



## **SPECIFICATION 331001:** **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 potable water systems. Construction consists of furnishing all labor, equipment, tools, appliances and materials for performing all operations necessary for the construction and installation of water mains and service lines, including all piping, valves, valve boxes, fire hydrants, 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 installed 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 pipeline and appurtenance material in contact with potable water must be NSF-61 Certified.
- 1.1.4 All Construction plans, project submittals and record drawings must comply with the requirements of both 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 (F.A.C.), Chapter 62-555
- Florida Department of Transportation (FDOT)
- Hillsborough County Code of Ordinances, Chapter 121, Cross-Connection Control and Backflow Prevention
- Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- National Association of Corrosion Engineers (NACE)
- National Fire Protection Association (NFPA)
- NSF International (NSF)
- 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 Special Terms and Conditions, Technical Specifications, and Supplemental Specifications of the Contract 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 the location and plan views of all Jack and Bore pits (see also Specification 330524), and Horizontal Directional Drill (HDD) pits (see also Specification 330523).
  - 1.3.1.5 Service Connections.
  - 1.3.1.6 Valves and Valve Boxes.
  - 1.3.1.7 Fire Hydrants and Assemblies.
  - 1.3.1.8 All Appurtenant Items.
  - 1.3.1.9 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 proposed heat plate temperatures, and fusion heating/cooling times and pressures, etc.
  - 1.3.1.10 Contractor's plans for flushing and testing all supplied water system piping.
- 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 these 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 The pipe sizing design criteria for water distribution systems must as a minimum provide 100% of the combined peak hour (maximum day demand rate) plus fire flow. Refer to Section 3 of the Technical Manual for flow criteria and peaking factors.
- 2.1.2 The allowable minimum service pressure under said design condition must not be less than 20 psi (pounds per square inch), or 35 psi in a transmission line.
- 2.1.3 Design flows and method of computation must be submitted to Development Services Department (DSD) for review by the Public Utilities Water Resources Department Infrastructure Planning Team at the time of the preliminary plat or site plan submittal, or at the time of the Master Plan submittal.
- 2.1.4 Minimum pipe size: The minimum pipe diameter for distribution mains not serving fire hydrants or fire hydrant branches must be four inches. The minimum diameter for distribution mains serving fire hydrants and fire hydrant branches must be six inches.

### 2.2 LINE ROUTING

- 2.2.1 The primary feed for the 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. Multiple points of connection may be required in order to minimize service outage in emergencies, repairs, etc., or to improve fire protection and water quality.
- 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 4.17 listing requirements for all connections to existing water mains.
- 2.2.3 The Engineer of Record must utilize Level "A" SUE work (locates) to design all points of connection. Level "A" SUE must comply with the definition by ASCE 38-02 as 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. 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, 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 by jack and bore, unless an alternate installation method is approved by Right-of-Way Permitting, or the Governing Authority for the road.
- 2.2.8 For projects where the proposed improvement is over existing water lines, all pipe material not meeting the currently approved specifications will require replacement and relocation.
- 2.2.9 Minimum water line clearance from the property line is five feet.
  - 2.2.9.1 Where a sidewalk is located at the ROW line, the water main must be installed eight (8) feet (min) from the property line. For lines six inches and greater in diameter, the line must be installed 10 feet (min) from the property line to facilitate fire hydrant installation.
  - 2.2.9.2 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 pipe installations in an easement.
- 2.2.10 Where inverted crown roads are installed, all 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 of 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 all diameters, depth of cover in FDOT or County arterial road right-of-way 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 331002, Exhibit W-8A through W-8D 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 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 water line must be replaced or relocated as determined by the County.

### **2.4 PROTECTION OF POTABLE WATER SYSTEMS**

- 2.4.1 General
  - 2.4.1.1 There must be no physical connection between the public water system and any private water supply, any wastewater or reclaimed water line, or any appurtenance of a wastewater or reclaimed water line that would allow the passage of any sewage, untreated, or polluted water into the potable public water system. Refer to Hillsborough County Code of Ordinances, Chapter 121, Cross-Connection Control and Backflow Prevention for more information about cross-control measures.
  - 2.4.1.2 Potable water mains must not be installed in the same trench with, or within conflict structures containing, reclaimed water mains, sanitary sewers, sanitary force mains, or storm water systems.
  - 2.4.1.3 When the required horizontal and vertical separations cannot be maintained, a design exception must be obtained from the Utility Design Section Manager prior to construction commencement.
  - 2.4.1.4 All distances are defined as and must be measured from face to face.

2.4.2 Horizontal Separation:

- 2.4.2.1 Water mains must be laid to provide a minimum horizontal separation of 10 feet from any existing or proposed wastewater line (gravity or force main).
- 2.4.2.2 A minimum separation of three feet must be maintained between potable water mains and any existing or proposed reclaimed or storm water lines.
- 2.4.2.3 A minimum horizontal separation of three feet must be maintained between potable water mains and all other underground utilities, except as listed in 2.4.2.1 above. Refer also to UAG Section 5.4.
- 2.4.2.4 For service lines, a minimum of five feet must be maintained between a potable water line and a gravity lateral.

2.4.3 Vertical Separation:

- 2.4.3.1 Water mains crossing other pipelines and utilities must be laid to provide a minimum vertical distance of 18 inches. This must be the case where the water main is either above or below the other pipelines.
- 2.4.3.2 Water main crossings below other pipelines should be avoided whenever possible.
- 2.4.3.3 At crossings, one full length of water pipe must be located so both joints will be as far from the other pipelines as possible.

## 2.5 CROSS-CONNECTION CONTROL

- 2.5.1 Backflow Prevention Assemblies must be installed at all connections to Hillsborough County's water distribution system in accordance with Chapter 121 of the Hillsborough County Code of Ordinances, Part B, Public Utilities (Chapter 121).
- 2.5.2 All rules, regulations and procedures necessary to administer and enforce the provisions of cross-connection control are established in Chapter 121, which is incorporated herein and made a part hereof.
- 2.5.3 Backflow Preventers must be installed in compliance with applicable governing authorities, and in accordance with Specification 331002, Exhibits W-1A through W-1G, and W-2.
- 2.5.4 Where auxiliary water sources are present on a Residential property, dual check backflow devices (as a minimum) are required. Refer to Chapter 121 for additional guidance.
- 2.5.5 All Construction Site connections to Hillsborough County's water distribution system must be protected by a Backflow Assembly. Backflow Protection must remain in place until the Development or Project Site water systems have had all the following items submitted and accepted by DSD.
  - 2.5.5.1 Acceptance through written approval by the Department of Health;
  - 2.5.5.2 Final Inspection by Public Utilities Water Resources Department employees is completed, confirming there are no potential or existing health or safety conditions present which could place Hillsborough County in violation of pertinent State Regulations, or could impair, contaminate or in some fashion render Hillsborough County's water distribution systems unstable, or unsafe.
  - 2.5.5.3 Acceptance and placement of the distribution system under the legal control of Hillsborough County's Public Utilities Water Resources Department.

## 2.6 METERS AND METERING ASSEMBLIES

- 2.6.1 All meters and meter boxes must be compliant with the existing Hillsborough County AMI system.
- 2.6.2 Except for dedicated fire service connections, water lines serving commercial and industrial facilities must be metered. All connections must be equipped with a backflow assembly as required by Chapter 121. Refer also to Specification 331002, Exhibits Numbers W-1A through W-1H.
- 2.6.3 Meter size must be dependent upon flow characteristics. The design Engineer will size the meter or meters subject to approval by WRD Planning Team.
- 2.6.4 For three-inch and larger meters, a capped tee with a two-inch threaded plug must be installed immediately downstream of the meter for use as a test port. Refer to Specification 331002, Exhibits W-1C to W-1F for location and orientation of the test port.
- 2.6.5 Meters three-inch and larger shall be evaluated to determine if a strainer is required by the manufacturer.
- 2.6.6 A master meter assembly (meters three-inch and larger) must be directly accessible by boom truck off the County right-of-way or by an interior access road/driveway. The meter assembly must not be blocked by a wall or gate. The access road/driveway must be a minimum width of 12 feet. All access roads must comply with the Hillsborough County Transportation Technical Manual, and FDOT requirements. The access must allow the County to drive a truck alongside the length of the meter assembly.
- 2.6.7 The elevation of the meter concrete slab must be higher than the immediate surrounding area (two inches minimum). The meter assembly must be located so there is no sheet flow over the slab.
- 2.6.8 A five-foot “landscape free” buffer must be maintained around the meter slab. Do not mulch around the slab. Do not install any landscape that will hinder access in the future to the meter assembly.
- 2.6.9 Meter assemblies located above ground and within a vehicle traffic area (parking lot, driveway, or within 15 feet of the edge of pavement or back of curb) must be protected by bollards.
- 2.6.9.1 For meter assemblies less than three inches, the assembly must be protected by a minimum of four, 4-inch diameter, steel pipe bollards. Refer to Specification 331002, Exhibit W-1A or W-1B for bollard details for meter assemblies less than 3-inches in diameter.
- 2.6.9.2 For meter assemblies three inches and larger, a minimum of six, six-inch diameter bollards must be required. Refer to Specification 331002, Exhibit W-1D or W-1E for bollard details for meter assemblies three inches and larger in diameter.
- 2.6.9.3 Bollards must be painted with one coat of rust prohibitive primer and one coat of Safety Yellow (SAE-AMS-STD-595 #13591) or Ultra White (SAE-AMS-STD-595 #27925) high grade enamel.
- 2.6.10 Meter assemblies less than three inches in diameter may eliminate the two-inch gate valve at the assembly if all the following criteria are met.
- 2.6.10.1 An isolation gate valve is located within 10 feet of the meter assembly.
- 2.6.10.2 The isolation valve and valve box are located outside of a traffic lane, turn lane, or driveway.





- 2.6.10.3 A request to eliminate the valve is submitted to DSD with the Construction plans.
- 2.6.11 The above ground portion of the meter assembly (including the fire service line) must be painted 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 painted with one coat of rust-prohibitive primer and one coat of Safety Blue (SAE-AMS-STD-595 #15102) high-grade finish paint. Dedicated fire service assemblies must be painted with one coat of rust-prohibitive primer and one coat of Safety Red (SAE-AMS-STD-595 #11120) high-grade finish paint.

## 2.7 SERVICE CONNECTIONS

- 2.7.1 Water service connections, two-inch and smaller, must be included as part of the construction of the distribution system and consist of: the corporation stop or tapping valve; the service line; the meter valve, or if a dual service, a U-branch with meter valves. Water service connections must be furnished and installed as shown in Specification 331002, Exhibit W-3A through W-3G, and as specified herein.
- 2.7.2 Water service connection taps and service saddles must be at least 18 inches apart. Two-inch service connections are considered non-residential (commercial) and require a two-inch isolation/tapping valve at the point of connection.
- 2.7.3 Dual service near-side residential connections serving two lots are allowed only where County reclaimed water service is readily available. When a dedicated irrigation service meter is installed for an individual residence on the potable water system, either a separate individual line must be installed for the irrigation service, or a dual service single lot connection must be installed with the residential meter on the left and the irrigation meter on the right (when facing the house).
- 2.7.4 All near-side residential services must be one-inch polyethylene (HDPE) for both single and dual services.
- 2.7.5 All far-side residential services of any type must be single one-inch HDPE tubing with individual service connections for each lot.
- 2.7.6 Far-side residential service lines crossing under pavement must be installed in a two-inch PVC or HDPE sleeve at a minimum depth of three feet below pavement. A single three-inch sleeve may be used to encase two, one-inch service lines. The sleeve must extend a minimum of 24 inches beyond edge of pavement or, if present, curb and gutter.
- 2.7.7 Common area services two inches and smaller 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. Regardless of the service line size, far-side common area service lines must be sleeved in 4-inch diameter PVC. Common area service lines larger than 2-inch are considered and must be treated as commercial connections.
- 2.7.8 Within a residential subdivision, a four-inch PVC sleeve must be used for any two-inch service line and where any size far-side residential service is longer than 50 feet in length (such as across a cul-de-sac).
- 2.7.9 Service connections must utilize a tapping or service saddle. Direct taps onto lines is not allowed.

- 2.7.10 Non-residential/Commercial Services two-inch and smaller must use two-inch polyethylene (HDPE) tubing from the service tap up to the meter assembly. Where non-residential services are re-located or require replacement, or where a service changes from residential to non-residential, the service and tap must be upsized to 2" minimum.
- 2.7.11 No trees or shrubs must be planted within five feet of a service meter.
- 2.7.12 Water service lines and building sewer laterals must maintain a five foot separation per the Florida Plumbing Code. For locations where this separation cannot be maintained, refer to the latest edition of the Florida Plumbing Code for guidance.

## 2.8 FIRE HYDRANT SPACING, LOCATION, AND FLOW

- 2.8.1 Manufacturing and Industrial Areas: Fire hydrants must be placed every 300 feet along the right-of-way with a maximum distance of 150 feet to the last lot. The maximum distance from a hydrant to a building must comply with the Florida Fire Code. The minimum required fire flow must be 1000 gallons per minute (gpm), provided by either: 1) each hydrant individually, or 2) multiple hydrants flowing simultaneously (aggregate fire flow of all hydrants within 1000 feet of a building). The required fire flow must be determined by the County Fire Marshal's Office as part of the preliminary plan review process. Hydraulic capacity of the system may be able to provide fire flow above the 1000 gpm minimum, but any required fire flow not provided by the system must be provided onsite.
- 2.8.2 Commercial and Apartment Areas (residential multifamily): Fire hydrants must be placed every 500 feet along the right-of-way with a maximum distance of 250 feet to the last lot. The maximum distance from a hydrant to a building must comply with the Florida Fire Code. The minimum required fire flow must be 1000 gpm, provided by either: 1) each hydrant individually, or 2) multiple hydrants flowing simultaneously (aggregate fire flow of all hydrants within 1000 feet of a building). The required fire flow must be determined by the County Fire Marshal's Office as part of the preliminary plan review process. Hydraulic capacity of the system may be able to provide fire flow above the 1000 gpm minimum, but any required fire flow not provided by the system must be provided onsite.
- 2.8.3 Residential Areas (detached single family dwellings): Fire hydrants must be placed a maximum distance of 500 feet apart along the right-of-way with a maximum distance of 500 feet to the last lot at the end of the street. The maximum distance from a hydrant to the building must comply with the Florida Fire Code. The minimum flow from each hydrant must be 750 gpm.
- 2.8.4 Other Areas: Fire hydrants must be placed a maximum of 1000 feet apart, along the right-of-way of rural roads or other areas, as approved by the County on a case-by-case basis.
- 2.8.5 Location Criteria
- 2.8.5.1 Hydrants must be located within one foot of the side lot lines, between adjacent properties. Hydrants must not be located within one pipe length (20 feet) of an intersection corner.
- 2.8.5.2 Hydrants must be a minimum of 24 inches from the edge of right-of-way in areas without sidewalks, and a minimum of six feet from the edge of right-of-way in areas with sidewalks. Fire hydrants must be located not more than 12 feet from the fire department access road.
- 2.8.5.3 The pumper discharge will face the nearest roadway. Refer to Specification 331002,





- Exhibits W-5A through W-5D for further clarification.
- 2.8.5.4 No object(s) may be placed or constructed near a fire hydrant that would obscure the hydrant from full view or would in any other manner hinder the Fire Department from gaining immediate access to the fire hydrant. Per Florida Fire Code (NFPA 1), clearances of 60 inches (5 feet) in front of the fire hydrant, and 36 inches (3 feet) to the sides and rear of the hydrant must be maintained.
  - 2.8.5.5 Hydrants must be a minimum of four feet from the face of the curb to the front nozzle of the hydrant (FDOT Design Manual Table 215.2.2 and section 215.2.8). For cul-de-sacs, the fire hydrant must be positioned at the entrance to the cul-de-sac. If the cul-de-sac exceeds 150 feet (as measured from the intersection to the center of the cul-de-sac) another hydrant must be installed within 150 ft of the center of the cul-de-sac. See Specification 331002, Exhibit W-6B and W-6C.
  - 2.8.5.6 Lateral offset criteria of hydrants on flush shoulder roadways must be outside the clear zone per FDOT Design Manual Table 215.2.2 and section 215.2.8.
  - 2.8.5.7 Hydrants within paved areas must be protected by bollards of four-inch (minimum) steel pipe, three feet above and below grade, filled with concrete, set in a cubic yard of concrete, and place as required. Bollards must be painted Safety Yellow (SAE-AMS-STD-595A #13591).
  - 2.8.5.8 The location of new fire hydrants must be identified with a blue reflective pavement marker installed on the roadway. The reflective marker must be located perpendicular to the hydrant, in the center of the lane closest to the hydrant.
  - 2.8.5.9 There must be a 24-inch (minimum) separation between the hydrant valve outlet and the inlet of the fire hydrant assembly, excluding where the spool pieces are inserted in the hydrant valve and the fire hydrant assembly shoe, as shown in Specification 331002, Exhibits W-5A through W-5D.

## 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), fire hydrant stubs, and other locations as required to facilitate operation of the distribution system. All valves must be installed at the tee, cross, or point of connection. An in-line isolation valve must be installed wherever a fire hydrant tee is placed. Refer to Specification 331002, Exhibit W-5A and W-5B, Note 6.
- 2.9.2 Valves must be placed so that the maximum allowable length of water main required to be shut down for repair work must not be more than 500 feet in commercial, industrial, multi-family, or residential districts, and 1,000 feet in other areas.
- 2.9.3 The temporary end of all water main extensions or water mains ending at a project phase must have a valve and valve box installed with a blow-off assembly (Specification 331002, Exhibit W-6A, and Part 2.10, herein).
- 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 Valves must not be located in ADA (American with Disabilities Act) ramps, or in curbs.
- 2.9.6 If a valve falls in a driveway, sidewalk, or other pavement, the valve box cover must be a “long skirt” designed to reduce the risk that the valve cover will flip. 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 Butterfly valves are not acceptable for use in water service.

## **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 water mains (defined as pipe sizes greater than 16-inch) 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 diameter 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 water system is a closed system. All pipe ends 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 water main pipe alignment changes direction.

2.10.9.2 The length of pipe to be restrained, and the actual length that is restrained during construction, 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 prior to actual construction. Refer also to Part 1.3, herein.

2.10.9.4 Thrust blocks are not allowed.

2.10.9.5 When Exhibit W-7A 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 (ARVs)**

2.10.10.1 ARVs, or fire hydrants, 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 ARVs 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 ARV stationing on both the plan and profile views.

- 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 331002, Exhibits W-8B, through W-8D
- 2.10.11 Blow-off Assembly
  - 2.10.11.1 A blow-off assembly must be installed on all dead-end mains and at the end of cul-de-sac distribution mains. See Specification 331002, Exhibits W-6A through W-6C for details.
  - 2.10.11.2 Temporary Blow-off Assembly: 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, unless a fire hydrant is installed. 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 DEDICATED SAMPLING TAPS

- 2.11.1 Dedicated sampling taps (DST) are required by WRD for water quality testing. How many DST and where they are to be located will be determined during the Utility Master Plan review and site plan review.

# PART 3.0 PRODUCTS

## 3.1 PIPE MATERIAL

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

Diameter	Material	General Specification
2-inch and less (Service lines only)	HDPE	ANSI/AWWA C901, CTS SDR 9
2-inch and 3-inch (Service sleeve only)	HDPE	ANSI/AWWA C901, IPS SDR 17
2-inch and 3-inch (Service sleeve only)	PVC	ASTM D2241, Class 1120 or 1220, SDR 21 (minimum)
4-inch to 12-inch	PVC	ANSI/AWWA C900, DR 18
4-inch 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 Water Resources 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 Water Resources Department 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 Water Resources Department prior to commencement of installation 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 Pipe interior must have a cement mortar lining with a 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.
  - 3.2.1.3 Joints for ductile iron pipe must be mechanical or push-on joints, unless otherwise specified herein.
- 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 blue stripe/tape in accordance with F.A.C. 62-555.320(21) (b) (3). Adhesive tape must be two inches wide vinyl, and at least 4.5 mils thick.
- 3.2.4 Fittings
- 3.2.4.1 All ductile fittings must be mechanical joint, and restrained, with a minimum pressure rating of 250 psi, and 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.
  - 3.2.4.3 All DIP fittings must bear the approval seal of the National Sanitation Foundation (NSF) for potable water pipe.
- 3.2.5 Mechanical Joints
- 3.2.5.1 Mechanical joints (MJ) consisting of bell, socket, gland, gasket, bolt 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 331002, Exhibit W-7A.
- 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 a flanged-plain end (FLG-PE), and flanged-restrained (FLG-RJ). The flange joint must be equipped with an O-ring gasket.
- 3.2.8.4 Flanged joints to be lined 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 blue, 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
- Anchor bolts must be Grade 316 stainless steel, installed in accordance with the construction drawings, and utilizing non-shrink grout.
  - Roller stands: Roller stands and roller axles must be Grade 316 stainless steel.
  - Insulated pipe rollers: Pipe support rollers must be constructed of dielectric synthetic resin.
  - 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 the 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.
  - Hangers: Hangers must be made in accordance with MSS SP-58, and ANSI/ASME pressure piping code B31.1.
- 3.2.8.6 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 8 mils thick.

### 3.3 POLYVINYL CHLORIDE PIPE AND FITTINGS

- 3.3.1 All PVC pipe and fittings must bear the approval seal of the NSF International (NSF) that will remain legible during normal handling, storage, and installation. Pipe color must be BLUE for all potable water mains.
- 3.3.2 PVC pressure pipe (4 inches through 12 inches in diameter) must conform to the requirements of ANSI/AWWA C900.
- 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 conform to pipe dimension ratio (DR) of 18, must have a minimum working pressure of 200 psi, and 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 mechanical joint 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 expanded bell end section 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 Specification 331002, Exhibit W-7A and W-7B 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, conforming to ANSI/AWWA C111/A21.11, must be made of Viton (fluorocarbon elastomer), EPDM (ethylene propylene diene monomer) or SBR (styrene-butadiene rubber). Material selection must be dependent upon service and 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 as specified in ANSI/AWWA C901.
  - 3.5.3.2 The standard dimension ratio for two and three-inch diameter pipe (used as casing pipe only) 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: Polyethylene potable water service pipe or tubing must be blue in color or identified with a blue stripe and the words *Potable Water* at eight-inch intervals. A list of pre-approved materials is 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 and must be cast with the manufacturer's name, year the valve casting was made, and the pressure rating on the body, and if applicable, the valve type, size, and a 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 Gate Valves

- 3.6.2.1 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.
- 3.6.2.2 All gate valves must be iron body, bronze trimmed, solid wedge, resilient-seated, and must be equipped with O-Ring type stuffing boxes.
- All gate valve stem nuts must be bronze.
  - All gate valve "gates" must be fully encapsulated with and fully bonded to the resilient seat material.
  - All gate valve resilient wedges, O-Rings, and gaskets in contact with the potable water must be EPDM (Ethylene Propylene Diene Monomer) material.
- 3.6.2.3 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.
- 3.6.2.4 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.
- 3.6.2.5 All gate valves, when fully opened, must have an unobstructed waterway diameter equal to or larger than the full nominal diameter of the valve.
- 3.6.2.6 Underground gate valves
- These valves must have non-rising stems and must be furnished with two-inch square AWWA operating nuts.
  - Valves must have MJ-RJ ends and must be furnished complete with joint accessories.
- 3.6.2.7 Exposed or above-ground gate valves must be outside screw and yoke (OS&Y) flanged joint type with an operating hand wheel. The face-to-face dimensions and drilling must conform to ANSI B16.10 for Class 125 flanged joint end gate valves.
- 3.6.2.8 The minimum design working water pressure must be:
- 200 psi for three-inch through 12-inch sizes;
  - 150 psi for 16-inch through 36-inch sizes.
- 3.6.2.9 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.



- 3.6.2.10 All gate valves must be warranted by the manufacturer for a minimum of 10 years.
- 3.6.3 Tapping Valves, Tapping Sleeves, and Service Saddles
- 3.6.3.1 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.
- 3.6.3.2 No size-on-size taps, or direct taps to pipe, are allowed.
- 3.6.3.3 Tapping Valves
- Tapping valves must be mechanical joint outlet, non-rising stem, resilient seat gate valves meeting the applicable requirements of ANSI/AWWA C509/C515 and C550.
  - Tapping valves must be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.
  - Tapping valves must be manufactured with an integral tapping flange having a raised lip design in accordance with MSS SP60.
  - 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.
  - Tapping valves must be furnished with a combination flange and mechanical joint for connecting the branch to the main.
- 3.6.3.4 Tapping Sleeves and Crosses
- 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 3.6.2.8.
    - SS with wraparound gaskets must be limited for use on all pipes up to 12 inches in diameter.
    - 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.
    - Fabricated carbon steel units with fusion bonded epoxy coating and outlet seal gaskets must not be used on AC pipe.
  - The Contractor must verify the outside diameter of the existing main before ordering the sleeve.
  - Tapping sleeves must have an outlet flange per ANSI B16.1, Class 125 standard.
- 3.6.3.5 Service Saddles
- Service saddles must have a ductile iron body, be equipped with double tie straps, and be suitable for either wet or dry installation.
  - 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.
  - Tie straps and bolts must be a corrosion resistant alloy steel.
  - Service saddles must be as pre-approved in Appendix B.
- 3.6.4 Service Connections
- 3.6.4.1 Corporation Stops
- Corporation stops from one inch through 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.
  - The inlet connection must be male, iron pipe thread (MIP).
  - The outlet connection must be a pack joint or compression joint outlet for copper or plastic tubing (CTS). All seats and seals must be 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.
- 3.6.4.2 Curb Stops and Meter Valves



- a) The curb stops must comply with the requirements of ANSI/AWWA C800. They 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 that use chloramines for disinfection.
  - c) Meter valves for use with copper or plastic one-inch services and connecting to a service meter must have an inlet connection with a compression joint and an outlet connection with meter swivel nut, aka spud connection. See Appendix B for a list of pre-approved products.
  - d) Curb stops for two-inch service line must have an inlet compression joint connection and the outlet must be female iron pipe thread (FIP). See Appendix B for a list of pre-approved products.
  - e) Meter Assemblies: Locking curb stops for meter assemblies with meters two inches and smaller must be female iron pipe thread inlet (FIP) by female iron pipe (FIP) outlet.
- 3.6.4.3 Dual Service 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 service branches for a one-inch service are listed in Appendix B.
- 3.6.5 Air Release Valve Assembly
- 3.6.5.1 Air release valves (ARVs) must be installed at high points as indicated in Construction drawings. The locations may be considered approximate. Actual location of ARV on high points must be determined in the field during construction and reflected in record drawings.
  - 3.6.5.2 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.
  - 3.6.5.3 The air release valve assembly must consist of an ARV with a 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 with an additional 4" isolation gate valve); brass pipe and fittings, and a locking curb stop (IP in/out)
  - 3.6.5.4 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 that are 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 331002, Exhibit W-8A through W-8E for ARV details.
  - 3.6.5.5 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*.
- 3.6.6 Valve Boxes
- 3.6.6.1 Cast iron valve boxes with lids must be provided for all valves installed below ground. They must be screw-type adjustable to fit the depth of earth cover over the valve; and



- designed to prevent the transmission of surface loads directly to the valve or piping. See Specification 331002, Exhibit W-12A.
- 3.6.6.2 Valve boxes must have a minimum interior diameter of not less than 5 inches.
  - 3.6.6.3 Valve box extension must be installed to reserve a minimum of 50% of the adjustment for a future extension. Extension sections must only be screw type cast iron and compatible with the valve box.
  - 3.6.6.4 The word *WATER* must be cast into the valve box lid. The lid must be painted blue and must be constructed so as to prevent tipping or rattling.
  - 3.6.6.5 All valves locations must be identified with a concrete valve pad containing a bronze disc embedded in concrete. See Specification 331002, Exhibits W-9A and W-9B.
  - 3.6.6.6 For valve boxes in pavement, the protective concrete collar ring must be constructed of Type I (3000 psi) concrete. Valve box covers must be “long skirt” to prevent flipping. See Specification 331002, Exhibit W-9A.

### 3.7 METERS AND METER BOXES

#### 3.7.1 Meters

- 3.7.1.1 The design must incorporate the requirements of Specification 331002, Exhibits W-1A through W-1G, and must comply with Part 2.6 of this specification. Refer to Appendix B for a list of pre-approved products.
- 3.7.1.2 All meter testing and their associated lay lengths must meet the applicable ANSI/AWWA C700 series standard.
- 3.7.1.3 Meter Accuracy
  - a) Meters two inches 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) Meters three inches 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. Manufacturers 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 3 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 of the performance or the physical integrity of the meter. Meters must also be able to withstand extended exposure to Hydrogen sulfide gas and periodic exposures to salt water.
- 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 modifiable to allow installation of an AMR register. AMR registers must be compatible with all 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 black 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 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: 14-5/8 inches by 16-5/8 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. Boxes and lids must also comply with Specification 331002 Exhibit W-4.
  - 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 FIRE HYDRANTS

- 3.8.1 Fire hydrants must be of the dry barrel, compression-type that closes using line pressure. All hydrants must comply with ANSI/AWWA Standard C502 *Dry-Barrel Fire Hydrants* and must be both Underwriters Laboratory (UL) listed and Factory Mutual (FM) approved.
- 3.8.2 Fire hydrants must open counterclockwise and must have an arrow clearly cast on the top showing the direction of opening.
- 3.8.3 Hydrants must have a 1½-inch pentagon operating nut with an anti-friction mechanism on the thrust collar to reduce operating torque. The operating nut, main stem, coupling and main valve assembly must be capable of withstanding input torque up to 200 ft-lbs in both opening and closing directions.
- 3.8.4 The hydrant must have a factory-filled lubricant reservoir surrounding the working parts in the bonnet. These parts must be replaceable without removal of the bonnet section.
  - 3.8.4.1 The reservoir must have double O-ring stem seals, a thrust nut O-ring seal, and a weather shield designed to protect the operating nut seal.
  - 3.8.4.2 Grease-lubricated hydrants must use food grade lubricant.
- 3.8.5 Fire hydrants must have two 2½-inch hose nozzles and one 4½-inch pumper nozzle. Nozzles must use National Standard Fire Hose Threads.
  - 3.8.5.1 Hose nozzles must have a minimum 18-inch clearance from their centerline to the bury line. The bury line must be cast (or otherwise permanently designated) on the lower barrel. The hose nozzle must be threaded, “O”-ring sealed, and locked into place with a stainless locking device.
  - 3.8.5.2 Hose nozzle caps must have durable EPDM or neoprene nozzle cap gaskets. Nozzle caps must be cast with a 1½ -inch pentagon nut for cap removal.
- 3.8.6 Fire hydrants must have a breakable safety flange and steel or cast-iron stem coupling located below the break line of the hydrant that allows 360-degree positioning. The safety stem coupling must be





- painted with a corrosion-resistant coating. All necessary stem and cotter pins must be Grade 304 stainless steel.
- 3.8.7 Fire hydrant main valves must be a minimum 3/4-inch thickness and 95 durometer EPDM. The main valve must be fully supported by bronze or epoxy coated upper and lower valve plates. The main valve assembly must be replaceable by disassembling at the hydrant bonnet flange. Lower stem threads must be gasket sealed from water intrusion in both the open and closed position for corrosion protection. The bronze seat ring must be a minimum five-inch inside diameter and must thread into a bronze ring. The drain valves and outlets must not be drilled, creating a positively plugged drain system. All wetted, bronze, hydrant parts must be in accordance with ANSI/AWWA C502, Section 4.4.2.5, Table 1, and meet the following additional requirements:
- 3.8.7.1 A minimum copper content of 79%.
  - 3.8.7.2 Must not exceed 16% zinc.
  - 3.8.7.3 Must meet the following yield strength/elongation criteria of 25,000 psi (minimum)/15% minimum elongation in two-inch (gauge length of sample), or 32,000 psi (minimum)/10% minimum elongation in two-inch.
- 3.8.8 Fire hydrants must have a minimum bury depth of three feet six inches to the bottom of the shoe, and the barrel sections must have a fully assembled six-inch mechanical joint shoe inlet. The preferred bolt configuration in the underground flanging of the shoe and the lower barrel must be 3/4-inch 304 stainless steel (ss) with six full bolts. All internal and external bolts must be 304 ss.
- 3.8.9 Fire hydrants must have 150 psi working pressure and 300 psi test pressure. Hydrants must have a maximum 2.0 psi head loss when tested in accordance with ANSI/AWWA C502, Section 5.2.1.
- 3.8.10 Fire hydrant must be painted above ground with one coat of rust prohibitive primer and one coat Safety Yellow (SAE-AMS-STD-595A #13591) approved high grade brushing enamel. All continuously wetted ferrous metal surfaces in the hydrant shoe, including the lower valve plate, must be epoxy coated and all other surfaces must be coated with asphalt varnish as noted in ANSI/AWWA C502, Section 4.13. All hydrants must be designated “Hillsborough County Specifications” on the low barrel. Fire hydrants must be AWWA Traffic Models meeting the above stipulations and as pre-approved in Appendix B.
- 3.8.11 All fire hydrants must be flow tested and the bonnet color coded in accordance with NFPA 291. All flow test results must be submitted to Public Utilities Water Resources Department personnel during final walk-through inspection.

### 3.9 BACKFLOW PREVENTERS

- 3.9.1 Backflow Preventers must be placed on water service connections in compliance with Chapter 121 of the Hillsborough County Code of Ordinances, Part B, Public Utilities
- 3.9.1.1 The backflow preventer must be installed in accordance with the Florida Plumbing Code, and in such a manner as to allow ready access for inspection, in-line repair, removal and replacement without disturbing the structural integrity of the piping system, or the integrity of the shutoff valves used to isolate the backflow preventer.
  - 3.9.1.2 All backflow preventers must comply with NSF/ANSI 61 *Drinking Water System Components – Health Effects*.
  - 3.9.1.3 Dissimilar metals must be separated by dielectric unions, (Florida Plumbing Code).
  - 3.9.1.4 The size of the backflow preventer must not be smaller than the size of the meter. In the event the water service connection is not metered, the size of the backflow preventer





- must be no smaller than the size of the water service connection itself.
- 3.9.1.5 All backflow preventers must be of a horizontal configuration.
  - 3.9.1.6 It must be the responsibility of the Design Engineer or the Engineer of Record to determine whether a strainer is required or warranted at the service connection.
  - 3.9.1.7 All backflow prevention assemblies must be listed in the *List of Approved Backflow Prevention Assemblies* published by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research.
- 3.9.2 Reduced-Pressure Principle Backflow Preventer Assembly
- 3.9.2.1 All reduced-pressure principle backflow preventer assemblies must meet both the requirements of ANSI/ASSE 1013 and ANSI/AWWA C511, *Reduced-Pressure Principle Backflow Prevention Assembly*.
  - 3.9.2.2 The backflow device body must be male iron pipe (MIP) end for sizes 3/4 inch to 2 inch.
- 3.9.3 Double Check Valve Assembly
- 3.9.3.1 The double check valve assembly must be a device containing within its structure two spring-loaded independently operating poppet-type valves mounted in a common body.
    - a) There must be two gate valves and four test cocks, and must be designed for installation in a normal horizontal flow attitude.
    - b) The test cock arrangement will be such that each check valve can be tested without removal of the assembly from the line.
  - 3.9.3.2 The check valves must be designed to open under normal flow conditions at a pressure differential not less than one psi at each check valve and close when the downstream pressure is greater than the supply pressure.
  - 3.9.3.3 All moving parts must be corrosion resistant. The device must also meet the requirements of ANSI/AWWA C510, *Double Check Valve Backflow Prevention Assembly*, and ANSI/ASSE 1015.
- 3.9.4 Fire Service Only – Reduced Pressure Detector Assembly
- 3.9.4.1 All reduced pressure detector assemblies must meet the requirements of ANSI/ASSE 1047.
  - 3.9.4.2 Valves must be outside stem and yolk (OS&Y)
  - 3.9.4.3 Refer to 331002, Exhibits W-2A and W-2B for details of installation.

## PART 4.0 CONSTRUCTION

### 4.1 WORK AT HIGHWAY OR RAILROAD CROSSINGS

Construction must not commence for any work along or within County roads, FDOT highways, or railroad crossings until all 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 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 potable 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 for pipes 12 inch and less. 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, and connections to pipe, fittings, valves, meters or apparatus must be installed so as to ensure no negative pressure is placed or potentially 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 BLUE.
  - 4.3.4.1 Ductile iron must be marked as specified in Part 3.2.3. Adhesive tape must be two-inch wide vinyl, and a minimum of 4.5-mil thick.
  - 4.3.4.2 Polywrap must be color coded blue or clear.
  - 4.3.4.3 PVC pipe must be blue 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 or replaced immediately at the Contractor's or developer's expense. The repair or replacement must be 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 331002, Exhibit W-10 for Jack and Bore details and Exhibit W-11 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. The minimum size of pipe to be directional drilled is 6 inches.



- 4.3.9 No pipe must be laid when the trench conditions or the weather is unsuitable for such work.
- 4.3.10 The 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 an insulated 10-gauge or 12-gauge solid copper or copper clad steel core locating wire with HDPE color coded coating (blue) 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 minimum two-inch wide duct tape. Tape must be at every joint and at four to five-foot spaced intervals. When 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 ends of all mains/stubs, including fire hydrants.
- 4.3.13.3 Locating wire must terminate at a ground level magnetized access point. The access point and base rating is dependent upon 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.
- 4.3.13.5 Access points (two terminals minimum) must be installed at least every 1000 lineal ft. Ground rod 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 continuous to the next/nearest access point outside of pavement.
- 4.3.13.7 Wire must be installed on the water line/lead to fire hydrants. The wire must terminate at an above grade access point on the hydrant flange.
- 4.3.13.8 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 331002, Exhibit W-14.
  - 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 inches 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 of Record. 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 6-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 331002 Exhibit W-13). 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 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 finish 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 laying 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 For 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 For 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 or 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 particular joint used must comply with the requirements of Part 3.2 and 3.3. For County contracted projects, the particular 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 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.
- 4.8.4 Push-On Joints: Push-on joints must be made in strict compliance with the manufacturer's recommendations.
  - 4.8.4.1 Lubricant must be an inert, non-toxic, water soluble compound.
  - 4.8.4.2 Insert the spigot end into the bell so that it is in uniform contact with the gasket.
  - 4.8.4.3 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.
  - 4.8.4.4 For DIP, push the pipe until the reference mark on the spigot end disappears into the bell.
- 4.8.5 Joint Compounds: Sulfur based joint compounds must not be used.
- 4.8.6 Restrained Joints must be provided at all changes in direction, and size changes, of all mains.
  - 4.8.6.1 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.
  - 4.8.6.2 All restrained joints must be installed in accordance with manufacturer's recommendations.
  - 4.8.6.3 Restraining gaskets must never be pushed; nor should pipe be homed all the way to the bell shoulder.  
**All restrained joints** (manufacturer supplied or field lock gaskets) **must have the joint bell marked in red.** Paint the bell red or wrap the bell with vinyl, adhesive red marking tape

## 4.9 INSTALLING APPURTENANCES

- 4.9.1 Valves and Valve Boxes
  - 4.9.1.1 Valves: Valves must be carefully inspected, opened wide and then tightly closed and the





- various nuts and bolts must be tested for tightness, on site, 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 W-12A
- 4.9.1.3 Valves must not be located below the top of bank, within a storm water ditch, or within a swale.
- 4.9.1.4 Valves installed below ground must be identified with a bronze disc embedded in concrete to identify potable water valves (see Specification 331002, Exhibits W-9A and W-9B).
- 4.9.1.5 Concrete Valve Pad: Valve boxes outside of paved areas must be cast in a reinforced 3000-psi concrete slab, two-foot by two-foot square and six-inch (minimum) thick. See Specification 331002, Exhibit W-9B for unpaved installations.
- 4.9.1.6 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 331002, Exhibits W-9A and W-9B.
  - 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, 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 331002, Exhibit W-12B.
  - g) The valve boxes must be provided with covers marked "WATER" and must be so constructed as to prevent tipping or rattling. The valves must be identified 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 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 water main and as approved by the Project Manager or the Engineer of Record.
  - 4.9.2.3 Automatic air release valves must be installed in a shallow manhole not subject to flooding, as shown in Specification 331002 Exhibit W-8B through Exhibit W-8D.

- 4.9.2.4 Manual ARVs must be installed as shown in Specification 331002 Exhibit W-8A.
- 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 water main and as approved by the Project Manager or Engineer of Record.
- 4.9.4 Fire Hydrants
  - 4.9.4.1 The fire hydrant break flange must be installed 6 inches above grade.
  - 4.9.4.2 All fire hydrants must be flow tested and the bonnet color coded in accordance with NFPA 291. All flow test results must be submitted to WRD personnel during final walk-through inspection.
- 4.9.5 Water Meter Assemblies:
  - 4.9.5.1 Water meter assemblies must be installed in accordance with Specification 331002, Exhibit W-1A through W-1H, and Part 2.6.
  - 4.9.5.2 Installation of the water meter assembly slab must comply with the requirements of Specification 031000, 032000, and 033000.
  - 4.9.5.3 Meter assemblies less than three inches may eliminate the 2-inch gate valve at the assembly if all the following criteria are met:
    - a) An isolation/tapping gate valve is located within 10 feet of the meter assembly.
    - b) The valve and valve box are located outside of a traffic lane, turn lane, or driveway.
  - 4.9.5.4 All backflow assemblies or devices must have ASSE approval and must be a reduced pressure device as listed on the approved list of the University of South California Foundation for Cross Connection and Hydraulic Research.
  - 4.9.5.5 Fire Service Only lines must be installed with a Reduced Pressure Detector Assembly meeting the requirements of Specification 331002, Exhibit W-2.
  - 4.9.5.6 Master Meter Assemblies (3-inch and larger) are to be tested by Hillsborough County WRD Meter Testing Team after installation and before project acceptance to ensure proper operation.
  - 4.9.5.7 A master meter assembly (meters 3-inch and larger) must be directly accessible by boom truck off the County right-of-way, or by an interior access road that is not blocked by a wall or gate. The truck access road must be a minimum width of 12 feet. All access roads must comply with the Hillsborough County Transportation Technical Manual, and FDOT requirements.
  - 4.9.5.8 The elevation of the meter concrete slab must be higher than the immediate surrounding area (two inches, minimum). The meter assembly must be located so there is no sheet flow over the slab.
  - 4.9.5.9 A five-foot “landscape free” buffer must be maintained around the meter slab. Do not mulch around the slab. Do not install any landscape that will hinder access in the future to the meter assembly.

## 4.10 WATER SERVICE CONNECTIONS

- 4.10.1 The Contractor must furnish and install water service connections as shown on the Construction Drawings or as directed by the County as dictated by actual field conditions. Water service connections must include service lines, corporation stops and curb stops as defined in Part 2 and Part 3, herein. Dual service near-side connections servicing more than one residence are only allowed where reclaimed water service is available.
- 4.10.2 Meters installed in residential areas within a meter box must be installed plumb, level, and positioned facing the lot served. The meter valve depth must be six (6) inches, plus or minus one ( $\pm 1$ ) inch, below final grade. A two (2) by two (2) inch temporary identification stake must be placed adjacent to the meters with a final grade line clearly marked on it.
- 4.10.3 Service connections must utilize a tapping or service saddle. Direct taps of lines are not allowed
- 4.10.4 Service Box Location: The developer is required to clearly identify the location of the curb stop and future service connection (see Specification 331002, Exhibit W-3A)
- 4.10.4.1 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 blue and marked with the lot(s) number to be served and **must clearly show the final grade line**.
- 4.10.4.2 Permanent identification: When the roadway is complete, the Developer must mark the roadway curb indicating the location of the curb stop and water service connection by cutting a W into the curb.
- 4.10.5 Water service lines and building sewer laterals must maintain a five (5) foot separation per the Florida Plumbing Code. For locations where this separation cannot be maintained, refer to the latest edition of the Florida Plumbing Code.

#### **4.11 POLYETHYLENE TUBE ENCASMENT/POLYWRAP**

- 4.11.1 All buried ductile iron pipe, valves, and fittings, including ductile 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.
- 4.11.2 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.
- 4.11.3 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.
- 4.11.4 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.
- 4.11.5 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.
- 4.11.6 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.



- 4.11.7 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 1½-inch wide polyethylene adhesive tape. Use red tape around restrained joints.
- 4.11.8 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.
- 4.11.9 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.
- 4.11.10 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.
- 4.11.11 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.

## **4.12 BACKFILL/COMPACTION**

- 4.12.1 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 potable water system include Fire Hydrants and ARVs. All trenches must be prepared per the requirements of Part 4.4. Also refer to Specification 331002 Exhibit W-14.
- 4.12.2 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.
- 4.12.3 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.
- 4.12.4 Backfilling Procedures: The backfilling procedures outlined in the following must be followed for water mains, at all points of connection to the existing system, and at all water-related structures/appurtenances. Refer to 4.12.6 for compaction test requirements/locations. The backfilling must be done in three stages:
  - 4.12.4.1 Water Mains
    - a) 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.
    - b) 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 the outside



- diameter of the pipe. Material to be placed in six-inch layers (loose thickness).
- c) Third stage - the remainder of the trench must be backfilled with suitable material in layers not to exceed 12-inch loose thickness and compacted.
- 4.12.4.2 Water Structures – Hydrants & ARV's
- a) The Contractor must provide well-compacted sub-base under the structure.
- b) 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.
- 4.12.5 Compaction Density: The excavation backfill density for all stages must be provided as follows:
- 4.12.5.1 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.
- 4.12.5.2 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.
- 4.12.6 Compaction Test Requirements
- 4.12.6.1 Compaction test results must be submitted for all work.
- 4.12.6.2 Results of compaction tests must meet minimum requirements prior to proceeding with the next stage of the work.
- 4.12.6.3 In the second and third stage of backfilling, density tests must be made every one foot vertically, staggered every 200 feet (minimum) horizontally along the length of the pipe. There must be a minimum of one test (per vertical foot) between structures, and a minimum of one test per day
- 4.12.6.4 For structures, density tests must be every two feet vertically, staggered spirally around the structure, and a minimum of one test per day.
- 4.12.6.5 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
- 4.12.6.6 For developer projects, one complete set of all test reports must be submitted with the as-built package to the Site Engineering Review Section, and the WRD Inspector upon project completion.
- 4.12.6.7 For County run projects, one complete set of all test reports must be submitted with the as-built package to the Project Manager upon project completion.
- 4.12.6.8 The Contractor must employ an independent testing laboratory, acceptable to the County and pay for all required tests.
- 4.12.6.9 The laboratory must submit one copy of the certified test reports, after testing in each phase, to the Development Services Department and the WRD Inspector, or the County Project Manager (as applicable), for approval.

## 4.13 TEMPORARY WATER SERVICE FOR CONSTRUCTION

- 4.13.1 The provisions set forth herein must be applicable to all construction projects. The Developer/Contractor must be responsible to submit a temporary water plan (Plan). The Plan must describe how water will be provided, and the type of meter (if applicable) and backflow assembly that will be installed for construction needs and fire demand (if applicable). It must include the maximum peak hour flow which will be required prior to acceptance for occupancy.





- 4.13.1.1 For County Projects, the Plan must be submitted to the Project Manager along with the required construction plans.
- 4.13.1.2 For Developer projects, the Plan must be submitted to the Development Services Department along with the required construction plans.
- 4.13.2 Connections to Hillsborough County's distribution system exclusively for construction activities must be supplied using a temporary construction backflow assembly or a hydrant meter assembly. Refer to the County's Website ([HillsboroughCounty.org](http://HillsboroughCounty.org)) and choose Businesses-Land Development-Sits & Subdivision for additional information on both types of assemblies.
  - 4.13.2.1 Construction Backflow Assembly - For supply lines six inches and greater an appropriate temporary construction backflow assembly will be installed and comply with all the installation/connection requirements listed in Part 4.13.4. Private sources, such as wells, may also be acceptable to the County.
  - 4.13.2.2 Hydrant Meter Assembly - A hydrant meter can be utilized for Construction site activity. A hydrant meter can only be placed on a hydrant owned and maintained by Hillsborough County. Hydrant meter assemblies cannot be used for final flushing and cleaning, or fire flow testing of newly constructed water lines.
- 4.13.3 Temporary Construction Backflow Assembly: An appropriately sized temporary backflow assembly will be furnished, maintained and installed at the construction site by the Developer/Contractor. Connections to the Hillsborough County distribution system must conform to Part 2.5. The RPZ must be of an approved model. A Backflow permit and Certified Test Report will be required for the backflow assembly each time it is installed (even if relocated between phases).
- 4.13.4 When flow demand necessitates the use of a six-inch supply line, the following criteria must apply.
  - 4.13.4.1 The temporary construction backflow assembly must be placed along the right-of-way on the primary feed for the water distribution system of any proposed development. The assembly must be a maximum of 250 feet from the first lot. See Specification 331002, Exhibit W-1F for backflow assembly requirements and Exhibit W-1H for installation notes.
  - 4.13.4.2 Hydrostatic Testing: The primary feed line from the point of connection including the backflow assembly will be cleaned (pigged and flushed). Testing must be as described in Parts 4.14 and 4.15.
  - 4.13.4.3 Disinfection: The primary feed line from the point of connection up to and including the backflow assembly must be disinfected and receive the required approvals and clearances prior to placing the backflow assembly in service. Disinfection must be in accordance with Part 4.16.
  - 4.13.4.4 Pipe and Fittings
    - a) Above ground pipe must be flanged ductile iron. The pipe barrel must conform to the requirements of ANSI/AWWA C151/A21.51, Class 53, with cement lined interior.
    - b) All above ground ductile fittings must be flanged joint with a minimum pressure rating of 250 psi and must conform to the requirements of ANSI/AWWA C110/A21.10 or C153/A21.53.
    - c) Underground pipe must comply with the requirements of Parts 3.2 or 3.3, as applicable.
  - 4.13.4.5 Requirements: For County projects, the Contractor must furnish and be responsible for the permitting, installation, and testing of the temporary construction backflow assembly. For Developer projects, the Developer must furnish and be responsible for the permitting,





installation, and testing of the temporary construction backflow assembly. WRD will be responsible for the inspection of the backflow prevention device.

- 4.13.5 Removal of Temporary Construction Assembly: After the entire development water distribution system has been installed, cleaned, pressure tested, disinfected, and the requirements of part 2.5.5 have been met, the Contractor must remove the assembly as directed by Hillsborough County WRD.

#### **4.14 FLUSHING AND CLEANING**

- 4.14.1 All mains must be cleaned and flushed to remove all sand and other foreign matter.
- 4.14.1.1 The Contractor must be responsible for developing a flushing plan to be submitted to the Engineer of Record for approval with the shop drawings. The flushing plan must be submitted with the “temporary water plan” listed in Part 4.13.1.
- 4.14.1.2 The Contractor must dispose of all water used for flushing without causing a nuisance or property damage.
- 4.14.1.3 Any permits required for the disposal of flushing water must be the responsibility of the Contractor.
- 4.14.2 Flushing water must be potable water provided by the Contractor, taken from an approved metered source. Flushing water must be at the Contractor’s expense.
- 4.14.2.1 Water 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.
- 4.14.2.2 When flushing the pipeline, the flow velocity should be a minimum of 3 feet per second (fps).
- 4.14.2.3 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.
- 4.14.3 Pipelines 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".
- 4.14.4 Temporary plugs or caps must be installed on new mains until the pressure tests and bacteriological tests are completed. Upon satisfactory completion of the tests, and written approval from the County (DSD/WRD PM), the caps or plugs must be removed and the connections made to the existing mains.

#### **4.15 HYDROSTATIC TESTING**

- 4.15.1 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.
- 4.15.2 The piping must be tested in sections, thereby, testing each valve for secure closure.
- 4.15.3 The mains must be tested in accordance with, the latest revision of 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.



- 4.15.4 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.
- 4.15.5 The test pressure must not vary by more than five psi for the duration of the test. All visible leaks must be corrected.
- 4.15.6 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.
- 4.15.7 All water for testing must be potable water provided by the Contractor, no cost to the County, from a source approved by the County. Flow velocity during line filling should not exceed two (2) feet per second (fps).
- 4.15.8 All restrained sections of the buried main must be completely backfilled before such sections are tested.
- 4.15.9 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 sign off of the County Inspector. All hydrostatic pressure tests must be recorded on the form(s) attached in Part 5.
- 4.15.10 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 limits upon retesting.
- 4.15.11 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.

#### **4.16 DISINFECTING WATER SYSTEMS**

- 4.16.1 After completion of pressure testing as described in Part 4.15, the Contractor must disinfect all pipe and fittings installed in the system and receive the required approvals and clearances prior to placing the system in service.
- 4.16.2 The disinfection must be accomplished in accordance with the latest applicable provisions of ANSI/AWWA C651, “Disinfecting Water Mains”, all appropriate approval agencies and the County WRD “Procedures for Water Main Cleaning, Disinfection, and Bacteriological Testing.” See APPENDIX C for a copy of the WRD procedure. Forty-eight hours advance notice must be provided to the County Department of Health and the Public Utilities Governmental Laboratory prior to disinfection procedures start.
- 4.16.3 Care must be taken to provide disinfection of the entire system. After disinfection, the line must be thoroughly flushed until water samples show a chlorine content equal to or less than the existing system.
- 4.16.4 Temporary plugs or caps must be installed on disinfected mains until the connections are made to the existing water mains.

## 4.17 CONNECTION TO EXISTING WATER MAINS

- 4.17.1 Connections to existing potable 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 is required in order to accomplish this task. The Contractor must supply connection procedures and customer notification schedules to the County, for approval, two weeks prior to the proposed connection date.
- 4.17.2 At all new points of connection, a tee or cross with the appropriate isolation valves must be installed. All connections to existing 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.
- 4.17.3 Valves on existing mains must be operated only by Hillsborough County WRD personnel.
- 4.17.4 When service must be interrupted to existing customers during construction:
- 4.17.4.1 The Contractor must provide three days' notice to the Hillsborough County WRD Field Maintenance Services (FMS).
- 4.17.4.2 The Contractor or developer must be required to notify existing customers as directed by WRD FMS Personnel.
- 4.17.4.3 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.
- 4.17.4.4 WRD will postpone a service cut-off if the Contractor is not ready to proceed on schedule.
- 4.17.5 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 area 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".
- 4.17.5.1 In areas where there is no reasonable alternative for providing service, the County may approve a six-inch minimum size connection which reduces to a four-inch pipeline configured for a future parallel distribution system for additional services.
- 4.17.5.2 The connection must include a line size by connection size tee (six-inch minimum.), an isolation valve at the point of connection, a six inch by four-inch (minimum) tee or cross to allow for expansion, and plugged isolation valves on each extension.
- 4.17.6 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 a Water Main:
- 4.17.6.1 No size on size taps are allowed.
- 4.17.6.2 The Contractor must contact the Service Availability Team, Customer Service Section of the Hillsborough County WRD, to pay the appropriate tapping fee. The payment must be made a minimum of 48 hours prior to proposed tie-in to the water main.
- 4.17.6.3 After paying the tapping fee, the Contractor must contact WRD Inspection confirming



- they are ready to perform the tap and requesting Inspection contact Field Maintenance Services to authorize scheduling the tap.
- 4.17.6.4 The Contractor must furnish, install and pressure test the tapping sleeves and valves to existing water mains.
- 4.17.6.5 For all taps up through 12 inches, County WRD FMS personnel will furnish the necessary tapping machine and tools and will perform the tap.
- 4.17.6.6 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.
- 4.17.6.7 Prior to the tap:
- The Contractor must assemble all materials, tools, equipment, labor and supervision necessary to make the connection.
  - 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.
  - 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 psig above the pressure in the water main being tapped (whichever is greater).
  - The Contractor must maintain the pressure on the sleeve for 10 minutes at zero (0) pressure loss.
- 4.17.6.8 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.
- 4.17.6.9 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 potable water supply from contamination.
- 4.17.6.10 The Contractor must be responsible for properly backfilling the work area pit after the work is completed.
- 4.17.7 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.
- 4.17.8 Master Meter Assemblies must be flow tested by the WRD FMS Meter Team prior to final acceptance/inspection.



## PART 5.0 PRESSURE TESTING FORM

### PRESSURE TEST REPORT

PROJECT NAME: \_\_\_\_\_ PROJ. NUMBER: \_\_\_\_\_

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

EOR COMPANY NAME: \_\_\_\_\_

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

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

SERVICE REQUEST NUMBER: \_\_\_\_\_ 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: