

WATER & WASTEWATER STANDARDS MANUAL

WATER MAINS
WASTEWATER MAINS
RECLAIMED WATER MAINS
WASTEWATER PUMP STATIONS

January 1, 2017 – Edition

*"Foundation for the Future
Water and Wastewater Standards"*

SUMMARY OF MAJOR CHANGES FOR 2017

I. SECTION II. CHAPTER 492 (ADDED)

I.1.1. VINYL COATED POSTS AND RAILS:

Polymer coated framework shall have a PVC coating fused and adhered to the exterior zinc coating of the post or rail. PVC coatings shall have a minimum thickness of 10-mils (0.254 mm) per ASTM F1043. Color to match the fabric.

I.1.2. VINYL COATED TENSION WIRE:

Polymer coated steel tension wire: 7 gauge wire complying with ASTM F1664. Class 2b, fused and adhered. Color to match the fabric.

I.1.3. VINYL COATED FITTINGS:

In compliance with ASTM F626, polymer coating minimum thickness 0.006 in. (0.152 mm) fused and adhered to zinc coated fittings. Color to match the fabric.

II. POTABLE WATER PIPING – SECTION 350

II.1.1. Changed Table For Pipe sizes and applications shall conform to the following:

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)
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II.1.2. III.6.4.2. Certified Tester: (Removed "or Contractor")

A person ~~or Contractor~~ that has been certified by the Manufacturer of the approved testing equipment 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. WATER VALVES AND APPURTENANCES – SECTION 351 (REVISION IN YELLOW)

III.1.1. VIII.1. To be utilized only for live tap applications or where specifically approved by JEA. **No taps (all sizes) shall be made within 5 feet of a fitting, joint or tap.** Unless approved otherwise by JEA, size-on-size taps are limited on PVC mains to 12 inch size and smaller. Size-on-size taps are acceptable on D.I.P. (all sizes). For size-on-size taps, on 8" and larger mains, the actual tap hole size shall be reduced by 1-inch. Added: Locate wire box reference, Locate wire box and certification check list.

III.1.2. II.2.1.18 **The meter main case shall be made of an American Water Works Association C700 bronze casting composition standard material meeting the 2014 EPA standards for lead free brass, with a bolted split case arrangement and bottom plate that meets American Water Works Association C700 4.1 and 4.2 non-breakable standards with stainless steel bolt fasteners.**

IV. WASTEWATER MANHOLES – SECTION 427

IV.1. II.1.5 PVC SAND SLEEVE: (REMOVED SDR 35 REPLACE WITH SDR 26)

The PVC sleeve shall have the same SDR rating as the connecting pipe (SDR-26 at a minimum). The outside surface shall have a rough building sand finish. No internal pipe stop is required. A minimum of one internal rubber gasket is required.

V. GRAVITY WASTEWATER – SECTION 428 (REMOVE SR35 PIPE FROM STANDARDS)

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 3	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.1.1.3. PVC 1120, Class 118, SDR 35 Pipe: (remove SR35 pipe from standards)

II. 2.2.3. PVC 1120, Class 118, SDR 35 Fittings (remove SR35 pipe from standards)

I.V.2.5. GENERAL REQUIREMENTS: REMOVED SDR-35

VI. WASTEWATER FORCE MAINS – SECTION 429

Changed Table For Pipe sizes and applications shall conform to the following:

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)
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VII. WASTEWATER VALVES AND APPURTENANCES – SECTION 430

Removed Tapping V.1.1.Cast Iron Joint and V.13 Carbon Steel sections

VII.1. REVISED V.3 TAPPING SADDLE (2 INCH AND SMALLER OUTLET):

Stainless steel service saddles shall include stainless steel double bands. Outlet sizes shall be 1 inch through 2 inches and have iron pipe threads (IPS). The outside diameter range of the saddle shall be properly sized to conform to the type of pipe being tapped without placing undue stress on the pipe. Pipe shavings or cuttings, including coupon, shall not enter the host pipe during the tapping operation. The hole cut in the host pipe shall be 1/16 inch diameter smaller than the outside diameter of the saddle outlet.

VII.2. REVISED V.4. TAPPING SADDLE (GREATER THAN 2 INCH OUTLET):

Saddles which require an outlet larger than 2 inch size shall utilize a "tapping sleeve" with a flanged outlet, as specified above.

VIII. SUBMERSIBLE WASTERWATER PUMPING STATIONS – SECTION 433

VIII.1.1. Added, I. All Pump Stations in JEA's service area shall conform to section 433.

VIII.1.2. Revised, III.6 SELECTION OF PUMP STATION STANDARDS

JEA Pump Station Standards are available in Auto CAD format, on the jea.com website. The selection of a pump station type shall comply with the following:

Pump Station Type	Pump Station Maximum Peak Flow	Pump Station Maximum ADF, & EDU	Back Up Power Required	Odor Control Required	Additional Design Requirements
Class One	100 – 440 GPM	174,999 GPD 499 EDU	Generator Disconnect Switch	Not Required	
Class Two	441 – 1000 GPM	175,000 – 436,450 GPD 500 - 1247 EDU	Generator	Electrical sizing, piping and pad provided for future odor control.	
Class Three	1001 – 2000 GPM	436,451 - 971,250 GPD 1,248 – 2,775 EDU	Generator	Electrical sizing, piping and pad provided for future	
Class Four	2001 GPM and Above	971,250 GPD and above 2,775 EDU and above	Generator	Required	Electric power, controls, building with ventilation if pumps larger than 75 HP
* Any station which discharges through a 12" or larger force main or whose maximum design is 441 GPM or greater shall have a generator.					

VIII.1.1. Definition of Flow:

VIII.1.1.1. Maximum Peak flow in GPM (gallons per minute) is the ultimate peak design flow of the pump station using the 10 State Standards peaking factor applied to 3.5 people per EDU and 100 GPD per person.

- VIII.1.1.2. The pump station Maximum Average Daily Flow (gallons per day) is the station's un-peaked maximum/ultimate average daily flow rate the station will be pumping.
- VIII.1.1.3. The pump station's number of EDU's is the number of Equivalent Dwelling Units it will be pumping, which equates to 350 GPD per EDU.
- VIII.1.1.4. The pump station maximum GPM excludes the flow from the permanently installed stand-by pump and any emergency standby by pump (pony).
- VIII.1.2. Back Up Power Requirements:
 - VIII.1.2.1. Pump Stations discharging through a 12" force main or larger, or which re-pump flow from another pump station, through a force main, shall include means for continued pumping operations (emergency operating system) during a power outage/failure. The emergency operating system shall be an Automatic Emergency Generator; (see section 472, Emergency Generator).
 - VIII.1.2.2. An emergency operating system shall be required for any pump station whose maximum peak design is 441 gallons per minute or greater or whose average daily flow is 175,000 gallons per day or greater regardless of force main size. The emergency operating system shall be an Automatic Emergency Generator (see section 472, Emergency Generator).
 - VIII.1.2.3. Pump Stations with a peak design capacity of less than 441 GPM shall include means for continued pumping operations (emergency operating system) during a power outage/failure. The emergency operating system shall be provided for by installation of a Generator Disconnect Switch (see paragraph VI.3.10).
 - VIII.1.2.4. Exceptions: For pump stations with maximum capacity of 175,000 ADF or greater and less than 436,450 ADF, use of a dual electrical feed from 2 separate substations or portable pumping equipment (pony pump system) may be substituted for the required generator with a written exception from the City of Jacksonville, Environmental Protection Board, (Rule 3, Section 3.404 A.10) and JEA.
- VIII.1.3. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter(indicating, totalizing, and recording capabilities) with bypass configuration located within the fenced area.
- VIII.1.4. Exception to Class One Pump station: Grinder pump system intended to serve fill-in areas or areas which are limited to less than 99 (maximum) GPM and cannot be expanded (Wastewater service area) beyond 99 GPM. Low Flow Station Stations less than 99 GPM may utilize a 6 foot diameter wet well. If the potential Wastewater service area can be expanded beyond 99 GPM, then a larger pumping station (Class Two or Three) shall be constructed.
- VIII.1.5. Odor Control Requirements:
 - VIII.1.5.1. All stations with a maximum peak flow greater than 440 GPM shall include electrical service sizing, control panel sizing, piping and concrete pad for future odor control.

VIII.1.5.2. All stations with a maximum peak flow greater than 2000 GPM shall include an odor control system.

VIII.1.5.3. Exceptions: Odor control for stations with a maximum peak flow greater than 2000 GPM with a written exception from JEA.

VIII.1.6. Added III.6.6. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter(indicating, totalizing, and recording capabilities) with bypass configuration located within the fenced area.

VIII.1.7. Revised VI.3.10 to Generator Disconnect Switch

VIII.1.8. Revised VI.3.12.1.1 diagram to remove the emergency breaker/added generator disconnect switch diagram.

VIII.1.9. Removed/obsolete VI.3.13.15.8, VI.3.13.15.8, and VI.3.13.18.2

IX. IN LINE WASTEWATER BOOSTER STATION - SECTION 435

Add III.4.5. All pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter(indicating, totalizing, and recording capabilities) with bypass configuration located within the fenced area.

IX.1.1. Revised for Generator Disconnect Switch

IX.1.2. Revised diagram to remove the emergency breaker/added generator disconnect switch diagram.

X. WATER WASTEWATER PROTECTIVE COATINGS-SECTION 447

Edited chapter, defining Operation and Maintenance projects vs Capital projects.

XI. EXISTING CONCRETE PREPARATION AND REPAIR – SECTION 448

New Chapter

XII. EMERGENCY GENERATOR (LESS THAN 600KW) – SECTION 472

Chapter Revised: Shared Services Standards is taking over the Generator Specifications.
Contact information:

Project Administrator

Breadon, William A. breawa@jea.com

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XIII. AS-BUILTS DRAWINGS – SECTION 501

XIII.1.1. Change: Acceptance dates shall be accepted in lieu of installation dates for equipment and materials.

