch service line must have an inlet compression joint connection and an outlet female iron pipe thread, and must be as pre-approved in Appendix B.
  - 3.6.5.3 Dual Services Branches: Dual service branches (near side services only) must be solid brass and have CTS compression type connections with internal and external locking device. Pre-approved dual services branches for a one-inch service are listed in Appendix B.
- 3.6.6 Air Release Valve Assembly
  - 3.6.6.1 Air release valves (ARVs) must be installed at high points as indicated in Construction drawings. The locations may be considered approximate. Actual locations of ARV on high points must be determined in the field during construction and reflected on record drawings.
  - 3.6.6.2 Automatic air release valves must be of the type that will release air from the line when pressurized and keep air from entering the line when not pressurized. Overall height of the ARV (with vacuum check) must not exceed 15 inches.



- 3.6.6.3 The air release valve assembly must consist of an ARV with a minimum two-inch inlet; a service or tapping saddle; corporation stop (full port ball valve, with iron pipe (IP) outlet) or a 4 inch tapping valve; brass pipe and fittings; and a locking curb stop (IP in/out).
- 3.6.6.4 The automatic air release valves must be installed in traffic bearing pre-cast concrete vaults with concrete bottoms. Automatic ARV's are not to be installed in manholes subject to flooding.
  - a) Manual ARVs must be installed in a traffic bearing box. Pre-approved traffic bearing boxes are listed in Appendix B.
  - b) See Specification 339002, Exhibit R-6A through R-6E for ARV details.
- 3.6.6.5 Valves, fittings, and piping must be rated for a minimum working pressure of 150 psi, and meet the requirements of ANSI/AWWA C512, *Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service*
- 3.6.7 Valve Boxes
  - 3.6.7.1 Cast iron valve boxes with lids must be provided for all valves installed underground. The valve boxes must be screw-type adjustable to fit the depth of earth cover over the valve; and must be designed to prevent the transmission of surface loads directly to the valve or piping. See Specification 339002, Exhibit R-13A.
  - 3.6.7.2 Valve boxes must have an interior diameter of not less than five inches.
  - 3.6.7.3 Valve box extension must be installed to reserve a minimum of 50% of the adjustment for a future extension. Extension sections must be screw type cast iron and compatible with the valve box
  - 3.6.7.4 The words *Reclaimed Water* must be cast into the valve box lid. The lids must be painted purple and must be so constructed as to prevent tipping or rattling.
  - 3.6.7.5 All valve locations must be identified with a concrete valve pad containing a bronze disc embedded in concrete. See Specification 339002, Exhibits R-7 and R-8.
  - 3.6.7.6 For valve boxes in pavement, the protective concrete collar ring must be constructed of Type I (3000 psi) concrete. See Specification 339002, Exhibit R-8.

## 3.7 METER AND METER BOXES

- 3.7.1 General
  - 3.7.1.1 The design must incorporate all the requirements of Specification 339002, Exhibits R-1A through R-1E (commercial), and Exhibits R-2A through R-2F (residential), Part 2.7 and 2.11, and must be in compliance with of this specification. Refer to APPENDIX B for pre-approved products.
  - 3.7.1.2 All meter testing and their associated lay lengths must meet the applicable ANSI/AWWA C700 series standards.
  - 3.7.1.3 Meter Accuracy
    - a) For meters two-inch and smaller: The meter assembly must be designed to measure flow to within an accuracy range of plus (+) or minus (-) 1.5% of normal operating flow (1-20 gpm), and with flow indication down to 0.25 gpm (Zero being 100% accurate register reading).
    - b) For meters three inch and larger: The meter assembly must meet Class II criteria designed to measure flow to within an accuracy range of plus (+) or minus (-) 1.5% of actual flow (with zero being 100% accurate register reading) for the designed application.
  - 3.7.1.4 Meter Assembly Supports: Pipe supports must be adjustable.



- 3.7.1.5 Meter Calibration: Each meter must be provided with proof of calibration prior to installation. Manufacturer must provide confirmation that independent testing and calibration were performed in accordance with AWWA standards.
  - 3.7.1.6 Registers must be permanently and hermetically sealed at the factory.
    - a) Registers must be direct read or straight read with a center sweep and must read in U.S. gallons.
    - b) Digital registers for meters three inches and larger that may be used in high use, industrial, or commercial applications must be configured to display the flow totalization only with a 100-gallon multiplier (#x100). Flow measurement is in 100-gallon increments
  - 3.7.1.7 All meters must be weather resistant, submersible, and able to withstand extended UV exposure without degradation to the performance of the physical integrity of the meter. Meters must also be able to withstand extended exposure to Hydrogen sulfide gas and periodic exposure to saltwater.
  - 3.7.1.8 One inch and smaller meters must be compact and have threaded ends. Meters sized 1-½ inches and larger must have IP or flanged ends.
  - 3.7.1.9 Polymer clamping devices are not acceptable.
  - 3.7.1.10 All external bolts, nuts, screws and washers must be 304 or 316 stainless steel.
  - 3.7.1.11 Shear pin bolts must not be used.
  - 3.7.1.12 All meters must have automated meter reading (AMR) compatible registers. The meters must be readily modifiable to allow installation of an AMR register. AMR registers must be compatible with PRC pre-approved meters.
  - 3.7.1.13 Strainers, where required, must be stainless steel.
- 3.7.2 Meter Boxes
- 3.7.2.1 Meter boxes must be purple in color and of one-piece construction. Boxes must not exceed 25 pounds in weight.
  - 3.7.2.2 Boxes and lids must pass an AASHTO H-20 (16,000-pound wheel load) style test, and the boxes must be able to withstand a 200-pound side load.
  - 3.7.2.3 Boxes must have pre-cut pipe entry areas and must be designed to be securely stackable.
  - 3.7.2.4 Boxes for Residential Service must be able to take a standard lid size:
    - a) Single Service: 11-1/8 inches by 18 inches (+ 1/8 inch).
    - b) Dual Service: 14-3/8 inches by 16-3/8 inches (+ 1/8 inch).
  - 3.7.2.5 Box depth must be 12 inches, from the face of the lid to the bottom of the box. Residential boxes and lids must also comply with Specification 339002, Exhibit R-9.
  - 3.7.2.6 Dimensional deviations must be approved by the Product Review Committee.
  - 3.7.2.7 See Appendix B for a listing of pre-approved products.

### **3.8 HOSE BIBB ASSEMBLY**

- 3.8.1 The assembly must include a lock box assembly and key, a hose unit, and Hose Bibb components which include a 3/4-inch curb stop, 3/4-inch 90° elbow or galvanized tee, 3/4-inch galvanized plug (with tee option), 3/4-inch by two-inch galvanized nipple, 3/4-inch full port valve T580, 3/4-inch NY-Glass cam/groove coupling Part B, and pipe nipples.
- 3.8.2 Lock Box Assembly: Hose Bibb connections must be located in a locked below-grade vault clearly labeled "RECLAIMED WATER" and bearing the words in English and Spanish "DO NOT DRINK, NO BEBER" together with the equivalent standard international symbol.



- 3.8.3 Rubber Hose Unit: This must consist of a 3/4-inch rubber hose with a NY-Glass cam/groove 3/4-inch coupling Part E and 1-1/4-inch stainless steel center punch clamps, designed specifically for this Hose Bibb connection. On the other end of the hose must be a 3/4-inch brass male nipple to accommodate a standard spray nozzle or sprinkler attachment. See Specification 339002, Exhibit R-10.

## **PART 4.0 CONSTRUCTION**

### **4.1 WORK AT HIGHWAY OR RAILROAD CROSSINGS**

Construction work for any County/FDOT highway or railroad crossing to be performed must not commence until all Right-of-Way permits for the pipeline occupancy have been obtained.

### **4.2 PRECONSTRUCTION PIPE INSPECTION/CERTIFICATION**

- 4.2.1 The Contractor must obtain from the pipe manufacturer a certificate of inspection to the effect that the pipe and fittings supplied for the project have been inspected at the plant and that they meet the requirements of these specifications.
- 4.2.1.1 For County contracted projects the Contractor must submit these certificates to the Project Manager prior to installation of the pipe materials.
- 4.2.1.2 For developer projects, the Contractor must submit these certificates to the WRD Inspection Group prior to the installation of the pipe materials.
- 4.2.2 Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.
- 4.2.3 The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.
- 4.2.4 For County contracted projects all pipe and fittings must be subjected to visual inspection at time of delivery and before they are lowered into the trench to be laid.
- 4.2.5 PVC pipe must not be off-loaded with chains, wire rope or other pipe handling implements that may scratch, nick, cut or gouge the pipe. Any scratch or gouge that is greater than 10% of the wall thickness is considered significant and must be rejected.

### **4.3 INSTALLATION**

- 4.3.1 The provisions set forth herein must be applicable to all underground reclaimed water piping installations.
- 4.3.2 All pipe must be installed at a minimum depth of three feet (36 inches to the top of pipe) below final grade. Depth of bury is increased to a minimum of four feet (48 inches) for pipes greater than 12 inches, or if the pipe falls within the road or right of way of a FDOT road or a County arterial or collector road.
- 4.3.3 All mechanical joints, or connections to pipe, fittings, valves, meters or apparatus must be installed so as to ensure no negative pressure is placed or potential placed against the joint, or connection, thereby causing a malfunction or failure of the mechanical joint, or connection.



- 4.3.4 All pipe must be color coded PURPLE.
  - 4.3.4.1 Ductile iron must be marked as specified in Part 3.2.3. Adhesive tape must be two-inch wide vinyl, 4.5-mil thick (minimum).
  - 4.3.4.2 Polywrap must be color coded purple or clear.
  - 4.3.4.3 PVC must be colored purple throughout the thickness.
- 4.3.5 It must be the Contractor's and Developer's responsibility to verify all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where conflicts exist, SUE work must be coordinated with the facility owner and performed so as to cause minimum interference with the service rendered by the facility disturbed.
- 4.3.6 Facilities or structures damaged must be repaired and/or replaced immediately at the Contractor's and/or developer's expense, in conformance with current standard industry practices, according to the direction of the owner of such facility and approved by the County.
- 4.3.7 See Specification 339002, Exhibit R-11 for Jack and Bore details and Exhibit R-12 for Ditch Crossing details.
- 4.3.8 Directional Drill/Jack and Bore: Where open cut is not practical, Directional Drilling per Specification 330523, or Jack and Bore per Specification 330524, must be used. All Directional Drill, and Jack and Bore, locations must be indicated on the Construction drawings, and approval from WRD is required prior to starting construction.
- 4.3.9 No pipe must be laid when the trench conditions or the weather is unsuitable for such work.
- 4.3.10 The reclaimed water system is a closed system. The ends of pipe must be capped or plugged.
- 4.3.11 Polyvinyl chloride pipe may be damaged by prolonged exposure to direct sunlight. The Contractor must take necessary precautions during storage and installation to avoid this damage. Pipe must be stored under cover and sufficient backfill must be placed to shield it from the sun as the pipe is installed.
- 4.3.12 All pipe crossing driveways and landscape areas is to be installed by directional drill unless otherwise noted on the construction drawings. All pipe crossing arterial and collector roads must be cased and installed by jack and bore.
- 4.3.13 **All pipe** must be installed with two insulated 10-gauge or 12-gauge, solid copper or copper clad steel core locating wire with HDPE color coded coating (purple) and attached at 10:00 or 2:00. Wire for direction drill applications must be copper clad "hard drawn" steel core with a minimum breaking strength of 1000 pounds.
  - 4.3.13.1 Tracer/locate wire must be attached to the carrier pipe using a minimum two-inch wide duct tape. Tape must be at every joint and at four to five-foot spaced intervals. When the tracer wire is installed within a PVC pipe, the PVC pipe must be attached to the carrier pipe.
  - 4.3.13.2 Tracer wire must start at the point of connection to existing County infrastructure, and terminate at the end of all mains/branches (ex. blow-offs)
  - 4.3.13.3 Locating wire must terminate at a ground level magnetized access point. The access point and base rating is dependent on the final location. When required wires must be spliced together with a waterproof, corrosion proof, connector with a dielectric non-hardening silicone sealant. No more than 6 splices may be used between access points.



- 4.3.13.4 Tees and crosses must have continuous connections utilizing underground splices on the primary run. (see Specification 331002 Exhibit W-12A).
  - 4.3.13.5 Access points (two terminals minimum) must be installed at least every 1000 lineal ft. Ground rods must be installed at every access point.
  - 4.3.13.6 In the case where an access point location would fall within a paved road, the locate wires must be continued to the next/nearest available access point outside of pavement.
  - 4.3.13.7 The Contractor is required to submit Certification (signed and sealed by the EOR, or their representative) that a passing locate test has been performed on the installed tracer/locate wire. The locates must be done by either the Contractor or a SUE firm
- 4.3.14 When fusible PVC is used, Fusion Technicians must be fully qualified by the pipe supplier to install fusible PVC of the type(s) and size(s) being used. Qualification must be current as of the actual date of fusion performance on the project.
- 4.3.15 Excavation, trenching and backfilling must be in accordance with the requirements of the applicable portions of these specifications. In addition, all underground facility installations must comply with the requirements of Section 5.4 of the Utility Accommodation Guide.

#### **4.4 TRENCH EXCAVATION**

- 4.4.1 All excavations must be open cut, with banks of trenches kept as nearly vertical as possible and wide enough to allow approximately eight inches clearance on each side of the pipe.
- 4.4.2 The trench floor must provide a uniform bearing for each full length of pipe section. Excavate bell holes after trench has been graded. See Specification 339002, Exhibit R-15.
- 4.4.3 Perform all excavations of whatever substance encountered to the depths shown or indicated on plans.
- 4.4.4 In the event unsuitable or unstable soil is encountered, remove it to a depth of six inches (minimum) below the bottom elevation of the pipe (12 inch if rock or boulders are encountered) and replace with material meeting AASHTO Soil Classification A-1, A-2, or A-3, as approved by the Project Manager or Engineer. Reference FDOT Standard Specifications for Road and Bridge Construction Section 125-4.
- 4.4.5 Dewatering: Remove all water from excavations and maintain the excavations free of water while construction therein is in progress. Provide dewatering equipment as necessary to conform to this requirement. Dewatering procedure must meet all regulatory requirements.
- 4.4.6 Protection of Trees: Trenching must not take place within the root zone of trees with a trunk diameter of six inches or larger. The root zone must be defined as the greater of one) the drip line of the tree or two) a circular zone extending outward from the base of the tree a distance equivalent to 1/2-foot for every inch of trunk diameter as measured 4-1/2 feet above natural grade (see Specification 339002 Exhibit R-14). Exotic nuisance species, such as Brazilian Pepper and Melaleuca, are exempt from this protection.

#### **4.5 HANDLING AND CUTTING PIPE**

- 4.5.1 Every care must be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coating both inside and out.



- 4.5.2 Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. The pipe must not be dropped or unloaded by rolling.
- 4.5.3 Any fitting showing a crack, and any fitting or pipe which has received a severe blow that may have caused an incipient fracture (even though no such fracture can be seen) must be marked as rejected and removed at once from the work.
- 4.5.4 In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by WRD, may be cut off before the pipe is laid. The cut must be made in the sound barrel at a point of at least 12 inches from the visible limits of the crack. All cutting must be done with a machine adapted to the purpose. All cut ends must be examined for possible cracks caused by cutting.
- 4.5.5 Cutting Pipe: The Contractor must cut pipe by means of an approved mechanical cutter. The cut must be perpendicular to the longitudinal axis of the pipe and rough ends or spurs will be satisfactorily removed prior to installation and seating.

## **4.6 FUSION PROCESS**

- 4.6.1 Fusible PVC must be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and the pipe supplier's guidelines.
- 4.6.2 Fusible PVC must be fused by qualified fusion technicians, as documented by the pipe supplier.
- 4.6.3 Each fusion joint must be recorded and logged by an electronic monitoring device affixed to the fusion machine.
- 4.6.4 Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier must be used for the fusion process. Fusion machines must incorporate the following properties/elements: heat plate, carriage, and data logging device.
- 4.6.5 Other equipment specifically required for the fusion process must include the following:
  - 4.6.5.1 Pipe rollers used to support the pipe on either side of the fusion machine.
  - 4.6.5.2 A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage.
  - 4.6.5.3 Fusion machine and maintenance manual must be kept with the fusion machine at all times.
  - 4.6.5.4 Facing blades specifically designed for cutting fusible PVC.

## **4.7 PIPE LAYING**

- 4.7.1 Pipe must be constructed of the materials specified and as shown on the drawings.
- 4.7.2 Cradle: Upon satisfactory excavation of the pipe trench, recesses for the pipe bells and joints (or couplings) must be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel must receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
- 4.7.3 Cleanliness: The interior of the pipes must be thoroughly cleaned of all foreign matter before being gently lowered into the trench and must be kept clean during laying operations by means of plugs





or other approved methods. During suspension of work for any reason at any time, a suitable stopper must be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

#### 4.7.4 Gradient

4.7.4.1 Lines must be laid straight, and depth of cover must be maintained uniform with respect to finished grade, whether final grading is completed or proposed at time of pipe installation. When a grade or slope is shown on the Construction Drawings, means must be used by the Contractor to assure conformance to required grade.

4.7.4.2 Any pipe which has its grade or joint disturbed after the pipe has been laid must be taken up and re-laid.

#### 4.7.5 Pipe/Joint Deflection: Whenever it is desirable to deflect pipe, the amount of deflection must not exceed the following:

4.7.5.1 Pipe Joints: 75% of the maximum limit as specified in AWWA C600 (for Ductile iron) or AWWA C605 (for PVC), or the manufacturer's recommendation, whichever is less.

4.7.5.2 PVC Pipe: 75% of the maximum limit as specified in AWWA C605, or the manufacturer's recommendations, whichever is less.

4.7.6 Rejects: Any pipe and fittings defective due to interior or exterior damage must be immediately removed and replaced with sound pipe or fitting at the Contractor's expense.

