
ARTICLE 2. WATER SUPPLY FACILITIES

2.0 GENERAL PROVISIONS

2.0.1 APPLICABILITY. All water main construction within the Authority and all water service line construction connecting to the Authority's water mains shall be designed and constructed in accordance with these Standard Specifications. The requirements stated herein shall apply to new water system construction and to repairs to existing facilities.

2.0.2 APPROVAL PROCESS. If application for service is accepted by the Authority as described in Section 1 of these Standards, then the Developer shall be authorized to proceed with the approval process for his development.

The following steps apply to the approval for installation of water mains, fire hydrants, valves, fitting, services and appurtenances by private developers in either commercial, industrial, or residential developments where the proposed water system will be tied to or served from any water main already owned, maintained or operated by the Jackson County Water and Sewerage Authority or for any system within Jackson County to be accepted by the Authority for ownership and operation. The cost of installation and connection to the Authority's main shall be the responsibility of the developer.

- A. Three (3) copies of preliminary plans showing the type of development, location and general plan for water lines and other appurtenances shall be submitted to the Authority.
- B. Flow and Pressure Tests will be conducted by the developer in the area of the proposed development (only where the proposed development is to be tied to or served from an existing Authority main). Prior coordination with Authority staff is required for flow and pressure tests. Results of Flow and Pressure Tests must be included with the Developer's Preliminary Application. Show high and low pressure for a given 24-hour period. Flow testing shall be done in accordance with requirements in the AWWA manual M17 – *Installation, Field Testing, and Maintenance of Fire Hydrants*. A site map showing flow and residual hydrants (numbered appropriately) shall be provided with each report.
- C. Comments will be addressed to the Developer by the Authority relating to the availability of water including both flow and pressure or other items pertinent to the development.
- D. The Developer must then submit five (5) copies of construction plans as outlined in these specifications to the Authority for review. These plans must carry the stamp of a registered professional engineer or other registered professional licensed and authorized in the State of Georgia and duly qualified and capable of designing water systems and computing flows and pressures in said systems. Plans shall include all erosion control measures and NPDS storm water permit compliance requirements including a copy of the erosion control approval, the NOI to be sent to EPD, and the Comprehensive Monitoring Program.
- E. If approved as submitted, two (2) copies of plans stamped approved will be returned to the developer.
- F. If changes are required, a checklist will be returned to the developer.

- G. After the changes have been made, the developer must submit five (5) additional copies of construction plans to the Authority for review.
- H. If all changes have been properly made, two (2) copies stamped "Approved" will be returned to the developer. This process must be repeated until the plans are approved.
- I. Copies of permits or approvals from other appropriate regulatory agencies must be submitted to the Authority prior to the beginning of construction. This includes erosion and sediment control permits, Georgia DOT permits, County road and building permits, railroad permits, etc.
- J. Two copies of "As-Built" plans shall be submitted to the Authority immediately after construction completion. These plans shall be submitted in both hard copy and digital format as described in Section 1 of these Standards.

2.0.3 WATER SUPPLY CONSTRUCTION PLANS. In addition to the requirements listed in section 1.4 of these Standard Specifications, water supply construction plans shall include the following items:

- A. Water mains.
 - 1. Size.
 - 2. Length.
 - 3. Materials used and types of joints.
 - 4. Location dimensions.
- B. Fittings.
 - 1. Tees.
 - 2. Crosses.
 - 3. Reducers.
 - 4. Bends.
 - 5. Plugs.
 - 6. Blow-offs / Sampling Stations
- C. Valves.
- D. Fire Hydrants.
- E. Plan, profile and complete details for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.

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- F. Standard bedding detail (cross-section).
 - G. Service connections or stub-ins details.
 - H. Any other applicable details.
- 2.0.4 WATER CONNECTION FEE.** Water connection fees are described in Section 1.3.3 of these Standards.
- 2.0.5 PROOF OF PAYEMENT.** Developers of systems to be accepted by the Authority shall provide proof that all bills relating to construction have been paid.
- 2.0.6 LETTER OF CREDIT.** Developers shall provide a maintenance bond or Letter of Credit for 10% of the construction cost of the system for a period of one year to begin on the date of written acceptance by the Authority. The maintenance bond shall be of a form acceptable to the Authority. Additional information is contained in Section 1.2.5 of this Standard.
- 2.0.7 TAPPING EXISTING WATER MAINS.** Tapping existing water mains shall be either wet taps or a shut down of a portion of the main line to facilitate a tie in. A contractor who specializes in the type of work being performed shall perform tapping of all mains. The shut down of any portion of the water system will be allowed only when uncontrolled circumstances do not permit a wet tap. All residential service line taps shall be wet taps. The Authority shall approve any shut down of the water system in writing. The Authority shall be notified forty-eight (48) hours prior to the commencement of any tapping work.
- 2.0.8 TRENCHING, BACKFILLING AND COMPACTING.** Trenching, backfilling and compacting shall be performed in accordance with all applicable portions Article 4, Site Work and Earthwork.
- 2.0.9 CROSS CONNECTION CONTROL PROGRAM.** The Authority maintains a cross connection control program consistent with Georgia EPD requirements and EPA regulations as described in the following paragraphs. Violations of cross connection requirements are not permitted and are subject to immediate termination of service and other enforcement action in accordance with County and State law.

For the purposes of this section, a cross connection shall be defined as “any physical arrangement whereby a public water supply is connected, directly or indirectly with any nonpotable or unapproved water supply system, groundwater well, storm sewer, sanitary conduit, pool storage reservoir, plumbing fixture, or other device which contains or may contain any contaminated water, liquid, or other waste of unknown or unsafe quality that could impart a contaminant to the public water supply as a result of backflow.”

Types of Cross Connection Control Devices:

- A. Reduced Pressure Principal Backflow Prevention Device: The reduced pressure principal backflow device, (RPZ), consists of two (2) independently acting, internally loaded approved check valves separated by a reduced pressure zone. During normal operation, the pressure between the two check valves is maintained at a lower pressure than the supply pressure. If either check valve should leak, the differential pressure relief valve shall maintain a difference of not less than two (2)

psi between the supply pressure and the zone between the two check valves by discharging to the atmosphere.

The RPZ is normally used in location where an approved air gap or a barometric loop is impractical. This device is effective against backflow caused by back pressure and backsiphonage and is used to protect the water system from substances which are hazardous to health.

Installation:

1. The RPZ shall be installed per the manufacturer's instructions and with adequate space to facilitate maintenance and testing. An RPZ shall be inspected and tested as soon as possible after installation to ensure its satisfactory operation and proper installation.
2. It is important that some models of RPZs be installed twelve (12) inches, plus nominal size of the device, above the ground because the removal of the pressure relief valve requires a minimum of twelve (12) inches clearance. Also, some devices require a minimum wall clearance for driving the pins from the check valves.
3. An RPZ installation shall not be approved for any pit or vault location below ground level. Semi-buried puts are acceptable if the RPZ is installed above the ground level with an approved air gap between the relief valve port and daylight drain. The daylight drain from above ground or semi-buried vaults must:
 - a. Be able to be bore sighted.
 - b. Be installed above ground level.
 - c. Be able to handle the volume of after that can be discharged from the relief valve port.
 - d. The RPZ shall be installed with four (4) test cocks properly placed for testing purposed.
 - e. No bypasses shall be allowed around any backflow presenter unless the same approved backflow prevention device is installed on the bypass.
 - f. The device shall be protected from freezing. Various heating elements are effective if power is available. If the system can be drained, additional "frost-proofing" can be accomplished by drilling and tapping holes, at carefully selected points as instructed by the manufacturer, in the compartments which trap water.
 - g. Care should be taken to ensure the device is not installed where the pressure can be maintained above the devices rated capacity.
 - h. If hot water conditions are anticipated, inquire as to the manufacturer's recommendations.

- i. When the RPZ is located inside the building, a drain pipe or other approved adequate drainage shall be provided for the relief valve port.
 - j. If a drain is to be provided for the relief valve port, there shall be an approved air gap between the port and the drain.
 - k. Size the device hydraulically to avoid excessive pressure loss. The head loss is not necessarily directly proportional to flow. Some devices have a high loss at low flows and a low loss at high flows.
 - l. A strainer shall be required ahead of the device in some localities.
 - m. Thoroughly flush the lines prior to installing an RPZ.
- B. Double Check Valve Assemblies (DCVA): This device consists of two (2) internally-loaded approved check valves, either spring loaded or internally weighted, installed horizontally as a unit between two (2) tightly closing shutoff valves. This device is effective against backflow caused by backpressure and backsiphonage and is used to protect the water system from substances which are not hazardous to health.

Installation:

- a. A DCVA shall be installed with adequate space to facilitate maintenance and testing. A DCVA shall be tested and inspected as soon as possible after installation to ensure its satisfactory operation and proper installation.
 - b. The device shall be protected from freezing.
 - c. If hot water conditions are anticipated, inquire as to the manufacturer's recommendations.
 - d. The DCVA shall be installed horizontally with four (4) test cocks properly placed for testing purposes.
 - e. No bypasses shall be allowed around any backflow preventor unless the same approved backflow prevention device is installed on the bypass.
 - f. When the DCVA is located inside a building, adequate floor drainage shall be provided to allow for device testing.
 - g. A strainer shall be required ahead of the device in some localities.
 - h. Thoroughly flush the lines prior to installing a DCVA.
- C. Vacuum Breaker (VB): VB's, either pressure or atmospheric, are effective against back-siphonage only and cannot be used in an area where a positive pressure can be developed on the downstream side of the device or in an area where the VB are subject to flooding. VB's are not acceptable backflow protection at service connections other than lawn sprinkler systems. When VB are installed in a line which shall reach a temperature of one hundred sixty (160) degrees Fahrenheit or above, a hot water type VB shall be used.

1. Pressure Vacuum Breaker with Internal Check Valve (PVB). PVB assemblies consist of a check valve (sometimes two), vacuum relief, inlet and discharge shutoff and properly installed test cocks. The PVB has a vacuum relief valve which is internally loaded, normally by means of a spring. This spring loading allows the device to be installed on the pressure side of a shutoff valve.

This device shall be installed a minimum of twelve (12) inches above the highest outlet and/or overflow level on the nonpotable system. VB shall not be installed more than five (5) feet above the ground. Adequate room shall be made available for maintenance and testing.

2. Atmospheric Vacuum Breaker (AVB). An AVB is a device which allows air to enter the water line pressure is reduced to a gauge pressure of zero or below. The atmospheric VB is designed to prevent back-siphonage only. It is not effective against backflow due to backpressure and shall not be installed where it shall be under continuous operating pressure for more than twelve (12) hours in any twenty-four (24) hour period.

Poppets of all atmospheric VBs shall be precision fitted to ensure positive closure. This device shall be installed downstream of the last shutoff valve and a minimum of six (6) inches above the highest outlet and/or overflow level on the nonpotable system. VBs shall not be installed more than five (5) feet above the ground. It is not recommended for use in areas where water is discharged on a sustained basis because the poppet valve will tend to stick and not work properly.

2.0.10 MANDATORY BACKFLOW PREVENTION INSTALLATIONS. Below is a list of suspected high-hazard installations. The following general fields of installations shall be required to have backflow prevention devices installed on water service lines.

- Sewage Lift Stations
- Wastewater Treatment Facilities
- Funeral Homes
- Hospitals (Clinics, including Veterinary Clinics, etc.)
- Plating and Chemical Companies
- Laboratories (Industrial and Medical)
- Meat Packing Houses and Rendering Plants
- Manufacturing Plants
- Lawn and Irrigation Systems
- Car Washes
- Nursing and Convalescent Homes
- Professional Buildings (Doctors, Dentists, etc.)
- Retail Complexes
- Schools
- Motels and Hotels
- Laundries and Cleaners
- Major Office Buildings
- Apartment Houses (High rise over forty (40) feet)

In applying the recommendation outlines in this sections, it is vital that the degree of protection provided must be commensurate with the degree of hazard present. In situations where health hazards, or unknown hazards exist, the reduced pressure

principle backflow device should be used because it offers the highest known degree of reliability.

Backflow prevention devices from the following manufacturers are approved by the Authority: Febco, Watts. Other manufacturer's products may be used upon prior approval by the Authority.

2.1 DESIGN CRITERIA

2.1.1 GENERAL. Water distribution systems shall comply with the requirements of these Standard Specifications for water main and service line construction and may include special criteria established by the Authority for the overall hydraulics of the water utility system. Special criteria shall be outlined at pre-design meetings scheduled, as determined necessary by the Authority.

2.1.2 DESIGN FLOW REQUIREMENTS. The design of the water distribution system shall be based on the following water demands:

UNIT WATER DEMANDS FOR FUTURE LAND USE

<i>Land Type</i>	<i>Avg. Demand</i>	<i>Max. Day/ Avg. Day</i>	<i>Peak Hr./Max Day</i>
Residential	300 gpd/ERU	2.6	1.5
Commercial ¹	1650 GPD/Acre	2.6	1.5
Industrial ¹	1650 GPD/Acre	2.6	1.5
Park ¹	3060 GPD/Acre	2.6	1.5

¹ Numbers shown are for planning purposes only. In all cases, the developer's engineer shall provide calculations to justify estimated water consumption. Schools are considered commercial for the purposes of this table.

Minimum design fire flow shall be as noted below:

Multifamily	1,000 gpm
Shopping Centers	1,000 gpm
Motels, Light Industry and Schools	750 gpm
Heavy Industry, Large/Tall Buildings (Warehouses, Office Buildings, Institutional)	1,000 gpm (Min)
Residential	500 gpm

Exceptions may be made to increase or decrease minimum fireflows when deemed necessary by the Authority. Demand for other than residential to be determined for each specific development.

2.1.3 OPERATING PRESSURE REQUIREMENTS. All areas shall be designed to have a maximum static head of three hundred (300) feet (one hundred thirty [130] psi) and a minimum static head of one hundred (100) feet (forty-three [43] psi). Distribution systems shall also be designed to maintain a twenty (20) psi residual pressure during a maximum day plus fire flow event, and a forty psi (40) residential residual during peak hour residential flows. The maximum pressure drop from static head to maximum day plus fire flow, or peak hour residential flow, shall not exceed thirty psi (30). The service pressures listed above are design figures for new developments and are not represented by the Authority to be a guarantee of supply conditions for the existing distribution system.

2.1.4 WATER MAIN SIZES. Any system, whether served from an existing Authority water main or otherwise, shall have a minimum size of 8" pipe installed. All piping in proposed subdivision along main streets shall be 8". Piping on cul-de-sac may be 6" if the total length is less than six hundred feet and no future extension will ever occur. Cul-de-sacs of longer length shall have 8" piping along the street (with the last 600 feet reduced to 6") unless looping is provided. Actual sizes may be larger depending on the size required to meet the demand of the proposed development.

Where a water main extension from an existing Authority water main is required along an existing public right of way or future supply route, the size of pipe to be used will be either 8", the size required to meet the demand of the development, or a size equal to the existing Authority main, whichever is largest. The Authority may require a larger pipe size if payment is made by the Authority for the difference in cost.

2.1.5 FIRE HYDRANT LOCATIONS. Fire hydrants will be required as set forth in these specifications where a proposed system is to be served from an existing Authority water main or in any case where the Authority is to accept a new system for ownership and operation.

2.1.6 SPACING OF FIRE HYDRANTS. Spacing of fire hydrants where required shall be as follows:

- A. Multi-family: Fire hydrants shall be spaced not more than five hundred feet (500') apart as measured along street curb line and at an overall spacing that will not average less than one hydrant to two hundred thousand (200,000) square feet throughout an individual subdivision. Where blocks are over eight hundred feet (800') in length, intermediate hydrants shall be placed in the center of the blocks. A hydrant shall be placed in the end of each cul-de-sac over three hundred feet (300') in length. Every cul-de-sac shall have a fire hydrant and Eclipse Model 88 Sampling Station. Dead end cul de sacs shall terminate with a two inch blowoff in addition to the hydrant and sampling station required above. Fire hydrants shall be located on the northeast corner of intersections whenever possible. Additional fire hydrants shall be located as necessary to permit all portions of buildings to be reached by hose lays of not more than 300 feet in length.
- B. Shopping Centers, Malls, Etc,: Fire hydrant spacing not more than 300 feet (300').
- C. Motels, Light Industry and Schools: Fire hydrant spacing not more than 300 feet (300').
- D. Heavy Industry, Large/Tall Buildings: Fire hydrants spacing not more than 300 feet.
- E. Single Family: Single family residential developments shall have fire hydrant spaces at 500 feet (500') separation along the streets. Fire hydrants shall be located at all intersections and at all dead end lines. Along county roads where housing density is not as great, hydrant spacing can be reduced to a maximum of 1,000 feet with a hydrant at each intersection.
- F. No installation requiring fire hydrants shall have spacing greater than 1,000 feet apart as measured along the main supply line.

Fire hydrant locations and spacing shall be as approved by the Authority.

- 2.1.7 SEPARATE FIRE LINES.** Facilities that require separate fire lines shall provide backflow preventers in accordance with the Authority's cross connection program. Each fire line backflow prevention facility shall be equipped with a fire department connection (FDP, also known as Siamese connection) of adequate size and a fire hydrant within 50 feet of the backflow device.
- 2.1.8 FIRE LINE TO NON-RESIDENTIAL AREA.** The property owner shall maintain all fire lines extending from the valve on the Authority water main. Valves on newly constructed fire lines shall be located on the tee at the main line. Fire lines shall be used exclusively for fire protection. Domestic water taps or irrigation taps shall not be allowed on a fire line.
- 2.1.9 HOSE LAY.** Hose lay is defined as being measured along the route a piece of fire apparatus must travel inlaying a fire line from the fire to the fire hydrant.
- A. All plans for development must meet all applicable fire protection codes.
 - B. All requirements for design criteria and material and construction specifications must be met.
- 2.1.10 FIRE MAIN SIZE.** In all cases, the design and final sizing of fire protection infrastructure shall be the responsibility of the Developer's Design Engineer. Notwithstanding this requirement, and subject to engineering limitations, the minimum fireline sizes are listed below:
- A. Multifamily: Water fire mains of at least 8" pipe shall be installed; 6" pipe may be used only where it completes a grid and then only up to 600 feet in length between interconnecting mains of approved diameter.
 - B. Large Shopping Centers, Malls, etc.: Water fire mains to be no less than 8".
 - C. Commercial areas: If the area is less than 200,000 square feet, use fire main no less than 8"
 - D. Motels, Light Industry, and Schools: Water mains to be no less than 8".
 - E. Heavy Industry, Large/Tall Buildings: Water fire mains to be no less than 10".
- 2.1.11 DISTRIBUTION SYSTEM LAYOUT.** No more than twenty (20) individual lots may be served by a single unlooped main without prior Authority approval. Distribution mains and lateral lines shall be located as indicated on the approved plans. Minimum pipeline diameter for lateral lines shall be eight inches (8"). At dead-ends less than six hundred feet (600') long six-inch (6") diameter pipe may be used. Dead ends shall be minimized by looping whenever possible. Lines at ends of long cul-de-sacs shall be looped along lot lines to adjacent streets. Dead ends shall be provided with a permanent blow-off or fire hydrant preceded by an Eclipse Model 88 Sampling Station. Mains and laterals shall be extended to the boundaries of filings and completely across the frontage of individual lots.
- 2.1.12 LOCATION OF WATER LINES AND FIXTURES.** On existing and proposed roads, water lines shall be located a minimum of eight feet (8') from the edge of pavement or

back of curb with a minimum cover of forty-eight inches (48”) or as required by the Georgia Department of Transportation. Reference the Jackson County UDC and the Standard Details of these Specifications for additional information regarding waterline location. Exceptions shall be made only by written approval by the Authority.

- 2.1.13 VALVE SPACING.** The maximum spacing for valves shall in all distribution mains and lateral lines shall be approximately one-thousand feet (1000') or at every other hydrant. Four-way and three-way street intersections shall require four (4) and three (3) valves respectively, one located on each extended property line. For a succession of short blocks perpendicular to the direction of the distribution main, and without residential or commercial services between intersections, one of the mainline valves at an intersection may be omitted, provided the one-thousand foot (1000') maximum spacing requirement is maintained. Valves shall be placed at each end of a line running through an easement on private property, on each side of a major creek or channel crossing, and on each side of a distribution line that provides service to a hospital, school or large industrial user.
- 2.1.14 COMBINATION AIR VALVES.** Combination air valves shall be installed at each high point in all transmission mains and for all pipelines 12” or larger. Combination air valves shall be installed in pre-cast manholes or vaults fitted with air vents open to the atmosphere.
- 2.1.15 BLOW-OFF ASSEMBLIES.** Provisions shall be included in the design to allow for the flushing of distribution mains and lateral lines at all low points in the system, at all dead ends, or at any point noted on the approved plans. The blow-off assembly shall be installed perpendicular to and on the downhill side of the main or line and shall drain to the nearest gutter line or drainage channel.
- 2.1.16 PIPE.** Pipe class shall be as required for specific project conditions.
- 2.1.17 HYDRAULIC DESIGN.** Transmission and Distribution mains shall be designed using the Hazen-Williams friction coefficients and maximum head losses noted below unless prior approval is granted by the Authority. The given head losses shall apply at peak hourly flows.

Maximum Head Loss by Pipe Size

<i>Pipe Size</i>	<i>Hazen-Williams 'C'</i>	<i>Max. Head Loss</i>
6" - 12"	C-110	3.0' per 1,000'
14" - 16"	C-120	2.5' per 1,000'
20"	C-130	2.0' per 1,000'
Over 20"	As directed by the Authority	TBD

All pipes shall be designed to have a maximum velocity of ten feet (10') per second at max day flow plus fire flow conditions.

- 2.1.18 MINIMUM DEPTH.** All water pipes shall be installed with a minimum of forty-eight inches (48”) of cover from finished grade to the top of the pipe.

2.1.19 WATER SERVICE. All existing structures provided water service by an unapproved individual well(s) or other non-regulated private water service, and are now applying for a permit to obtain water service from the Authority's system, must either fill in their well(s), when connection is made to the Authority system or, install a backflow preventer, per EPD regulations and the Authority's Cross Connection Program.

All new structures except single-family residences applying for permit to obtain water service from the Authority system, must obtain a plumbing permit from the Building Official, and install a backflow preventer as required by the Authority and per the Authority's Cross Connection Program. Refer to Article 1.3.6 of these Standards for Terms of Service.

2.1.20 WATER SERVICE LINES. Authority approval of service line locations is required for all services. Water service lines at the curb stop shall be no deeper than five feet - six inches (5'-6"). Water service lines shall be a minimum of two feet (2') from the property line or as shown in the Standard Details. If any portion of the service line is to be located under a hard surface such as driveway or if joint trenching is approved by the Authority then the service line will be sleeved.

A Water and Sewer Preconstruction Meeting is required before any digging can take place. Unmetered / unauthorized connections are not allowed in this jurisdiction. Water use is prohibited without the use of a meter or without prior written permission from the Authority. If this provision is violated, the Owner of the offending service shall be immediately assessed a \$750 fine per incident per day.

2.1.21 WATER SERVICE SIZE. Water services shall be adequately sized to meet the requirements of the facility being served. The minimum size water service shall be three-quarter inches (3/4"). The service line and meter shall be sized according to AWWA manual M22 - *Sizing Water Service Lines & Meters* and shall be approved the Authority on the basis of:

- A. Number of units serviced.
- B. Length of service line.
- C. Total GPM required.
- D. Annual consumptive demand.

Service lines shall be the same size as the corporation stop unless written permission is given by the Authority.

2.1.22 METERS. Meters will be furnished and installed by the Authority and issued upon approval of a Jackson County Building Permit and payment by the Authority is received. The Authority will furnish the meter and remote reader for all services. All other service line Components such as pipe, fittings, meter pits and meter setters, shall be furnished and installed by the developer/owner.

Water meters shall be set when the owner requests water for the structure. Meter sets shall be ordered from Jackson County Water and Sewerage Authority at least forty-eight (48) hours in advance. Note: If the meter cannot be set due to improper installation, a \$25

fee shall be assessed for each return inspection. If the building is occupied prior to a meter set, a \$1000 fine shall be assessed by the Authority.

The Authority will supply and maintain the water meter, which was paid for at the time a Building Permit was issued by Jackson County. It is the Owner's responsibility to ensure that the water billing address is correct and bills are paid promptly. The Owner shall notify the Authority of any change of ownership or of any change of billing responsibility.

2.1.23 LOCATION OF METERS AND REMOTE READOUTS. Meters for all services in the Authority shall be installed with remote readouts. Remote readouts shall be mounted in an approved location. All meter set and remote readouts locations will be approved by the Authority and will not be covered in any way at anytime as to prevent the Authority total access for repairs.

2.1.24 METER SIZE.

- A. Minimum size of meter shall be ¾" and shall be suitable for one single-family residence or commercial facility with a peak demand of 20 gpm or less.
- B. Meters for other services shall be sized as follows (per AWWA guidelines):

<i>Safe Operating Flow Rate(gpm)</i>	<i>Meter Size (In)</i>
50	1"
100	1 ½"
160	2"
320	3"
500	4"
1,000	6"
1,600	8"
2,300	10"

All persons proposing service for other than a single-family residential structure shall submit a basis of meter sizing to prevent undersizing and oversizing of meters. Said submittal shall propose average and peak (gpm) daily water usage and shall be based on AWWA M22 and is subject to approval by the Authority Engineer.

- C. The Authority maintains a cross connection control program consistent with Georgia EPD requirements and EPA regulations. Violations of cross connection requirements are not permitted and are subject to immediate termination of service and other enforcement action in accordance with County and State law.

2.1.25 CURB STOPS. Curb stops shall be installed on all service lines to provide a means to shut off the service line. The curb stop and stop box shall be located as shown on the standard details.

2.1.26 PRESSURE REGULATORS. A pressure regulator, adjustable from twenty-five (25) to seventy-five (75) psi, shall be installed on all service lines in which normal operating pressure exceeds 60 psi.

2.1.27 PRESSURE BOOSTER SYSTEMS. In locations where the Authority's water distribution system is not capable of providing adequate pressure to certain individual lots, the Authority may require installation of pressure booster systems within the affected area. Booster systems may be required when static pressure at the meter is less than 43 psi. Booster systems will be sized to provide adequate flow and will generally consist of a booster pump and a pressure tank. The Authority shall approve booster systems prior to installation. Generally, booster systems will not be allowed when the service pipeline can be at sufficient size to not impact pressure and flow.

2.1.28 SERVICE LINE STUB-INS. Water service lines shall be in a separate trench and shall be a minimum of ten feet (10') from sewer service lines. Water service lines shall be a minimum of eighteen inches (18") above any sanitary sewer crossing.

2.1.29 SERVICE LINE TAPS. Service line taps shall be made under full line pressure. Taps shall be made in the upper half of the main at the ten o'clock or two o'clock position. The tap shall be made on the same side of the main as the water meter. Tapping shall be performed after the water main has passed pressure, disinfection, and bacteriological tests.

All 3/4" taps shall be made using a double strap tapping saddle with corporation stop and 3/4" Type K-copper tubing. Service taps shall have a minimum separation of 18 inches and shall be no closer than 18 inches to a coupling or bell. Upon completion of all service taps, a visual inspection shall be made by the Authority to check for leakage.

2.1.30 METER CHECK VALVES. Check valves shall be required for all meters one and one-half inch (1-1/2") and larger. Reduced pressure principle backflow preventers may be required where conditions exist that could cause a flow of water from the property to the main.

2.1.31 PUMPING FACILITIES.

A. GENERAL. In locations where the Authority's water distribution system is not capable of providing adequate water pressure to a development area, the Authority may require the construction of a pumping facility in order to provide proper service. The Authority may not approve the installation of a pumping facility where, in the opinion of the Authority such an installation would have an adverse effect on the operation, or future operation, of the Authority's water system. The Developer shall provide the Authority with a set of design calculations for review and acceptance by the Authority. Drawings shall conform to Article 1.4 of these Standard Specifications.

The pumping facility shall satisfy all requirements of the GA EPD and of these Standard Specifications. The Developer shall prepare a set of "as built" drawings of the pumping facility in accordance with Article 1.2.5 of these Standard Specifications. Upon completion of the pumping facility, the Contractor shall also provide the Authority with two (2) copies of an "Operation & Maintenance Manual" for the facility.

B. DESIGN CRITERIA. The Authority on a case-by-case basis will establish specific design criteria for water pumping facilities. Prior to commencing design, the developer and his engineer shall meet with the Authority to develop design criteria for the project.

As a minimum, pump stations shall have a minimum of two (2) pumps and shall be capable of pumping the peak design flow with the largest pump out of service. All pumping equipment shall be manufactured and supplied by the same company.

The station shall be sized to accommodate all pumps, electrical equipment and controls required to operate the facility. The station shall be lighted, heated and well ventilated, and if required shall be designed for easy expansion. The architectural finish of the station shall blend with that of the surrounding architecture.

A standby generator, capable of operating the entire station for a minimum of four hours, shall be provided and shall be located outside of the building in an all weather enclosure. Additional requirements for generators are listed in Section 3 of these Standards.

C. CONTROLS AND TELEMETRY. A telemetry system shall be incorporated at the pump station for control monitoring and reporting. The system shall be capable of differentiating between varieties of emergency conditions including high and low pressures, pump failures and power failure. The telemetry system shall be compatible with the Authority's system and will be reviewed and accepted by the Authority prior to installation.

D. SITE IMPROVEMENTS. An eight-foot (8') high chain link fence with barbed wire shall be installed around the perimeter of the pump station site. Upon completion of the pump station construction all disturbed areas within the site shall be fertilized, seeded and mulched in accordance with Article 4.8, Site Restoration, of these Standard Specifications.

Landscaping and various other improvements required are covered by the Jackson County Unified Development Code.

2.2 MATERIALS

2.2.1 GENERAL. All cast materials shall be U.S castings. No foreign castings shall be used. All materials used for potable water system shall be certified for such by the American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF 61). No materials used shall adversely affect the drinking water quality or the public health.

2.2.2 PIPE. All pipes used for water main construction shall be ductile iron unless otherwise approved by the authority. Ductile iron pipe shall conform to ANSI/AWWA A21.50/C150. Pipe shall be Pressure Class 350 minimum unless otherwise approved by the Authority. Flanged pipe shall be Class 53. Pipe shall be manufactured in accordance with ANSI/AWWA A21.51/C151. Pipe shall be standard cement lined and seal coated with approved bituminous seal coat in accordance with ANSI specification A21.4 (AWWA C104), latest revision.

2.2.3 JOINTS. Buried pipelines shall have push-on joint in conformance with AWWA C111 or manufacturer's standard restrained joint as appropriate. Exposed piping, valves, and fittings, in vaults and manholes, shall have flanged joints in conformance with AWWA C115. Flanges for ductile iron pipe shall have ANSI B16.1, Class 125 drilling unless service conditions warrant heavier flanges.

2.2.4 MJ FITTINGS. Fittings shall be furnished in accordance with ANSI Specifications A21.10 (AWWA C153, or C110 as appropriate), latest revision. Class designation shall be compatible with the pipe class designated for the project. A standard thickness cement mortar lining shall be applied in conformance with AWWA C104 or epoxy coated lining in conformance with AWWA C116. All fittings shall receive a bituminous outside coating approximately one (1) mil thick.

2.2.5 GATE VALVES. Buried gate valves in sizes four inches (4") to twelve inches (12") shall be of the iron body, non-rising bronze stem, and resilient-seated type conforming to AWWA standard C509. Exposed gate valves shall be outside screw and yoke (OS&Y), bronze trimmed with flanged ends.

Gate valves shall provide zero leakage at working pressures up to two hundred (200) psi in either direction. Valves shall open left (counter-clockwise). Valves shall be furnished with a two-inch (2") square operating nut for buried locations, and with a hand wheel operator for exposed locations. End connections shall be furnished with all necessary joint materials. Valves shall have a full opening flow-way of equal diameter to the nominal size of the connecting pipe.

Coatings shall be in conformance with AWWA C550 and the following specific requirements. Internal ferrous metal surfaces shall be fully coated, holiday free, to a minimum thickness of four (4) mils. The coating shall be a two-part thermosetting epoxy suitable for field over coating and for touchup with the same coating material without special surface preparation or extreme heat. The supplier shall furnish detailed performance tests of adhesion, hardness and abrasion resistance of the furnished coatings. Coating shall have a successful record of performance in valves, pipe or other allied equipment, for a minimum of ten (10) years. Gate Valves shall be as manufactured by Mueller, American, or approved equal.

2.2.6 BUTTERFLY VALVES. Valves having a nominal diameter greater than twelve inches (12") shall be butterfly valves designed for direct burial or exposed service and shall conform to AWWA specification C504, Class 150-B. Valves shall be of the tight closing rubber seat type with seats bonded to the valve body. Metal to metal sealing surfaces shall not be permitted. Valves shall be rated bubble tight at one hundred fifty (150) psi with flow in either direction. Valve discs shall rotate 90° from the fully open position to the fully closed position. Coatings shall conform to standards specified above for gate valves. Valve bearings shall be sleeve-type corrosion-resistant, and self-lubricating with the load not to exceed twenty-five hundred (2500) psi.

Manual operators shall have worm gearing or traveling nut operating in a lubricating bath. The required maximum input force on a hand wheel or chain wheel shall be not more than 80 pound pull to develop the required operator seating torque. Manual operators shall comply with AWWA C-504. Hand wheel operators in structures shall be furnished with a direct valve position indicator. Buried valves shall be rated for underground installation. Valves shall open left (counter-clockwise). Butterfly valves shall be as manufactured by DeZurik, Pratt, American, or approved equal.

2.2.7 PRESSURE REDUCING/SUSTAINING VALVES (PRV/PSV). PRV/PSVs shall maintain a constant downstream pressure regardless of fluctuations in demand. When the upstream pressure becomes equal to the spring setting of the pressure sustaining control, the valve shall throttle to maintain a constant inlet pressure. If the downstream pressure is greater than the upstream pressure, the valve shall close automatically to

prevent return flow. The valve shall be equipped to provide for slow opening and closing by means of independent, field adjustable opening and closing speed controls.

Valves shall be a hydraulically operated, diaphragm-actuated, globe or angle pattern valve. Valves shall have a resilient, synthetic rubber disc, having a rectangular cross section, contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. The diaphragm assembly containing a valve stem shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. This diaphragm shall consist of nylon fabric bonded with synthetic rubber and shall not be used as a seating surface. Packing glands and stuffing boxes are not acceptable. There shall be no pistons operating the valve or pilot controls.

Valve design shall allow the repair of all internal parts through the top flange without removing the valve from the pipe.

The pressure reducing pilot control shall be direct-acting, adjustable, spring-loaded, normally open diaphragm valve, which closes when downstream pressure exceeds the spring setting.

The pressure-sustaining pilot shall be a direct-acting adjustable, spring-loaded, normally closed diaphragm valve, which opens when upstream pressure exceeds the spring setting.

The main valve body and cover shall be made of cast iron conforming to ASTM A48. The main valve trim shall be Bronze (ASTM B-61) or 303 Stainless Steel. The pilot controls material shall conform to ASTM B-61 Bronze. The end details shall be flanged, ANSI B16.1 Class 125 or heavier if service conditions warrant.

Pressure reducing/pressure sustaining valves shall be as manufactured by OCV Control Valves, Cla-Val, or approved equal.

2.2.8 FIRE HYDRANTS. All fire hydrants shall comply in all respects with Authority Standards and shall be designed and manufactured to comply with the latest specifications of the AWWA. The hydrants shall be designed for 150 pounds working pressure, of simple design, easy to operate, effectively and positively drained and protected from damage by freezing, and convenient for repairing and replacing parts.

Fire Hydrants shall be six inches (6") above final grade or back of sidewalk and have a distance of no less than three feet (3') in circumference clear of all obstructions around the fire hydrant. Longer hydrants shall be provided if required by specific grading conditions. Hydrants shall be equipped with one 4-1/2" pumper nozzle and two 2-1/2" diameter hose connections, which shall have threads meeting the latest requirements of the State Fire Insurance Commission. Hydrants shall have a safety flange on the barrel and a safety coupling on the system valve stem, to prevent damage to the barrel and stem in case of a traffic accident.

The connection at the base of the hydrant shall be mechanical joint for 6" ductile iron pipe. The valve opening shall meet the requirements of the AWWA Specifications for 4-1/2" hydrant. The valve, valve seat and inner working parts shall be easily accessible. The depth from the surface of the ground to the bottom of the connection pipe shall be at

least 36". The distance from the ground to the silver reflecting paint shall not be less than 24". Each hydrant shall be neatly painted with a silver reflecting paint. Each hydrant shall be tested to 150 psi. Any hydrant showing defects by leakage, sweating, or otherwise shall be rejected. The barrel and all parts shall withstand these tests. These tests shall be made in the field, after the hydrants are installed. All fire hydrant laterals shall be of 6" ductile iron pipe and shall have a 6" gate valve between the main line and fire hydrant. Hydrants shall be M&H Valve Fitting Co., Traffic Model Style 129, Mueller Super Centurion, or approved equal.

2.2.9 VALVE BOXES. The manufacturer of valve box components shall be experienced in the design and manufacture of valve boxes, and shall be regularly engaged in the manufacture of valve boxes. The manufacturer shall have produced valve boxes, which have given successful service for a period of at least five (5) years.

Valve box parts shall be made of gray cast iron in compliance with the requirements of ASTM A48 or ASTM A126. The casting shall be coated with two coats of coal-tar pitch varnish. Valve boxes shall be complete with bases and accessories. Valve box shall be of sufficient length to reach from the pipe to at least 1-inch above the final ground elevation. Extension pieces shall be those recommended by the manufacturer.

The operating nut depth shall not exceed 5 ½ feet. If the depth of the operating nut is to be deeper than 5 ½ feet then an extension shall be attached to the operating nut. The extension shall extend to be a minimum of 8" from finished grade. The operating nut shall be centered in the valve box and turn freely. The word "WATER" shall be embossed with large letters across the lid for potable water installations only.

Valve boxes shall be the three-piece adjustable screw type. The following patterns are acceptable:

- Mueller screw-type 5 1/2" H-10357 with No. 160 oval base
- Tyler screw-type 6" cast iron valve box assembly series 6860 with No. 160 oval base.
- Clay and Bailey screw-type 6" cast iron valve box assembly No. P-108 with No. 160 large oval base.

2.2.10 COMBINATION AIR RELEASE VALVES. Combination air release valves shall be designed to exhaust large volumes of air when the system is filled with water and to allow large volumes of air to enter the pipeline when the system is drained. The air and vacuum relief portion of the valve shall have a discharge orifice area, which is equal to or greater than the valve inlet. The valve shall also be capable of venting small quantities of entrained air, which typically accumulate at high points in the pipeline during system operation. Entrained air shall be vented under pressure by means of a small, independently controlled orifice. The combination air release valve shall be designed for a minimum working pressure of 150 psi.

The combination air release valve body, cover and baffle shall be cast iron conforming to ASTM A48 or ASTM A126. The valve float shall be stainless steel conforming to ASTM A240. The float retainer, outlet orifice plug, float cushion retainer, restraining screws and internal lock nuts and washers shall be stainless steel conforming to ASTM A276. The float cushion and outlet orifice seat shall be synthetic Buna-N rubber manufactured in

compliance with ASTM SB800. The combination air release valves shall be as manufactured by APCO, Valmatic, or approved equal.

2.2.11 BLOW-OFF ASSEMBLY / SAMPLING STATION. The standard blow-off shall be through a two-inch (2") ball valve with a two-inch (2") gate valve operating nut, box, piping and cover. All piping shall be threaded copper and valves shall be brass. Galvanized piping or fittings shall not be allowed. The blow-off pipe shall be no deeper than 4 inches (4") from the top of the valve box. Sampling stations shall be Eclipse model #88 as manufactured by Kupferle.

2.2.12 VAULTS. Vaults shall be pre-cast or cast-in-place concrete and shall be constructed in accordance with these Standard Specifications. Pre-cast vaults shall be designed so that joints and corners are waterproof. Vaults shall be waterproofed after construction by use of sealants, epoxies, or other approved methods. Vaults shall be designed to resist all lateral and vertical loads imposed. Vault roofs shall be designed to support the overhead fill, any surcharge and an H-20 traffic loading.

2.2.13 MANHOLES. Refer to Section 3 of these Standard Specifications.

2.2.14 MANHOLE BASE SLABS AND BASE BEAMS. Refer to Section 3 of these Standard Specifications.

2.2.15 SUMP PITS FOR VAULTS AND MANHOLES. Gravel sumps shall be provided in all vaults. In areas where groundwater is anticipated, the gravel sump shall be replaced with a concrete sump to prevent entry of groundwater into the vault. In areas where groundwater is anticipated, the vault shall be designed with adequate safety features against floating. Developer's engineer shall submit buoyancy calculations to Authority engineer for review and approval. Buoyancy calculations to assume water surface elevation at the top of the slab of the proposed vault.

A gravity drain line or sump pump shall be provided when a concrete sump is utilized.

2.2.16 VENT PIPES. Vent pipes shall be installed in all vaults and pits unless vented hatches or positive ventilation equipment is present. Installations that contain electrical equipment shall have a blower attached to the vent system.

Above ground vent pipes shall be six-inch (6") nominal diameter galvanized steel pipe, Grade 40, conforming to A.S.T.M. Standard Designation A 53 or flanged ductile iron. The vent screen shall be a three-fourths inch (3/4") No. 9-11 flattened expanded galvanized metal screen. Below ground vent pipe shall be six inch (6"), scheduled 40 PVC with glued joints. A PVC glued joint by standard pipe thread female adapter shall be used to connect the steel pipe to the PVC pipe at ground level.

2.2.17 JOINT RESTRAINTS. Joint restraints for buried ductile iron pipe shall be the pipe manufacturer's standard restrained joint system (RJ), or for MJ Bells, joint restraints shall be MEGALUG® as manufactured by EBAA Iron Sales, Inc., or approved equal.

2.2.18 BEDDING MATERIALS. Bedding materials shall be in accordance with Article 4.2.1, Pipe Bedding Materials, of these Standard Specifications.

2.2.19 CONCRETE. Concrete shall conform to Article 5, Concrete Work, of these Standard Specifications.

2.2.20 STEEL CASINGS FOR BORES. Steel casing pipe shall comply with all applicable requirements of Article 3.3.8, Steel Casings for Bores, of these Standard Specifications.

2.2.21 SERVICE LINE EQUIPMENT AND MATERIALS.

A. SERVICE LINE PIPE AND FITTINGS. Service lines shall be seamless copper tube or ductile iron pipe. Service line materials shall conform to one of the following specifications:

1. Seamless copper tube, Type K (soft), shall be used for service lines three-fourths inch (3/4") through 2 inches (2") for buried installations. Type L copper shall be used for exposed copper piping. Pipe fittings for "K" copper service lines shall be all brass construction in accordance with AWWA C-800. Fittings used inside a building or a meter vault (2" meter and larger) may be of the sweat copper type.
2. Ductile Iron Pipe shall be used for all service lines three inch (3") and larger. Pipe fittings for DIP service lines shall comply with Articles 2.2.3 and 2.2.4 of these Standard Specifications.

B. CORPORATION STOPS. Corporation Stops shall be manufactured in accordance with AWWA C800, with AWWA taper thread on the inlet side.

C. CURB STOPS. Curb stops/ball valves shall have a body constructed of 85-5-5-5 waterworks brass with flared outlets. Styles shall be Ford Ball #B-22, Mueller #H-15204, or approved equal.

D. CURB STOP BOXES. Curb stops which are not installed in meter boxes shall be equipped with a box. Curb stop boxes shall be arch pattern base, which do not permit the transfer of loading onto the curb stop valve. Curb boxes shall be constructed of cast iron and steel, as manufactured by The Mueller Company or approved equal.

E. PRESSURE REGULATORS. The regulator shall be a Watts Model 25AUB. If the property falls into a high-pressure zone (higher than 120 psi at the meter) the developer or builder will need a high-pressure zone service installation which diverts flow to the floordrain in the event of a pressure regulator failure.

F. METER COUPLINGS. Meters one and one-half inch (1-1/2") and larger shall be provided with a coupling to allow for the removal of the meter without disturbing the pipe. Couplings shall be Ford LOK-PAK Meter Couplings or approved equal.

G. METER SETTERS. Meter setters shall be of an all copper and brass construction and shall have a positive 1/4 turn shut-off valve on the inlet side of the setter with padlock wings.

The water meter setting shall provide a continuous, electrically conductive path around the water meter. If a bonding jumper is required, it shall be made of copper with fittings suitable for the bonding jumper and the water pipe material. The meter setting installation shall be in compliance with the NEC, Articles 100, 250-81, 250-94, 250-112 and 250-115(a).

H. VALVES FOR USE WITH METERS. Gate or ball valves three inch (2") and smaller to be used with copper service pipe shall be brass, with non-rising stems and solid wedge disc. Gate valves shall meet the requirements of AWWA Standard C800. Valves shall be Nebco #T22 or Approved equal.

Valves three inches (3") and larger for use with ductile iron service pipe shall be gate valves conforming to Article 2.2.5, Gate Valves, of these Standard Specifications.

I. TAPPING SADDLES. Water service tapping saddles for service lines 2-inch diameter and smaller shall be bronze casting with double silicone bronze straps. Single strap saddles shall not be permitted. Tapping saddles being used shall be Smith-Blair #232, Ford 202B, Mueller #16100 Series, or approved equal.

J. METER PITS AND COVERS. Meter pits shall be as shown in the Details.

2.3 WATER MAIN CONSTRUCTION.

2.3.1 GENERAL. All work will conform to applicable portions of the most current AWWA C600. Installation of Ductile Iron Water Mains and Appurtenances, and to the pipe manufacturer's recommendations, as modified herein.

2.3.2 PIPE INSTALLATION. The Contractor shall provide proper equipment, tools and facilities required for convenient performance of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench in such a manner as to prevent damage to pipe materials and to protect coatings and linings. Under no circumstances shall pipe or fittings be dropped or dumped into the trench; any pipe or fittings that are dumped shall be removed from the work site and shall not be used.

All pipe and fittings shall be carefully examined for cracks and other defects immediately before installation in final position. The groove in the bells of ductile iron pipe shall be full and continuous. Defective pipe or fittings shall be tagged and removed from the job site within twenty-four (24) hours. All foreign matter or dirt shall be removed from the interior and ends of pipe and accessories before they are lowered into position in the trench.

Precautions shall be taken to prevent foreign material, including trench water from entering the pipe. During construction, no debris, tools, clothing, gravel or other foreign materials shall be placed in the pipe. The Contractor shall provide and maintain adequate equipment to properly remove and dispose of all water entering the trench or other part of the work. At times when pipe laying is not in progress, the open ends of pipe shall be closed by means of a water tight plug.

Cutting of pipe for inserting valves, fittings, or closures pieces shall be done in a neat and workman-like manner without damage to the pipe or lining. Cuts shall result in a smooth end, at right angles to the axis of the pipe. Pipe ends shall be smooth and beveled with a file or other tools according to the pipe manufacturer's recommendations.

Rubber gaskets shall be lubricated and installed according to the manufacturer's recommendation. Extreme care shall be used to keep joints clean during assembly.

Ductile iron pipe, fittings and appurtenances in proximity to gas lines equipped with cathodic protection (rectifier type) shall be protected with polyethylene film wrap per the

most current AWWA standard C-105. Miscellaneous steel or other ferrous pipe for blow-offs, etc., shall be similarly protected.

2.3.3 ALIGNMENT AND GRADE. Where required by the Authority, field survey parties under the supervision of a registered land surveyor shall determine alignment and grade of the pipe and the location of fittings, valves, and hydrants. The required minimum depth of cover between the top of the pipe barrel and the finished grade shall be 4'-0". The water main shall be laid to the required lines and grades with fittings, valves, and hydrants at the required locations.

2.3.4 THRUST BLOCKS. Thrust blocks shall be constructed at all bends and fittings in addition to joint restraint systems such as Megalugs®. Care shall be taken not to block outlets or to cover bolts, nuts, clamps or other fittings or make them inaccessible. A bond breaker shall be placed between the pipe and the thrust block to aid in ease of future removal. Thrust blocks shall bear against undisturbed earth. Formwork for thrust blocks and anchors shall be constructed using wood forms. Wood forms shall be removed before backfilling. Newly placed thrust blocks shall be allowed to set, undisturbed, for a minimum of twenty-four (24) hours prior to backfilling, tamping or compacting.

2.3.5 MECHANICAL JOINT RESTRAINTS. Mechanical joint restraints shall be used at all bends and fittings along with thrust blocks. In addition, mechanical joint restraints shall be installed at the following locations:

1. Fire hydrants.
2. Fire sprinkler connections.
3. Domestic connections.
4. Vertical bends.
5. Vertical offsets.

When pipe is to be buried, harness rods may be used only when the use of thrust blocks or a mechanical joint restraint is not feasible. Harness rods shall be used only at locations shown on the approved plans and only with prior approval of the Authority. Harness rods intended for buried service must be encased in polyethylene sleeves and taped at both ends to prevent corrosion.

2.3.6 SETTING VALVES AND HYDRANTS. Immediately prior to the installation of a valve or hydrant the valve or hydrant shall be carefully inspected; the interior shall be thoroughly cleaned; the valve or hydrant shall be operated as many times as necessary to determine that all parts are in proper working order with the valve seating properly and the hydrant drain valve operating properly. Valves and hydrants shall be set plumb, in a vertical position and securely braced in place. Each hydrant shall have a six-inch (6") gate valve on the inlet line and shall be connected to the main by a six-inch (6") ductile iron pipe.

Hydrants shall be set six-inches (6") above the established finished grade, with hose nozzles parallel to the curb or centerline of the street, and the pumper nozzle facing the curb or street.

Valves shall be provided with valve boxes centered and plumb over the operating nut of the valve. The boxes shall be supported by the soils and isolated from the valve to prevent any shock or stress being transmitted to the valve. Valve boxes shall be maintained in position during backfilling.

Hydrants shall be provided with a drainage pit with nine (9) square feet of surface area and two feet (2') of depth below the barrel of the inlet. Pits shall be backfilled with one and one-half inch (1-1/2"), washed, crushed rock to a level six inches (6") above the barrel drain hole. A concrete thrust block shall be provided at the bowl of each hydrant (as shown on the Standard Detail) and shall be placed so as to not obstruct the barrel drain hole. Hydrants and valves shall be backfilled to the ground surface as specified in Article 4, Site Work and Earthwork, of these Standard Specifications.

2.3.7 STEEL CASING AND CARRIER PIPE INSTALLATION. Steel casing and carrier pipe shall be installed in accordance with Article 3.3.8, Steel Casings for Bores, of these Standard Specifications.

2.3.8 PLUGGING OF DEAD ENDS. Standard plugs or caps shall be installed at dead ends of all fittings and pipes, and adequate restraint shall be provided.

2.3.9 FILLING AND VENTING THE LINE. Only Authority personnel shall operate valves. Pipelines shall be slowly filled with water and all air expelled from the pipe. All hydrants, air and vacuum relief valves, and other vents shall be open during the filling of pipelines. Where hydrants or other permanent vents are not available in the line, the Contractor shall install the required temporary vents. The rate of filling pipelines shall not exceed the venting capacity. RPZs are required for fill valve assemblies used to fill new pipelines which have not been disinfected.

2.3.10 DISINFECTION AND FLUSHING MAINS. Disinfection and flushing shall be performed in accordance with AWWA C651, "Standard for Disinfecting Water Mains".

The chlorine solution shall be retained in the line for at least twenty-four (24) hours. The chlorine residual at the pipe extremities and other representative points shall be at least twenty-five (25) parts per million at the end of the twenty-four (24) hour period. If the test is not satisfactory, the disinfection shall be repeated until a twenty-five (25) parts per million of chlorine residual is obtained.

Following chlorination, the main shall be thoroughly flushed until the water runs clear with no chlorine residual in excess of that carried in the existing system.

The contractor shall take the necessary precautions to prevent any chlorine solution or residual flow into existing water facilities or receiving waters and shall assume responsibility for any damages caused by heavily chlorinated water. Water mains shall not be placed in service or tapped until successful chlorination and bacteriological testing have been performed. These samples shall be delivered to an approved, certified testing laboratory for tests by the Authority, and if samples show evidence of contamination upon testing, the above procedure of disinfection shall be repeated until approved samples are obtained. No connections shall be made to the existing system until all of the samples have been tested and approved.

Following disinfection and flushing, a bacteriological test shall be performed. Authority personnel will take samples for bacteriological testing. If the test fails, the line shall be re-

chlorinated, re-flushed and retested. The Authority will require at least forty-eight (48) hours notice for testing. No Testing/Samples on Mondays or Fridays.

- 2.3.11 LEAKAGE TESTING.** Pressure and leakage tests shall be conducted in accordance with AWWA C600. Test pressure shall be the greater of working pressure plus fifty (50) psi or one hundred fifty (150) pounds per square inch, measured at the high point of the section being tested. The maximum length of line to be tested shall be one thousand feet (1,000'). All joints in connections shall be watertight within tolerances set forth in AWWA 600. Any leakage that is discovered by observation or tests shall be located and corrected by the Contractor. Pressure and leakage tests shall not be conducted until the line has been disinfected. Please refer to AWWA standard C-600, "Installation of Ductile Iron Pipe Water Mains and their Appurtenances. "

The Authority will furnish the necessary water for testing the lines where appropriate. However, any water lost through breakage of the lines or unnecessary or excessive flushing of lines will be charged to the Contractor.

Any section of the line not meeting the above test shall have the leaks found and corrected at once and re-tested until the leakage falls within the limits specified above. All water used for re-testing shall be paid for by contractor.

- 2.3.12 TRACE WIRE.** Tracer wire and locater tape is required on all pipelines (both metal and PVC). Tracer wire shall be electric conductive wire to meet the USA Standard Code for pressure piping USAS 831.8 Paragraph 842.431 (9) and shall be taped to the pipe at 4' intervals. Locater tape shall be similar and equal to Lifeguard Type II with standard imprint-"Caution Water Line Below", by Lifeguard, Inc. P.O. Box 426, Wheaton, Illinois 60187 and shall be installed 12 to 18 inches above the pipe. All water main pipeline shall be marked. Trace wire test stations are to be located at all blow offs, and behind all fire hydrants. Wire shall be a minimum of 12 AWG. After installation there shall be a minimum of twenty four inches (24") of slack wire available in the test box or valve box.

- 2.3.13 TRENCHING.** Trenching for water and sewer lines shall be separated horizontally at least ten (10) feet apart. Trenches shall remain open after taps are made until the Authority's operations personnel can inspect all installations. Water service lines shall be installed according to detail. Common trenching is not allowed unless approved in writing by the Authority.

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