XIII.1.2. Change: Private Pump Stations ownership information is not required

XIII.1.3. Change: A Bore in plan and profile view or Bore log on 24" x 36" sheets with Cadd & PDF file attached is required

XIII.1.4. Change: Removed Valve Depth to Nut

XIII.1.5. Change: All materials and sizes of lines and fittings indicated on drawing tables for Pump Stations

- XIII.1.6. Change: Pressure mains section between fittings/valves is shown with pipe size, pipe material and pipe pressure class called out with a leader line pointing to the applicable main (exceptions noted for extended pipe run)
- XIII.1.7. New: JEA Record Drawing Submittal Transmittal for Water/ Wastewater Plants, Wells and Pumping stations.
- XIII.1.1. Corrected II.3.3 Coordinates or elevations on the main and finished grade will be required at points of connection to the existing system, fittings (bends, valves, tees, plugs, etc.), ~~500~~ 100' intervals, at high points, and where the standard depth of cover is not provided.
- XIII.1.1. Corrected II.5.3. Coordinates or elevations on the main and finished grade will be required at points of connection to the existing system, fittings (bends, valves, tees, plugs, etc.), ~~500-100'~~ 100' intervals, at high points, and where the standard depth of cover is not provided.

XIV. HORIZONTAL DIRECTIONAL DRILL - SECTION 750

XIV.1. V. PIPE ASSEMBLY (REVISED IN YELLOW)

Pipe shall be welded/fused together in one length, if space permits. Pipe shall have no more than three (3) welds per 20 foot section. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately .10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

XV. HORIZONTAL DIRECTIONAL DRILL - SECTION 755

XV.1. V. PIPE ASSEMBLY (REVISED IN YELLOW)

Pipe shall be welded/fused together in one length, if space permits. Pipe shall have no more than three (3) welds per 20 foot section. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately .10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

XVI. WATER AND RECALIMED CONSTRUCTION DETAILS

- XVI.1.1. W-15 CHANGED DRAWING ADDING 57 STONE TO FINSH GRADE
- XVI.1.2. W-17 ADDED REFERENCE SECTION 351, PARAGRAPH X.2.
- XVI.1.3. W-37 CORRECTED STUBOUT LENGTH FROM 20 TO 40LF
- XVI.1.4. W-44 ADDED NOTE 9. FOUR LANES OF TRAFFIC (HAVING TWO LANES OF TRAFFIC IN EACH DIRECTION) OR GREATER THE LOCATE WIRE SHALL AND VALVE BOX BE OFF-SET TO THE RIGHT-OF-WAY.
- XVI.1.5. W-44B ADDED" HEAVY DUTY VALVE COVER, REF W-16

XVII. WASTERWATER CONSTRUCTION DETAILS

- XVII.1.1. S-4/5 REMOVED SDR-35 (REPLACED WITH SDR-26)
- XVII.1.2. S-13 REMOVED SDR-35 (REPLACED WITH SDR-26)
- XVII.1.3. S-16 REMOVED SDR-35 (REPLACED WITH SDR-26)
- XVII.1.4. S-19 REMOVED "DEPTH OF CUT EQUAL OR GREATER THAN 12' "
- XVII.1.5. S-20 REMOVED DEPTH OF CUT EQUAL OR GREATER THANS 12' "
- XVII.1.6. S-32 ADDED REFERENCE SECTION 430, PARAGRAPH VI.2.
- XVII.1.7. S-44 CORRECTED STUBOUT LENGTH FROM 20 TO 40LF
- XVII.1.8. S-46 ADDED NOTES
 - XVII.1.8.1. NOTE 4. NO CONNECTIONS PERMITTED INTO JEA FORCE MAINS WHICH ARE GREATER THAN 12" WITHOUT PRIOR JEA APPROVAL.
- XVII.1.9. S-49 ADDED NOTE 9. FOUR LANES OF TRAFFIC (HAVING TWO LANES OF TRAFFIC IN EACH DIRECTION) OR GREATER THE LOCATE WIRE SHALL AND VALVE BOX BE OFF-SET TO THE RIGHT-OF-WAY.
- XVII.1.10. S-49B HEAVY DUTY VALVE COVER, REF S-31.
- XVII.1.11. S-51 REMOVED SDR-35 (REPLACED WITH SDR-26)

XVIII. WATER & RECLAIMED APPROVED MATERIALS (UPDATED CORRECTED MANAUFACUERS)

- XVIII.1.1. AW-101 Corrected
- XVIII.1.2. AW-201 Updated

XIX. WATER & RECLAIMED APPROVED MATERIALS (UPDATED CORRECTED MANUFACTURERS)

- XIX.1.1. AS-602 Updated
- XIX.1.2. AS-603 Updated
- XIX.1.3. AS-501 Updated
- XIX.1.4. AS-409 Corrected
- XIX.1.5. AS-401 NEW Full Circle 2" Tapping Saddle for ARVs
- XIX.1.6. AS-402 Corrected
- XIX.1.7. AS-303 Removed SRD-35
- XIX.1.8. AS-302 Updated
- XIX.1.9. AS-205 Removed SRD-35
- XIX.1.10. AS-202 Removed from Standards
- XIX.1.11. AS-103 Removed SRD-35
- XIX.1.12. AS-102 Corrected

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SUBMERSIBLE WASTEWATER PUMPING STATIONS – SECTION 433

I. SCOPE OF WORK

All Pump Stations in JEA's service area shall conform to section 433.

The Contractor shall furnish, install, test and place in operation the submersible pumping station shown on the drawings and specified hereinafter. All applicable sections of the City of Jacksonville Standard Specifications and JEA Water and Wastewater Standards shall be considered part of this work. All references to Industry Standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated. Only those materials included in the JEA Water and Wastewater Standards Manual, (including, but not limited to, submersible pumps, VFD equipment and control panels), shall be installed. All materials shall be new unless specifically called for otherwise. All structures, pumps and panels shall require a complete shop drawing submittal, as detailed in this specification for JEA's review and approval prior to the start of construction.

II. WARRANTY

II.1. CONTRACTOR WARRANTY:

- II.1.1. The Contractor shall supply to JEA a two (2) year unconditional warranty effective on the date of the JEA's Operation and Maintenance Pump Station acceptance letter. 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 to insure safe and correct operation of the station.

II.2. SPECIALTY WET WELL LINER MANUFACTURER WARRANTY:

- II.2.1. The liner manufacturer shall warrant the liner against defects for at least ten (10) years after the date of acceptance by JEA. Defects are defined as cracking, delamination or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to satisfaction of JEA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

II.3. PUMP MANUFACTURER WARRANTY:

- II.3.1. The Pump Manufacturer shall warrant to JEA all permanently installed municipal sewage service Submersible Pumps and Motors against all defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years: Mechanical Seals, Bearings, Shafts, Motor Electrical Cables and Motor Stators. See section below entitled "Submersible Pumps" for additional requirements.

III. GENERAL REQUIREMENTS

III.1. PROJECT SCHEDULE AND COOPERATION:

The project schedule shall be established based on working a normal work schedule including five days per week, single shift, and 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 setting wet well (base and riser sections), field pump test, 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 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 systems limitations and provide such work or services at no additional cost to JEA. Unless approved otherwise, a JEA representative shall be present to observe the excavated area prior to setting (installing) the wet well. The date and time for setting (installing), the pre-cast wet well shall be reviewed and approved by JEA, prior to the actual work.

III.2. SHOP DRAWING SUBMITTALS:

Actual catalog data, brochures and descriptive literature will be required for wet well pumps and electrical and controls at a minimum as specified here-in.

III.3. AS-BUILT DRAWINGS:

As-built drawings shall be required on all Wastewater, force main and pump station 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" and as defined here-in. 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. The Contractor shall submit "As Built" drawings before pump station start-up.

III.4. WORKMANSHIP:

All work shall be proved to be in first class condition and constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor with no additional cost to JEA.

III.5. MATERIALS:

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.

III.5.1. Unless indicated otherwise on the drawings, all metal components in the wet well, with the exception of pumps and motors shall be ~~anodized aluminum or~~ 316 stainless steel as specified here in or on the plans.

III.5.2. The pump supplier to ensure unit compatibility shall supply the pumps, motors and guide rail system.

III.5.3. Station piping shall conform to JEA Water and Wastewater Standards Chapter IV. 3. - Section 429, entitled Wastewater Force Mains and Chapter IV. 4. Section 430 entitled Wastewater Valves and Appurtenances. Specifically, station piping for Class I, Class II, Class III and Class IV stations shall be plumbed and aligned according the latest ASTM, AWWA standards, any piping ill-regularities shall be removed and replaced.:

III.5.3.1. Piping within the wet well shall be flanged 316 stainless steel, (schedule 10, one-piece construction with no butt-welds with exception of pump-out pipe). Fittings within the wet well shall be flanged 316 stainless steel. ~~Fittings, (within the wet well), which are below the water level 100% of the time during normal operation may be ductile iron, short body with flanged connections.~~ All nuts, bolts and accessories within the wet well shall be 316 stainless steel.

~~III.5.3.2.~~ Pipe and fittings outside of the wet well and above ground shall ~~be epoxy lined, Class 53, ductile iron or~~ 316 stainless steel (flanged, schedule 10 with no butt-welds). All bolts, washers and nuts shall be 316 stainless steel, threaded and shall be coated with "Never Seize" type coating. ~~All above ground pipe, fittings and valves shall receive two coats of an exterior coating of "moisture cured aluminized urethane" or epoxy paint as specified below. Moisture cured (aluminum and primers, grey or silver color), Sherwin-Williams~~

~~or "Wasser MC Aluminum" JEA approved equal. Surface preparation shall be in accordance with paint manufacturer's recommendation.~~

III.5.3.3. ~~Epoxy Paint System – A. Surface Preparation: 1. All piping to be coated shall receive an SSPC-SP 1 Solvent Cleaning Standard or equal. This shall be received by mixing Devco Coatings Devprep 88 Heavy Duty Cleaner mixed 1 part Devprep 88 to 2 parts of potable water or equal, low pressure applied, then removed with a minimum of 3,000 psi washing unit. Repeat as necessary until all surfaces are clean and contaminant free, including all removal of Devprep 88 Cleaner. 2. Carbon steel shall receive an SSPC-SP 3 Hand Power Tool Cleaning standard until all surfaces are abraded thoroughly. 3. Stainless steel shall receive the same method of preparation however a much more aggressive abrasive such as 30 grit must be used to create a minimum consistent one mil surface profile. 4. All surfaces shall be left clean and dry prior to the applications of all coatings, with the surface temperature being a minimum of 5 degrees above the dew point and not falling. B. Primer Coats: Stainless Steel: All stainless shall receive Devco Coatings Devran 201 Epoxy applied or equal @ 2.0-3.0 mils dry film thickness. Carbon Steel: All carbon steel surfaces shall receive Devco Coatings Bar Rust 231K3501 Off-White Epoxy Primer or equal applied @ 4.0-8.0 mils dry film thickness. C. Finish Coats: Both stainless and carbon steel surfaces shall receive Devco Coatings Devthane 379 UVA Aliphatic Gloss Urethane Enamel (grey color) or equal applied @ 2.0-3.0 mils dry film thickness or to full capacity. If brush and rolled, multiple coats may be required to achieve correct film thickness and/or hide. All products shall be applied in accordance with manufacturer's recommendations and their technical data pages.~~

III.5.3.4. Force main piping below ground, outside of the wet well shall be in accordance with Chapter IV. 3. - Section 429 and Chapter IV. 4. – Section 430 of this standards manual. No connections permitted into JEA force mains which are greater than 12" size unless the connection is from a master pump station (441 GPM/MIN) class two pump station or larger. All connections shall be 4" size or larger (no 2" size connections).