4.7.7 PVC: All PVC water mains must have electronic locator wires in accordance with Part 4.3.12, herein. The wires must be continuous between valves.

4.7.8 Any section of pipe already laid which is found to be defective or damaged must be replaced with new pipe without additional cost to the County.

4.7.9 Installation of PVC pipe and fittings must be in accordance with the installation requirements established by the manufacturer and AWWA Manual of Practice M23 and AWWA C605.

## 4.8 INSTALLING JOINTS

4.8.1 The joints of all pipelines must be assembled in straight alignment and made tight. The joint design used must comply with the requirements of Part 3.2 and 3.3. For County contracted projects, the joint used must be reviewed and approved by the Engineer of Record prior to installation.

4.8.2 Ductile iron pipe and fittings can only be pushed when using a restrained joint system that does not allow the spigot to contact the bell shoulder. Pipe may be pulled using restrained joint pipe or restraining gaskets as restraints.

4.8.3 Restraining gaskets must never be pushed; nor should pipe be homed all the way to the bell shoulder.

4.8.4 Mechanical Joints: All types of mechanical joint pipes must be laid and jointed in full conformance with manufacturer's recommendations. Torque wrenches set as specified in ANSI/AWWA C111/A21.11, must be used; or spanner type wrenches not longer than specified therein may be used with the permission of the County. Impact wrenches must not be used.

4.8.5 Push-On Joints: Push-on joints must be made in strict compliance with the manufacturer's



- recommendations.
- 4.8.5.1 Lubricant must be an inert, non-toxic, water soluble compound.
  - 4.8.5.2 Insert the spigot end into the bell so that it is in uniform contact with the gasket.
  - 4.8.5.3 For PVC pipe, push the spigot until the reference mark on the spigot end is flush with the end of the bell. If the reference mark is not visible after assembly, the joint is to be cut out and reassembled.
  - 4.8.5.4 For DIP, push the pipe until the reference mark on the spigot end disappears into the bell.
- 4.8.6 Joint Compounds: Sulfur based joint compounds must not be used.
- 4.8.7 Restrained Joints must be provided at all changes in direction, and size changes, of all mains.
- 4.8.7.1 All pipe and fitting joints must be restrained as shown on the Construction Drawings, or where in the opinion of the Design Engineer, settlement or vibration is likely to occur.
  - 4.8.7.2 All restrained joints must be installed in accordance with manufacturer's recommendations.
  - 4.8.7.3 All restrained joints (manufacturer supplied or field lock gaskets) must have the joint bell marked in red. Paint the bell or wrap the bell with vinyl adhesive red marking tape.
  - 4.8.7.4 Restraining gaskets must never be pushed; nor should pipe be homed all the way to the bell shoulder.

## 4.9 INSTALLING APPURTENANCES

- 4.9.1 Valves and Valve Boxes
- 4.9.1.1 Valves must be carefully inspected on site, opened wide and then tightly closed and the various nuts and bolts must be tested for tightness prior to installation.
    - a) Special care must be taken to prevent any foreign matter from becoming lodged in the valve seat.
    - b) Any valve that does not operate correctly must be immediately removed and replaced by the Contractor.
  - 4.9.1.2 Valves/valve boxes must not be installed in ADA ramps or in curbs. They must not be installed in paver driveways and must have at least 6" of concrete/pavement on all sides of the valve box. Refer to Exhibit R-7
  - 4.9.1.3 Valves installed below ground must be identified with a bronze disc imbedded in concrete to differentiate reclaimed water valves from potable water valves (see Specification 339002, Exhibits R-7 and R-8).
  - 4.9.1.4 Concrete Valve Pad: Valve boxes outside of paved areas must be cast in a 3000-psi concrete slab, two-foot by two-foot square and six-inch (minimum) thick. See Specification 339002, Exhibits R-7 for unpaved installations.
  - 4.9.1.5 Valve Boxes: Valve boxes must be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut.
    - a) Valve boxes must be set to conform to the level of the finished surface and held in position by a ring of concrete placed under the support flange as shown on the Construction Drawings. See Specification 339002 Exhibits R-7 and R-8.
    - b) The valve box must not transmit surface loads to the pipe or valve.
    - c) Care must be taken to prevent earth and other material from entering the valve box.
    - d) Any valve box which is out of alignment or whose top does not conform to the finished ground surface must be dug out and reset.
    - e) Before final acceptance of the work, all valve boxes must be adjusted to finished grade and valve box extensions must be installed to reserve a minimum of 50% of the



adjustment for future extension. Extension sections must be threaded/screwed cast iron.

- f) The operating nut should not exceed 36 inches below finished grade. However, if conditions require that the operating nut exceeds 36 inches below grade, then an extension, mechanically attached to the valve, must be added, and the top of the extension must not exceed 12 inches below finished grade. See Specification 339002, Exhibit R-13B.
- g) The valve boxes must be provided with covers marked “RECLAIMED WATER” and must be so constructed as to prevent tipping or rattling. Valves must be marked with a bronze disc embedded in concrete.
- h) Valves that fall in concrete/pavement must have a “long skirt” valve cover to prevent the cover from flipping.

#### 4.9.2 Air Release Valve Assemblies

- 4.9.2.1 Construction plans and record drawings must include air release valve stationing on both the plan and profile views.
- 4.9.2.2 The locations of ARVs indicated on the Construction plans are approximate. The actual placement of the air release valves must be determined in the field and must be located at the high points as established during installation of the reclaimed water main and as approved by the Project Manager.
- 4.9.2.3 Automatic air release valves must be in a shallow manhole not subject to flooding, as shown in Specification 339002, Exhibit R-6B through Exhibit R-6D.
- 4.9.2.4 Manual ARVs must be installed as shown in Specification 339002, Exhibit R- 6A.
- 4.9.2.5 The Contractor must furnish and install at no additional cost to the County all necessary fittings to make adjustments in the field for the installation of air release valves at all high points.

#### 4.9.3 Blow-Off Valve Assemblies

- 4.9.3.1 The Contractor must furnish and install blow-off valve assemblies as shown on the Construction Drawings.
- 4.9.3.2 The locations shown are approximate. The actual placement of the blow-off valve must be determined in the field and must be located at the low point or end of the pipeline as established during installation of the reclaimed water main and as approved by the Project Manager.

4.9.4 Reclaimed Water Meter Assemblies must be installed in-accordance with Specification 339002, Exhibit R-1A through R-1H, and part 2.7.

### **4.10 GOLF COURSES AND OTHER MAJOR USERS**

Golf courses and other major water users (over 100,000 gallons per day annual average) are required to install a meter and equipment to monitor and control the flow entering the property. Installation details must comply with the general requirements herein, and the requirements of Part 2.6.

### **4.11 SERVICE CONNECTIONS**

4.11.1 The Contractor must furnish and install reclaimed water service connections as shown on the Construction Drawings. Reclaimed water service connections must include service lines, corporation stops, and curb stops as defined in Part 2 and Part 3, herein.



- 4.11.1.1 In residential subdivisions, the developer is not required to install the individual meter box. The County will install the meter box in response to the residential customer's application for service.
- 4.11.1.2 For County run projects, the Contractor must include the installation of the meter boxes as part of the project.
- 4.11.2 Meters installed in residential areas within a meter box must be installed plumb, level, and positioned facing the lot served. The meter's depth must be six (6) inches, plus or minus one ( $\pm 1$ ) inch, below final grade. A two by two-inch temporary identification stake must be placed adjacent to the meters with a final grade line clearly marked on it.
- 4.11.3 Service connections must utilize a tapping or service saddle. Direct taps of lines are not allowed.
- 4.11.4 Service Box Location: The developer is required to clearly identify the location of the curb stop and future service connection (see Specification 339002, Exhibits R-2A – D).
  - 4.11.4.1 Temporary identification: During construction, the location may be temporarily identified with a two-inch by two-inch by 18-inch wood stake with the top painted purple and marked with the lot(s) number to be served and **must clearly show the final grade line**.
  - 4.11.4.2 Permanent identification: When the roadway is complete, the Developer must mark the roadway curb (dashed type curb marker) indicating the location of the curb stop and reclaimed water service connection. The marking procedure must be subject to approval by the County.

## 4.12 INSTALLING BACK-FLOW PREVENTION DEVICES

- 4.12.1 Residential: Prior to receiving reclaimed water service, a dual check valve assembly (as a minimum) will be installed on each residential customer's **potable** water meter in order to protect the potable water system. Refer to Specification 331001 for requirements on the installation and type of acceptable backflow preventers.
- 4.12.2 Commercial: Multi-family complexes and commercial properties with master-metered potable water service and master-metered reclaimed water service must be required to install a Reduced Pressure Principal Backflow assembly downstream of the master potable water meter.
- 4.12.3 The Contractor must call for inspection immediately after installation to obtain approval of performance and operation of the device.

## 4.13 HOSE BIBB CONNECTION ASSEMBLY

- 4.13.1 Hose Bibb assembly used with an existing in-ground irrigation system must be placed downstream of the curb stop. Use a 3/4-inch tee to connect the Hose Bibb assembly to the existing in-ground irrigation system. A Hose Bibb assembly that is not used in conjunction with an in-ground irrigation system must use a 3/4-inch elbow. Refer to Part 3.9 for a detailed description of the assembly.
- 4.13.2 Lock Box Assembly: Hose Bibb connections must be located in a locked box clearly labeled "RECLAIMED WATER" and bearing the words in English and Spanish "DO NOT DRINK, NO BEBER" together with the equivalent standard international symbol.



- 4.13.3 Hose Bibb Location: The Lock Box and Hose Bibb Assembly must be located within the owner's property boundary, visible from the street, and must not be located in the County's right-of-way.

#### **4.14 POLYETHYLENE TUBE ENCASEMENT/POLYWRAP**

- 4.14.1 All buried ductile iron pipe, valves, and fittings, including ductile iron pipe inside of a casing, must be polywrapped. Installation of polyethylene tube encasement must be in accordance with Method A of ANSI/AWWA C105/A21.5 and as specified herein.
- 4.14.2 Raise a length of pipe at the side of the trench to a height of about three feet above ground level by means of hoisting equipment and a pipe sling or tongs.
- 4.14.3 Using a precut length of polyethylene tubing, two feet longer than length of pipe to be covered, slide plastic tubing over spigot end of the pipe up to the pipe sling or tongs. Bunch the excess of the plastic tubing near the sling or tongs.
- 4.14.4 Lower the pipe into the trench, joining the lowered length of pipe with that already in place. Shallow bell holes at the pipe joints must be made to facilitate overlapping of the polyethylene at the pipe joints.
- 4.14.5 Raise bell end of the pipe mechanically or by hand, clear of trench bottom. Slide plastic tube along balance of pipe length to the pipe bell. Leave surplus bunched at the bell for subsequent covering of the joint. Approximately one foot of surplus should be provided at each end of pipe.
- 4.14.6 To cover the joined pipe joint pull the plastic tubing from the preceding length of pipe over the bell end of the pipe, fold around the spigot end of new pipe section and wrap with three circumferential turns of 1-1/2 inch wide polyethylene tape to seal and hold the film in place.
- 4.14.7 Pull the bunched polyethylene tubing on the new pipe barrel near spigot end over the first polyethylene wrap until it covers the joint, neatly folded behind the bell, seal and hold in place by three circumferential turns of 1-1/2-inch wide polyethylene adhesive tape. **Use red tape around restrained joints.**
- 4.14.8 The polyethylene film covering the pipe will be loose. Excess material should be neatly drawn up around the pipe barrel, folded into an overlap on top of the pipe and held in place by means of pieces of the plastic tape at approximately three to five-foot intervals.
- 4.14.9 Repair any rips, punctures or other damage to the polyethylene with tape or by cutting open a short length of tube, wrapping it around the pipe and securing with tape.
- 4.14.10 Fittings such as pipe bends must also be covered by use of the plastic tubing and plastic adhesive tape in much the same manner as the pipe.
- 4.14.11 Irregular-shaped appurtenances must be covered by splitting a suitable length of the polyethylene tubing and using the resulting flat sheet with plastic tape to cover such items.

