

GRAVITY WASTEWATER SECTION 428

I. GENERAL

I.1. SCOPE OF WORK

The Contractor shall furnish and install all gravity wastewater lines, fittings, and appurtenances required for a complete system as shown on the drawings and specified herein. The work shall also include such connections, reconnections, temporary service, and all other provisions in regard to existing wastewater operations and modifications 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.

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 T-V inspections, 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, 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, in the Engineer's opinion, may 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 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 specification \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 "certification of completion" rules regarding (C.O.C.).

I.5. CONTRACTOR WARRANTY

The Contractor shall supply to JEA a two (2) year unconditional warranty. 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.

II. **MATERIALS**

All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified, 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 gravity sewage lines shall be polyvinyl chloride (PVC) as shown on the drawings and as herein specified. Pipe to be installed underground shall be PVC push-on joint type. Pipe installed above ground shall be welded Stainless Steel pipe or flanged Stainless steel pipe as described in these specifications. PVC pipe shall not be used in above ground applications. The "depth of cut" shall be defined as the vertical distance from pipe invert to finish grade. For pipe bursting construction, the pipe shall be high density polyethylene (HDPE, grey color with green strip) with a DR-17 rating. See Chapter VI. 2. - Section 750 for additional material requirements. Pipe and fittings sizes and applications shall conform to the following chart.

PIPE AND FITTINGS	PIPE SIZE	JOINT TYPE	ACCEPTABLE BURY DEPTHS	APPLICATION
PVC DR18	6 inches and larger	Push-on joint	Refer to note 1 and 2	gravity mains & laterals & jack and bore carrier pipe in r/w and easements
PVC SDR 26	6 inches and larger	Push-on joint	Refer to note 1 and 2	gravity mains & laterals in r/w and easements
Steel	6 inches and larger	Welded	Refer to note 2	casing only

Note No. 1: The maximum "Depth of Cut" shall be no greater than 15 feet for mains without laterals.

Note No. 2: The maximum "Depth of Cut" shall be no greater than 12 feet with laterals.

II.1.1. POLYVINYL CHLORIDE (PVC) PIPE

Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. All PVC sanitary wastewater pipe shall be green. Storage and handling of PVC pipe shall be in accordance with chapter 6 of AWWA Manual M23.

II.1.1.1. PVC 1120, CLASS 150, DR 18 PIPE

Pipe shall conform to AWWA Standard C900 for 6-inch through 12-inch diameter pipe, and AWWA Standard C905 for 16 inch through 36-inch diameter pipe. All pipe shall be hydrostatically proof tested at the factory in conformance with UNI-B-11 standards. In case of conflict between standards specified herein, the requirements of AWWA Standard C900 and C905 shall prevail. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters. The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784. Pipe shall be rated 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. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and a quick burst test of 755 psi in conformance with ASTM D1599.

II.1.1.2. PVC 1120, CLASS 160, SDR 26 PIPE

Pipe shall conform to ASTM D3034 for sizes 4 inch thru 15 inch diameter pipe and ASTM F679 for 18 inch through 36 inch diameter pipe. The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784 with wall thickness T-1. Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3212. Elastomeric seals shall meet ASTM F477 or ASTM F913. The pipe shall be designed to pass without failure a sustained pressure test of 340 psi in conformance with ASTM D1598 and a quick burst test of 400 psi in conformance with ASTM D1599.

II.1.2. STAINLESS STEEL PIPE

Pipe shall be manufactured from ASTM-A240 annealed and pickled sheets and plates in accordance with ASTM A778 in grade 316L stainless steel. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19, Table 2. The pipe wall thickness shall be schedule 40 for pipe sizes 8" and smaller and shall be 0.25 inches (min) for pipe sizes 10" and larger. The pipe wall thickness for stainless steel piping at pump stations sites shall be schedule 10. Piping system shall be capable of withstanding satisfactorily all resultant forces exerted by normal pressure conditions, thermal expansion & contraction, and any surge pressures which may arrive from flow reversals during start up or shut down of the system. Fittings may be 316 stainless steel butt weld or flanged type manufactured in accordance with ASTM-A-774 of the same raw material and in the same thicknesses as the pipe. Fittings may also be flanged ductile iron with specialty inside coating. The fittings utilized at wastewater pump station sites shall only be flanged stainless steel (no butt weld fittings) or flanged ductile iron with specialty inside coating. The finish on the raw material, manufactured to ASTM A-240 will be No. 1, HRAP (hot rolled annealed and pickled) or better. The finish on the completed pipe and fittings shall be as specified in ASTM

A778 and A774, respectively. Transition from PVC to stainless steel flange to mechanical joint.

II.1.3. 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. 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.2. FITTINGS

Fittings shall be pressure rated (DR&SDR rated) and have joints that match the type of pipe furnished (at a minimum) except as follows or as otherwise specified. Fittings 6 inches and larger on PVC pipe installed underground shall be of the same PVC type as the pipe with joints to match the pipe being installed. Fittings 6 inches and larger installed above ground shall be ductile iron with flanged ends or restrained joints.

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. 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 specification.

II.2.2. POLYVINYL CHLORIDE FITTINGS

Fittings shall match the type of pipe (pressure rating and joint) and shall conform to the applicable sections of this specification for PVC pipe and PVC joints. The interior finish shall be smooth with no rough edges which

may cause line stoppages. Saddle tees or saddle wyes shall not be permitted.

II.2.2.1. PVC 1120, CLASS 150, DR 18 FITTINGS

PVC fittings 4 inches thru 12 inches 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.

II.2.2.2. PVC 1120, CLASS 160, SDR 26 FITTINGS

Fittings shall be gray in color, meeting the requirements of ASTM D3034 and ASTM F1336 for sizes 4-inch through 15-inch diameter and ASTM F679 and ASTM F1336 for 18 inch through 36 inch diameter with minimum wall thickness of SDR 26. Fittings shall be gasket joint type meeting the requirements of ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 or ASTM F913. PVC material shall have a cell classification of 12454-B in accordance with ASTM D1784.

II.2.3. NON-STANDARD FITTINGS AND WALL CASTINGS

Fittings having non-standard 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 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. Mechanical joint gaskets shall be of a composition suitable for exposure to sewage, sludge or scum within the pipe.

II.3.2. PUSH-ON JOINTS

II.3.2.1. POLYVINYL CHLORIDE (PVC)

PVC push-on joints shall have a bell type coupling with a thickened wall section integral with the pipe barrel. Joints for PVC DR18 pipe shall be in accordance with ASTM D3139. Joints for PVC SDR 26 shall be in accordance with ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 for PVC DR 18. Elastomeric gaskets for SDR 26 fittings shall conform to ASTM F477 or ASTM F913.

II.3.3. 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, and a minimum thickness of 1/16 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 A307 Specifications for steel machine bolts and nuts and tap bolts. 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.3.4. STEEL CASING PIPE JOINTS

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.

II.3.5. RESTRAINED JOINTS

II.3.5.1. 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 of PVC pipe to mechanical joint fittings or bell to spigot PVC pipe joints. Restraints shall provide a full 360-degree contact with sufficient gripping action to secure the clamp to the pipe and be designed so that restraint action is increased as a result of increases in line pressure. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance.

II.3.6. FLANGE ADAPTERS

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.3.7. PIPE COUPLINGS

The contractor shall furnish and install pipe couplings as required to complete the work. Pipe couplings used to join two pieces of PVC pipe shall be sized to suit the outside diameter of the pipeline. Transition couplings shall be used to join pipes of different outside diameters. The D.I.P. 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 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. After installation, all coupling surfaces including bolts and nuts shall be coated with an approved coating as specified in these specifications. PVC repair couplings shall be extra-long length, with gaskets and no internal stops. The PVC coupling shall be same SDR rating as the connecting pipe (SDR-26 at a minimum). Connection of gravity wastewater pipe of different materials shall be with a shear-resistant transition repair coupling. The coupling shall have a one piece molded PVC bushing gasket with an exterior 12 mil (min.) stainless steel shear ring. The coupling shall connect to the pipe ends with type 316 SS nut and bolt worm gear clamps. Coupling shall be ASTM C1173 & D5926 compliant, and be a Series 5000 Repair Coupling as manufactured by Fernco, Inc., or approved equivalent.

II.3.8. FULL CIRCLE REPAIR CLAMPS

Full circle repair clamps shall have type 304 stainless steel shell, lugs, bolts, nuts and washers as per ASTM A193, A194, A240, or shall have type 304 stainless steel shell 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 and wastewater service.

II.4. PIPING SUPPORTS

II.4.1. The Contractor shall furnish and install all special pipe supports as shown on the drawings and as necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or as specified. Special pipe supports shall be worked out in the field and approved by the Engineer to suit local conditions and emergencies.

II.4.2. 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 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 stainless steel pipe and 4 feet on centers for PVC pipe.

II.4.3. CASING SPACERS

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 18-inch and larger 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.

III. INSTALLATION**III.1. REFERENCE POINTS AND LAYOUT**

The Contractor shall be responsible for setting all grade lines, centerline of construction, and locating property lines. JEA or the Owner will provide 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 may 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

The pipe laying shall proceed upgrade, beginning at the lower end of the wastewater, with all bell ends upgrade. In no case shall the pipe be walked on either before or after the joints have been made. Extreme care shall be taken to keep the pipe in exact alignment and elevation. Pipe shall be laid to conform accurately to the lines and grades indicated on the drawings. It shall be the Contractors responsibility to locate all underground utilities in advance of construction, to insure that no conflicts occur with the proposed line and grade. The contractor shall coordinate utility locates with Sunshine State One-Call of Florida, Inc. (#811 or web site www.callsunshine.com), at a minimum. If approved by the Engineer, minor changes in the alignment but not the grade will be permitted to avoid underground facilities, provided that straight alignment can be maintained between manholes. However, if a conflict is found between an existing utility and proposed grade, the Contractor is to furnish the Engineer all pertinent information so that remedial design can be performed.

III.3.2. LAYING AND JOINTING

The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe. Suitable excavations shall be made to receive the bell of each pipe, which shall be carefully laid true to line and grade. All adjustments to line and grade must be made by scraping away or filling in under the barrel of the pipe and not by wedging and blocking up any portion of the pipe. The spigot end of each pipe shall abut against the base of the socket of the adjacent pipe in such a manner that there will be no unevenness of any kind along the bottom halves of the pipes. Just before jointing the pipes, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material. The pipe shall be jointed in accordance with the recommendations of the manufacturer of the pipe and gasket. The trench must be dewatered when joints are made and kept dewatered with a dry trench bottom, until pipe trench has been backfilled. The pipe shall not be driven down to grade by striking it with any unyielding object. The Contractor shall take all necessary precautions to prevent flotation of the pipe due to flooding of the trench.

III.3.3. PIPE COVER

The cover over all piping shall be a minimum of 30 inches in unpaved areas and 36 inches in paved areas.

III.3.4. JOINTING PVC TO VITRIFIED CLAY PIPE

Unless specifically indicated otherwise, connections of PVC to vitrified clay pipe in the run of the wastewater line shall be made with an approved cast coupling.

III.3.5. PLUGS

Openings such as stubs, tees, or services along the lines shall be securely closed by means of an approved plug that fits into the bell of the pipe and is recommended by the pipe manufacturer. This plug shall be installed in such a manner that it may be removed at some future time without injury to the pipe itself. At the close of each day's work, and at other times when pipe is not being laid, the end of the pipe shall be temporarily closed with a plug.

III.3.6. CLEANING

All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing material into the pipelines. As the work progresses, the interior of the wastewater shall be cleaned of all dirt, and foreign material. The Contractor shall flush all wastewater lines constructed with clean water, prior to final inspection, to assure complete removal of all debris and foreign material.

III.3.7. BEDDING AND BACKFILL

Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement. Unsuitable material shall be removed and replaced with AASHTO Class A-3 soil upon approval of the Engineer. A-3 soil and native material backfilled shall be compacted to the requirements of Chapter II. 3. Section 408 of these specifications.

III.4. GRAVITY WASTEWATER MAIN AND WATER MAIN SEPARATION REQUIREMENTS:

III.4.1. REQUIREMENTS

The minimum separation requirements between gravity wastewater and potable water mains shall be as outlined in specification Chapter VI. 2. - Section 350 and Detail Nos. S-26 and S-27. 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.

III.5. SYSTEM CONNECTIONS

All connections and ties to JEA's Wastewater System will be performed by the Contractor under supervision of JEA.

III.6. CARRIER PIPES IN CASINGS

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 foot intervals along the carrier pipe for pipe up to 48 inches with 20 foot laying lengths. Casing spacers shall be installed one foot on both sides of each carrier pipe joint for pipe up to 48 inches with 13-foot laying lengths. 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. 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.7. LATERAL CONNECTIONS

Types of lateral connections shall be as shown on the drawings. Although the general location of lateral connections may be shown on the drawings, the actual location shall be determined by the Contractor, subject to approval by the Engineer. Each lateral connection shall be accurately recorded by stationing on the As-Built drawings which shall be furnished to the Engineer. Unless authorized by the Engineer in writing, or shown on the drawings, lateral connections shall be limited to 2 ties into new or existing dead end manholes. All lateral connections shall be terminated at the property line unless indicated otherwise on the drawings or directed otherwise by the Engineer. All active lateral connections on sanitary wastewater to be replaced shall be connected to the new sanitary wastewater. Contractor shall be responsible for locating lateral connections prior to construction. Unless approved otherwise by a JEA O&M manager, no gravity wastewater main with wastewater service laterals shall be constructed with a "depth of cut" greater than 12 feet (see Detail S-20).

III.7.1. MARKING SERVICE LINES

An "S" shall be cut in the curb (painted green) directly over each service line or in the street side of a sidewalk where no curb is available. In addition, for new development areas where the wastewater lateral is "not in use", a landscape timber (3" x 3" minimum P.T. timber, top painted green) w/marker ball at finish grade depth of 3' maximum shall be installed to mark the location of the 6-inch plug. For projects where no concrete curb exists, an electronic marker is required for all laterals, which are "NOT IN USE" at finish grade depth of 3' maximum. The electronic marker shall be a mid-range type as manufactured by Scotch Mark or JEA pre-approved equal. During the final inspection or project acceptance inspection, JEA may elect to field test the installed electronic markers utilizing JEA locate equipment. The contractor shall assist in the field locate services required to complete this test.

III.7.2. WASTEWATER SADDLE

A wastewater saddle may be utilized in the construction of a new wastewater service lateral which is tapping an existing (in-use) clay or PVC gravity wastewater main. A wastewater saddle shall not be used on totally new wastewater system work on HDPE gravity pipe mains. The saddle shall include a ductile iron saddle casting with corrosion-resistant paint, SBR gasket, 304 stainless steel band with 304 S.S. Adjusting bolts and 304 S.S. Pipe clamp. Acceptable is ROMAC style "CB" or JEA approved equal.

III.8. STUB-OUTS

Where shown on the drawings, stub-outs shall be provided for the connection of future wastewater lines to manholes. The end of each stub out shall be provided with a bell end which shall be closed by an approved plug as previously specified. Each stub-out shall be accurately referenced to the center of the manhole, and the actual invert elevation of each end of the stub out shall be accurately recorded on the As-Built drawings.

III.9. YARD PIPING

Yard piping shall be defined as the wastewater service piping and appurtenances privately owned and located entirely on private property. All yard piping shall conform to local plumbing code and all applicable building codes. No work shall be done on private property without written consent of property owner (Temporary Construction Easement). Contractor must obtain plumbing permit prior to work.

III.10. LOCATE WIRE

No locate wire is required on gravity lines.

IV. FIELD TESTING

All work constructed shall be subject to visual inspection for faulty alignment, defects, or leaks. Any such deviation or omission shall be corrected at once. All tests shall be made by the Contractor who shall provide necessary equipment for TV testing and lamping the system in the presence of, and under the supervision and instructions of the JEA's representative. All costs for testing defined below shall be borne by the Contractor.

IV.1. LAMPING

Lamp tests shall be observed first hand by JEA's representative to assure proper horizontal alignment. Upon completion, each section of wastewater line shall show a full circle of light when lamped between manholes.

IV.2. TELEVISION INSPECTION**IV.2.1. SCOPE**

Television inspection will be required on all new and/or replacement wastewaters constructed. The Contractor shall provide this service. JEA shall instruct the Contractor when this

requirement shall be performed. The newly constructed wastewaters shall be televised in the presence of JEA's representative. Unless approved otherwise by JEA, prior to T-V inspections, all manhole inverts must be built and roadways shall be lime rocked and have density test completed. Gravity in easements must be compacted backfill to final grade. For areas which require "Special Pavement" all base material shall be compacted ready for asphalt pavement prior to TV work.

IV.2.2. QUALITY ASSURANCE

Inspection Operation shall be conducted by experienced personnel trained in locating and identifying structural defects in pipe, leaks, obstruction, faulty alignment or any abnormalities detrimental to the proper functioning of the wastewater system. Contractor shall have a minimum of (4) years of experience with internal examination of wastewater lines using CCTV equipment. Unless approved otherwise by JEA, a JEA employee, experienced in CCTV inspections shall be present during all inspection operations. JEA reserves the right to reject any tests due to quality or tests performed without the knowledge or presents of a JEA representative.

IV.2.3. VIDEO INSPECTION EQUIPMENT

The CCTV inspection camera shall be specifically designed and constructed for wastewater line inspections, and shall be self-contained audio-visual system complete with winches, (power or mechanical) or be self-propelled, with a minimum of 500 feet of cable, monitor, video tape recorder, and suitable measuring devices accurate to + 1.0% of the total length (e.g. accurate within 5.0 feet for 500 feet total length) to determine the position of the camera in the line being inspected at all times, and all necessary equipment for the successful completion of the video inspection. The video inspection system shall have the ability to superimpose the measured footage onto the monitor screen and be recorded visually by the video tape recorder. The camera shall be operative in 100 percent humidity conditions and shall be capable of producing a full-color picture at a remote monitor. Lighting and camera quality shall be suitable to allow a clear, in-focus picture of a minimum of 6 linear feet of the entire inside periphery of the wastewater pipe. The camera shall have a minimum resolution of 320 lines to ensure peak picture quality throughout all conditions encountered during the investigation, a variable intensity control of the lights and remote control adjustments for focus and iris shall be located at the monitoring station. The camera shall be equipped with a rotating head enabling a view of 90 degrees to the axis to be inspected so that service connections can be properly inspected.

IV.2.4. COLOR VIDEO MONITORS

Color video monitor shall be located within a temperature controlled studio that will allow seating for two authorized viewing personnel, (Contractor representative and JEA field representative) in addition to the operating technician. All persons shall have a clear and comfortable view of the monitor. Monitor shall have a resolution capability of no less than 650 lines. Continuously displayed on the monitor as recorded by the video camera shall be the date of the survey, number designation of the manhole to manhole pipe segment being surveyed, and a continuous forward and reverse read out of camera distance from the reference manhole. Audio descriptions of the operating technician's observations shall be recorded on the video tape. Picture quality and definition shall be to the satisfaction of the JEA. If the picture quality is unsatisfactory, the video equipment shall be replaced.

IV.2.5. GENERAL REQUIREMENTS

Pipe to be televised shall be cleaned and free of any dirt, sand or debris, prior to CCTV inspection and in the presence of an authorized JEA representative. The wastewater line shall be introduced with enough water at the upstream manhole that it flows through the downstream manhole. The JEA representative shall verify the adequacy of the water flow and depth. Inspections shall commence within thirty (30) minutes of said verification. Underdrains if used shall be plugged and other ground water drainage (i.e. well point systems) shall be stopped to permit the ground water to return to normal levels insofar as practicable. If possible, service connections at the right-of-way shall not be made until after TV test have been successfully completed. The contractor shall provide at no additional cost to JEA a temporary plug and/or by-pass pumping on wastewater with active wastewater service laterals, if deemed necessary by the JEA representative to assure a quality TV inspection. If required by JEA, the contractor shall eliminate active flow in wastewater laterals by shutting off the water supply service to the contributing house(s). Contractor shall comply with the current JEA water outage procedures for shutting off customers' water service. A mandrel is required on PVC SDR-26 (12 inches and smaller). The mandrel shall be pulled through the pipe ahead of the TV camera at a rate of speed slow enough not to displace any standing water. A mandrel is not required for gravity wastewater pipes larger than 12-inch size and constructed of PVC SDR-26 or DR-18 Pipe. A full report, as to the condition of pipe, type, depth, location of services, length, type joint, and distance between manholes, etc., shall be furnished to JEA prior to the final acceptance of the main. Each manhole shall be identified on the DVD and report by manhole number and nearest address or intersection. In addition to the written report, a DVD disc (formatted for Windows Media Player or JEA approved equal) of the TV inspection shall be provided to JEA for review. The disc shall become the property of JEA. Any pipe found to have defects, including but not limited to leaks, cracks, pipe deflection from external pressures, rolled or pinched gaskets, joint gaps (wider than 1 inch), or holding water greater than the following limits (a "dip") or otherwise defective shall be removed and replaced with new pipe at no additional cost to JEA.

IV.2.5.1. A "dip" is defined as any water holding depth which is equal or greater than the "minimum" depth as listed below. There shall not be any more than 1 "dip" per 135 linear feet of wastewater pipe installed (1 minimum). The defective pipe sections, or those "dip"/sections over the allowable limit, shall be removed and replaced (at no cost to JEA). Each run of pipe, between two manholes, shall be evaluated independently for compliance. Any "dip" which is greater than the "maximum" "dip" depths listed below are not acceptable and shall be removed and replaced at no cost to JEA. Regardless of the number of "dips" in the line section, if, in the opinion of the JEA inspector, the number and/or location of the "dips" is believed to create an unacceptable operating condition, than the defective pipe section(s) shall be removed and replaced at no cost to JEA. Any deviation from these "dip" limitations must be approved by a JEA Manager.

Pipe Size	Water Holding Depth (inches)	
	Minimum	Maximum
8 inch - 10 inch	0.50	1.00
12 inch - 15 inch	0.75	1.50
18 inch - 21 inch	1.00	2.00
24 inch and greater	1.25	2.50

IV.2.6. DEFORMATION/DEFLECTION LIMITS

Pipe shall be tested with a mandrel for deformation or deflection. Any pipe found to be deformed and/or deflected in excess of 7.5% of the nominal diameter of the pipe shall be removed and replaced with new pipe at no additional cost to JEA. All mandrels used in testing shall be available to be checked for proper sizing by use of truing rings at the request of a JEA Representative. Results of the test shall be submitted to JEA for review and approval. The use of a re-rounding device or other similar equipment is not permitted to correct deflected (egg shape) pipe.

IV.2.7. MANHOLE INSPECTIONS

All manholes shall be inspected for leaks and any defects that may cause infiltration, or weaken the structural integrity. Before the final inspection, manholes shall be trimmed of any excess Ram-Nek joint sealant. Any voids in pre-cast manhole shall be filled with non-shrink grout and the grouted areas shall be thoroughly field coated (2 coats) with bituminous waterproofing excluding invert and bench, as required. The gasket on the manhole cover shall be inspected for cuts, tears, scraps and proper fit. If found damaged, the entire gasket seal shall be replaced in accordance with the manufacturer's recommendation, at contractors expense.

Contractor shall be required to televise the interior of each new and/or replacement manhole utilizing a pole mounted type camera. Televising of the manhole structures to occur when gravity wastewater mains are CCTV'd, and in the presence of JEA representative. Results shall be observed by the JEA representative on the CCTV color monitor used for viewing the associated wastewater main. Interior manhole structure to be televised shall be free of debris prior to inspection. Each manhole shall be identified on the DVD and report (both to be copied and delivered to JEA for review and its files) by manhole number and nearest address/intersection or by as-built station number/offset. Manhole to be televised shall require review of frame, cone, risers, joints, bench, flow channel, and each pipe connection.

IV.2.8. LATERAL INSPECTION

All laterals shall be inspected to insure proper connection to the gravity main.

V. WASTEWATER ABANDONMENT

Abandonment of all existing gravity wastewater lines falling within the limits of street, alley or highway right-of-ways shall be treated in the following manner. Existing gravity wastewater lines will not be classified as abandoned until such time as all existing lateral connections have been transferred to a new operating wastewater line.

V.1. SEALED

All abandoned wastewater lines where called for on the Contract Drawings to be sealed, shall be sealed at each end and at every break in the line. Seals for all pipe sizes shall be of Class "C" concrete or concrete grout and rubble and shall extend into the wastewater for at least 12 inches.

V.2. GROUT FILLED

All abandoned wastewater lines where called for on the Contract Drawings to be grout filled shall be accomplished by the following procedure. Lines to be grout filled shall be completely filled with a sand-cement grout by pumping the mixture into the pipelines from downstream or low end of the line with an approved grout pump. The Contractor shall clean the line of all sand and debris prior to grout filling. Grout for filling abandoned wastewater lines shall consist of at least 15 percent Portland Cement by volume and shall be mixed to a consistency suitable for pumping. Sand used in the grout mixture shall meet the requirements for fine aggregate as specified in the City Standard Specifications for the City of Jacksonville, Public Works Department, Section 130.

VI. REMOVE EXISTING

Where shown on the drawings or called for elsewhere in the Contract Documents to remove existing, shall mean the complete removal and disposal of the wastewater pipe as specified by the Engineer. Excavation and backfill shall be as specified in Chapter II. 3. - Section 408 of these specifications.

VI.1. REMOVE AND CONSTRUCT PIPING

Where shown on the drawings or called for elsewhere in the Contract Documents shall mean the complete removal of the existing wastewater pipe and constructing a new wastewater pipe in the same trench, but not necessarily at the same elevation. The existing pipe shall be disposed of as specified by the Engineer.

VI.2. SEAL AT EXISTING STRUCTURES

When wastewaters that are to be abandoned or existing lines to be removed fall above or below the new line to be constructed, the opening left in the existing manhole wall shall be thoroughly plugged with non-shrinking mortar applied and cured in strict conformance with the manufacturer's recommendations. The mortar shall be finished smooth and flush with the adjoining interior manhole wall surface.

VII. 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 crossings shall be in full compliance with the terms of the permit and in accordance with the Utility Accommodation Guide and standard specifications, of the Florida State Department of Transportation. 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 sanitary wastewater main shall then be placed in the casing with approved casing spacers as specified in this section. All joints within the carrier pipe shall be mechanically restrained joints. After inspection, the ends of the casing shall be filled with 2500 psi concrete not less than eight inches thick.

VIII. RAILROAD CROSSINGS

Permits for all work within the right-of-way of a railroad will be obtained by the Engineer. The Contractor shall, however, verify existence of a 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 carrier pipe shall be placed in steel casing pipe under the railroad crossing by jacking

and boring. The wastewater 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.