III.5.3.5. All Cam-locks shall be 316 stainless steel.

III.5.4. Minimum wet well size shall be 8-foot diameter, ~~except that Class One Pump Station less than a 100 GPM may be 6 foot minimum.~~ A 12 foot diameter wet well (minimum) shall be utilized in cases where the pump discharge piping (in the wet well) is 10-inch diameter or larger.

III.5.5. Refer to Chapter IV. 7. - Section 472, "Emergency Generator", for technical specifications on automatic standby emergency generator with diesel engine drive and above ground fuel storage tank. All generators shall be sized to run ~~two pumps, at a minimum~~ all pumps at station.

III.5.6. Emergency Pump Engines refer to section 470, for technical specifications on standby emergency pump engine with fuel storage tank. All emergency pump engines shall be sized to run all pumps at station.

III.6. SELECTION OF PUMP STATION STANDARDS:

JEA Pump Station Standards are available in Auto CAD format, on the jea.com website. The selection of a pump station type shall comply with the following:

Pump Station Type	Pump Station Maximum Peak Flow (GPM)	Pump Station Maximum ADF, & EDU	Emergency Operating System Required	Odor Control Required	Additional Design Requirements	Solids Removal
Class One	0 – 440 GPM	174,999 GPD 499 EDU	Generator or Pump Engine	Not required	Flow meter and Smart meter.	
Class Two	441 – 1000 GPM	175,000 – 436,450 GPD 500 - 1247 EDU	Generator or Pump Engine	Electrical sizing, piping and pad provided for future odor control.	Flow meter and Smart meter	
Class Three	1001 – 2000 GPM	436,451 - 971,250 GPD 1,248 – 2,775 EDU	Generator and 2 Pump Engines	Electrical sizing, piping and pad provided for future odor control. Required	Flow meter and Smart meter Electric power, controls, building with ventilation. See section 11.6.10.	Required
Class Four	2001 GPM and Above	971,250 GPD and above 2,775 EDU and above	Generator and 2 Pump Engines	Required	Flow meter and Smart meter Electric power, controls, building with ventilation. See section 11.6.10.	Required
* Any station which discharges through a 12" or larger force main or whose maximum design is 441 GPM or greater shall have a generator.						

III.6.1. Definition of Flow:

- III.6.1.1. Maximum Peak flow in GPM (gallons per minute) is the ultimate peak design flow of the pump station using the 10 State Standards peaking factor applied to 3.5 people per Equivalent Dwelling Units (EDU) and 100 GPD per person.
- III.6.1.2. The pump station Maximum Average Daily Flow (gallons per day) is the station's un-peaked maximum/ultimate average daily flow rate the station will be pumping.
- III.6.1.3. The pump station's number of EDU's is the number of Equivalent Dwelling Units it will be pumping, which equates to 350 GPD per EDU.
- III.6.1.4. The pump station maximum GPM excludes the flow from the permanently installed stand-by pump and any emergency standby by pump (pony).

III.6.2. Back Up Power Requirements:

- III.6.2.1. Pump Stations discharging through a 12" force main or larger, or which re-pump flow from another pump station, through a force main, shall include means for continued pumping operations (emergency operating system) during a power outage/failure. The emergency operating system shall be an Automatic Emergency Generator (see section 472, Emergency Generator).
- III.6.2.2. An emergency operating system shall be required for any all pump stations. ~~Whose maximum peak design is 441 gallons per minute or greater or whose average daily flow is 175,000 gallons per day or greater regardless of force main size.~~ The emergency operating system shall be an Automatic Emergency Generator (see section 472, Emergency Generator) or Emergency Pump Engine (see section 470, Emergency Pump Engine).
- III.6.2.3. ~~Pump Stations with a peak design capacity of less than 441 GPM shall include means for continued pumping operations (emergency operating system) during a power outage/failure. The emergency operating system shall be provided for by installation of a Generator Disconnect Switch (see paragraph VI.3.10). An Automatic Emergency Generator (see section 472, Emergency Generator) or an Emergency pump engine (see section 470).~~
- III.6.2.4. Exceptions: For pump stations with maximum capacity of 175,000 ADF or greater and less than 436,450 ADF, use of a dual electrical feed from 2 separate substations or portable pumping equipment (pony pump system) may be substituted for the required generator with a written exception from the City of Jacksonville, Environmental Protection Board, (Rule 3, Section 3.404 A.10) and JEA.
- III.6.3. All pumping stations shall have a Smart meter to monitor electrical conductivity. Meters shall be supplied the electrical provider.
- III.6.4. All pumping stations emergency pump engine, separate or combined, are to be sized to the same rate as all permanent pumps, pumping simultaneous.
- III.6.5. All Class One and Two pumping stations, both rehabilitation and new construction, shall include an ultrasonic flow meter (indicating, totalizing, data transmission via scada and recording capabilities).
- III.6.6. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter (indicating, totalizing, data transmission via scada and recording capabilities) with bypass configuration located within the fenced area.
- III.6.7. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include an influent solids removal system with debris storage, offsite disposal method and odor control.
- III.6.8. ~~Exception to Class One Pump station: Grinder pump system intended to serve fill-in areas or areas which are limited to less than 99 (maximum) GPM and cannot be expanded (Wastewater service area) beyond 99 GPM. Class One Station Stations less than 99 GPM may utilize a 6 foot diameter wet well. If the potential Wastewater service area can be expanded beyond 99 GPM, then a larger pumping station (Class Two or Three) shall be constructed.~~
- III.6.9. Odor Control Requirements:
- III.6.9.1. All stations with a maximum peak flow greater than 440 GPM shall include electrical service sizing, control panel sizing, piping and concrete pad for future odor control.
- III.6.9.2. All stations with a maximum peak flow greater than ~~2000~~ 1000 GPM shall include an odor control system.

III.6.9.1. ~~Exceptions: Odor control for stations with a maximum peak flow greater than 2000 GPM with a written exception from JEA.~~

III.6.10. Electrical Control Building required if any of the below conditions exists:

III.6.10.1. Pumps larger than 75HP

III.6.10.2. Station FLA > 400 amps

III.6.10.3. Station HAS > 3 pumps

III.7. PUMP STATION INSPECTION CHECKLIST:

III.7.1. 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 (i.e. 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 station. The Contractor's representative shall complete the Inspection Checklists (e.g. electrical, start-up, generator, instrumentation, mechanical, etc.) for each new or rehabilitated pump station, and have the JEA attendees provide original signatures/names on the signature blocks. The JEA representative shall scan the checklists and ensure the documents are filed in the electronic file folder for the project.

IV. SUBMERSIBLE PUMPS

IV.1. OPERATING CONDITIONS AND UNIT SIZES:

Operating conditions and unit sizes shall be as shown on the drawings. The pump design operating conditions shall be within 10% +/- of the best efficiency point, unless otherwise approved by JEA. When possible, the pump selection shall be made in the center of the family of curves.

IV.2. SHOP DRAWINGS AND PUMP TAGS:

Prior to commencing the pumping station installation and/or the furnishing of replacement pumps, the pump distributor shall submit for approval, detailed and dimensioned shop drawings for pumps including factory curves of identical model pumps provided to JEA. The pump distributor shall furnish and deliver at the time of acceptance for use of the pumping station and/or of the replacement pump(s) by JEA, 3 computer diskettes (Microsoft Word) containing Operation & Maintenance data and motor and pump nameplate data (including serial numbers) for each pump supplied. The pump supplier shall provide a vinyl or aluminum placard or tag which indicates all operating conditions of the pumps, including name plate data, impeller size and part number, design flow, TDH, and other pump related data. The tag shall be placed (with adhesive) inside the front panel of the pump control panel or as directed by JEA.

IV.3. PUMP EQUIPMENT:

Pumping equipment shall be as listed in AS-603 and premium quality submersible non-clog pumps for sewage service. Pumps shall be as listed in the Approved Materials section. Wet-pit pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide rails, motor electrical cable (minimum 50 feet in length) to connect at the demarcation box (no splicing allowed) and all other appurtenances specified or otherwise required for proper operation. Dry-pit pumps shall be complete with a submersible electric motor, electric cable (min. 50 feet in length), maintenance free cooling system, pump support legs and all other appurtenances specified or otherwise required for proper operation.

IV.4. GENERAL:

Equipment furnished and installed shall be fabricated, assembled, erected and placed in proper operating condition in full accordance with drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by JEA.

IV.5. SERVICE CONDITIONS:

Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component.

IV.6. MATERIALS:

Major pump components shall be of gray cast iron. All exposed nuts, bolts, washers, anchor bolts and other fastening devices shall be 316 stainless steel.

IV.7. SOLID HANDLING PUMP CONSTRUCTION (WET-PIT AND DRY-PIT PUMPS):**IV.7.1. Impeller:**

The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be a semi-open or enclosed one-piece casting with not more than two non-clog passages and must pass a minimum 3 inch solid Screw impellers are not acceptable. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut.

IV.7.2. Mechanical Seals (Upper and Lower Seals):

Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be either carbon-ceramic, tungsten carbide or silicon carbide material. Adjustable wearing rings shall be provided for all pumps 25 HP and larger.

IV.7.3. Mating Surfaces:

All mating surfaces (pump assembly), of major components shall be machined and fitted with O-rings where watertight sealing is required.

IV.7.4. Discharge Base and Elbow (for Wet-Pit Applications Only):

The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The base shall be sufficiently rigid to firmly support the guide rails, discharge piping and pump under all operating conditions. The base shall be suitable for bolting to the floor, (bolting to a standard 1" thick metal plate, see details on drawings), of the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a "quick disconnect" type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need for unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and guide rail-sliding bracket. The bracket shall be designed to obtain a leak proof seal between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions. Metal to metal mating surfaces are acceptable, if machined finished.

IV.7.5. Motors:

The pump shall be driven by a totally submersible electric motor at 1800 RPM (max.). Pump motor shall be of sufficient horsepower as to be non-overloading over the entire length of the pump curve. The stator housing shall be a watertight casing. Motor insulation shall be moisture resistant, Class F, 180 degree C. at a minimum. All motors shall be VFD rated including class H

winding insulation. Motor shall be NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour. All motors over 3 HP shall be 3 phase. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be designed to operate in a totally, partially or non-submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assemble with grommet. An epoxy seal may be added to this cable entrance assembly to improve water tightness. The system used shall ensure a watertight submersible seal. Cable shall terminate in a junction chamber. Junction chamber shall be sealed from the motor by a compression seal. For Dry-Pit applications, the pump shall be limited to 1800 RPM (max.).

IV.7.5.1. Cooling System and Supports (Dry-Pit Applications Only):

The pump should have a reliable, maintenance free cooling system that circulates a cooling liquid in a closed loop through a cooling jacket, and transfers the heat to the pumped liquid by heat exchange. A system that circulates the pumped liquid in a cooling system is not acceptable. The pump should be equipped with support base to secure the pump and facilitate the installation.

IV.7.6. Balance:

All rotating parts shall be accurately machined and shall be rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed.

IV.8. GUIDE RAILS(FOR WET-PIT APPLICATIONS ONLY):

Pump shall be equipped with one or more guide rails (no cable wire assembly). Guide rails shall be one piece welded design with all operating surfaces sanded and smooth (no couplings) and a minimum of 2 inch diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Intermediate rail braces shall be supplied and solidly secured to the wet well wall. Braces secured to the discharge piping shall not be accepted. Guide rails and brackets shall be 316 stainless steel.

IV.9. LIFTING CHAIN (FOR WET-PIT APPLICATIONS ONLY):

A heavy-duty chain and shackle appropriately sized (3/8" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. Unless approved otherwise by JEA, the lift chains shall be shackled to a heavy duty 316 stainless steel lifting bail (see details) attached to the pump/motor housing for removal and reinstallation. Three feet of excess chain above the top of the wet well shall be provided to expedite removal. A chain/motor electric cable holder shall be provided and appropriately sized to accommodate the lift chains and motor electrical cables provided without deformation. Chain/electric cable holder shall include extra heavy-duty 3/8" rod hooks for attaching control floats, lifting chains, and other wet well accessories (6 hooks minimum) and be located on the side of the wet well hatch opening opposite of the discharge piping. The chain, shackles, lifting bail, and cable holder shall be 316 stainless steel.

IV.10. PAINTING:

Exterior of pump shall be coated with manufacturer's standard finish (powder coated epoxy finish is preferred, not required).

IV.11. INSTALLATION (FOR WET-PIT APPLICATIONS ONLY):

Pump discharge base shall be leveled, plumbed and aligned into position to fit connecting piping. The discharge base shall be solidly secured to the wet well floor using a 1" thick steel hold-down plate (see details) and appropriately sized 316 stainless steel anchors then grouted after initial fitting and alignment and before final bolting of the discharge piping. This work shall be inspected by JEA prior to any liquid being allowed into

the wet well. After final alignment and bolting, pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

IV.12. GRINDER PUMP CONSTRUCTION (FOR CLASS ONE PUMP STATIONS ONLY):

IV.12.1. Pump shall be of the centrifugal type with an integrally built grinder unit and submersible motor. The grinder unit shall be capable of macerating all material in normal domestic and sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like into a fine slurry that will pass freely through the pump and 1 1/4" discharge pipe connection. Pumps shall be as listed (submersible pump) in the Approved Material section, plate AS 603

IV.12.2. Grinder Pump Motor:

Stator winding shall be of the open type with Class F insulation rated for 133°C (311°F) maximum operating temperature. All motors over 3 HP shall be 3 phase. Winding housing shall be filled with a clean, high dielectric oil that lubricates the bearing and seals and transfers the heat from the winding and rotor to the outer shell. Air filled motors, which do not have the superior heat dissipating capabilities of the oil filled motors shall not be considered equal.

Motors shall have two heavy duty ball bearings to support the pump shaft and take the radial and thrust loads. Ball bearings shall be designed for 50,000 hours L 10 life. Stator shall be heat shrunk into the motor housing.

Single phase motors shall have a heat sensor thermostat and overload attached to the top end of the motor windings to stop if the motor winding temperature reaches 200°F. The high temperature shut off will cause the pump to cease operation should a control failure cause the pump to run in a dry wet well. The thermostat shall reset automatically when the motor cools to a safe operating temperature.

NOTE: Contractor must verify and confirm motor voltage and phase before the equipment can be released to production and manufacturer.

The common motor, pump and grinder shaft shall be of 416 stainless steel, threaded, on the pump end, to accept the impeller and grinder assembly.

IV.12.3. Mechanical Seals:

The motor shall be protected by two mechanical seals mounted in tandem in a seal chamber. The seal chamber shall be oil filled to lubricate the seal faces and transmit the heat from the shaft to the outer motor shell. The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be either carbon ceramic, tungsten carbide or silicon carbide material.

Seal faces shall be carbon ceramic and lapped to a flatness of one light band. An electrode shall be mounted in the seal chamber to detect any water from entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control box. The signal shall not stop the motor but act as a warning only, indicating that service is required.

IV.12.4. Impeller/Cutter Assembly:

The pump impeller shall be of the recessed type to provide an open and unobstructed passage through the volute for the ground solids. The impeller shall be constructed of cast iron and shall be threaded onto a stainless steel shaft.

The grinder assembly shall consist of a grinder, an impeller and a shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto a stainless steel shaft and shall be locked to the shaft with a screw and a washer. The shredding ring shall be pressed into an iron holding flange for easy removal and replacement. Shredding ring shall be reversible for double life without disassembly of the pump unit. The holding flange shall be

provided with tapped holes such that screws can be used to push the shredding ring from the housing. All grinding of solids shall be from the action of the impeller against the shredding ring. Both the grinder and the shredding ring shall be constructed of 440C stainless steel hardened to 58 to 60 on the Rockwell C scale.

IV.12.5. Castings:

All iron casting shall be pre-treated with a phosphate and chromic rinse and shall be painted before machining. All machined surfaces exposed to sewage shall be repainted. All pump and motor fasteners shall be 316 stainless steel.

IV.12.6. Mating Surfaces:

All mating surfaces of the pumps major components shall be machined and fitted with O-rings where seating is required.

IV.12.7. Power Cord:

The motor power cord shall be 14-5 SOW/SOW-A and shall be fastened by means of a cord grip in the top of the pump. The power cord shall be fifty (50) feet (min) in length. The motor shall contain a waterproof junction box, which will provide space to connect the power cord to the motor leads. The motor leads shall seal between the motor housing and the junction box by means of a rubber compression fitting around each wire. The power cord shall have a green carrier ground conductor that attaches to the motor flange.

IV.12.8. Discharge Base and Elbow:

The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The bases shall be sufficiently rigid to firmly support the guide rails, discharge pipe and pump assembly under all pumping conditions. The base shall be bolted to the wet well floor and sealed on the wet well exterior to prohibit any intrusion or leakage from the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a quick disconnect type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need of unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and a guide rail sliding bracket. The bracket shall be designed to obtain a leak proof seal between the flange faces as final alignment of the pump occurs on the connected position. The bracket shall maintain proper contact and suitably sealed connection between flange faces under all operating conditions.

IV.12.9. Balance:

All rotating parts shall be accurately machined and shall be rotational balance as. Excessive vibration shall be sufficient for rejection of the equipment. The impellers shall be rebalanced after being trimmed.

IV.12.10. Guide Rails:

Pump shall be equipped with guide rails. Guide rails shall be a minimum of one (1) inch diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to that access hatch cover at the top of the wet well. Guide rails and brackets shall be 316 stainless steel.

IV.12.11. Lifting Chains:

A heavy duty chain and shackle appropriately sized (1/4" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. The chain shall be 316 stainless steel and attached.

~~IV.12.12. Frame and Covers:~~

~~Access frame and covers shall be suitably sized for pumping units furnished and shall be constructed of skid proof aluminum with a minimum rating of 150 lbs./sq.ft. Frame and covers shall be furnished and complete with stainless steel staple assembly, hold open device, upper guide holder and cable holder.~~

~~Minimum size total hatch opening shall be sufficient for easy pump handling. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes the hinges shall be bolted to the door with stainless steel carriage bolts and nuts. The nuts shall be welded to the bolts on the door.~~

IV.13. PUMP WARRANTY (SOLID HANDLING) ~~AND GRINDER PUMPS~~:

The following warranty conditions shall also apply to existing pump station pump replacements.

IV.13.1. The manufacturer shall warrant to JEA for permanent installation in municipal sewage service submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years, mechanical seals, bearings, shafts, motor electrical cables and motor stators. The warranty shall include no less than 100% coverage for original equipment manufacturer (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to JEA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for use the pumping station and/or of the replacement pump by JEA.

IV.13.2. Verification of guarantees of performance and warranty certificate shall be indicated in the shop drawing submittal and in the Operation and Maintenance disc (Microsoft Word).

IV.13.3. The pump distributor shall employ and make available proficient manufacturer-authorized service technicians to perform service calls to pumps supplied to JEA on a 24-hour basis, 7 days a week. The pump distributor shall provide service technicians company-owned service vehicles equipped with lifts/booms capable of retrieving all sizes of submersible pumps from wet wells, all necessary tools, test and safety equipment, etc., that are required to make field repairs. Service personnel shall adhere to all JEA Safety Rules & Regulations and be trained and certified for confined space entries and carry liability and workers compensation insurance.

IV.13.4. During the warranty period, the pump distributor shall at no cost to JEA repair and re-install the subject pump within 24 hours or provide a loaner pumps which can be transported, installed, and capable of maintaining operation of JEA's sites. The location address, contact names, phone numbers, (including emergency, mobile, etc.) and fax numbers of the manufacturer-authorized warehouse and service center shall be indicated in the shop drawing submittal and in the Operation & Maintenance diskettes (Microsoft Word).

~~IV.13.5. Fiberglass Wet Well and Valve Box (for Class One Pump Stations Only):~~

~~The basin/structure manufacturer shall warrant the wet well against defects for at least five (5) years after the date of acceptance by JEA. Defects are defined as cracking, delimitation or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials and equipment to repair defects to the satisfaction of JEA. The contractor and/or manufacturer shall not make any exemptions or exception to the above stated conditions or warranty.~~

IV.14. LOW FLOW SIMPLEX PUMP STATIONS, APPROVED BY JEA, CASE BY CASE (FOR SINGLE RESIDENTIAL USE ONLY):

IV.14.1. Pump shall be of the grinder type with an integrally build grinder unit and submersible motor. The grinder unit shall be capable of macerating all material in normal domestic and sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like into a fine slurry that will pass freely through a pump and 1-1/4" discharge pipe connection, at a minimum. The minimum pump performance

shall include a 0-40 GPM total flow range and a 25-100' total head range. The design engineer shall be responsible for the final design and pump selection to meet all operating conditions. Approved pumps and wet well shall meet or exceed these specifications. See Wastewater construction detail S-50 for additional construction details.

IV.14.2. Grinder Pump Motor:

Stator winding shall be of the open type with Class F insulation rated for 155°C (311°F) maximum operating temperature. Winding housing shall be filled with a clean, high dielectric oil that lubricates the bearing, seals, and transfers the heat from the winding and rotor to the outer shell. Air filled motors, shall not be considered equal. Motors shall have heavy-duty bearings to support the pump shaft, take the radial, and thrust loads. Single-phase motors shall have a heat sensor thermostat and overload attached to the top end of the motor windings to stop if the motor winding temperature reaches approximately 300°F. The high temperature shut off will cause the pump to cease operation should a control failure cause the pump to run in a dry wet well. The thermostat shall reset automatically when the motor coils to a safe operating temperature. NOTE: Contractor must verify and confirm motor voltage and phase before the equipment can be released to production and manufacturer. If not approved otherwise by JEA, the common motor, pump and grinder shaft shall be of 316 stainless steel, threaded, on the pump end, to accept the impeller and grinder assembly.

IV.14.3. Mechanical Seals:

The motor shall be protected by two seals mounted in tandem in a seal chamber. The seal chamber shall be oil filled to lubricate the seal faces and transmit the heat from the shaft to the outer motor shell. Seal faces shall be carbon ceramic on the upper seal and tungsten carbide or silicon carbide on the bottom seal. An electrode shall be mounted in the seal chamber to detect any water from entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control box. The signal shall not stop the motor but act as a warning only, indicating that service is required.

IV.14.4. Impeller/Cutter Assembly:

The pump impeller shall be of the recessed type to provide an open and unobstructed passage through the volute for the ground solids. The impeller shall be constructed of cast iron, bronze or stainless steel and shall be threaded onto a stainless steel shaft. The grinder assembly shall consist of a grinder, an impeller, and a shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto a stainless steel shaft and shall be locked to the shaft with a screw and a washer.

Both the grinder and the shredding ring shall be constructed of 440C stainless steel hardened to 55 to 60 on the Rockwell C scale or JEA approved equal.

IV.14.5. Castings:

All iron casting shall be class 30 cast iron and the exterior shall be paint with epoxy coating. All pump and motor fasteners shall be 316 stainless steel.

IV.14.6. Mating Surfaces:

All mating surfaces of the pumps major components shall be machined and fitted with O-rings where seating is required.

IV.14.7. Power Cord:

The motor power and control cord shall be 40' long (min), multi-conductor type and shall be fastened by means of a cord grip in the top of the pump. The motor shall contain a waterproof junction box, which will provide space to connect the power cord to the motor leads. The motor leads shall seal between the motor housing and the junction chamber by means of an isolation

fitting around each wire. The power cord shall have a green carrier ground conductor that attaches to the motor flange.

IV.14.8. Discharge Base and Elbow (Optional):

The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The bases shall be sufficiently rigid to firmly support the guide rails, discharge pipe and pump assembly under all pumping conditions. The base shall be bolted to the wet floor and sealed on the wet well exterior to prohibit any intrusion or leakage from the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a quick disconnect type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need of unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and a guide rail sliding bracket. The bracket shall be designed to obtain a leak proof seal between the flange faces as final alignment of the pump occurs on the connected position. The bracket shall maintain proper contact and suitably sealed connection between flange faces under all operating conditions.

IV.14.9. Balance:

All rotating parts shall be accurately machined and shall be perfect rotational balance. Excessive vibration shall be sufficient for rejection of the equipment. The impellers shall be rebalanced after being trimmed.

IV.14.10. Guide Rails(Optional):

Pump may be equipped with guide rails. Guide rails shall be a minimum of ¾" diameter, or 1" square and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to that access hatch cover at the top of the wet well. Guide rails and brackets (including fasteners) shall be 316 stainless steel.

IV.14.11. Lifting Chains:

A heavy-duty chain or cable and shackle appropriately sized (3/8" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. The chain or cable shall be 316 stainless steel and attached to a stainless steel hook at the top of the wet well.

IV.14.12. Wet Well:

The basins shall be fiberglass, filament wound and with a minimum size of 36" in diameter, by 4' deep. Basins shall have consistent wall thickness (.25" min.) and provide impact resistance structural integrity with anti-floatation collar on bottom. Basins shall be corrosion resistant, and have either full skid-proof aluminum (3/8" thick min) or fiberglass top with 316 S.S. hold-down bolts rated at 200psi minimum live load. A 4"-(min.) flexible entry boot with 316 stainless steel fastener, compression ring and stainless steel bands or cast iron hub with rubber seals shall be provided.

IV.14.13. Electrical Controls:

Unless otherwise approved by JEA, the panel shall be as followings: a NEMA 4X fiberglass or plastic control panel shall be furnished with each pumping unit to be installed. The control panel enclosure shall be molded of glass reinforced polyester resins, which are chemically resistant to corrosive atmospheres. The resin system shall be pigmented to impart a gray color to the enclosure and be resistant to ultraviolet light. The enclosure shall be of one piece, weatherproof construction with smooth exterior and interior. The enclosure shall be fitted with a closed cell neoprene gasket cover. The enclosure shall be provided with back panel mounting provisions and be attached to the wall of the house or a 4x4 pressure treated post or 3" aluminum post

anchored 24" (min) into the ground (bottom of panel located 18"-24" above finished grade). The cover shall be hinged with a heavy-duty corrosion resistant stainless steel piano hinge. The cover shall be lockable by means of two (2) high quality combination stainless steel latches and padlock hasps. The enclosure shall be provided with external mounting feet. These mounting feet shall be of fiberglass and molded as an integral part of the enclosure. The panel shall include a double pole 20 amp main disconnect breaker minimum, alarm circuit fuse, control circuit fuse, I.E.C. rated motor contractor, Klixon overload or an internal pump overload, pump hand-off auto switch, pump run light, seal leak light, start and run capacitors, start relay, terminal blocks, ground lug and all necessary wiring and brackets. The control panel shall be fitted with a red lexan (polycarbonate) alarm light. The light shall be approximately 3" high and 3-1/2" diameter. The globe shall be mounted on top of the enclosure with a neoprene gasket. The alarm shall have a bright glow and flash during high water conditions. The alarm light will go out when the water level drops. An internal wiring shall be neat and color-coded. Each wire shall be a different color or stripe (except for ground), and all incoming wires shall terminate into a box clamp type terminal block (except incoming power). A schematic diagram shall be permanently fastened to the inside of the enclosure. An Installation and Service Manual shall also be included with each control panel. The control panel shall be U.L. listed as an assembly. The wet well should contain two control (on, off) floats or one wide-angle float (single differential float switch) operating over a 90-degree swing with the tether length between the float body and the pivot point controlling the pre-set on-off range. A high water level alarm float shall also be provided. All floats shall be wired to the control panel for control of the pump.

IV.14.14. Warranty:

IV.14.14.1. Pump Warranty

The following warranty conditions shall apply to new and existing pump station requirements. The manufacturer shall warrant to JEA for permanent installation in municipal sewage service submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years: mechanical seals, bearings, shafts, motor electrical cables and motor stators. The warranty shall include no less than 100% coverage for original equipment manufacturer (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to JEA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for maintenance by JEA (i.e., that the pump station is totally complete) of the pumping station and/or of the replacement pump by JEA.

Verification of guarantees of performance and warranty shall be indicated in the shop drawing submittal and in the Operation and Maintenance diskettes (Microsoft Word).

IV.14.14.2. Wet Well:

The manufacturer of the basin/structure and pump removal assembly shall warrant the materials against defects for at least five (5) years after the date of acceptance by JEA. Defects area defined, at a minimum, as cracking, delimitation or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials and equipment to repair defects to the satisfaction of JEA. The contractor and/or manufacturer shall not make any exemptions or exception to the above stated conditions or warranty.

V. FRAME AND COVERS

Access frame and covers shall be suitable size for pumping units furnished and shall be constructed of skid-proof aluminum with a minimum load rating of 300 lbs. /sq. ft. or H-20 traffic loading when called for on the drawings. Frame and covers shall be furnished complete with stainless steel staple assembly (not recessed) for the locking mechanism,

hold-open device, upper guide holder and cable holder. If door is not within a private fenced area, the locking mechanism shall be recessed type. Access covers shall be double door for duplex stations and triple door for triplex stations. Access covers shall be hinged to open as indicated on the drawings. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system).

Minimum size total hatch opening shall be 36 inches by 48 inches for duplex stations and 36 inches by 96 inches for triplex stations. Class One pump station hatches shall be sized to adequately remove pumps and shall not be required to adhere to the minimum size requirements. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes, the hinges shall be bolted to the door(s) with stainless steel carriage bolts and nuts. The nuts shall be welded to the bolts on both the door(s) and frame with 316L. JEA will provide pad locks, as required.