#### **4.15 BACKFILL/COMPACTION**

- 4.15.1 Backfilling and compaction must be conducted in a manner as to preclude subsequent settlement and provide adequate support for the surface treatment, pavement, pipelines, or structures to be



placed thereon. Structures within the reclaimed water system include ARVs. All trenches must be prepared per the requirements of Part 4.4. Also refer to Specification 339002 Exhibit R-15.

- 4.15.2 Backfill and bedding material must be common fill material free from organic matter, muck or marl, and rock exceeding 2-1/2 inches in diameter, and must not contain broken concrete, masonry, rubble or other similar materials. When unstable or unsuitable material is encountered replace with AASHTO soil classification A-1, A-2, or A-3.
- 4.15.3 Method of Compaction: The Contractor must adopt compaction methods which will produce the degree of compaction specified herein without damage to the new or existing facilities. The degree of compaction specified in the following must be considered the minimum allowable. See Specification 339002, Exhibit R-15.
- 4.15.4 Backfilling Procedures: The backfilling procedures outlined in the following must be for reclaimed water mains at all points of connection to the existing system, and at all water-related structures/appurtenances. Refer to 4.15.6 for compaction test requirements/locations. The backfilling must be done in three stages as follows:
- 4.15.4.1 Reclaimed Water Mains
- First stage - the Contractor must provide adequate compacted fill beneath the haunches of the pipe, using mechanical tampers suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding material. Fill compacted by mechanical compactors must be placed in six-inch layers and thoroughly tamped over the entire surface.
  - Second stage- the Contractor must obtain a well-compacted bed and fill along the sides of the pipe and to a point of at least one foot above the top of the pipe. The width of backfill and compaction to be done under this second stage must be the width of the portion of the trench having vertical sides; or, when no portion of the trench has vertical sides, it must be to a width at least equal to three times the outside diameter of the pipe. Material to be placed in six-inch layers (loose thickness).
  - Third stage - the remainder of the trench must be backfilled with suitable material in layers not to exceed 12-inch loose thickness and compacted.
- 4.15.4.2 Reclaimed Water Structures – ARV’s
- The Contractor must provide well-compacted sub-base under the structure.
  - From the bedding up to grade the Contractor must backfill around the structure in lifts not to exceed 12-inch layers (loose thickness). The width of the backfill and compaction must be the width of the excavation, or to a width equal to three times the manhole diameter whichever is less.
- 4.15.5 Compaction Density: The trench backfill density for all stages must be as provided as follows:
- 4.15.5.1 From right-of-way line to right-of-way line, including all structures and railroad crossings: Compaction must be 98% of the maximum density as determined by AASHTO T-180 (ASTM D1557 - Modified Proctor) with no tolerance.
- 4.15.5.2 For outside of the right-of-way (but within maintenance easements): Compaction must be 95% of the maximum density as determined by AASHTO T-180 (ASTM D1557 - Modified Proctor) with no tolerance.
- 4.15.6 Compaction Test Requirements
- 4.15.6.1 Compaction test results must be submitted for all work.
- 4.15.6.2 Results of compaction tests must meet minimum requirements prior to proceeding with the next stage of the work.



- 4.15.6.3 In the second and third stage of backfilling, density tests must be made every one foot vertically, staggered every 200 feet (minimum) horizontally. There must be a minimum of one test (per vertical foot) between structures, and a minimum of one test per day
- 4.15.6.4 For structures, density tests must be every two feet vertically, staggered spirally around the structure, and a minimum of one test per day.
- 4.15.6.5 Compaction testing at the **Point of connection** to existing infrastructure is required to be taken at the point of connection within the width of the portion of the trench having vertical sides; or when no portion of the trench has vertical sides, tests must be within a width equal to three times the width of the pipeline or structure.
- 4.15.6.6 For developer projects, one complete set of all test reports must be submitted with the as-built package to the Site Plan and Subdivision Review Section and the WRD Inspector upon project completion.
- 4.15.6.7 For County run projects, one complete set of test reports must be submitted with the as-built package to the Project Manager upon project completion.
- 4.15.6.8 The Contractor must employ an independent testing laboratory, acceptable to the County and pay for all required tests.
- 4.15.6.9 The laboratory must submit one copy of the certified test reports, after testing in each phase, to the Construction Services Section in the Development Services Department and the WRD Inspector, or the County Project Manager (as applicable), for approval.

#### **4.16 TEMPORARY POTABLE WATER SERVICE FOR CONSTRUCTION**

- 4.16.1 Refer to Specification 331001, Part 4.13 whenever County supplied temporary potable water service is desired for Construction. If County water is not available the Contractor will be responsible for supplying their own potable water to the job site.
- 4.16.2 Removal of County supplied Temporary Water Construction Assembly: After the entire development water distribution system has been installed, pressure tested, disinfected, and accepted by the Department of Health, the Contractor must remove the backflow assembly as directed by the WRD.

#### **4.17 FLUSHING AND CLEANING**

- 4.17.1 All mains must be cleaned and flushed to remove all sand and other foreign matter.
  - 4.17.1.1 The Contractor must be responsible for developing a flushing plan to be submitted to the Engineer of Record for approval with the shop drawings. If temporary potable water service, per Part 4.16, is used the flushing plan must be submitted with the “temporary water plan”.
  - 4.17.1.2 The Contractor must dispose of all water used for flushing without causing a nuisance or property damage.
  - 4.17.1.3 Any permits required for the disposal of flushing water must be the responsibility of the Contractor.
- 4.17.2 Flushing water used by the Contractor must be taken from an approved metered source. Flushing water must be at Contractor's expense.
  - 4.17.2.1 Reclaimed mains must be filled slowly at a rate that allows air to leave the line at the same rate as the water entering the line.
  - 4.17.2.2 When flushing the pipeline, the flow velocity should be a minimum of 3 feet per second (fps).



- 4.17.2.3 Flushing should continue until the discharge appears clear, however the minimum duration should be based on a minimum of three (3) changes of pipeline volume
- 4.17.3 Pipeline must be cleaned with a "pig", of an appropriate material for the pipeline to be cleaned, so as not to damage the interior lining of the pipeline. Contractor must be responsible to install and remove appropriate connections to accomplish the required pipeline "pigging".
- 4.17.4 Temporary plugs or caps must be installed on new mains until the pressure and leakage tests are completed. Upon satisfactory completion of the tests the caps or plugs must be removed and the connections made to the existing mains.

#### **4.18 HYDROSTATIC TEST**

- 4.18.1 Reclaimed water mains must be tested in sections between valves. The total length of pipe for any single test must not exceed 2,000 feet. Testing must be done immediately after installation and backfilling has been completed.
- 4.18.2 The piping must be tested in sections, thereby, testing each valve for secure closure.
- 4.18.3 The mains must be tested in accordance with, the latest revision of ANSI/AWWA C600 (for Ductile Iron) and C605 (for PVC) under an average hydrostatic pressure of not less than 150 psi, using a 300 psi gauge, for a minimum of two hours. Pressure must be maintained until all sections under testing have been checked for evidence of leakage.
- 4.18.4 While the system is being filled with water, air must be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor must install corporation stops or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled.
- 4.18.5 The test pressure must not vary by more than five psi for the duration of the test. Any visible leaks must be corrected.
- 4.18.6 All pumps, gauges and measuring devices must be furnished, installed and operated by the Contractor; and all such equipment, devices and their installation must be approved by the County Inspector.
- 4.18.7 All water for testing must be potable water or reclaimed water, as provided by the Contractor at the Contractor/developer's expense, from a source approved by the County. Flow velocity during line filling should not exceed two (2) feet per second (fps).
- 4.18.8 All restrained sections of the buried main must be completely backfilled before such sections are tested.
- 4.18.9 All pressure lines must be tested. All pressure testing must be done in the presence of the County Inspector and the Engineer of Record or his designated representative. Pressure testing is considered a "hold" point and requires the County Inspector sign off. All hydrostatic pressure tests must be recorded on the form(s) attached in Part 6.
- 4.18.10 When leakage occurs, the defective pipe, pipe joints or other appurtenances must be located and repaired at the expense of the Contractor. If the defective portions cannot be located, the Contractor, at his own expense, must remove and reconstruct as much of the original work as





necessary to obtain a water main within the allowable pressure upon retesting.

- 4.18.11 If the Contractor elects to perform hydrostatic testing against valves in an existing distribution system, he does so at his own risk and will bear the cost of any damage to the existing valve, piping system, private or public property, or the new pipeline under test.

#### **4.19 CONNECTION TO EXISTING RECLAIMED WATER MAINS**

- 4.19.1 Connections to existing reclaimed water pipelines must be made as shown on the Construction Drawings. At all new points of connections, a tee or cross with the appropriate isolation valves must be installed. Coordination between the County and the Contractor must be required in order to accomplish this task. The Contractor must supply connection, procedure, and customer notification schedules to the County, for approval, two weeks prior to the proposed connection date.
- 4.19.2 No reclaimed water connections can be made until the appropriate backflow preventer is installed on the potable water service lines.
- 4.19.3 At all new points of connection, a tee or cross with the appropriate isolation valves must be installed. All connections to existing reclaimed water mains must be made under the direct supervision of Hillsborough County WRD after the Contractor has coordinated with and received approval from the County (approval must be obtained through DSD, or the County Project Manager, as applicable). All connections, cut ins, and taps must be done under the supervision of WRD FMS personnel. Final tie-ins may be under the supervision of either WRD Inspection or FMS personnel.
- 4.19.4 Valves on existing mains must be operated only by Hillsborough County WRD personnel.
- 4.19.5 When service must be interrupted to existing customers during construction of a tap or addition of appurtenances:
- 4.19.5.1 The Contractor must provide three days' notice to the Hillsborough County WRD FMS Personnel.
  - 4.19.5.2 The Contractor or developer must be required to notify existing customers as directed by the WRD FMS Personnel.
  - 4.19.5.3 The Contractor must be ready to proceed with as much material preassembled as possible at the site to minimize the length of service interruption. Such connections may be made at night to minimize effects. No customer must be without service for more than six hours.
  - 4.19.5.4 The WRD will postpone a service cut-off if the Contractor is not ready to proceed on schedule.
- 4.19.6 Connections smaller than six inches (for single connections or distribution systems) to transmission mains (larger than 16 inches) are not allowed. Connections of any size, including the connection alternatives noted in the subsections below, will be prohibited in areas that are both outside the Urban Service Area and outside the areas defined in Policy 4.3.1 of the One Water Element of the Comprehensive Plan. Transmission mains outside of these areas must be defined as "Limited Access Transmission Mains".
- 4.19.6.1 In areas where there is no reasonable alternative for providing service, the County may approve a four-inch minimum size connection and pipeline configured for a future parallel distribution system for additional services.
  - 4.19.6.2 The connection must include a line size x connection-size tee (six-inch minimum



connection size), an isolation valve at the point of connection, a four-inch minimum tee or cross, to allow for expansions, and isolation valves on each extension.

- 4.19.7 If a tee and isolation valve cannot be cut in, and approval has been obtained from the Utility Design Section Manager for a Design Exception, then the following procedures must be followed. Tapping Existing Reclaimed Water Mains:
- 4.19.7.1 No size on size taps are allowed.
  - 4.19.7.2 The Contractor must submit a request to the Service Availability Team, Customer Service Section, of the Hillsborough County WRD to schedule a tap and pay the appropriate tapping fee. The request must be made a minimum of 48 hours prior to proposed tie-in to the reclaimed water main.
  - 4.19.7.3 The Contractor must furnish, install and pressure test the tapping sleeves and valves to existing reclaimed water mains:
  - 4.19.7.4 For all taps up through 12 inches, County WRD FMS personnel will furnish the necessary tapping machine and tools and will perform the tap.
  - 4.19.7.5 For taps larger than 12 inches, the Contractor must furnish the tapping machine and tools and must perform the tap under WRD FMS Personnel supervision. All taps must be witnessed by the County Inspector.
  - 4.19.7.6 A hydraulic driven tapping machine is indicated for tapping concrete pipe mains. Either hydraulic or pneumatic driven tapping machines may be indicated for mains other than concrete.
  - 4.19.7.7 In areas where there is no reasonable alternative for providing service, the County may approve a four-inch minimum size connection and pipeline configured for a future parallel distribution system for additional services.
  - 4.19.7.8 Prior to the tap:
    - a) The Contractor must assemble all materials, tools, equipment, labor and supervision necessary to make the connection.
    - b) The Contractor must excavate a dry and safe working area pit of sufficient size to enable the County WRD FMS personnel to perform the necessary work.
    - c) The Contractor must pressure test the tapping sleeve and valve installation under the supervision of County WRD FMS personnel. The test pressure must be 150 psi, or 10 psi above the pressure in the reclaimed water main being tapped (whichever is greater).
    - d) The Contractor must maintain the pressure on the sleeve for 10 minutes at zero (0) pressure loss.
  - 4.19.7.9 Reclaimed water mains must be tapped in such a manner as to avoid disturbance or disruption to the operation of the main in service and to protect the reclaimed water supply from contamination.
  - 4.19.7.10 The Contractor must be responsible for properly backfilling the work area pit after the work is completed.
- 4.19.8 Verification is required that each tap has been performed onto the intended pipe. The coupon is to be removed and inspected. The valve is to be cracked open to verify pressure and type of liquid being expelled. At the County's option a pressure test valve may be required to be installed at no cost to the County.



## PART 5.0 PIPE SIZING CRITERIA

### 5.1 DESIGN STANDARD FOR RECLAIMED WATER DISTRIBUTION SYSTEMS

The following provides the recommended minimum criteria for determining pipe sizes for reclaimed water distribution systems in residential and commercial developments. The recommended irrigation application for turf grass is one and one quarter inches per week for an annual average daily flow based on Hillsborough County reuse data.

### 5.2 RESIDENTIAL SUBDIVISIONS

To determine the annual average daily flow (AADF) in a residential subdivision, use the following equation:

$$\text{Gallons per Day (GPD)} = A \times I \times 0.111 \times N$$

To determine the individual lot irrigation requirement at maximum peak demand in gallons per minute (GPM), use the following equation:

$$\text{Gallons per Minute (GPM) per Lot} = (A \times I \times 0.523) / 1,440$$

where:

A = Average Lot Size (in Square Feet)

0.523 = Conversion Factor (converts irrigation of 1.25 inch/week to gallons/day and includes a 4.7 peaking factor to simulate the peak hour in the peak day of the (peak month).

0.111 = Conversion Factor (converts irrigation of 1.25 inch/week to gallons/day)

I = Percent of Irrigable Area = 70%

N = Number of lots in subdivision

*Example:*

*To determine the gallons per minute (GPM) for 8,000 SF lots and 12,000 SF lots in a subdivision, compute as follows:*

$$\text{GPM (8,000 SF lots)} = (8,000 \times .70 \times 0.523) / 1,440 = 2.03 \text{ (round up to next tenth) = use 2.1 GPM/lot}$$

$$\text{GPM (12,000 SF lots)} = (12,000 \times .70 \times 0.523) / 1,440 = 3.05 \text{ (round up to next tenth) = use 3.1 GPM/lot}$$

In addition, place a demand of 75 gpm at critical nodes such as terminus points, high elevation points, and cul-de-sacs to represent simultaneous irrigation by five residential units.

**\*\*\* The system must be able to support an additional 75 gpm demand at any point in the system \*\*\***



### 5.3 COMMERCIAL DEVELOPMENTS

The developer must provide an irrigation plan showing irrigation zones and anticipated flow per zone to determine maximum peak demand in gallons per minute for each property in the development for sizing of distribution system.

To determine annual average daily flow (AADF), use the following equation (using the previous definitions) to determine the AADF for each property in the development, then total:

$$\text{Gallons per Day (GPD) per property} = A \times I \times 0.111$$

To determine maximum peak demand in gallons per minute (GPM), use the following equation:

$$\text{Gallons per Minute (GPM) per property} = (A \times I \times 0.523) / 1,440$$

**Notes:**

- (1) *Contact the Reclaimed Water Planning Team of WRD for flow and pressure characteristics of the County transmission system.*
- (2) *Minimum distribution main pressure is 45 psi during peak conditions.*
- (3) *Hazen Williams Roughness Coefficient (C): 130 for PVC and cement lined DIP; 140 for Polyethylene (HDPE).*
- (4) *Minor losses associated with meters, check valves, etc. must be included in the hydraulic calculations. The C value of 130 for PVC and cement lined DIP will compensate for the minor losses associated with bends, tees, and other pipeline losses.*
- (5) *Minimum residential service line size for single service is one inch in diameter to avoid high velocities and head losses for simultaneous irrigation at 15-20 gpm. Dual far-side residential service must be two, one-inch diameter HDPE services.*



## PART 6.0 PRESSURE TESTING FORMS

### PRESSURE TEST REPORT

PROJECT NAME: \_\_\_\_\_ PROJ. NO.: \_\_\_\_\_

ENGINEER OF RECORD: \_\_\_\_\_

EOR COMPANYNAME: \_\_\_\_\_

CONTRACTOR'S REPRESENTATIVE: \_\_\_\_\_

CONTRACTOR COMPANY NAME: \_\_\_\_\_

SERVICE REQUEST NO.: \_\_\_\_\_ DATE: \_\_\_\_\_

INSPECTOR: \_\_\_\_\_

\_\_\_\_\_ WATER PRESSURE TEST \_\_\_\_\_ FORCEMAIN PRESSURE TEST

\_\_\_\_\_ RECLAIMED MAIN PRESSURE

#### FIELD MEASUREMENTS:

START TEST @ \_\_\_\_\_ PRESSURE = \_\_\_\_\_ psi

FINISH TEST @ \_\_\_\_\_ PRESSURE = \_\_\_\_\_ psi

LOSS = \_\_\_\_\_ psi

LF OF PIPE BEING TESTED: \_\_\_\_\_

PEOPLE PRESENT:

TEST RESULTS AND COMMENTS: