

POTABLE WATER PIPING – SECTION 350

I. GENERAL

I.1. SCOPE OF WORK

The Contractor shall furnish and install a potable water piping system, complete, tested and ready for operation. The work shall also include such connections, reconnections, temporary service and all other provisions in regard to the existing operation and modification as is required to perform the new work. All references to Industry Standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless otherwise stated. Only those materials included in the JEA Water and Wastewater Standards Manual shall be installed. All materials shall be new unless specifically called for otherwise and shall adhere to the 2014 EPA standards for lead free brass. For the supply of domestic water during construction, the contractor shall utilize a JEA meter assembly (meter & back flow device) except in the case where the new main is connected directly into the active water system for line filling and flushing operation. Un-metered reclaimed water may be utilized for flushing and testing of new reclaimed water mains. Un-accountable domestic water quantities shall be minimized, where possible.

I.2. PROJECT SCHEDULE AND COOPERATION

The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, eight hours per day or four days per week, single shift, ten hours per day. Unless approved otherwise by JEA, normal or general items of work, such as bacteriological testing, leakage and pressure testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational and manpower limitations on the JEA systems, JEA will require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations, including but not limited to, line filling and flushing operation, tie-in work (cut-in work or other tie-in work) and other phases of the work which may impact the continued (non-interruptible) service to existing JEA customers. The contractor shall plan and anticipate the cost impact of these system limitations and provide such work or services at no additional cost to JEA.

I.3. SHOP DRAWING SUBMITTALS

Actual catalog data, brochures and descriptive literature will not be required for items of standard usage, which meet the requirements of Chapter X. and Chapter XI. of the JEA Water and Wastewater Standards Manual. Any specialty item not shown in this manual will require a complete shop drawing submittal. The Engineer may at any time require the Contractor to provide a complete detailed shop drawing submittal for any material, which may, in the Engineer's opinion, not be in compliance with the JEA Water and Wastewater Standards.

I.4. AS-BUILT DRAWING

As-built drawings to be utilized in future utility locate work are required on all water, wastewater, force main, pump station, chiller lines and reclaimed water projects, including projects for JEA, City of Jacksonville, JTA, DOT, private developments (utilities to be dedicated to JEA), and other City Authorities, etc. As-built drawings shall be in accordance with Chapter VI. 1. - Section 501, entitled "As-built Drawings". As built drawings shall be reviewed and approved by JEA. The cost to provide as-built drawings shall be included as part of the related work requirements or general conditions for the utility work. In addition, as-built drawings are required which meet current regulatory rules regarding "water main clearances" and "certification of completion" rules regarding (C.O.C.).

I.5. WARRANTY

The Contractor shall provide to JEA a two (2) year unconditional warranty after substantial project completion or any designed portion thereof or after total project acceptance. The warranty shall

include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

I.6. LOCATE WIRE BOX AND INSPECTION CHECKLIST

All Locate wire boxes shall be outside of driveways, sidewalk and pavement. Locate wire boxes are to be marked on the curb, cut with a "LW" and the color of the utility it serves. Locate wire shall be installed on hydrant independent valves and no access points on a potable water, reclaim, sewer force main should be missed. On new installations, splices should be minimal unless a repair is required. Contractor shall schedule a final walk through (prior to substantial completion) in order to create a punch list for each project. List of attendees shall include but not be limited to the Contractor's representative, JEA representative (ie. project inspector), and designated JEA Operation personnel. Contractor shall be required to provide a crew complete with all necessary equipment to allow observation of each new locate wire box. The Contractor's representative shall complete the associated JEA "Final Inspection Checklist" located on JEA.com for each new locate wire box, and have the JEA attendees provide original signatures/names on the signature block. The JEA representative shall scan the checklists and ensure the documents are filed in the electronic file folder for the project. Locate wire certification email address locatewire@jea.com for submittals of final testing results.

II. **MATERIALS**

All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified, and shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

II.1. PIPE

Pipe for potable water lines in sizes up to 16 inches direct bury shall be ductile iron, polyvinyl chloride (PVC) or high density polyethylene (HDPE), as shown on the drawings and as herein specified. Pipe for potable water lines 20" and larger direct bury shall be ductile iron. Pipe to be used as a casing in sizes 4 inches and larger shall be welded steel pipe as shown on the drawings and as herein specified. Pipe to be installed underground shall be push-on joint type. Pipe installed on bridges, piles or other above ground installations shall be push-on restrained or mechanical joint utilizing fast-grip gaskets (American Pipe), Field Lok gaskets (U.S. Pipe), restrained mechanical joint ductile iron pipe or flanged ductile iron pipe as described in these specifications (Bell and rod restraints shall not be used unless approved otherwise by JEA). PVC pipe shall not be used in above ground applications. Underground pipe shall be furnished in nominal 18 or 20 foot laying lengths unless indicated otherwise on the drawings. Pipe shall be cut to length as required to fit installation conditions. PVC or HDPE piping shall not be utilized on bridges or other above ground applications. For water mains and service lines (from main pipe to back flow device) in contaminated soils (as defined by regulatory agencies), ductile iron pipe with nitrile (NBR) gasket material shall be utilized on 4-inch and larger pipes, and galvanized pipe shall be utilized on 2-inch and smaller pipes (the use of PVC or HDPE pipe shall be prohibited). Pipe sizes and applications shall conform to the following chart.

PIPE	PIPE SIZE	JOINT TYPE	APPLICATION
Ductile Iron	4 inches and larger *	Mechanical joint, push-on joint, flanged joint, ball joint, etc.	water mains and services (above ground or below ground)
	3 inches	Mechanical joint, push-on joint	water service only (below ground)
PVC DR14, DR18 (C900)	4 -12 inches *	Push-on joint	water mains and services (below ground)
PVC DR14, DR18, DR25 (C905)	16-inches only	Push-on joint	water mains and services (below ground)
PVC DR-18 (fusible joints)	4-12 inches *	Fusible-PVC	water mains & services (below ground)
SCH 40 PVC	2 inches only	Solvent Weld	water mains only (below ground)
SCH 80 PVC	2 inches only	Solvent Weld	water mains only (below ground)
SDR 21 PVC	2 inches only	Push-on joint	water mains only (below ground)
Polyethylene	2 inches and smaller	No mechanical joints in pipe under roadway	services only (below ground)
Polyethylene (HDPE)	4 inches and larger	Fused (no more than 3 fused joints per 20 foot section)	directional drill or pipe bursting only, unless approved by JEA (below ground)
Galvanized	smaller than 3 inches	I.P.T.	contaminated soil sites (below ground)
Steel	4 inches and larger	Welded	casing only

*Pipe sizes 14" and 18" shall not be utilized unless specifically approved by JEA with the exception of HDPE.

II.1.1. DUCTILE IRON PIPE

Ductile iron pipe wall thickness and pressure class shall conform to ANSI Specification ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151) with pressure class 150 as a minimum. Pipe shall also be certified by ISO 9000 by an accredited registrar. Each length shall be clearly marked with the name of the manufacturer, location of the foundry, pressure rating, thickness or pressure class, nominal pipe diameter, weight of pipe without lining and length. All pipe furnished by the manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. All ductile iron pipe shall be externally coated and internally lined as specified in this section. All ductile iron pipe shall be color coded blue by field applying a 3-inch wide

utility marking tape (tape with adhesive backing), along the crown of the pipe barrel. For large diameter pipe (12 inches and greater), a filler gauge may be utilized during the installation to check for rolled gaskets.

II.1.2. POLYVINYL CHLORIDE PRESSURE PIPE

Pipe shall be virgin polyvinyl chloride (PVC) pipe for potable water and shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Elastomeric seals shall meet ASTM F477 and shall be attached to the bell utilizing glue (AWWA and manufacturer approved type) or rieber ring. The pipe material shall be clean, virgin, National Sanitation Foundation No. 14 approved, Class 12454-A or 12454-B PVC compound conforming to ASTM resin specification D1784. Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. Storage and handling of PVC pipe shall be in accordance with chapter 6 of AWWA Manual M23. All PVC potable water pipe shall be blue. All PVC raw water main piping shall be white with a 3-inch wide warning tape (non-detectable type) which indicates "RAW WATER MAIN".

II.1.2.1. PVC 1120, CLASS 100, DR 25 PIPE

Pipe shall conform to AWWA Standard C905 for 16 inch pipe. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters.

II.1.2.2. PVC 1120, CLASS150, DR 18 PIPE

Pipe shall conform to AWWA Standard C900 for 4 inch through 12 inch pipe. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters.

II.1.2.3. PVC 1120, CLASS 200, DR 14 PIPE

Pipe shall conform to AWWA Standard C900 for 4 inch through 12 inch pipe. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters.

II.1.2.4. PVC 1120, PR200, SDR21 PIPE

Pipe shall conform to ASTM D2241 and shall be used only for the construction of 2 inch water mains. Blue color pipe is preferred, but if not available then white or grey color pipe may be utilized with the addition of 3 inch wide (minimum) non-detectable utility tape (tape with an adhesive backing). Pipe is to be manufactured to I.P.S. (Steel) Standard Pipe equivalent outside diameters. Pipe shall be marked NSF- PW approved.

II.1.2.5. PVC 1120, SCHEDULE 40 and SCHEDULE 80 PIPE

Pipe shall conform to ASTM D1784 and D1785 and shall be used only for the construction of 2 inch water mains. Blue color pipe is preferred, but if not available then white or grey color pipe may be utilized with the addition of 3 inch wide (minimum) non-detectable utility tape (tape with an adhesive backing). Pipe is to be manufactured to I.P.S. (Steel) Standard Pipe equivalent outside diameters. Pipe shall be marked NSF-PW approved. To ensure water tight

connection, the contractor shall utilize "purple primer" and "rain or shine glue" or JEA approved equal.

II.1.2.6. STEEL CASING PIPE

Pipe to be used as a casing shall conform to either ASTM Standard A139 for "Electric Fusion (arc) Welded Steel Pipe" with minimum yield strength of 35,000 psi or "API Specification API-5LX, Grade X-42 Welded Steel Pipe". Wall thickness shall meet the requirements of the latest Revision of the American Railway Engineering Association Manual of Recommended Practice or the Florida Department of Transportation Standard Specification for Road and Bridge Construction, as applicable. For street uses which are not DOT or railroad, use DOT casing thickness unless otherwise indicated by Engineer. All pipe furnished by the manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. Full pipe length shall be provided. No short pipe lengths less than 8 feet long will be allowed unless approved by JEA. The pipe ends shall be tapered where welding is required.

II.1.3. GALVANIZED PIPE

Galvanized pipe shall be 2-inch for flushing hydrants or for contaminated soil sites (when specified) only. Galvanized pipe shall be schedule 40, hot-dipped galvanized, welded (seamless) pipe in accordance with ASTM A53. Pipe is to be manufactured to I.P.S. (Steel) Standard Pipe Equivalent outside diameters. No color code on the pipe is required.

II.1.4. HIGH DENSITY POLYETHYLENE (HDPE) PIPE

It should be noted that the use of this product (especially for DR-11 pipe) may require up-sizing the main so that the inside diameter is approximately the same as PVC size where applicable. See Horizontal Directional Drilling (Chapter VI. 2. - Section 750 and 755) for technical specifications for this product and associated construction standards.

II.1.5. POLYETHYLENE TUBING SERVICE LINES AND MAINS (2-INCH AND SMALLER)

All services and mains 2 inches and smaller shall be polyethylene tubing. Tubing shall be manufactured of PE 4710, High Density Polyethylene (HDPE), in accordance with AWWA C901, ASTM D1248, ASTM D2239, ASTM D2737 and ASTM D3350. The tubing shall have a minimum working pressure of 250 psi. Polyethylene tubing shall be copper tube size SDR-9 and shall be colored blue. HDPE pipe shall have ultraviolet (UV) inhibitors for protection against direct sunlight for 1 year. Inserts for polyethylene tubing may be utilized, at contractors' options, and, if used, shall be 316 stainless steel. The use of no-lead brass couplings, tees and "Y" fittings are acceptable on poly service tubing, if not located under the roadway. Tubing shall be approved for use with potable water by the National Sanitation Foundation (NSF-14) and shall be continuously marked at intervals of not more than four feet with the following:

- II.1.5.1. Nominal size
- II.1.5.2. Pressure rating
- II.1.5.3. NSF seal
- II.1.5.4. Manufacturer's name or trademark
- II.1.5.5. Standard dimension ratio
- II.1.5.6. ASTM specification

II.1.6. FUSIBLE PVC PIPE (4"-12" SIZE)

May be used on potable water or reclaimed water systems. Fusible PVC may be utilized for directional drilling and direct bury applications. Pipe shall meet C-900 pressure class, DR-18 wall thickness and color coded. The pipe shall be marked with the name and

location of the manufacturer, pressure rating and size. Unless approved otherwise by JEA, the bending radius shall not exceed 50% of the manufacturer's recommendation and the pulling force shall not exceed 80% of the manufacturer's recommendation.

II.2. FITTINGS

Fittings shall have joints that match the type of pipe furnished except as follows or as otherwise specified. PVC fittings (2-inch size) may be push-on bell type joint or solvent weld. Fittings 3 inches and larger on push-on joint pipe installed underground shall be ductile iron with restrained mechanical joint ends or PVC with restrained push-on bell type joint. Fittings 3 inches and larger installed above ground shall be ductile iron with flanged ends or restrained joints unless shown otherwise on the drawings.

II.2.1. DUCTILE IRON FITTINGS

Ductile iron fittings shall have a minimum working pressure of 250 psi. Fittings shall conform to ANSI Specification A21.10 (AWWA C110), A21.11 (AWWA C111), A21.15 (AWWA C115) and/or A21.53 (AWWA C153). Fittings shall also be certified by ISO 9000 by an accredited registrar. Compact fittings shall normally be installed. Long body fittings shall be used where the drawings specifically call for long body fittings, where compact fittings are not available, or at the option of the Contractor when the laying length is not controlled by compact fitting patterns. All fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable. All fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. Fittings shall have cast on them the pressure rating, nominal diameter of openings, manufacturer's name, foundry location, plant code and degrees or fraction of the circle. Cast letters and figures shall be on the outside body of the fitting. The JEA may require random ductile testing of manufacturer's fittings. All ductile iron fittings shall be externally coated and internally lined as specified in this section. Ductile iron welded-on outlets are not acceptable. In lieu of ductile tee/fittings, a tapping sleeve may be utilized on 24 inch and larger (D.I.P. or PVC) pipe for outlets 12-inch and smaller.

II.2.2. POLYVINYL CHLORIDE FITTINGS

Fittings that are 2-inch may be PVC with push-on bell type joint or PVC with solvent weld joints as outlined above. Fittings that are 4 inches and larger shall be restrained push on bell joint. Restraints shall be in accordance with this specification regarding installation and material. The fittings shall conform to the appropriate sections of these specifications for PVC pipe and PVC pipe joints.

II.2.2.1. PVC 1120, CLASS 150, DR18 FITTINGS

PVC fittings 4-inch through 12-inch may be used with PVC C900 pipe. Fittings shall be PVC injection molded, made from materials meeting or exceeding the requirements of cell class 12454-B material as defined in ASTM D1784. All PVC fittings must comply with, or exceed, AWWA C907. All fittings must be designed to the pressure class of DR18, with a pressure rating of 150 psi and a 2.5 to 1 factor of safety. Virgin materials only shall be used in the manufacture of PVC pressure fittings. These fittings must have UL-FM approval and shall comply with or exceed all ASTM Standards for PVC fittings. All fittings must have NSF-61 approval. The elastomeric gasket shall comply with the requirements specified in ASTM F477 and shall be attached to the bell utilizing glue (AWWA and manufacturer-approved type) or rieber ring.

II.2.2.2. PVC 1120, SDR 21, FITTINGS

SDR 21 fittings shall be injection molded, push on bell type with elastomeric rubber seals in accordance with ASTM D3139. Seals shall conform to ASTM F477.

II.2.2.3. PVC 1120, SCHEDULE 40 and SCHEDULE 80 FITTINGS

Schedule 40 and Schedule 80 fittings shall have solvent weld joints and shall be in accordance with ASTM D2672.

II.2.2.4. POLYETHYLENE FITTINGS

See "Horizontal Directional Drilling", (Chapter VI. 2. - Section 750), for technical specifications for this product and associated construction standards.

II.2.3. NONSTANDARD FITTINGS AND WALL CASTINGS

Fittings having nonstandard dimensions and cast specifically for this project shall be of approved design. They shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect. Wall castings shall be of the size and types indicated on the drawings. Flanges, facing, and drilling shall conform to the 125-pound American National Standard. Flanges shall be drilled and tapped for studs. Other dimensions shall be substantially equal to corresponding parts of standard bell and spigot fittings.

II.3. JOINTS

Type of joint used shall meet the following specifications or be approved by the Engineer prior to installation. Joints shall be made in accordance with approved printed instructions of the manufacturer, and shall be absolutely watertight.

II.3.1. MECHANICAL JOINTS

All jointing materials for mechanical joints shall be provided by the pipe and/or fitting manufacturer. Material assembly and bolting shall be in accordance with ANSI Specification A21.11 (AWWA C111). All glands shall be made of ductile iron only.

II.3.2. PUSH-ON JOINTS

II.3.2.1. DUCTILE IRON

Push-on joints shall be in accordance with ANSI Specification A21.11 (AWWA C111). All joint material shall be provided by the pipe manufacturer and installation shall be in accordance with the manufacturer's recommended practice.

II.3.2.2. POLYVINYL CHLORIDE (PVC)

PVC pipe joints shall be the manufacturer's standard push-on bell type with rubber sealing ring in accordance with ASTM D3139. Elastomeric gaskets shall conform to ASTM F477.

II.3.3. BALL AND SOCKET JOINTS

Where subaqueous joints are indicated, joints shall be bolted or boltless flexible ball and socket joints conforming to the pressure and thickness requirements of ANSI A21.10 (AWWA C110) and ANSI A21.51 (AWWA C151) and shall be capable of providing a maximum deflection of fifteen degrees at each joint. Joints and gasket material shall be manufacturer's standard. The specific type joint shall be as shown on the drawings and/or as approved by the Engineer. Installation shall be in accordance with the manufacturer's recommended practice.

II.3.4. FLANGED JOINTS

Ductile iron flanged joints shall conform to ANSI A21.10 (AWWA C110) and ANSI A21.15 (AWWA C115). Flanges shall be in accordance with ANSI Specification B16.1, Class 125 with any special drilling and tapping as required to insure correct alignment and bolting. Screwed flanges shall be

screwed in tight at the foundry by machine before they are faced and drilled. Flanges for flanged joints and flanged specials shall be integrally cast at right angles to the axis, accurately faced, and drilled smooth and true. Gaskets shall be rubber ring type, cloth inserted, with minimum thickness of 1/8 inch and shall be used on all flanges. The entire gasket, including the retainer and sealing ring, shall be one continuous piece. Retainers glued together will not be accepted. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI standard as the flanges. Bolts and nuts shall be of Grade B conforming to the ASTM Specifications for steel machine bolts and nuts and tap bolts, designation A307. Bolt studs shall be of the same quality as machine bolts. Bolts shall be tightened so as to distribute evenly the stress in the bolts and bring the pipe in alignment. The Contractor shall provide suitable filling rings where the layout of the flange piping is such as to necessitate their use. In materials, workmanship, facing and drilling, such rings shall conform to ANSI B16.1 Class 125.

II.3.5. MACHINED SURFACES

Machined surfaces shall be cleaned and coated with a suitable rust preventive coating at the shop immediately after being machined.

STEEL CASING JOINT PIPES

Steel casing pipe joints shall be electric fusion (arc) welded by operators whose qualifications meet the requirements of the American Welding Society Standard procedures and in conformance with AWWA C206. For field welds, the joints to be welded shall be tapered (approximately 45 degree taper).

POLYVINYL CHLORIDE SOLVENT WELD JOINTS

Pipe joints for schedule 40 or schedule 80 pipe shall be solvent weld joints. The solvent cement shall comply with ASTM D2564. The joint shall be made in accordance with ASTM D2855. The joint shall conform to ASTM D2672.

POLYETHYLENE JOINTS

II.3.5.1. Polyethylene joints shall be butt-fused, done with polyethylene fittings or no-lead brass compression fittings.

II.3.6. RESTRAINED JOINTS

II.3.6.1. RESTRAINERS

The restrainer shall be manufactured of ductile iron and shall meet or exceed all the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shall provide anchoring ductile iron pipe and fittings, valves and PVC pipe to mechanical joint pipe or fittings, or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance. In the assembly of the restraint device, the contractor shall tighten the bolts to the correct torque range as recommended by the restraint manufacturer. The restrainers shall be painted black for ductile iron pipe and painted red for PVC pipe applications. The restraining device shall not damage or lower the working pressure of the pipe installed. Restrainers shall be properly stored to minimize sand and debris build-up. Specifically, the twist-off-screws and associated threads shall be clean (free of sand) prior to installation.

II.3.6.2. RESTRAINERS SPECIFICALLY FOR DUCTILE IRON PIPE

Joints may be restrained by utilizing a joint restraint gasket which includes a stainless steel locking segments vulcanized into the rubber gasket. The gasket shall be rated for operating pressures up to 250 psi based on the performance requirements of ANSI/AWWA C111/A21.11, Standard for

Rubber – Gasket Joints of D.I.P. & F. Pipe Manufacturer's restraints for joint restraints designed for operating pressures of up to 250 psi minimum will also be acceptable if approved by JEA..

II.3.7. FLANGE ADAPTERS

Flanged adapters shall only be utilized if no other method is possible. Flange adapters shall be ductile iron manufactured to ASTM A536 standards. Bolt circles and bolt holes shall meet ANSI B16.1 for 125 pounds. Adapter flanges shall meet or exceed all test requirements of AWWA C900, ASTM D2241 and ASTM D1599.

II.3.8. PIPE COUPLINGS

The Contractor shall furnish and install pipe couplings as required to complete the work. Pipe couplings used to join two pieces of ductile iron pipe or PVC pipe shall be sized to match the outside diameter of the pipeline. Transition couplings shall be used to join pipes of different outside diameters. The coupling sleeve shall be manufactured of ductile iron conforming to ASTM A536 and be coated with 14 mils of epoxy. The bolts shall be manufactured of a metal of high corrosion resistance and shall conform to ANSI 21.11 (AWWA C111). Gaskets shall be wedge-type and manufactured of virgin SBR for water and wastewater service. The installation of all couplings shall be in accordance with latest manufacturer's recommendations. Unless approved otherwise by JEA, the maximum gap between pipe ends shall be: (based upon sleeve length) 5" sleeve, 1" gap; 7" sleeve, 2" gap, 10" sleeve, 3-1/2" gap; other per manufacturer's recommendation. Couplers and adapters for polyethylene pipe shall be no-lead brass conforming to AWWA C800 and shall be female IPS, pack joint or compression nut.

II.3.9. FULL CIRCLE REPAIR CLAMPS

Full circle repair clamps shall have type 304 stainless steel shells, lugs, bolts, nuts and washers as per ASTM A193, A194, A240, or shall have type 304 stainless steel shells per ASTM A240, ductile iron lugs as per ASTM A536, and 304 stainless steel bolts, washers and nuts. Gaskets for both types shall be virgin SBR as per ASTM D2000 for water service. Minimum lengths shall be 7½" long for 6" nominal and smaller pipe, 12" long for 8" – 12" nominal pipe and 20" long for pipes larger than 12" nominal pipe.

II.3.10. EXPANSION JOINT FITTINGS

Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron. The type, location and quantity of expansion joint fittings shall be specifically designed by the design engineer and shown on the construction drawings. The expansion joint shall be designed to protect the pipe main against damage from thermal linear expansion. Linear expansion joints shall be factory-set for 50% expansion/50% contraction. The expansion joint may include an integral ball and socket type flexible joint. The fitting shall be lined with a minimum of 15 mils of fusion-bonded epoxy. The expansion joint fitting shall be pressure tested to 350 psi (250psi for 30-inch and larger). Acceptable manufacturers include EBAA Iron, Star or approved equal.

II.4. CORROSION PROTECTION FOR DUCTILE IRON PIPE

II.4.1. INTERIOR LINING

The interior of all ductile iron pipe, fittings and specials shall be thin cement lined with a seal coat. The lining shall comply with ANSI Standard A21.4 (AWWA C104). High-speed cement lining, (offered by American Pipe) is acceptable with no seal coat.

II.4.2. EXTERIOR COATING

All ductile iron pipe and fittings except as otherwise noted, shall receive an exterior bituminous coating as specified in ANSI A21.51. The finished coating shall be continuous smooth, neither brittle when cold nor sticky when exposed to the sun, and be strongly adherent to the fitting. In areas where soils are corrosive in nature, all bolts, nuts, studs and other uncoated parts of joints for underground installation shall be coated with asphalt or coal-tar prior to backfilling. Corrosive soil shall be defined as described in AWWA-C105, appendix "A".

II.4.3. MARKING FOR DUCTILE IRON PIPE AND 2" PVC PIPE

All ductile iron pipe and 2" PVC pipe below ground shall be marked with a 3 inch wide (minimum), non-detectable utility marking tape (tape with an adhesive backing). The utility marking tape shall be installed on the pipe at the 12:00 o'clock position. Tape shall be 4 mil (minimum) ASTM D2103 thickness constructed for prolonged use underground, meet the industry standards (APWA) color code, tensile strength of 2750 psi (ASTM D882), and industrial standard repeatable message. All ductile iron pipe above ground (including bridge crossing) shall be color labeled "Water" stenciled in the center of each joint of pipe utilizing oil based paint. Stenciled lettering shall be 4" (minimum), high lettering and be blue color.

II.4.4. POLYETHYLENE WRAP

In areas where soils are corrosive in nature, ductile iron pipe, fittings, valves and other appurtenances shall be protected with polyethylene wrap or tubing. Corrosive soil shall be defined as described in AWWA-C105, appendix "A". The Contractor shall furnish and install polyethylene tube or wrap for ductile iron pipe at the locations shown on the construction drawings or as directed by JEA.

II.4.4.1. MATERIAL

The polyethylene material shall meet or exceed the requirements of ANSI A 21.5/AWWA C105 in all respects. The wrap shall be virgin, high density polyethylene, 4 mils thick minimum cross laminated type or 8 mils linear low density type. The polyethylene wrap shall be included industrial standard repeatable message blue color.

II.4.4.2. INSTALLATION

Although not intended to be a water-tight enclosure, the polyethylene shall prevent contact between the pipe and the surrounding backfill. Installation shall be done according to one of the methods described in AWWA C105, subject to approval by the Engineer and the manufacturer.

II.5. PIPING SUPPORTS

II.5.1. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or as specified.

II.5.2. Piping within pumping stations shall be adequately supported from floors, walls, ceilings or beams. Supports from the floor shall be by approved saddle stands or suitable concrete piers as indicated or approved. Pipe saddles shall be shaped to fit the pipe with which they will be used and shall be capable of screw adjustment. Concrete piers shall conform accurately to the bottom one-third to one-half of the pipe. Piping along walls shall be supported by approved wall brackets with attached pipe rolls or saddles or by wall brackets with adjustable hanger rods. For piping supported from the ceiling, approved rod hangers of a type capable of screw adjustment after erection of the piping and with suitable adjustable concrete inserts or beam clamps shall be used. If required, piping supports shall be placed so as to provide a uniform slope in the pipe without sagging. Supports shall be located wherever necessary, and in no case shall they exceed 8 feet on centers for ductile iron pipe and 4 feet on centers for PVC pipe.

II.5.3. Casing spacers shall be a two piece prefabricated unit by a single manufacturer. All casing spacers in a single casing pipe crossing shall be by the same manufacturer. Casing spacers shall have a shell made from either 304 stainless steel, 14 gauge mild steel which has been heat fusion coated with PVC plastic, (PVC coating shall be .01 inch thick over the entire band including the runner studs) or high density polyethylene.

Casing spacers on 16 inch and smaller carrier pipe shall have 8 inch wide steel bands and casing spacers on greater than 16 inch carrier pipe shall have 12 inch wide steel bands, except high density polyethylene spacers shall have high density polyethylene bands. All casing spacers for 12 inch and smaller pipe size shall have four 10 gauge or 14 gauge steel risers with runners and casing spacers for 16 inch and larger pipe shall have six 10 gauge or 14 gauge steel risers with runners (two top and four bottom), except high density polyethylene spacers shall have one riser for every diameter inch of carrier pipe. The runners (risers) shall be either glass reinforced plastic, UHMW polymer or high density polyethylene. All nuts, bolts and washers shall be 304 stainless steel. All risers over 2 inches in height shall be reinforced. Wooden skids are not an acceptable alternate.

II.6. LOCATE WIRING

Locate wire shall be installed on all PVC, ductile iron and HDPE water main piping, and services 10 LF or greater in length. No wire shall be installed on above ground installations (must meet minimum installation requirements, see details). Locate wiring for direct bury shall be 12 gauge, copper wire with .03 inches (minimum) HDPE insulation thickness, .141 inches (minimum) O.D. Rated break load 250 lbs., 30 volt, 21% IACS, The outside color of the wire shall be blue. Copperhead and Protrace tracer wire or JEA approved equal.

II.7. MATERIAL TESTING

JEA will perform random testing of all materials furnished for conformance to the following standards. The entire product of any manufacturer or of any one plant may be rejected when, in the opinion of JEA, the methods of manufacture fail to secure uniform results acceptable to the requirements of these specifications. Pipe and materials shall be tested in, and for conformity with, the latest editions of the following:

Item	Specifications
Ductile Iron Pipe and Fittings	ANSI A21.50 (AWWA C150)
	ANSI A21.51 (AWWA C151)
	ANSI A21.53 (AWWA C153)
	ANSI A21.40 (AWWA C104)
	ANSI A21.50 (AWWA C105)
	ANSI A21.10 (AWWA C110)
	ANSI A21.15 (AWWA C115)
Polyvinyl Chloride Pipe and Fittings	ASTM D1598
	ASTM D1599
	ASTM D1784
	ASTM D1785
	ASTM D2122
	ASTM D2241
	ASTM D2564
	ASTM D2672
	ASTM D2837
	ASTM D2855
	ASTM D3139
	ASTM F477
	AWWA C900
	AWWA C905
AWWA C907	
Polyethylene Tubing	ASTM D1248
	ASTM D2239
	ASTM D2737
	ASTM D3350
	AWWA C901

III. INSTALLATION

III.1. REFERENCE POINTS AND LAYOUT

The Contractor shall be responsible for setting all grade, lines and levels. The Contractor or Contractor's Surveyor will provide centerline of construction and will establish a bench mark. Any reference points, points of intersection, property corners, or bench marks, which are disturbed during construction, shall be restored by a Land Surveyor registered to practice in the State of Florida, and all costs thereof shall be borne by the Contractor. The Contractor shall assume all responsibility for the correctness of the grade and alignment stakes.

III.2. HANDLING AND CUTTING PIPE

Every care shall 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. The lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. If damaged, the material shall be repaired in accordance with the liner manufacturer's recommendations. 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, shall be marked as rejected and removed at once from the work. In any pipe showing a distinct crack in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by JEA, may be cut off before the pipe is laid so that the pipe used shall be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack. Except as otherwise approved, all cutting shall be done with a power driven cut off saw. All cut ends shall be examined for possible cracks caused by cutting.

III.3. PIPE INSTALLATION

III.3.1. GENERAL REQUIREMENTS

Water mains shall be constructed of the materials specified and as shown on the drawings. All PVC C900/C905 pipe shall be laid in accordance with AWWA C605. Pipe and fittings shall be carefully handled to avoid damage, and if feasible, while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks. Defective, damaged or unsound pipe or fittings shall be rejected. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. Only suitable soils (no heavy clay) shall be utilized in the backfill operation up to 12 inches above the pipe. The maximum joint deflection shall be limited to 80% of the pipe manufacturer's recommendation. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any time the pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. Any sand or foreign material that enters the pipe shall be removed from the pipe immediately. No pipe shall be installed when trench conditions (standing water, excess mud, etc.) or the weather (rain, etc.) is unsuitable for such work, except by permission of the Engineer. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe. The contractor shall coordinate utility locates with Sunshine State One-Call of Florida, Inc. (# 811 or web site www.callsunshine.com), at a minimum. The use of 90 degree bends 24-inch and larger size shall be avoided if possible (two 45 degree bends or other method is preferred).

III.3.2. SPECIAL CONSTRUCTION REQUIREMENTS FOR 20-INCH AND LARGER PIPE

For pipe 20 inch and larger, unless approved otherwise by JEA, a foundation bed of granular material (57 stone) shall be placed under and around all ductile iron fittings and valves for additional support of heavy system components. A foundation bed of granular material shall be provided for all valves 20 inch size and larger. For granular materials, the minimum vertical limit is 12 inches under the fitting or valve, up to 1/3 the overall height of the fitting or valve. The minimum horizontal limits of the granular material shall be 12 inches in all directions beyond the outer edges of the fitting or valve. The compaction of soils below the granular material shall be at 98% of the maximum density. Payment for this work shall be included in the associated fitting or valve unit cost. Where possible, a full joint of pipe (no short pipe lengths) shall be connected to all fittings and valves. No joint deflection shall be allowed at the fittings or valves.

III.3.3. PIPE COVER

The cover over all piping less than 24-inch size shall be a minimum of 30 inches in unpaved areas and 36 inches in paved areas with a maximum of 60 inches, unless approved otherwise by JEA. The cover over all piping 24-inch size or greater shall be 36-inches (paved or unpaved areas), with a maximum of 84 inches, unless approved otherwise by JEA. Cover for pipe under pavement shall be measured from the finished grade. Any reduction in pipe cover will require approval from JEA and the Engineer. Greater depths will be permitted where required to miss obstructions only. Lines shall be located as shown on the drawings. The Contractor shall investigate well in advance of pipe laying any conflicts which may require readjustments in planned locations and advise the Engineer of the results of these investigations so that the

Engineer may give instructions as to the modifications required. Refer to Chapter II. 3. - Section 408 for backfill and compaction requirements.

III.3.4. INSTALLATION OF IRON PIPING

All iron pipe and fittings shall be laid in accordance with the pipe manufacturer's recommendations and the American Water Works Association Specification AWWA C600.

III.3.5. THRUST RESTRAINT

All non-flanged fittings and valves shall be restrained using one of the following methods:

III.3.5.1. Mechanical restraint at fittings and valves and mechanical restraint along adjacent joints of pipe to a length as specified in the Restraint Joint Schedule (see Plate Nos. W-31A&B), at a minimum.

III.3.5.2. Mechanical joint fittings and valves shall be restrained using an approved restraining device and/or tie rods along adjacent joints of pipe to a length as specified. Tie Rods shall be ASTM A307 grade or equivalent (Fu=60 KSI, Ft=20KSI) Tie rods shall be as follows, at a minimum:

PIPE SIZE	NO. OF RODS	ROD SIZE
4	2	3/4
6	2	3/4
8	2	3/4
10	4	3/4
12	4	3/4
14	6	3/4
16	6	3/4
18	8	3/4
20	8	3/4
24	12	3/4
30	14	1
36	14	1
42	16	1 1/4
48	16	1 1/4
54	18	1 1/4

To connect tie rods to fitting, offset eyebolts shall be used. Tie rods shall be (core 10 steel or 316 S.S.), threaded as required, installed with a washer and nut (same material as the rod) on either side of the joint.

III.3.5.3. The use of thrust blocks shall be limited to situations such as point repair where exposing several joints of pipe is not feasible due to existing ground conditions and also must be used with mechanical joint restraining devices when, in the judgment of the Engineer, the nature and criticality of an installation is such as to require positive assurance of stability. Concrete collars with tie rods may be used on dead end lines at the Contractor's discretion. Concrete used for this purpose shall be 2,500 psi minimum. When applicable, schedule and details for the required thrust blocks are

included on the drawings (see Plate No. W-38). The JEA Standard Details show minimum size thrust blocks for use in good soil. Poor soils will require larger thrust blocks.

III.3.6. JOINT RESTRAINTS WITHIN CARRIER PIPE

All joints within steel casing pipe shall be restrained with mechanical restraining devices. End joints shall be tie rodded, with the ends of the rods welded to the end of the casing.

III.3.7. CASING SPACER INSTALLATION

All carrier pipes in casings shall utilize casing spacers installed on the carrier pipe, inside the casing pipe. Casing spacers shall be installed one foot on both sides of each carrier pipe joint, and at ten feet intervals along the carrier pipe for pipe up to 48 inches. For carrier pipes larger than 48 inches, casing placement shall be as recommended by the casing spacer manufacturer. A casing spacer shall also be installed within two feet of each of the ends of the casing pipe.

III.4. WATER MAIN AND NON-WATER MAIN SEPARATION REQUIREMENTS

III.4.1. It is required that "water mains" be installed, cleaned, disinfected and have a satisfactory bacteriological survey performed in accordance with the latest applicable AWWA Standards, Chapter 62-555, F.A.C. and latest JEA Water and Wastewater Standards. For the purpose of this section, the phrase "water mains" shall mean mains, including treatment plant process piping, conveying either raw, partially treated, or finished drinking water; fire hydrant leads; and service lines that have an inside diameter of three (3) inches or greater. In addition, the phrase "reclaimed water" refers to the water regulated under Part III of Chapter 62.610, F.A.C.

III.4.2. New or relocated, underground water mains shall be laid to provide a horizontal distance of at least three (3) feet between the outside of the water main and the outside of any existing or proposed storm wastewater, stormwater force main, or pipeline conveying reclaimed water regulated under Part III of Chapter 62.610, F.A.C..

III.4.3. New or relocated, underground water mains shall be laid to provide a horizontal distance of at least six (6) feet, and preferably ten (10) feet, between the outside of the water main and the outside of any existing or proposed gravity or pressure-type sanitary wastewater or wastewater force main or pipeline conveying reclaimed water not regulated under Part III of Chapter 62.610, F.A.C. The minimum horizontal separation distance between water mains and gravity-type sanitary wastewaters may be reduced to three (3) feet where the bottom of the water main is laid at least six (6) inches above the top of the wastewater (special case).

III.4.4. New or relocated, underground water mains crossing any existing or proposed gravity or vacuum-type sanitary wastewater or storm wastewater shall be laid so the outside of the water main is at least six (6) inches, and preferable twelve (12) inches, above or at least twelve (12) inches below the outside of the other pipeline. However, it is preferable to lay the water main above the other pipeline.

III.4.5. New or relocated, underground water mains crossing any existing or proposed pressure-type sanitary wastewater, wastewater or stormwater force main, or pipeline conveying reclaimed water shall be laid so the outside of the water main is at least twelve (12) inches above or below the outside of the other pipeline. However, it is preferable to lay the water main above the other pipeline.

III.4.6. At the utility crossings described in paragraphs (III.4.4.) and (III.4.5.) above, one full length of water main pipe shall be centered above or below the other pipeline so the water main joints will be as far as possible from the other pipeline. Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are at least three (3) feet from all joints in vacuum-type sanitary wastewaters, storm wastewaters, stormwater force mains, or pipelines conveying reclaimed water, and at least six (6) feet from all joints in gravity or pressure-type sanitary wastewaters or wastewater force mains or pipeline conveying reclaimed water.

III.4.7. New or relocated fire hydrants shall be located so that the hydrants are at least three (3) feet from any existing or proposed storm wastewater, stormwater force main, or pipeline conveying reclaimed

water; at least three (3) feet, and preferably ten (10) feet, from any existing or proposed vacuum-type sanitary wastewater; at least six (6) feet, and preferably ten (10) feet, from any existing or proposed gravity or pressure-type sanitary wastewater or wastewater force main.

- III.4.8. Where an underground water main is being laid less than the required minimum horizontal distance from another pipeline and where an underground water main is crossing another pipeline and joints in the water main are being located less than the required minimum distance from joints in the other pipeline, the contractor shall consult the design engineer to obtain approval of any alternative construction methods, prior to construction.
- III.4.9. In no case shall a water main be routed through a manhole structure (storm or sanitary wastewater manholes) unless approved otherwise by a JEA manager.
- III.4.10. The table below provides the minimum horizontal separation requirements between the proposed utility and structures (see notes).

Pressure Main (water & wastewater) Nominal Size (inches)	Horizontal Separation Requirements (min) (See note 1)
up to 6"	10 feet
8"	14 feet
10"-12"	18 feet
16" and larger	See note 4
For gravity wastewater mains, see note 2.	

Notes:

1. The table above provides the minimum horizontal separation requirements between the proposed JEA maintained utilities (including water mains, reclaimed water mains, water service laterals, meter boxes and wastewater force mains) and existing, proposed and future structures (including above ground structures, concrete footers and top of bank of ponds).
 2. For gravity wastewater mains, the horizontal separation from existing, proposed and future structures (including above ground structures, concrete footers and top of bank of ponds) shall be a minimum of 3 times the vertical depth of the deepest portion of the manhole to manhole wastewater run.
 3. Pressure mains with pipe cover greater than 36 inches will require additional horizontal separation as reviewed and approved by a JEA O&M Manager.
 4. Pressure mains 14 inch and larger will require additional horizontal separation as reviewed and approved by a JEA O&M Manager.
 5. All depth measurements will be based upon final finished grade elevations, unless approved otherwise by JEA.
- III.4.11. The planting of hardwood trees (see listing below) within 36 inches (horizontal clearance) of the outside surface of the pressure main and the tree trunk or the installation of a pressure main within 36 inches (horizontal clearance) shall be prohibited. Service lines are excluded from this requirement. The planting of hardwood trees with a horizontal clearance between 3 and 6 feet or the installation of a pressure main between 3 and 6 feet from the outside surface of the tree trunk shall require root barrier material to isolate the main from future root growth. The root

barrier (cut-off wall) shall be solid plastic or HDPE (0.0276" or 0.70 mm minimum thickness). The root barrier shall be installed/extended to all areas where the above clearances cannot be met. The root barrier shall extend vertically from the bottom of the pressure main to within 6 inches from top of finished grade, at a minimum.

NOTE: The list of hardwood trees includes the following at a minimum:

Ilex Attenuate, East Palatka/Savannah Holly, Magnolia Spp., Magnolia Family, Pyrus Calleryana, Bradford Pear, Juniperus Silicicola, Red Cedar, Gordonia Lasianthus, Loblolly Bay, Quercus Stellata, Post Oak, Palmacea Spp., Palm Family, Quercus Leavis, Turkey Oak, Pinus Spp., Pine Family, Nyssa Sylvatica, Blackgum, Salix Babylonia, Weeping Willow, Prunus Spp., Cherry Family, Liriodendron Tulipifera, Tulip Poplar, Betula Nigra, River Birch, Cupressocyparis Leylandii, Leyland Cypress, Taxodium Distichum, Bald Cypress, Quercus Spp., Oak Family, Acer Spp., Maple Family, Liquidambar Styraciflua, Sweetgum, Platanus Occidentalis, Sycamore.

III.5. SYSTEM CONNECTIONS

All connections and ties to the JEA Water System and transfer of services will be performed by the contractor under supervision of the JEA's representative.

III.5.1. WATER MAIN CONNECTIONS

Unless approved otherwise by JEA, tapped connections in the barrel of a pipe shall be less than the diameter of pipe being tapped except 4 inch pipe which may be tapped with a 4-inch tapping sleeve and valve. No taps (all sizes) shall be made within 5 pipe diameters or 5 feet (whichever is smaller) of a joint. When making 2-inch PVC water main connections to water mains, a 4" (minimum) gate valve shall be utilized with a 4" X 2", reducer connecting to the 2" main. No 2" gate valves (on the main) will be allowed.

III.5.2. WATER SERVICE CONNECTIONS

All water service connections (new and taps into existing mains), shall have a no-lead brass corporation stop at the main and connected directly into the service saddle. No taps (all sizes) shall be made within 5 pipe diameters or 5 feet (whichever is smaller) of a joint.

III.6. FIELD TESTING

III.6.1. SWABBING

The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing of a new pipeline swabbing shall be utilized as specified on the construction plans for each project. Swabbing details, Chapter VIII, Plates W-45, W-45A, W-45B, W-45C and W-45D.

III.6.1.1. New water, wastewater force, and reclaim mains greater than 12" I.D. (with exceptions to smaller pipe lines as deemed necessary by JEA) shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main.

III.6.1.2. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the CONTRACTOR to provide temporary access and egress points for the cleaning, as required.

III.6.1.3. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

III.6.1.4. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.

III.6.1.5. The Contractor shall insert flexible polyurethane foam swabs (two pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. A JEA

- representative shall be present for the swabbing process including swab insertion and retrieval.
- III.6.1.6. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
 - III.6.1.7. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.
 - III.6.1.8. At the receiver or exit point for the poly swab, the Contractor is responsible for creating a safe environment for collection of debris, water and the swab. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab.
 - III.6.1.9. Only with JEA personnel on-site shall the supply valve from the existing distribution system be operated. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab(s) is/are retrieved.
 - III.6.1.9.1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
 - III.6.1.9.2. Swabbing speed shall range between two and five feet per second.
 - III.6.1.10. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

III.6.2. DISINFECTION TESTS

- III.6.2.1. All water pipe and fittings of whatever size and wherever installed on potable water lines shall be thoroughly disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains as set forth in AWWA Standard C651 entitled "AWWA Standard for Disinfecting Water Mains" and shall be in accordance with the procedure entitled "WATER SYSTEM CLEARANCES FOR JEA AND PRIVATELY-OWNED PUBLIC WATER SUPPLY SYSTEMS" which is found in the back of this specification. Dechlorination of flushing water may be required to be in compliance with the State of Florida Surface water Quality Standards (F.A.C. 62-302.530). Dechlorination is necessary if the flushing of highly chlorinated water is to be discharged directly to a surface water or to a stormwater system. If the water can be sheet flowed over a large area or discharged to a holding pond, dechlorination may be avoided.
- III.6.2.2. The contractor shall prepare a written flushing plan which outlines water supply point and all blow-off points. Due to the limited water supply and operating limitations of the JEA system, the flushing plan must be approved by JEA, prior to implementation. The contractor shall modify the flushing plan as directed by JEA, at no additional cost. Temporary blow-offs, shall be installed for the purpose of clearing the water main. Blow-offs installed on water mains up to and including 12 inches shall be the same diameter as the water main. Unless approved otherwise by JEA, pipes shall be "flushed" at blow off points and at dead ends to achieve a minimum flow velocity of 3 FPS, and a minimum of 3 turn-overs of treated water shall be used in the flushing operation. Due to the many operating limitations of the existing water systems, the flushing

operation will be scheduled (date and time), by JEA and will often require flushing during low water demand periods (10 p.m. to 5 a.m.). The contractor shall anticipate flushing lines during low water demand periods. The flushing operation shall continue until "clear" water samples are obtained at the discharge end of the line and is acceptable to JEA. Blow-offs installed on 16 inch water mains and larger shall be the next smaller size, in diameter, than the water main being tested. Temporary blow-offs shall be removed and plugged after the main is cleared. The JEA Representative shall be present prior to and during the operation of blow-offs. The main shall be flushed prior to disinfection. The contractor shall be responsible for the proper disposal or discharge of the water during the flushing operation. The contractor shall be responsible (at no cost to the owner) for repairing all damages, due to the flushing operation.

- III.6.2.3. The new water main shall be connected to the existing water main at one point only for flushing purposes (no looping). The new main MUST have a blow off on the end as required previously. After the new main is thoroughly flushed, the open end shall be sealed and restrained and the main shall be thoroughly disinfected. The contractor may use a separate source of water for flushing purposes. Upon completion of the flushing, the contractor shall proceed with disinfection as specified.
- III.6.2.4. Anytime the new line is reopened, (to repair defective joints or pipe, defective fitting or valve), the complete disinfection process shall be repeated.
- III.6.2.5. Bacteriological testing on the water main shall be scheduled and completed by JEA. JEA will collect the water samples and be responsible for completing the water analysis (lab testing).
- III.6.2.6. Once bacteriological clearance (on 2 consecutive days of samples) has been approved, the main may be pressure tested against an existing system valve.
- III.6.2.7. No new water main may be put in service until a Certification of Completion has been approved by the regulatory authority. The contractor must submit As-Builts, accurately depicting installed conditions as required for line clearances. The Contractor shall allow time for this process to be completed.

III.6.3. PRESSURE AND LEAKAGE TESTS

The Contractor shall test pipelines installed in accordance with these specifications prior to acceptance of the pipeline by JEA or connecting pipeline to any existing pipeline or facility. All field tests shall be made in the presence of a JEA representative. Except as otherwise directed, all pipelines shall be tested. Pressure testing of PVC and ductile iron pipe (including poly service piping), shall not include HDPE water main piping. Pressure testing of HDPE main piping shall be completed separately with no PVC or ductile iron pipe included in the HDPE test section. Testing of HDPE main piping is detailed in the specification section entitled, "Horizontal Directional Drilling", (Chapter VI. 2. – Section 750). Pipelines laid in excavation (other than trench excavation), shall be tested prior to the backfilling of the excavation. All piping to operate under liquid pressure shall be tested in sections of approved length. For these tests, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. If the Contractor chooses to pressure test against an existing JEA water main/valve, the new water main must be disinfected prior to connection to the JEA line. JEA will not be responsible for failure of the pressure test due to the existing valve leaking. If positive test results cannot be obtained because the JEA valves will not hold the test pressures, the Contractor shall be required to disconnect from the JEA System and re-test independent of the JEA System and at the Contractor's expense. JEA may elect to furnish suitable pressure gauges. If not, the contractor will provide the pressure gauges. The gauges shall be calibrated by an approved testing laboratory, with increments no greater than 2 psi and a 4 inch diameter face. Gauges used shall be of such size that pressures tested will not register less than 10% no more than 90% of the gauge capacity. Leakage and

pressure testing shall be in accordance with applicable AWWA C600 or AWWA C605 and as outlined below.

III.6.3.1. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality and all air (or most of the air) shall be expelled from the pipe. Unlike water, entrapped air is compressible and is, therefore, very "explosive" and represents a very high risk of potential damage or even fatalities. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall make the necessary taps at such points (12:00 position) and shall plug said holes after completion of the test. The table below is a convenient method to determine the approximate water addition that is required to raise the pressure in the test section from 0 psi to 150 psi with 0% air entrapment. Obviously, the test section will include some amount of air entrapment. The table below will indicate the severity of the amount of air entrapment in the test section. If the actual field test quantities (additional water amount) is over 4 times greater than the listed amounts, the test section may have severe air entrapment. In this case, the contractor should make additional effort to remove the entrapped air.

III.6.3.2. The table below lists the approximate amount of water which must be added to the pipe to raise the line pressure from 0 psi to 150 psi when no air is present in the pipe.

Pipe Diameter (inch)	Gallons/1000 L.F.
6	0.73
8	1.31
10	2.04
12	2.94
14	4.00
16	5.22
18	6.61
20	8.16
24	11.75
30	18.36
36	26.44
42	35.98

III.6.3.3. For mains larger than 20 inch size, it is highly recommended that the contractor profile (line and grade) the main after installation and prior to pressure and leakage test to accurately locate all high points. Field survey instrument (Level equipment) shall be utilized for this task. Blow off valves shall be installed (at a minimum) at all high points which offset vertically more than two pipe diameters in length (at a minimum). The contractor shall consult the design engineer on any technical questions or concerns.

III.6.3.4. Hydrostatic testing shall consist of a combined pressure test and leakage test. Specified test pressures, based on the elevation of the highest point of the line or section under test, and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection and all

necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the Engineer. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves.

- III.6.3.5. All piping shall be pressure and leakage tested for a minimum of two hours duration at 150 psi minimum or 2 times operating pressure. Pressure tests shall be conducted simultaneously with the leakage test. During the 2 hour test, no pipe will be accepted if pressure loss is greater than 5 psi regardless of the leakage test results. All exposed pipe, fittings, valves and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings or valves that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory. Repairing, replacing and retesting shall be done at the Contractor's expense. For new installations, the contractor shall be limited to the number of repair couplings utilized to repair pipe joint leaks. Unless approved otherwise by JEA, the contractor is limited to two repair couplings (I.E., one joint leak) per 1,000 LF installed (same pipe size). Should the actual number of joint leaks exceed the above limit, then JEA may require the contractor to remove and re-install the entire associate main or certain sections of the main at the contractor's expense. For new work, "bell joint leak clamps" or similar devices are not acceptable for the repair of leaks at the joints.
- III.6.3.6. Leakage tests shall be conducted simultaneously with the pressure tests. At the end of the pressure test, the line will be pumped back to initial test pressure. The quantity of water used to re-pump the line shall be measured and compared to the limitations calculated using the allowable leakage equations below.
- III.6.3.7. Formula No. 1: may be used to determine an allowable leakage amount for PVC pipe, DIP or combination of both. If the actual leakage amount is equal or less than the allowable leakage amount (based upon Formula No. 1), the leakage test is acceptable (test passes and no other calculation are required). If the actual leakage amount is greater than the allowable leakage amount (based upon Formula No. 1), then the allowable leakage amount must be re-calculated based upon the sum total of Formula Nos. 2 and 3.
- III.6.3.8. Formula No. 2: shall be utilized to determine the allowable leakage amount for the test section constructed with PVC pipe (based upon the number of rubber gaskets).
- III.6.3.9. Formula No. 3: shall be utilized to determine the allowable leakage amount for the test section constructed with ductile iron pipe (based upon the total linear feet). For a test section, which includes both PVC and ductile iron pipe, the allowable leakage amount would be determined by adding the allowable leakage amount based upon Formula No. 2 (for the PVC pipe test section) and Formula No. 3 (for the DIP test section). No pipe installation will be accepted if the actual leakage amount (quantity of make-up water) is greater than the allowable leakage amount (based upon the sum total of Formula Nos. 2 and 3). These 3 formulas meet and exceed the requirements of AWWA C600 and AWWA C605. Pressure and Leakage Test forms for each of these 3 formulas are provided in the back of this section.

Formula No. 1: (PVC and DIP) L = SD P^{1/2}
148,000

Formula No. 2: (PVC only) L = ND P^{1/2}
7,400

Formula No. 3: (DIP only) L = SD P^{1/2}
133,200

P^{1/2} = 12.25, where P = 150 psi

In which L is the allowable leakage amount in gallons per hour; S is the length of pipeline tested, in feet (5,000 L.F. max.); D is the nominal diameter of the pipe, in inches; P is the average test pressure during the leakage test, in pounds per square inch; and N is equal to the number of joints (rubber gaskets) in the PVC pipe test section. If test (based on Formula No. 2 and/or No. 3) discloses leakage greater than that specified above, the Contractor shall, at its own expense, locate and repair the defective material and retest until the leakage is within the specified allowance. The total length of pipe within the test section shall not exceed 5,000 linear feet, unless approved otherwise by JEA.

- III.6.3.10. In the event a section fails to pass the tests, the Contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the Contractor's expense.
- III.6.3.11. If, in the judgment of JEA, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection shall be required if the line is de-pressurized for repairs prior to tying into the JEA system.
- III.6.3.12. HDPE: For leakage and pressure testing for high density polyethylene (HDPE, PE), Pipe and fittings, see "Horizontal Directional Drilling" (Chapter VI. 2. - Section 750), for technical specifications for testing HDPE products. Due to the expansion of HDPE pipe, the pressure testing of HDPE pipe sections must be tested separately from DIP and PVC pipe sections (see Chapter VI. 2. - Section 750 for clarification).

III.6.4. LOCATE WIRE

III.6.4.1. LOCATE WIRE TESTING REQUIREMENTS

Installed locate wiring within JEA service area shall be tested by the contractor as part of the final inspection procedure, using a JEA approved tester and approved testing equipment. The approved tester shall be pre-approved by JEA and listed within JEA's GC11. The contractor shall request and obtain approval from the JEA field representative inspector, of the locate wire field testing schedule. The JEA field representative may elect to be present during the testing period. The contractor shall provide the approved tester a copy of the as-built drawings with the locate wire boxes and stationing depicted on them. A tone shall be put on the locate wire. The technician shall trace the entire length of the installed wire and spot paint the location at least at 200-foot intervals along the route. The depth shall be tested at 200-foot intervals. The approved tester shall report (show on drawings), where the pipe/wire has less than the allowable minimum cover or more than the maximum allowable cover (see above for pipe cover limits). For pipe/wire which is installed within the acceptable cover limits, no remarks are required. All lateral stub-outs shall be marked and recorded. A final Locate Wire Report (JEA form by the approved tester), shall be submitted to JEA for review and approval. The report shall include a signed statement from the approved tester which certifies that all

installed wire (where shown on the drawing), was successfully (sounded), traced with no open breaks. The report shall also include a copy of the project site drawings which indicate all field notes, breaks found/repared, depths (if installed outside the acceptable cover limits), and other applicable field remarks by the approved tester. A Certified copy of the JEA form and marked-up drawings shall be furnished prior to final acceptance of the project or as approved otherwise by JEA.

III.6.4.1.1. DEFINITIONS

Approved Testing Equipment shall include variable frequency controls, digital depth read-out and tone continuity. The following is a list of approved equipment – Dynatel (3M)-2273 Cable/Fault Locator, Metrotech 9800XT, Ditch Witch 950 R/T or JEA pre- approved equal.

III.6.4.1.2. APPROVED TESTER

A person approved by JEA as proficient in the use of the equipment and has 12 months experience in the use of the equipment including documented proof of past performance.

III.6.4.2. LOCATE WIRE INSTALLATION

Contractor shall furnish and install locate wiring on all water mains (both PVC and ductile iron) and on water services 10 LF or greater in length (see Detail W-44 for other locate wire requirements). Locate wire must be attached to water mains and services with duct tape or plastic ties at each side of bell joint or fitting and at 10 foot intervals along pipeline (at a minimum). Locate wire shall be brought to grade within a valve box or Locating Station box, as required, at 475 foot intervals (maximum), 2 foot of slack is required at each access point and locate wire box. Locate wire shall be installed in box and along pipeline as detailed in the JEA Standard Details. Locate wire shall be installed in either the 1:00 or 11:00 position on the pipe. Connection or splices underground which are not inside a locate box (or valve box), shall be prohibited. If an underground connection is unavoidable, spliced tracer-wire joint shall be a waterproof connector, each connection shall be photograph showing a specific identification number (the station off-set location) written on each waterproof connector. The approved manufacturer is: DRYCONN, P/N 90120 - DB Lug Yellow, 5pc. Bag or JEA approved equal.

III.7. LOCATE WIRE

III.7.1. LOCATE WIRE INSTALLATION

- III.7.1.1. Contractor shall furnish and install locate wires on all force mains (see Detail S-49 for other locate wire requirements), water mains, chilled water lines, reclaimed water mains, hydrants, branches, and services (see Detail W-44 for other locate wire requirements).
- III.7.1.2. Locate wire must be attached to mains and services with duct tape or plastic ties at each side of bell joint or fitting and at 10 foot intervals along pipeline (at a minimum).
- III.7.1.3. Locate wire shall be brought to 4 foot above grade within a valve box or Locating Station box, as required, at 475 foot intervals (maximum).
- III.7.1.4. Locate wire shall not terminate in an air release valve (ARV) vault. ARV vaults may be corrosive environments for locate wire materials and the vaults are defined as confined spaces.
- III.7.1.5. Locate wire shall be installed in either the 1:00 or 11:00 position on the pipe.
- III.7.1.6. Connections and splices shall be made at grade within a Valve Box or a Locate Wire Box. Underground connections and splices are not allowed

and shall be prohibited. If an underground connection is unavoidable, contact locates before proceeding. Once approved, the spliced tracer-wire joint shall be a waterproof connector, each connection shall be photographed showing a specific identification number (the station and off-set location) written on each waterproof connector. The connector manufacturer shall be: DRYCONN, P/N 90120 - DB Lug Yellow, 5pc. Bag or JEA approved equal.

III.7.2. LOCATE WIRE TESTING REQUIREMENTS

III.7.2.1. Each installed locate wire within the JEA service area shall be tested by the contractor as part of the final inspection procedure, using an approved tester and approved testing equipment.

III.7.2.2. DEFINITIONS

III.7.2.2.1. Approved Tester: A person approved by JEA as proficient in the use of the equipment and who has 12 months experience in the use of the equipment including documented proof of past performance.

III.7.2.2.2. Approved Testing Equipment: The following is a list of approved equipment:

III.7.2.2.2.1. Dynatel (3M)-2273 Cable /Fault Locator;

III.7.2.2.2.2. Metrotech 9800XT;

III.7.2.2.2.3. Ditch Witch 950 R/T; or,

III.7.2.2.2.4. JEA pre- approved equal.

III.7.2.3. The approved tester shall be listed on the JEA Responsible Bidder List (RBL) for, at minimum, work category GC11 - Line locate services / Wire testing.

III.7.2.4. The contractor shall prepare the following:

III.7.2.4.1. A set of project site drawings showing the stationing and offset for each locate wire box.

III.7.2.4.2. A locate wire field testing schedule.

III.7.2.5. The contractor shall submit the project site drawings and the field testing schedule to the JEA field representative (inspector) for approval. The JEA field representative may elect to be present during the testing period.

III.7.2.6. The contractor shall provide the approved tester a copy of the project site drawings showing the stationing and offset for each locate wire box.

III.7.2.7. The approved tester shall place a tone on the locate wire and trace the entire length of the installed wire, spot painting the location at least at 200-foot intervals along the route.

III.7.2.8. The approved tester shall test the wire depth at 200-foot intervals.

III.7.2.9. The approved tester shall report (show on project site drawings), where the pipe/wire has less than the allowable minimum cover or more than the maximum allowable cover

(see Pipe Cover Section above for pipe cover limits). For pipe/wire which are installed within the acceptable cover limits, no remarks are required. All lateral stub-outs shall be marked and recorded.

- III.7.2.10. The approved tester shall prepare a Locate Wire Box checklist for each locate wire box.
- III.7.2.11. The approved tester shall prepare a final Locate Wire Report. The Locate Wire Report shall be submitted to the JEA field representative for review and approval. The report shall include the following:
 - III.7.2.11.1. A signed statement from the approved tester certifying that all installed wire (where shown on the project site drawings), was successfully (sounded), traced with no open breaks.
 - III.7.2.11.2. A copy of the project site drawings which indicate all field notes, breaks found/repared, depths (if installed outside the acceptable cover limits), and other applicable field remarks by the approved tester.
 - III.7.2.11.3. Copies of the Locate Wire Box checklist for each locate wire box shown on the project site drawings.
- III.7.2.12. A final Locate Wire Report shall be furnished prior to final acceptance of the project or as approved otherwise by JEA.

III.8. INSPECTION

All pipe and fittings shall be subject to inspection at time of delivery and also in the field just prior to installation. All pipe and fittings which in the opinion of the Engineer do not conform to these specifications will be rejected and shall be removed by the Contractor at the Contractor's expense. An authorized JEA representative must be present for all pressure and leakage testing, connections to JEA's existing lines, locate wire testing and the collection of water samples. The JEA representative will pull the water samples and deliver them to the lab.

III.9. STATE HIGHWAY CROSSINGS

Permits for all work within the right-of-way of a State Highway will be obtained by the Engineer. The Contractor shall, however, verify the existence of the permit before commencing work in this area. All work related to the State Highway crossing shall be in full compliance with the requirements of the Florida Department of Transportation permit and in accordance with the Florida Department of Transportation Utility Accommodation Guide and standard specifications. Unless otherwise shown on the drawings or specified herein, State Highway crossings shall be made by jacking a steel pipe casing, of the size shown on the drawings and shown in JEA Standard Details, under the highway at the elevations and locations shown. The water main shall then be placed in the casing with approved casing spacers as specified in this section. All joints within carrier pipe shall be mechanically restrained joints. After inspection, the ends of the casing shall be filled with 2500 psi concrete not less than 8-inches thick.

III.10. RAILROAD CROSSINGS

Permits for all work within the railroad right-of-way will be obtained by the Engineer. The Contractor shall, however, verify existence of the permit before commencing work in this area. All work related to the railroad crossings shall be in full compliance with the terms of the permit and AREA Specifications for Pipeline Crossings Under Railway Tracks for Non-Flammable Substances. The water main shall be placed in steel casing pipe under all railroad crossings whether installed by open cutting or jacking and boring. The water main shall then be placed in the casing with approved casing spacers as specified in this section. All joints within carrier pipe

shall be mechanically restrained joints. After inspection by the Engineer, the ends of the casing shall be sealed with 2,500 psi concrete not less than 12 inches thick. Upon completion and prior to final acceptance, the Contractor shall place crossing markers of a type acceptable to the Railroad Company at each end of the crossing at the railroad right-of-way.

III.11. NEW WATER SERVICES

New Water services shall be furnished and installed in the sizes and location indicated on the Contract documents. Short side services shall be services installed on the same side of the road as the water main. Long side services shall be services installed on the opposite side of the road as the water main. Long side services shall be installed by boring as indicated on the drawings or as directed by JEA. Boring may be accomplished by any method approved by JEA except that no water jetting shall be allowed. Long side services may be installed by open cut method only if the entire roadway is reconstructed or approved otherwise by JEA.

III.12. RENEWAL AND TRANSFER OF WATER SERVICE

III.12.1. GENERAL

Where a new water main is installed or where an existing water main is relocated or replaced, as shown on the drawings or where necessary due to a direct conflict with proposed construction and when approved by the engineer, the contractor shall install new service piping from the water main to each existing or new water meter. The lateral and meter shall be the same size. A renewal and transfer of water service shall include saddle, corp stop, service tubing, curb stop, no-lead brass adapter and meter coupling.

III.12.2. SPECIAL CONSTRUCTION CONNECTING INTO EXISTING 5/8" METERS

New water services which connect to an existing 5/8" x 5/8" water meter shall be constructed to allow for the future installation of a 3/4" water meter. Specifically for new k water services which connect to an existing 5/8" x 5/8" water meter, the following no-lead brass materials shall be utilized (at a minimum): 1" curb stop, 1" x 3/4" no-lead brass bushing, 3/4" meter coupling (hex on barrel type), no-lead brass adapter to change 3/4" meter to 5/8" meter spud size (Ford A13 or equal) and then connection into 5/8" existing meter. The cost to construct this connection shall be included in the unit price bid amount for new or replacement of water service.

III.12.3. SERVICE LINE SIZE

If shown on the drawings, a double one (1) inch water service line is acceptable for long side services utilizing 2 inch poly main per construction detail W-1. Gang water services (5 or more services in one area) is acceptable for long side services if shown on the drawings and constructed in accordance with construction detail W-1. Service lines and component parts thereof shall be sized based on the meter size as follows:

Meter Size	Tap, Corp Stop, Curb Stop and Pipe Size
1" and smaller	1"
1-1/2"	1-1/2"
2"	2"
3"	4"
4"	4"
6"	6"

8"	8"
10"	10"
12"	12"

IV. WATER SYSTEM CLEARANCES FOR JEA AND PRIVATELY-OWNED PUBLIC WATER SUPPLY SYSTEMS

IV.1. PLAN APPROVAL AND CONSTRUCTION SUPERVISION

IV.1.1. All plans and specifications for construction of each public water supply project must be prepared by an engineer registered in the State of Florida. Prior to construction, the plans and specifications together with FDEP Form 62-555.900(1) or 62-555.900(7). Application for a Specific Permit to Construct PWS Components or, Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs must be approved by the Florida Department of Environmental Protection or approved through the JEA Self-Permitting program. Systems which are 12 inches in diameter or less within Duval County can be eligible for the self-permitting program. Refer to www.jea.com for more details.

IV.1.2. "The PROVISOS for approval for each project are included on each application form. ATTENTION IS CALLED TO ITEM II "STATEMENT BY THE APPLICANT" WHICH REQUIRES A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF FLORIDA TO INSPECT CONSTRUCTION OF THE PROJECT FOR THE PURPOSE OF DETERMINING IF WORK PROCEEDS IN COMPLIANCE WITH THE CONSTRUCTION PERMIT AND APPROVED ENGINEERING PLANS AND SPECIFICATIONS. This engineer will be responsible for filing the Certificate of Completion for the project."

IV.1.3. It is required that "Water Supply Facilities" including mains and permitted service connections shall be installed, cleaned, disinfected and have a satisfactory bacteriological survey performed in accordance with the latest applicable AWWA Standards and Chapter 62-555, Florida Administrative Code. After project construction, flushing, disinfection and bacteriological sampling, a properly completed "Certificate of Construction Completion and Request for a Letter of Clearance to Place a Public Drinking Water Facility into Service" DEP Form 62-555.900(9) shall be submitted along with bacteriological survey results, and signed "as built" or "record" drawings to the Florida Department of Environmental Protection. A letter of clearance must be obtained from the Florida Department of Environmental Protection before the project is placed into service for any purpose other than disinfection, testing for leaks, or testing equipment operation. (Record or as built drawings must include elevations or separations at all crossings and parallel runs of water mains with sanitary wastewaters, storm wastewaters, and reclaimed water lines.)

IV.2. RESPONSIBILITY FOR WELL AND MAIN CLEARANCE

It is expected that the engineer of record shall have responsibility for supervising the flushing, disinfection and bacteriological sampling of all wells, treatment plans and distribution systems prior to clearance by the Florida Department of Environmental Protection. The Contractor shall obtain prior approval from the engineer of record of the procedure to be used for flushing and disinfection of the completed work.

IV.2.1. JEA OWNED WATER SYSTEMS

Sampling shall be done by JEA in the case of mains being connected to the JEA distribution systems. Contractor shall notify JEA to schedule sampling activities.

IV.2.2. PRIVATELY OWNED WATER SYSTEMS

Private utility companies are responsible for proper performance of main clearance/release procedures. Upon completion of procedures in accordance with AWWA Standards (AWWA C651 and Chapter 62-555 of the Florida Administrative Code), the Contractor for private water utilities shall make arrangements with the Environmental Engineering Section of the Florida Department of Environmental Protection. Questions concerning the proper clearance/release procedures shall be directed to the Florida Department of Environmental Protection or other approved regulatory agency.

IV.3. DISINFECTION OF WELLS AND WATER MAINS

IV.3.1. Bacteriological sample points shall be installed every 1,000 feet (maximum) and at deadends and stub outs greater than 40 linear feet, at a minimum.

IV.3.2. Reference: AWWA C651 and AWWA C654. Basic Principles: (#1) Prevention of contamination during construction or repair is of primary importance. Before disinfection procedures are commenced, well and mains shall be thoroughly flushed to remove contamination materials from the line. Section 4 of the AWWA procedure outlines precautions during construction and instructions for preliminary flushing. (#2) Disinfection is accomplished by introducing chlorine into the main to be sanitized. Either chlorine gas (liquid chlorine in cylinders) or hypochlorites may be used.

IV.3.3. Chapter 62-555.315(3) of the Florida Administrative Code and AWWA Standard C654 specify the procedures which shall be used for disinfection and clearance of wells, while Section 62-555.340 of the Florida Administrative Code and AWWA Standards C651, C652 and C653 give the procedures for disinfection standards in general. Liquid chlorine comes in 150 pound or ton cylinders. Great care must be exercised in its use under the personal supervision of a person familiar with its properties and toxicity. Hypochlorites are chemical compounds of chlorine. Commonly used are Calcium Hypochlorites, 5.25 to 16% chlorine by weight. Hypochlorites are best applied by preparing a solution and injecting it into the system in accordance with the procedures contained in Section 5 of the AWWA procedure. Concentration within the main shall be not less than 25 mg/l at the beginning of the required 24-hour holding period and shall not be less than 10 mg/l at the end of the holding period. Procedure shall ensure contact with all parts of the system.

IV.3.3.1. The "slug method" as outlined in Section 5.3 of the AWWA procedure employs 100 mg/l of chlorine for 3 hours with the chlorine remaining above 50 mg/l at the end of 3 hours.

IV.3.4. Final Flushing: After normal 24 hours contact time or the shorter contact time authorized when "slug method" is used, the heavily chlorinated water shall be flushed from the main until residual within the line reaches the level of chlorine normally carried in the distribution system - maximum 1.0 mg/l.

IV.3.5. Dechlorination of flushing water may be required to be in compliance with the State of Florida Surface water Quality Standards (F.A.C. 62-302.530). Dechlorination is necessary if the flushing of highly chlorinated water is to be discharged directly to a surface water or to a stormwater system. If the water can be sheet flowed over a large area or discharge to a holding pond, dechlorination may be avoided.

IV.4. BACTERIAL EXAMINATION

IV.4.1. WATER MAINS

Upon completion of water main flushing, samples shall be submitted until satisfactory results are obtained on two (2) successive working days (Fridays and Mondays are considered successive for this purpose). Great care must be exercised in sampling

because if the initial disinfection fails to produce satisfactory results, disinfection must be repeated and samples resubmitted. As outlined above, arrangements shall be made with JEA and the JEA Water Quality Lab for all collection of bacteriological samples from systems to be connected to JEA systems and for sampling of privately owned systems. Samples shall be collected in sterile bottles or bags, treated with sodium thiosulfate to neutralize chlorine residual. It is important that the chlorine residual (maximum 4.0 ppm allowed) and pH of the line (main) be taken and recorded in columns (3) and (4) of the Department of Health Form DH 655-1/97 (if the Department of Health Lab is not used for analysis then the lab's substitution form must have the same format). Hoses are not satisfactory sampling points. A suggested sampling tap consists of a standard corporation cock installed in the main with tube goose-neck assembly which may be removed after use or retained for future use as a sampling point. Samples shall be taken at all dead ends and at intervals of no greater than 1000 feet on continuous pipe runs. All permitted service stubs (domestic, irrigation or fire) shall be sampled at the meter location or the backflow location. Bacteriological test results shall be considered unacceptable if the tests were completed more than 60 days before the Department received the results.

IV.4.2. WELLS

Section 62-555.315 of the Florida Administrative Code requires that after thorough pumping of the well to remove the disinfecting agent, a series of 20 or more consecutive daily samples shall be submitted for laboratory examination. No more than two samples, at least 6 hours apart shall be collected per day. In extenuating circumstances, the number of samples may be reduced upon approval of the Florida Department of Environmental Engineering. In Jacksonville (Duval County) the Florida Environmental Department of Environmental Protection will make this determination on the basis of the nature of the aquifer, depth of well, type of construction, location and other pertinent facts. The same arrangements outlined above for clearance of water mains should be followed for wells.



RECORD of PRESSURE and LEAKAGE TEST
Based on Formula No. 1 (PVC and DIP Material)

PROJECT: _____

TEST SECTION: _____

JEA REPRESENTATIVE: _____ SIGNATURE _____

TEST DATE: ___/___/___ TEST TIME: _____ BEGIN _____ END _____

OTHER TEST PHASE ATTENDEE'S:

Pressure and Leakage Test Calculations: _____ WATER MAIN _____ WASTEWATER FORCE MAIN
_____ RECLAIMED WATER MAIN

Line Pressure Test:

Start: _____ PSI (Minimum of 150 PSI or 2x operating pressure) End: _____ PSI

Difference: _____ PSI (IF GREATER THAN 5 PSI, THE TEST FAILS)

Table with 5 columns: TYPE OF PIPE PVC/D.I.P. (1), DIAMETER OF PIPE (INCHES) (2), LINEAR FEET (3), 2-HOUR TEST FACTOR (4), TOTAL ALLOWABLE LEAKAGE (2x3x4) (5). Rows contain numerical values for factors and a total allowable leakage amount.

Allowable Leakage Amount _____ Gal _____ Oz. (32 oz per qt; 128 oz per gal)

Actual Leakage Amount _____ Gal _____ Oz.

Pressure and Leakage Test Results (Pass or Fail:) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period and utilizing Formula No. 1 as given below ("L" is the allowable leakage amount in gallons per hour, "S" is the length of pipe tested (5,000 L.F. max.); "D" is the diameter of the pipe and "P" is the average test pressure):

FORMULA NO. 1 L = SD P 1/2
(PVC AND D.I.P.) 148,000

Formula No. 1 may be used to determine an allowable leakage amount for PVC Pipe, DIP or combination of both. If the actual leakage amount is equal or less than the allowable leakage amount (based upon Formula No. 1), the leakage test is acceptable (test passes and no other calculation is required). If the actual leakage amount is greater than the allowable leakage amount (based upon Formula No. 1), the allowable leakage amount must be re-calculated based upon the sum total of Formula Nos. 2 and 3 (see other forms for these calculations). The above formula meets and exceeds the requirements of AWWA C600 and AWWA C605. The total length of pipe within the test section shall not exceed 5,000 linear feet, unless approved otherwise by JEA.

FILE No. _____

Revised January 1, 2014

Revised: January 1, 2020

Revised By: CWM

Approved By: ADN

POTABLE WATER PIPING - SECTION 350



RECORD of PRESSURE and LEAKAGE TEST
Based on Formula No. 2 (PVC Material Only)

PROJECT: _____

TEST SECTION: _____

JEA REPRESENTATIVE: _____ SIGNATURE _____

TEST DATE: ___/___/___ TEST TIME: _____ BEGIN _____ END _____

OTHER TEST PHASE ATTENDEES:

Pressure and Leakage Test Calculations: _____ WATER MAIN _____ WASTEWATER FORCE MAIN
_____ RECLAIMED WATER MAIN

Line Pressure Test:

Start: _____ PSI (Minimum of 150 PSI or 2x operating pressure) End: _____ PSI

Difference: _____ PSI (IF GREATER THAN 5 PSI, THE TEST FAILS)

Table with 5 columns: TYPE OF PIPE PVC (1), DIAMETER OF PIPE (INCHES) (2), NUMBER OF JOINTS (3), 2-HOUR TEST FACTOR (4), TOTAL ALLOWABLE LEAKAGE (2x3x4) (5). Includes rows for PVC and summary rows for PVC (Sum of Above), D.I.P. (From Formula 3), and Total Allowable.

Allowable Leakage Amount _____ Gal _____ Oz. (32 oz per qt; 128 oz per gal)

Actual Leakage Amount _____ Gal _____ Oz.

Pressure and Leakage Test Results (Pass or Fail:) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period and utilizing Formula No. 2 as given below ("L" is the allowable leakage amount in gallons per hour, "N" is the number of joints (rubber gaskets) in the test section; "D" is the diameter of the pipe and "P" is the average test pressure):

FORMULA NO. 2 (PVC ONLY) L = ND P 1/2 / 7,400

Formula No. 2 may be used to determine an allowable leakage amount for PVC Pipe only. If the actual leakage amount is equal or less than the allowable leakage amount (based upon Formula No. 2), the leakage test is acceptable (test passes). If the actual leakage amount is greater than the allowable leakage amount (based upon Formula No. 2), the leakage test fails. For a test section, which includes both PVC and ductile iron pipe, the allowable leakage amount would be determined by adding the allowable leakage amount based upon Formula No.2 (for the PVC pipe test section) and Formula No. 3 (for the DIP test section). The above formula meets and exceeds the requirements of AWWA C600 and AWWA C605. The total length of pipe within the test section shall not exceed 5,000 linear feet, unless approved otherwise by JEA.

FILE No. _____

Revised January 1, 2014

Revised: January 1, 2020

Revised By: CWM

Approved By: ADN

POTABLE WATER PIPING - SECTION 350



RECORD of PRESSURE and LEAKAGE TEST
Based on Formula No. 3 (DIP Material Only)

PROJECT: _____

TEST SECTION: _____

JEA REPRESENTATIVE: _____ SIGNATURE _____

TEST DATE: ___/___/___ TEST TIME: _____ BEGIN _____ END _____

OTHER TEST PHASE ATTENDEES:

Pressure and Leakage Test Calculations: _____ WATER MAIN _____ WASTEWATER FORCE MAIN
_____ RECLAIMED WATER MAIN

Line Pressure Test:

Start: _____ PSI (Minimum of 150 PSI or 2x operating pressure) End: _____ PSI

Difference: _____ PSI (IF GREATER THAN 5 PSI, THE TEST FAILS)

Table with 5 columns: TYPE OF PIPE PVC/D.I.P. (1), DIAMETER OF PIPE (INCHES) (2), LINEAR FEET (3), 2-HOUR TEST FACTOR (4), TOTAL ALLOWABLE LEAKAGE (2x3x4) (5). Includes rows for D.I.P. and summary rows for D.I.P. (Sum of Above), PVC (From Formula 2), and Total Allowable.

Allowable Leakage Amount _____ Gal _____ Oz. (32 oz per qt; 128 oz per gal)

Actual Leakage Amount _____ Gal _____ Oz.

Pressure and Leakage Test Results

(Pass or Fail:) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period and utilizing Formula No. 3 as given below ("L" is the allowable leakage amount in gallons per hour, "S" is the length of pipe tested (5,000 L.F. max.); "D" is the diameter of the pipe and "P" is the average test pressure):

FORMULA NO. 3 L = SD P 1/2 (D.I.P. ONLY) 133,200

Formula No. 3 may be used to determine an allowable leakage amount for D.I.P. Pipe only. If the actual leakage amount is equal or less than the allowable leakage amount (based upon Formula No. 3), the leakage test is acceptable (test passes). If the actual leakage amount is greater than the allowable leakage amount (based upon Formula No. 3), the leakage test fails. For a test section, which includes both PVC and ductile iron pipe, the allowable leakage amount would be determined by adding the allowable leakage amount based upon Formula No.2 (for the PVC pipe test section) and Formula No. 3 (for the DIP test section). The above formula meets and exceeds the requirements of AWWA C600 and AWWA C605. The total length of pipe within the test section shall not exceed 5,000 linear feet, unless approved otherwise by JEA.



FILE No. _____

Revised January 1, 2014

LOCATE WIRE BOX (utilizing co-polymer meter box)

JEA Final Inspection Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Sta: _____

Offset: _____

Check the following as applicable:

Wastewater

Curb Stamp w/ Color Coding:

Cover at Finish Grade:

Cover above finish grade--adjust per spec.

Cover below finish grade--adjust per spec.

Locate wire accessible in box

Yes

No, full of debris - excavate debris

Locate wire properly color coded

Yes

No--replace per spec

Locate wire signal verified

Yes

No--repair per spec

Extra 2' of Locate wire in box

Comments: _____

Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____

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