SECTION 331060

DUCTILE IRON PIPE AND FITTINGS FOR PRESSURE PIPE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnishing all labor, materials, equipment, and incidentals necessary to furnish, install, test, and disinfect (as required) all ductile iron pipe and appurtenances as shown in the Construction Plans and as specified herein.

B. Testing and disinfection (as required).

1.2 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)/American Water Works Association (AWWA):

1. ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water and Other Liquids.

2. ANSI/AWWA C105/A21.5 – American National Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

3. ANSI/AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3 In. through 48 In., for Water and Other Liquids.

4. ANSI/AWWA C111/A21.11 – Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

5. ANSI/AWWA C115/A21.15 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

6. ANSI/AWWA C150/21.50 – Ductile Iron Pipe, Thickness Classification.

7. ANSI/AWWA C151/A21.51 – Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

8. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings.

9. ANSI/AWWA C219 – Bolted Sleeve-Type Couplings for Plain-End Pipe.

B. American Society of Mechanical Engineers (ASME):

1. ASME B16.5 – Pipe Flanges and Flanged Fittings.

C. American Standard for Testing and Materials (ASTM):

1. ASTM A536 – Standard Specification for Ductile Iron Castings.

2. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

D. American Water Works Association (AWWA):

1. AWWA C651 – Disinfecting Water Mains.

1.3 QUALIFICATIONS

A. All ductile iron pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished.

B. All pipe and accessories to be used for potable water shall be NSF certified and copies of the lab certification shall be submitted to the City.

1.4 SUBMITTALS

A. General: Submit all submittals to the City in accordance with Section 01300.

B. Required Submittals:

1. Manufacturer's recommendations for pipe jointing and laying.

2. Product Data: Product literature including detailed listing of materials and materials of construction for the following (as required):

a. Ductile iron pipe

b. Ductile iron fittings

c. Flange adapters

d. Bolted sleeve-type couplings

e. Mechanical joint restraints

f. Bell restraints

1.5 QUALITY ASSURANCE

A. The Contractor shall provide thoroughly trained and experienced personnel who are completely familiar with and adequately equipped for the Work in this Section. Follow the Manufacturer's recommendation and the requirements herein for standard installation procedures for ductile iron pipe and fittings.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE

A. Size: As shown in the Construction Plans.

B. General: Ductile iron pipe shall conform to ANSI A21.51/AWWA C151.

C. Pressure or Thickness Class:

1. For buried pipes in sizes 4 inches to 14 inches, pipe shall be pressure class 350.

2. For buried pipes in sizes 16 inches and larger, pipe shall be pressure class 250.

3. Above-ground pipe shall have a minimum thickness class of 53 AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

D. Lining:

1. Potable and Reclaimed Water: Cement lining meeting the requirements of ANSI A21.4/AWWA

2. C104, minimum 1/8-inch thick.

3. Wastewater: Factory-applied amine-cured novolac ceramic epoxy. Minimum 40 mils dry film thickness.

4. Approved Products:

    a. Protecto 401.
    b. Novocoat SP200W.
    c. Or approved equal.

E. Coating: Bituminous seal coating inside and outside, standard thickness, ANSI A21.4/AWWA C104.

F. Joint: Push-on unless otherwise shown in the Plans, ANSI A21.51/AWWA C151.

G. Gaskets: ANSI A21.53/AWWA C153.

H. Maximum Length: 20 feet.

I. Approved Manufacturers:

    a. American Cast Iron Pipe Company.

    b. McWane Ductile.

    c. U.S. Pipe and Foundry.

    d. Griffin

2.2 DUCTILE IRON FITTINGS

A. Mechanical Joint Fittings: Ductile iron fittings complying with AWWA C110 or AWWA C153, designed to withstand a working pressure of not less than 350 psi, and conforming to the requirements of ASNI/AWWA C151/A21.51.

1. Joints and Gaskets: Mechanical joint with retainer gland. Comply with ANSI/AWWA C111/A21.11.

B. Flanged Joint Fittings: Ductile iron fittings complying with AWWA C110/ANSI A21.10, designed with a minimum working pressure of 250 psi, and conforming to the requirements of ASNI A21.51.

1. Joints and Gaskets: Flanged joint pipe shall be joined utilizing stainless steel nuts and bolts with full-face gaskets or tru-ring gaskets.

C. Lining and Coating: As specified for ductile iron pipe.

2.3 FLANGED JOINTS

A. All flanged joints shall be Class 125 standard per ASME B16.5 with neoprene rubber gaskets, minimum 1/8-inch thick.

2.4 INDENTIFICATION

A. Each pipe length and fitting shall be clearly marked with:

1. Manufacturer's name and trademark.
2. Pressure rating.
3. Nominal pipe diameter.
4. Material designation (e.g., “DI” or “Ductile”).

2.5 POLYETHYLENE WRAP

A. Ductile iron pipe shall be fully encased in an eight (8)-mil polyethylene sleeve, in accordance with ANSI A21.5/AWWA C105, Method A, at locations designated on the Construction Plans. Polyethylene material shall conform with the requirements of ASTM D1248.

B. Polyethylene wrap shall be colored to designate the end use of the ductile iron pipe:

USE COLOR

Potable Water Mains Blue

Reclaimed Water Mains Purple

Wastewater Force Mains Green

2.6 FLANGED ADAPTERS

A. Restrained flange adapters shall be used in lieu of threaded or welded flanged spool pieces, unless specified otherwise.

B. Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C115/A21.15.

C. Restraint for the flange adapter shall consist of a plurality of individually actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to ensure proper initial set of the

gripping wedges.

D. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum of 0.6-inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

E. The flange adapter shall have a minimum safety factor of 2:1.

F. Approved Manufacturer:

1. Ford Meter Box Co.
2. Sigma

2.7 BOLTED SLEEVE-TYPE COUPLINGS

A. General: Bolted sleeve-type couplings shall be used for joining the plain end of a PVC or ductile iron pipe to an existing asbestos cement pipe. For joining the plain end of a PVC or ductile iron pipe to any existing pipe that is not asbestos cement pipe, a ductile iron solid sleeve with joint restraints shall be used.

B. Bolted sleeve-type couplings shall comply with AWWA C219.

C. When used in potable water applications, fittings shall be NSF 61 certified.

D. Materials of construction shall be:

1. Center Rings: ASTM A53 Grade A steel for sizes 1-1/2 inches to 12 inches. ASTM A283 Grade C steel for sizes 14 inches to 60 inches.

2. Coatings: Fusion bonded epoxy, interior and exterior.

3. End Ring: ASTM A283 Grade C steel.

4. Gaskets: EPDM compounded for water, complying with NSF 61 and NSF 371.

5. Nuts and Bolts: Type 304 stainless steel.

6. Bridge: Type 304 stainless steel.

E. Approved Products:

1. Krausz, HYMAX 2 Coupling

2. Romac Industries, Macro HP Extended Range Coupling

3. Approved equal

2.8 MECHANICAL JOINT RESTRAINTS FOR DUCTILE IRON PIPE

A. Mechanical joint restraints shall include a gland and wedges, gaskets, and restraining bolts and lugs. Flexibility of the joint shall be maintained after burial.

B. Glands and wedges shall be manufactured of ductile iron conforming to ASTM A536.

C. Gaskets shall conform to ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/ANSI A21.53.

D. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

E. The mechanical joint restraint device shall have a working pressure of at least the required PSI of the pressure pipe, with a minimum safety factor of 2:1.

F. Approved Products:

1. EBAA Iron, Series 1100 MEGALUG

2. U.S. Pipe and Foundry

3. American Cast Iron Pipe

4. Sigma Co., ONE-LOK Model SLDE

5. SIP Industries, EZ Grip Model EZD

6. Stargrip MJ, Series 3000 for DI and 4000 for PVC

2.9 BELL RESTRAINTS FOR DUCTILE IRON PIPE

A. Bell restraints shall include a split ring used behind the bell, a serrated restraint ring used to grip the pipe, and bolts to connect the split ring and gripping ring.

B. The split ring and gripping ring shall be made of ductile iron conforming to ASTM A536.

C. A sufficient number of bolts shall be used to connect the bell ring and the

pipe ring such that the overall unit has a working pressure of at least the required PSI of the pressure pipe, with a minimum safety factor of 2:1.

D. Approved Products:

1. Ebba-Iron series 1500/1600
2. Sigma
3. SIP Industries – EZ Grip PTP Series
4. Ford
5. Star 1100 series bell restraints

2.10 THRUST BLOCKING MATERIALS

A. General: Thrust blocks shall not be permitted without prior written approval by the City and Engineer.

B. Non-structural concrete shall comply with Section 32104.

C. The use of high-early cement will be required to allow hydrostatic testing five (5) days following the installation of the thrust blocking.

2.11 PRESSURE GAUGE (FOR PRESSURE TESTING)

A. The Contractor shall furnish a Type A oil filled gauge for measuring pressure used during hydrostatic pressure testing. The gauge shall have pressure increments not more than two (2) psi.

PART 3 – EXECUTION

3.1 GENERAL

A. Pipe and fittings shall be handled with care to ensure that the pipe and fittings are in sound, undamaged condition. Particular care shall be taken to prevent damage to pipe coating and lining.

B. The Contractor shall furnish slings, straps, and/or other approved devices to support the pipe when it is lifted. Pipe and fittings shall not be dropped from trucks onto the ground or into the trench. Transporting pipe and fittings from storage areas shall be restricted to operations which will not cause damage to the pipe or lining.

C. All pipe and fittings shall be examined before laying and no pipe or fitting shall be installed which are found to be defective. Damaged pipe

coatings and/or lining, shall be repaired as approved or directed by the City.

D. Any pipe showing a distinct crack with no evidence of incipient fracture beyond the limits of the visible crack, if approved, may have the cracked portion cut off, at no expense to the City, by the Contractor before the pipe is laid so that the pipe used is sound. The cut shall be made in the sound portion of the barrel at least 12 inches from the visible limit of the crack.

E. If any defective pipe is discovered after it has been laid, the Contractor shall remove the defective pipe and replace it with sound pipe at no additional cost to the City.

3.2 CONTROL OF ALIGNMENT AND GRADE

A. Easement, property and other control lines necessary for locating the Work as well as elevations and benchmarks used in the design of the Work are shown in the Construction Plans. The Contractor shall use this information to set line and use a level or transit to set grade.

B. The use of string levels, hand levels, carpenter's levels, or other similar devices for transferring grade or setting pipe are not permitted.

C. At the request of the City, provide during construction all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of one or two rodmen as needed at intermittent times.

D. The Contractor shall not proceed until he/she has made timely request of the City for, and has received from the City, such controls and instructions as may be necessary as Work progresses. Work shall be done in strict conformity with such controls and instructions.

E. The Contractor shall carefully preserve benchmarks, reference points and stakes, and in case of willful, careless, or accidental destruction by his own staff, he will be responsible for the resulting expense to re-establish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the loss or disturbance of such control data.

F. The Contractor shall maintain good alignment in laying pipe. The deflection at joints shall not exceed 75 percent of the Manufacturer's recommended limit. Provide fittings, if required, in addition to those shown in the Construction Plans when pipe crosses utilities encountered when excavating the trench. Use solid sleeves only where approved by the City.

3.3 INSTALLING PIPE AND FITTINGS

A. The Contractor shall have on the job site with each pipe laying crew, all the proper tools to handle and cut the pipe.

B. All pipe and fittings shall be thoroughly cleaned before laying and shall be kept clean until installed.

C. Pipe shall be laid in the dry trench conditions. At no time shall water in the trench be permitted to flow into the pipe. At any time that Work is not in progress, or the trench is unattended, the end of the pipe shall be suitably closed to prevent the entry of animals, earth, water, etc., using watertight expandable plugs.

D. Lay pipe and fittings in accordance with the requirements of AWWA C600, except as provided herein.

E. Excavation shall conform to Section 311020.

F. As soon as excavation has been completed to the proper depth, the pipe bed shall be prepared as follows:

1. Pipe Laid on Undisturbed Subgrade: Manually excavate for pipe bells and along the trench bottom as necessary to provide a uniform bearing surface along the entire length of the pipe barrels.

2. Pipe Laid on Bedding Material: Place and compact bedding materials, as specified Section 311020, to the elevation necessary to bring the pipe to grade. The compacted material shall be shaped so that the bottom quadrant of the pipe rests firmly on the bedding for the entire length of pipe barrels. Suitable holes shall be dug for bells or couplings to provide ample space for jointing pipe.

G. When ledge is encountered in the bottom of the trench, pipe shall be bedded on a layer of crushed gravel having a minimum thickness of six inches (6”). Blocking shall not be permitted.

H. Each pipe section shall be placed into position on the pipe bed in such a manner and by such means required to avoid injury to persons, any property or the pipe.

I. Permanent blocking under the pipe is not permitted except where a concrete cradle is required, in which case precast concrete blocks shall be used.

J. Jointing shall conform to the Manufacturer’s instructions and

appropriate ASTM Standards.

1. Deflections: The maximum allowable deflection at pipe joints shall not exceed 75 percent of the maximum deflection specified by the Manufacturer. Where deflections greater than 75 percent of the maximum deflection specified by the Manufacturer are necessary, the Contractor shall provide ductile iron fittings.

K. Any debris, tools, etc., shall be removed from the pipe.

L. Place bedding material in accordance with Section 311020.

M. After placement of the bedding material the pipe shall be checked for alignment and grade. If the pipe has been properly installed, the Contractor may refill or backfill the remainder of the trench in conformance with Section 311020 and details shown in the Construction Plans.

N. At the end of each day's work or at other intervals, the City, with the Contractor will inspect the pipe installation. Unsatisfactory work shall be dug up and reinstalled to meet the requirements of the Contract Documents with no additional time allowed for completion of the Work and at no additional cost to the City.

O. When cutting of pipe is required, the cutting shall be done by machine (power cutter) without damage to the pipe or cement lining. Cut ends shall be smooth and at right angles to the axis of the pipe. Pipe ends to be used with a rubber gasket joint shall be beveled and filed or ground smoothly to conform to a manufactured spigot end.

P. Install concrete thrust blocks at locations as indicated on the Plans and with written consent of the City. Minimum bearing area shall be as shown on the Plans. Joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the subsequent removal of any fitting. Wooden side forms shall be provided for thrust blocks where trench conditions require. Thrust blocks shall be property set and adequately cured prior to pressurizing the system.

3.4 JOINTING DUCTILE IRON PIPE (PUSH-ON TYPE)

A. Make push-on joints in strict accordance with the Manufacturer’s written instructions. Lay pipe with bell ends looking ahead. Insert a rubber gasket in the groove of the bell end of the pipe and clean and lubricate the joint surfaces. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be jointed and pushed

home with a bar and block. Two (2) continuity brass wedges shall be installed in each push-on joint.

3.5 JOINTING MECHANICAL JOINT FITTINGS

A. Mechanical joints at valves, fittings, and where designated in the Construction Plans shall be in accordance with ANSI A21.11/AWWA C111, Appendix A – Notes on Installation of Mechanical Joints, and the Manufacturer's written instructions.

B. Field Installation: Thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Tightening torque for bolts shall be 75 to 90 ft-lbs. Under no condition shall extension wrenches or pipe over handle or ordinary ratchet wrenches be used to secure greater leverage. After installation, apply a bituminous coating to bolts and nuts. A retainer gland (not a common follower gland) shall be used whenever mechanical joints are used.

3.6 FLANGED JOINTS

A. Tighten bolts in flanged joints alternately and evenly as specified for mechanical joints. Apply a bituminous coating to bolts and nuts for buried joints.

3.7 VALVES

A. Valves shall be installed in the manner specified in Section 331040.

3.8 THRUST BLOCKING

A. Cast-in-place concrete thrust blocks shall be installed at all locations as indicated on the Plans, with written consent of the City. Thrust blocks shall not be permitted in locations where not indicated on the Plans without prior approval by the City and Engineer.

B. Minimum bearing area shall be as shown in the Plans.

C. Fittings shall be protected by felt roofing paper prior to placing concrete.

D. Concrete shall be placed against undisturbed soil materials; shall not cover joints, bolts, or nuts; and shall not interfere with the subsequent removal of any fitting. Wooden side forms shall be provided for thrust blocks where trench conditions require.

E. Thrust blocks shall be properly set and adequately cured prior to pressurizing the system.

3.9 FLUSHING

A. After the mains have been laid, each run of pipe shall be thoroughly flushed so as to remove all debris and foreign matter from the lines. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipeline. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipeline shall be opened and flumes or piping shall be provided by the Contractor to waste the water to the nearest approved disposal point. Sufficient flushing water shall be introduced into the mains to produce a scouring velocity of not less than 3.5 feet per second to re-suspend the solids, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

B. In the event that the Contractor cannot obtain the flushing velocity, a poly-pig swab must be used to clean the pipeline. The Contractor shall submit the proposed pigging plan to the City for review. The plan shall include type of pig material, water flow rate, discharge points, poly-pig detector, and retrieval options.

3.10 HYDROSTATIC TESTING OF DUCTILE IRON PIPE

A. General:

1. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops. Air testing of pressure pipe shall not be permitted under any circumstance. The Contractor shall furnish all necessary equipment and materials, make all taps, and furnish all closure pieces in the pipe as required.

2. The Contractor’s testing plan shall be submitted to the City for review and approval prior to testing.

3. Hydrostatic testing shall be performed at a minimum pressure of 150 psi or 1.5 times the working pressure (whichever is greater) for a period of not less than two (2) hours.

4. The Contractor shall supply a pump to apply the specified pressure to the test system. The pump suction shall be in a barrel/drum or similar device, or metered with a calibrated meter, so that the amount of water required to maintain the test pressure may be measured accurately.

5. The maximum length of pipe to be tested at one time is 2,600 linear feet. If more than 2,600 linear feet of pipe is tested during a single hydrostatic test, then the allowable leakage shall not exceed that which would be allowed for 2,600 linear feet of jointed ductile iron pipe.

6. No leakage shall be permitted for jointless pipe (i.e., fusion welded HDPE or FPVC pipe). If jointless pipe is included within a section being tested, then the length of jointless pipe shall not considered when calculating the allowable leakage.

B. Pre-Test Procedures:

1. The Contractor shall perform a hydrostatic pre-test to provide reasonable assurance of acceptance prior to performance of the witnessed test. Upon accomplishing a successful pretest, the Contractor shall schedule testing to be conducted in the presence of persons required to witness the test.

2. Testing for acceptance shall be conducted in the presence of representatives of the Engineer of Record, the City, and the Contractor. All persons required to be present for testing shall be notified by the Contractor a minimum of two (2) business days prior to commencement of the test. Should any of the persons required to be present not be able to attend, the test shall be rescheduled.

3. Piping and appurtenance to be tested shall be within sections between valves, unless alternate methods have received prior approval. Testing shall not proceed until concrete thrust blocks are in place and cured or other restraining devices installed and all trenches have been completely backfilled in accordance with the Contract Documents. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

4. The Contractor shall ensure that all equipment such as pumps, gauges, blow-offs, and valves are in good working order.

5. The Contractor shall ensure that all valves within a section to be tested are fully open. At the request of the City or the Engineer of Record, the Contractor shall operate each valve to demonstrate that they are open.

6. One day prior to the hydrostatic test, slowly fill the pipe with water and allow it to stand for 24 hours.

C. Hydrostatic Testing for Acceptance:

1. The procedure for conducting the test shall be that each section of pipe to be tested shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City and the Engineer of Record. Prior to applying the

specified test pressure, all air shall be expelled from the pipe. To accomplish this, the Contractor shall make taps and install appropriate valves to ensure all air is bled from the test section.

2. If during the two (2) hour test period the test pressure drops by five (5) psi from the starting pressure, additional water shall be pumped into the test section to return the pressure to the starting pressure. The amount of water required to return the pressure to the starting pressure shall be recorded.

3. At the end of the two (2) hour test period, additional water shall be pumped into the test section to return the pressure to the starting pressure. The amount of water required to return the pressure to the starting pressure shall be recorded.

4. Leakage shall be defined as the quantity of water added to hold the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$\frac{L = S \times D \times \sqrt{P}}{148{,}000}$$

L = allowable leakage (makeup water), in gallons per hour.
S = length of pipe tested, in feet.
D = nominal pipe diameter, in inches.
P = average test pressure, in psi (gauge).

5. If during the test, the integrity of the tested line is in question, the City may require a six (6) hour pressure test. Testing shall be in accordance with the applicable provisions as set forth in Section 4 of AWWA Standard C600.

6. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the Contractor with sound material and the test repeated until satisfactory results are obtained.

3.11 DISINFECTION (POTABLE WATER ONLY)

A. Following pressure testing and before water main disinfection, the water main shall be filled to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec. unless the City determines that conditions do not permit the required flow.

B. Water mains shall be disinfected in accordance with requirements of the City of North Port Utilities Standard Specifications, latest edition, and applicable Health Department standards and requirements.

3.12 BACTERIOLOGICAL TESTING (POTABLE WATER ONLY)

A. General: Comply with the requirements of FAC Rule 62-555.340, AWWA C651, all applicable permits, and all requirements of the Contract Documents.

B. Chlorinated water shall be flushed from the main until measured levels of chlorine leaving the main are no higher than background levels prevailing in the system.

C. A neutralizing agent shall be applied to the chlorinated discharge if there is a question as to whether this discharge will damage the environment.

D. Bacterial samples shall be collected by a representative of the Sarasota County Department of Health. Sampling locations shall be at each location required by the water main construction permit plus a minimum of one sample for each 1,200 LF of new water main, at each line end, and at each connection to an existing water main. The sampling locations shall be submitted to the City for review and approval prior to the collection of bacteriological samples. The Contractor shall provide acceptable taps for sampling.

E. Sampling shall be the responsibility of the Contractor. Samples will be taken on two (2) consecutive days by a Sarasota County Department of Health representative, in the presence of the City's representative in accordance with F.A.C. 62-555. The Contractor shall contact the City a minimum of two (2) business days prior to chlorination to coordinate witnessing chlorination by the City.

F. If bacteriological results do not show an absence of total coliform at all sample stations for two consecutive days, the Contractor will be required to re-chlorinate and flush the line and conduct additional bacteriological testing at no additional cost to the City.

3.13 CONNECTIONS TO EXISTING PIPING SYSTEMS

A. Approximate locations for existing piping systems are shown in the Plans. Prior to making connections into existing piping systems, the Contractor shall:

1. Field verify location, size, piping material, and piping system of the existing pipe.

2. Obtain all required fittings, which may include saddles, ductile iron sleeves or fittings, flanges, or others as shown in the Plans.

3. Construct concrete thrust blocks as shown in the Plans, and as authorized and approved for use by the City and Engineer.

B. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

END OF SECTION