VI. PUMP STATION ELECTRICAL

VI.1. STATION ELECTRICAL SERVICE

The Contractor shall provide complete new electrical service for each lift station, including coordination of electrical service selection and approval by JEA and the serving electrical utility company. Each lift station electrical service shall include complete primary and secondary electrical service equipment, metering and installation in accordance with these standards and the serving electrical utility company requirements.

VI.1.1. Unless specifically unavailable from the serving electrical utility company, the electrical service to each lift station shall be three phase. The basis of design lift station electrical service to be requested from the serving electrical utility company shall be as follows:

VI.1.1.1. 20 HP and below: 240/120 volt, 3 phase, open delta, full voltage motor starting, 15 starts per hour

VI.1.1.2. 21 HP thru 40 HP: 480/277 volt, 3 phase, wye, full voltage motor starting, 15 starts per hour

VI.1.1.3. 41 HP and above: 480/277 volt, 3 phase, wye, reduced voltage motor starting, 10 starts per hour

VI.1.2. The lift station design engineer shall contact the serving electrical utility company and obtain written documentation of the availability of the service requested. The electrical service documentation to be obtained from the serving electrical utility company shall identify each of the following basis of design issues:

VI.1.2.1. Electrical service voltage and phase

VI.1.2.2. Electrical service point of connection

VI.1.2.3. Type of motor starting required (full voltage or reduced voltage)

VI.1.2.4. Maximum number of starts per hour permitted

VI.1.2.5. Maximum available fault current

VI.1.3. The electrical service documentation obtained from the serving electrical utility company shall identify all applicable electrical utility company rules, regulations and fees. Additionally, the lift station electrical design engineer shall obtain a schedule that identifies when the requested electrical service would be available from the electrical utility company.

VI.1.4. If it is determined that the requested electrical service is not available from the electrical utility company, the design engineer shall submit an alternate basis of design recommendation for review and approval by JEA before proceeding with the lift station electrical design.

VI.1.5. The use of 208/120 volt, 3 phase, wye service shall not be permitted. For locations where the serving electrical utility company can only provide 3 phase wye services, the lift station electrical service shall be 480/277 volt, 3 phase, wye. For locations where the serving electrical utility company can only provide 240/120 volt single phase service, the pump motors shall be limited to

a maximum of 7.5 HP. Three phase pump motors shall be provided. Variable frequency drive motor starters shall be used to operate the three phase motors from the single phase electrical service.

- VI.1.6. Electrical service size shall be based on these standards and N.E.C. requirements. The minimum electrical service size shall be 100 amps. Where the electrical service requirements exceed 100 amps, but are less than or equal to 200 amps, the electrical service size shall be 200 amps. Where the electrical service requirements exceed 200 amps, but are less than or equal to 400 amps, the electrical service size shall be 400 amps. Above 400 amps, the electrical service size shall be selected by the lift station electrical design engineer.

VI.2. CONTROL SELECTION GUIDE

Below is a selection guide to determine the type of panel required for a Lift Station.

Variable Frequency Drives (VFD)

A Cross Line contactors (ACL)

- VI.2.1.1. 0-7.5HP, 1P to 3P VFD Duplex only, Panel is to be sized for no AC.
- VI.2.1.2. 0-20HP, ACL, 240VAC Service, If larger than 20HP service shall be upgraded to 480VAC.
- VI.2.1.3. 0-40HP, ACL, 480VAC Service
- VI.2.1.4. 41-75HP or FLA < 400A, VFD, 480VAC, Panel is to be sized for no AC and Heat sinks vented out the back.
- VI.2.1.5. 76-200HP or FLA >= 400A or > 3 Pumps, VFD, In a building. Please contact JEA for further details.

Note that 208VAC shall not be permitted

VI.3. OVERALL SPECIFICATIONS FOR SCADA EQUIPMENT

VI.3.1. Qualified Panel Manufacturers:

The electrical control panel shall only be manufactured by a JEA approved manufacturer as listed below. See section XI Wastewater Approved Materials, plate AS-604

- VI.3.1.1. JEA approved control manufacturers shall provide shop UL Certification for all control panels prior to JEA site delivery.

VI.3.2. Drawings:

Drawings are provided for Across the Line and Variable Frequency Drive designs on the JEA web site. All panels shall be built based on the latest drawings. These drawings are a template of how the overall Control Panel is to be designed. Note the drawings will need to be changed based on the voltage, pump size and the number of pumps. Keep existing format of drawings and only change Title Block.

- VI.3.2.1. Prior to building all drawings must shall be modified and submitted for approval in AutoCAD 2007 DWG format and PDF for review by JEA.
- VI.3.2.2. Variables for the Across the Line design are wire size, enclosure size, main surge suppression, circuit breaker, contactor size, SIMOCODE volt/current module rating and generator disconnect switch.
- VI.3.2.3. Variables for the VFD design are wire size, enclosure size, circuit breaker, VFD, reactors and generator disconnect switch.
- VI.3.2.4. A Control Panel Detail List shall be provided for quotation and design purposes. List will include items as the voltage and FLA. Included shall be detail additional Inputs if required for such items as Generator Monitoring, Odor Control, Potable Water Presser and other inputs.

- VI.3.2.5. Key electrical drawings as power distribution and I/O shall be laminated, attached to the door and in color. Drawings shall be printed on 8.5 x 11 if 11 x 17 is too large to fit on the door.
- VI.3.2.6. Full set of electrical drawings printed with a Laser Printer and in color shall be inserted in the door pocket. Ink jet is not accepted.
- VI.3.3. Panel Enclosures:
 - VI.3.3.1. All enclosures and heat shields shall be powder coated white. Before powder coating enclosures they shall be degreased, cleaned and treated with phosphate process.
 - VI.3.3.2. All insides of the Enclosures shall be Rated NEMA 12/3R with no ventilation to the outside.
 - VI.3.3.3. All Enclosures shall be fitted with 3-Point Latch.
 - VI.3.3.4. All enclosures shall have Marine Grade Aluminum heat shields on the top, front, back and side, unless mounted inside a building. They shall be fabricated from .125 Marine Grade Aluminum.
 - VI.3.3.5. Enclosures shall have pockets mounted on the inside of the door.
 - VI.3.3.6. The enclosure shall have a twelve gauge steel, formed, removable sub panel. The sub panel shall be degreased, cleaned, treated with phosphate process, then primed and painted with white industrial grade baked enamel.
 - VI.3.3.7. The maximum size of an aluminum enclosure shall be no taller than 60" wide or 60" high with 12" floor stands for a total height of 60". Any enclosure that requires a larger size shall use 316 stainless steel. These enclosures shall be fabricated from .125 Marine Grade Aluminum.
 - VI.3.3.8. Aluminum enclosures with free standing bases shall have the bases manufactured out of 316 stainless steel.
- VI.3.4. ACL Cabinet Requirements:
 - VI.3.4.1. The minimum size of an enclosure shall be 42" Height x 42" Wide x 10" Deep with a 36" Wide Door. These enclosures shall be mounted on poles. If panel requires a larger than 42 x 42 x 10 enclosure, a floor standing enclosure with 12" floor stands with an enclosure height of 48" shall be used. Enclosure a total height of 60"
- VI.3.5. 1P to 3P VFD Cabinet Requirements:
 - VI.3.5.1. Minimum enclosure size for 1P to 3P VFD cabinets shall be 48" high by 36" wide by 16" deep. These enclosures shall be fabricated from .125 Marine Grade Aluminum. Enclosure shall be mounted on 12" floor stands. Enclosure shall be sized to accommodate the heat load without Air Conditioning. Refer to Heat Load Calculations section of this document to size panel correctly. Above panel does not require heat sinks to protrude from rear.
- VI.3.6. 3P VFD Cabinet Requirements:
 - VI.3.6.1. Minimum enclosure size for a 40HP VFD cabinets shall be 60" high by 48" wide and 20" deep on 12" floor stands. The maximum enclosure height shall not exceed 72". The sides of the enclosure may be extended no more than three inches from the door. Refer to Heat Load Calculations section of this document to size panel.
 - VI.3.6.2. VFD's installed in an enclosure outside will be built in a NEMA 12/3R enclosure with the drives heat sinks vented. Refer to drawings for further details.

- VI.3.6.3. VFDs shall be bolted to a removable plate that will then be connected to the back of the enclosure with a gasket. The back of the enclosure shall have studs to attach the plate to. This plate is to be adequately designed to support the VFD. Enclosure cutout shall be sized a minimum of 2.75" wider and 3.5" higher on each side of the manufacturer recommended cutout for 40HP VFDs. This will result in a cutout that is no less than 5.5" wider and 7" higher than the manufacturer's specification. Additionally this distance will increase proportionately with the size of the VFD. For example: 80HP VFDs require a cutout that is 5.5" wider and 7.0" higher on each side (a total of 11" wider and 14" higher) of the manufacturer specified cutout. This requirement is to ensure that a future replacement of a VFD will allow for different VFD dimensions.
- VI.3.6.4. The rear sunshield shall have a removable cover with handles to allow access to the VFD heat sinks for cleaning and maintenance. The heat shield will have studs sticking out with wing nuts for the removable cover.
- VI.3.7. Components:

Components to build a control cabinet are classified as sole sourced or non sole sourced as listed below.

 - VI.3.7.1. Sole Sourced items are items in the drawings bill of material that shall not be substituted. These items are the radio, PLC, Input/Output modules, SINAUT communication module, SIMOCODE intelligent motor controls, UPS and CITEL 4-20ma surge suppression.
 - VI.3.7.2. Non sole sourced items such as Power Supply, Transformer, Circuit Protection and others may be substituted for an equivalent device. The specifications of the devices shall meet or exceed the items listed in the bill of material. Any items found to not meet specification must be replaced at the panel builder's expense.
- VI.3.8. Wiring:

Type and Identification:

 - VI.3.8.1. All Wire Colors in the panel shall follow the UL508A standards.
 - VI.3.8.2. Wire type #12 AWG and smaller shall be Hook-Up/Lead tinned copper, # 18 AWG stranded is minimum: BELDEN – 35612 Hook-Up Lead-UL AWM Style 3173-XL-DUR or equal.
 - VI.3.8.3. Control:
 - VI.3.8.3.1. All control cabinet wiring to the PLC and control devices shall be 18 AWG and terminated with ferrules.
 - VI.3.8.3.2. Control Wiring shall be numbered / lettered at each end. Wire numbers / letters shall be Flattened Polyolefin Heat Shrink Markers for Permanent Wire and Cable Identification (Panduit) or JEA approved equal. Pass & Seymour "Legrande" will no longer be acceptable.
 - VI.3.8.4. Power:
 - VI.3.8.4.1. Ampacity rating shall be a maximum of 75C.
 - VI.3.8.4.2. All wires going from Distribution Block to the Pump Breaker and Motor Contactor must be sized for 140% of Motors FLA.
 - VI.3.8.5. Field Wiring
 - VI.3.8.5.1. All field wiring shall be ground burial rated.

- VI.3.8.5.2. All control wires shall be tin plated and #12 AWG with dielectric grease applied to both ends to prevent corrosion.
- VI.3.8.5.3. All control wires shall be labeled at both ends for tracing.
- VI.3.8.5.4. Analog wires shall tin plated with a foil and braided shield.
- VI.3.8.5.5. VFD rated cable shall be used from the VFD to the demarcation box.
- VI.3.8.5.6. Field wiring colors:
 - VI.3.8.5.6.1. Motor Wires:
 - VI.3.8.5.6.2. 240V = Blue, Orange, Black
 - VI.3.8.5.6.3. 480V = Brown, Orange, Yellow
 - VI.3.8.5.6.4. Over Temp:
 - VI.3.8.5.6.5. Hot = Black
 - VI.3.8.5.6.6. Common = White
 - VI.3.8.5.6.7. Seal Fail:
 - VI.3.8.5.6.8. Hot = Red:
 - VI.3.8.5.6.9. Common = Orange
 - VI.3.8.5.6.10. Ground = Green
 - VI.3.8.5.6.11. High Well:
 - VI.3.8.5.6.12. Hot = Blue
 - VI.3.8.5.6.13. Common = White/Blue Stripe

VI.3.9. Terminals:

Terminals shall be based on the WAGO Top Job S series terminals. The minimum size shall be 4mm. The spring portion of the clamp shall be fabricated of a chrome nickel spring steel of high tensile strength and shall be solid, without perforation. The chrome nickel spring steel spring tension mechanism shall provide the installer the opportunity to directly insert solid or ferruled conductors without having to utilize tooling to open the clamping mechanism. The terminal block shall be designed to accept solid and/or stranded copper conductors without requiring special preparation, such as crimps, ferrules or tinning. Proportional clamping shall ensure mechanical and electrical connection integrity without damage to the conductors of various sizes throughout the rated range. The design of the terminal block shall not prevent or interfere with the use of wire preparation methods, such as crimps, ferrules or tinning. The pullout force shall be a minimum of 6 times that specified in VDE 0611 (Resistance to Vibration Test for Terminal Block). The current bar and clamping yoke shall have traverse grooves to increase the force required for conductor pull out and "Gas tight" connection. The voltage drop also shall remain virtually unchanged. Gas tightness will be per DIN 41640, part 76.

VI.3.10. Generator Disconnect Switch:

A NEMA 3R enclosed generator disconnect switch shall be supplied and sized as follows.

- VI.3.10.1. Approved manufacturer: Eaton quick-connect double-throw (QCDT) safety switch or approved equal.
- VI.3.10.2. The Generator Disconnect Switch shall be sized greater than or equal to the current rating of the Main Circuit Breaker but not larger than 400A.
- VI.3.10.3. The generator disconnect switch shall not be required if a generator set is installed on site.

VI.3.11. Across the Line Starter Specifications:

- VI.3.11.1. Intelligent Motor Control

Across the Line Starter will be controlled by Siemens SIMOCODE Intelligent motor control. The motor control shall consist of 4 discrete inputs and 2 discrete outputs.

Display interface shall display Warnings, Faults + History, Operational data such as Line Voltage, Current, Power and I/O Status. The display will also have the ability to control from the keypad and switch the modes from Hand, Off, Auto and Override. Profibus DP interface built into the device. This will allow JEA to read and write to all parameters inside the device and to program the device remotely.

VI.3.11.1.1. Decoupling modules shall be required on all non Wye power systems such as a Delta.

VI.3.11.1.2. Voltage/Current modules shall be sized based on Motors FLA.

VI.3.11.2. Contactors:

VI.3.11.2.1. All contactors shall be NEMA rated.

VI.3.11.2.2. Device shall be manufactured and tested as a NEMA device; IEC equivalent will not be accepted

VI.3.11.2.3. Minimum size contactor shall be NEMA Size 1.

VI.3.11.2.4. Fractional size contactors shall not be acceptable.

VI.3.11.2.5. Contactors shall be equipped with double break

VI.3.11.3. Thermal Magnetic Circuit Breakers:

Thermal Magnetic Circuit Breakers shall be used for the Main, Emergency and Pumps. As a minimum the breakers must comply with the standards as follows.

VI.3.11.3.1. Circuit breakers shall be minimum "E" frame.

VI.3.11.3.2. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device.

VI.3.11.3.3. Protector operators shall be quick make, quick break and trip free.

VI.3.11.3.4. Shall be rated a minimum of a 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18KAIC for 460/480 Volt systems.

VI.3.11.3.5. The thermal and magnetic elements shall operate independently and multiple pole breakers shall be designed with common trip bar breaking all poles when a fault is received on any pole.

VI.3.11.4. Main and Emergency Breakers

VI.3.11.4.1. The electric utility company servicing the utility shall provide the maximum available fault current rating for each electrical service. Each panel shall be UL rated for the maximum available fault current.

VI.3.11.4.2. The Trip Rating or Setting shall be calculated by taking the largest Pump Breaker's Amps + the Nameplate Amps of all the other Pumps + 10Amps (auxiliary loads) = Normal Main Breaker Trip Setting.

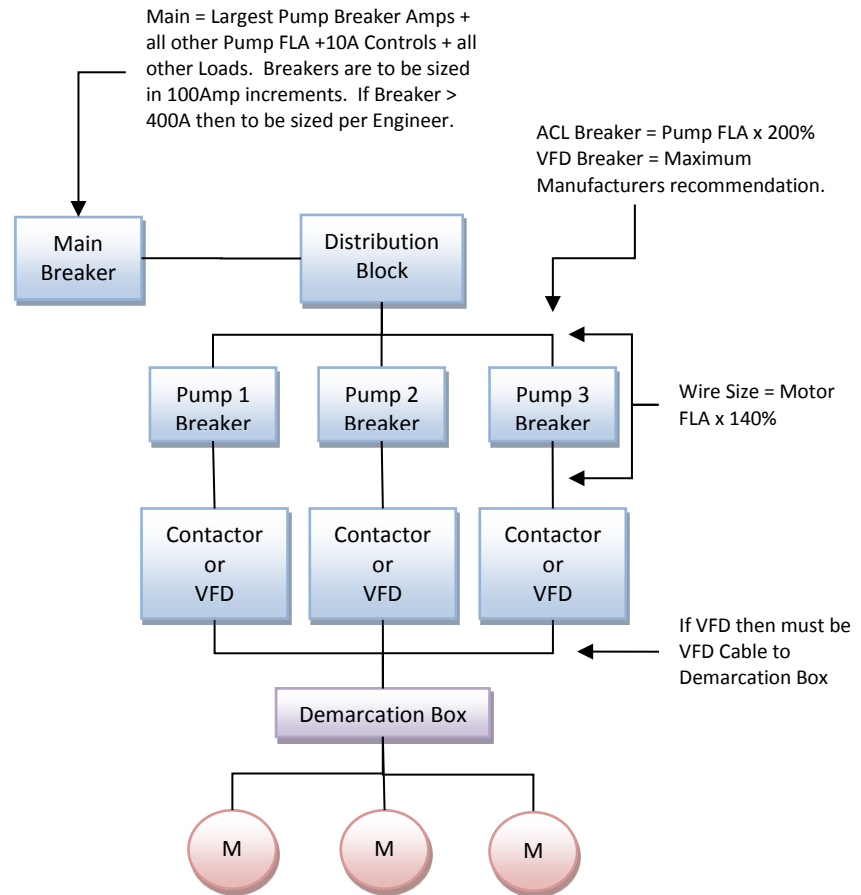
VI.3.11.4.3. The minimum size breaker will be 100A. Where the breakers trip setting is greater than 100 amps and less than or equal to 200 amps the breakers shall be rated at 200 amps. Where the breakers trip setting is greater than 200 amps and less than or equal to 400 amps the breakers shall be rated at 400 amps. Where the breakers trip setting is greater than 400 amps the main breaker shall be rated as determined by the lift station electrical design engineer.

VI.3.11.5. Across the Line Pump Breakers

VI.3.11.5.1. The Trip Rating or Setting shall be calculated using the Pump Motor Nameplate Amps x 200% for Across the Line Starters.

VI.3.12. Variable Frequency Drive Breakers

VI.3.12.1.1. Breakers shall be selected and sized for maximum ratings per manufacturer's recommendation.



VI.3.13. Variable Frequency Drive Specifications

VI.3.13.1. All VFD's shall be on the approved manufacturer list.

VI.3.13.1.1. Cutler Hammer – SVX9000

VI.3.13.1.2. Yaskawa – P7

VI.3.13.2. VFD's shall be sized for 110% continuous and 120% for 1 minute.

VI.3.13.3. VFD's shall have a minimum 3% Input Line Reactor on each of the drives.

VI.3.13.4. VFD's shall be rated for a minimum of 50 Celsius ambient temperature.

VI.3.13.5. VFD's in buildings shall have a DV/DT Output Filter on each drive.

VI.3.13.6. Each drive shall come with a Profibus DP module that supports "ProfiDrive" Communication not just Profibus DP. Each drive must support Profibus as a native protocol; a protocol translator between drives isn't acceptable. The drive shall be set up for PPO4 telegrams and data rates of 1.5 M.

VI.3.13.7. Each drive shall come with a keypad that supports Local/Remote, Jog, FWD/Rev, Run and Stop.

VI.3.13.8. Drives shall be rated a minimum of NEMA 12.

VI.3.13.9. Drive control boards shall be conformal coated.

VI.3.13.10. VFD's shall be flange mount capable.

VI.3.13.11. All VFD's shall come pre-programmed to the description of the VFD Float Backup Functional as described below.

VI.3.13.12. All drawings shall come with a parameter sheet, on the drawing, with instructions for drive set up on Profibus and have backup float capability.

VI.3.13.13. All drives shall come with a certified three year warranty with documentation showing proof.

VI.3.13.14. VFD Float Backup Functional

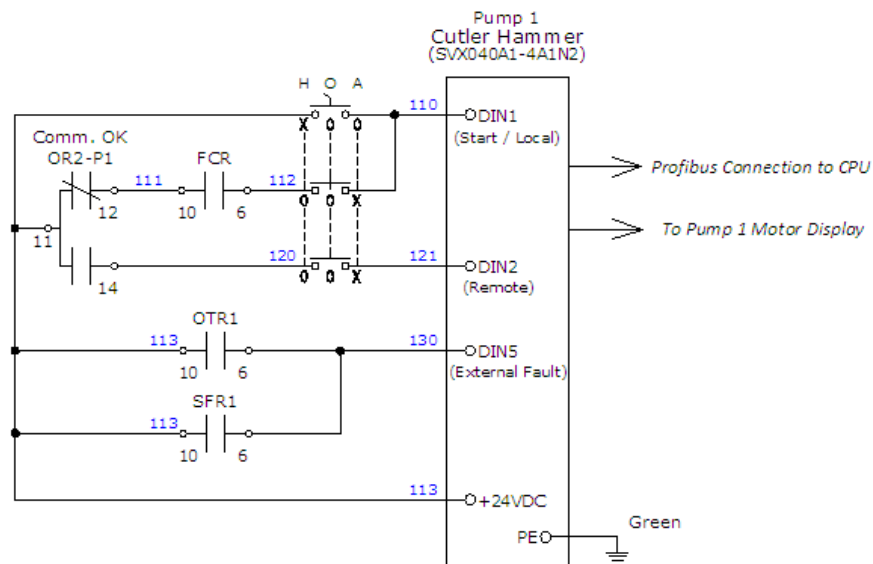
Each VFD shall be wired with a Hand, Off and Auto switch. The three modes of operation are described below.

VI.3.13.14.1. Off – The drive is disabled.

VI.3.13.14.2. Manual – The drive shall turn on and ramp up to maximum speed.

VI.3.13.14.3. Auto – If the VFD selector switch is put into Auto and PLC Communication to the drive is ok then the drive will be controlled over the Profibus communication. If communication is ever lost to the VFD the Communication OK relay will drop out and control the VFD from the Float Control Relay. The Communication OK relay is controlled by the PLC and is to be energized as long as the VFD Communication is ok.

Below is the connection diagram for the hardwired interface to the VFD.



VI.3.13.15. Heat Load Calculations for Gasketed / Unvented Enclosures

All heat calculations shall be provided showing surface area, internal heat load of components broken out, Watts per square foot and any other pertinent data. This data shall be submitted with the enclosure drawing for approval.

VI.3.13.15.1. The evaluation of the heat load on an enclosure, include the following:

VI.3.13.15.1.1.1. Total surface area of the enclosure

VI.3.13.15.1.2. Internal heat load [load and duty cycle to be considered in calculation]

- VI.3.13.15.1.3. Maximum allowable internal temperature [113F]; with an assumed outside temperature[95F]
- VI.3.13.15.2. Enclosure surface area is the primary factor in determining its ability to dissipate heat.
- VI.3.13.15.2.1. Surface Area = $2[(A \times B) + (A \times C) + (B \times C)] \div 144$
- VI.3.13.15.2.2. Where the enclosure size is A x B x C in inches.
- VI.3.13.15.2.3. This equation includes all six surfaces of the enclosure.
- VI.3.13.15.2.4. If any surface is not available for transferring heat (for example, an enclosure surface mounted against a wall), that surface's area should be subtracted.
- VI.3.13.15.3. For any temperature rise calculation, the heat generated within the enclosure or internal heat load shall be known.
This information can be obtained from the supplier of the components mounted in the enclosure.
Any internal heat calculation shall include but is not limited to the following components:
- VI.3.13.15.3.1. Transformer Power Supply UPS PLC Circuit Breakers Heat Load Main All Pump circuit breakers taking into consideration duty cycle.
- VI.3.13.15.3.2. VFD Heat Load
- VI.3.13.15.3.2.1.1. If VFD is inside the enclosure assume Heat Load = $(746W \times HP \times 3\%)$
- VI.3.13.15.3.2.1.2. If VFD heat sink is out back assume Heat Load = $(746W \times HP \times 3\%) \times 10\%$
- VI.3.13.15.3.2.1.3. Note: the 10% is from Cutler Hammers statement that with heat sinks out the back only 10% of the heat will be dissipated inside the enclosure. Other manufacturers may require a greater percentage and must adjust the formula accordingly.
- VI.3.13.15.3.3. VFD Duty Cycle
- VI.3.13.15.3.3.1.1. For two pumps VFD applications assume worst case of one pump running continuously.

VI.3.13.15.3.3.1.2. For three pumps VFD applications assume worst case of two pumps running continuously.

VI.3.13.15.4. Enclosure Temperature Rise (ΔT)

Example:

What is the temperature rise that can be expected from a 72 x 72 x 20 in. painted white enclosure designed to control 3 VFD's with external mounted heat sinks?

Solution:

$$\text{Surface Area} = 2[(72 \times 72) + (72 \times 20) + (20 \times 72)] \div 144 = 112 \text{ ft}$$

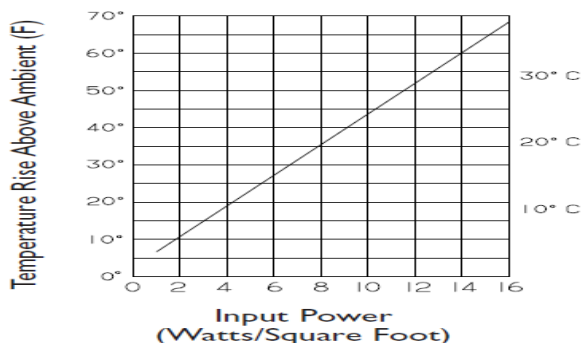
VI.3.13.15.5. Internal heat load (min.):

Component		PN	Load	Full Load Loss	Loss
Control Transformer	500VA	Siemens MT0500A	50%	21.5w	11w
24VDC Power Supply	5A	PULS CS5.241 89.4		15w	15w
CPU 313C-2DP	Siemens	6ES7 313-6CF03-0AB0		14w	14w
Analog Input Module	Siemens	6ES7 313-1KF01-0AB0		1w	1w
Communication Module	Siemens	SINAUT ST7, TIM 3V-IE		6w	6w
3 Pole 200 Amp [2]	Siemens	NFG3B200L	33% (65amps per drive)	80w per breaker at 200 amps	53w
[2] 50 HP VFD	Cutler-Hammer	SVX040A1-4A1N2	100%	112w per drive	224
Misc					13w
Total					337w

*Full Load loss data from component specifications sheets.

VI.3.13.15.6. Watts per Square Foot = total internal watts / surface area = 337/112 = 3 Watts/Square Foot

VI.3.13.15.7. Temperature Rise [ΔT] = 15 degrees F



VI.3.13.16. Air Conditioning (reference the Shared Services Standards Manual Division 23)

Only buildings will require air conditioning and shall meet the specifications below.

VI.3.13.16.1. Air conditioners shall be rated NEMA 4X and Corrosion Resistant.

VI.3.13.16.2. Buildings shall require heating strips.

VI.3.13.16.3. AC Units shall carry a minimum of a 3 year warranty in a corrosive environment.

VI.3.13.17. Surge Suppression:

Surge Protective Devices (SPD) for 120VAC and above shall be UL1449 Third edition.

VI.3.13.17.1. The Main Disconnect shall have a Type 1 SPD rated NEMA 4X. It will have a minimum surge capacity of 50kA at 8x20us

VI.3.13.17.2. The Control Panel shall have a minimum Type 2 SPD with a surge capacity of 40kA at 8x20us or above.

VI.3.13.17.3. The 4-20ma surge suppression shall be CITEL part # DLA-24D3. No other device will be accepted.

VI.3.13.18. Additional Field Wiring Requirements:

Some sites require additional inputs based on external field requirements. Below is a list of inputs for different field requirements.

VI.3.13.18.1. Generator Input requirements as listed.

Discrete Inputs – Generator Fault, Transfer Switch Normal, Transfer Switch Emergency, Generator Running, Normal Power Available and Fuel Leak, Analog Input 4-20ma – Fuel Level

VI.3.13.19. UL Labels:

The entire control system shall bear a UL 508A serialized label "Enclosed Industrial Control Panel". The use of the label "Industrial Control Panel Enclosure" without the UL508A serialized label shall not be acceptable.

VI.3.13.20. Warranty:

VI.3.13.20.1. The Panel Manufacturer shall supply to JEA a three (3) year (min.) unconditional warranty after completion or acceptance of MCC Panel on all parts supplied by the manufacturer, excluding parts supplied by JEA.

VI.3.13.20.2. 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 material or defective workmanship with new materials/workmanship conforming to the specifications.

VI.3.13.20.3. The Panel Manufacturer shall also be responsible to ensure that Component Manufacturer's Warranty which exceeds the Panel Manufacturer's warranty is honored.

VI.4. COMPONENTS EXTERNAL TO THE PANEL

VI.4.1. Floats:

VI.4.1.1. High Well Alarm – Shall have one S40NC that is red.

VI.4.1.2. Start – Shall be a S40NO with green electrical tape above the float to indicate start.

VI.4.1.3. Stop – Shall be a S40NO with red electrical tape above the float to indicate stop.

VI.4.2. Well Level Transducer:

The submersible level sensor shall be a solid state instrument designed to continuously measure and transmit liquid level data. The transducer shall have a 4-20ma output with 24VDC supply. The transducer shall be calibrated for 0-24' of water. Transducer shall have conduit adapter, 100 feet of cable and be rebuildable. The transducer shall not have a breathing (vent line) or boxes. Transducers shall have manufacturer's three year warranty from date of installation. The transducer shall be in stainless steel housing. The transducer shall be GP:50 Model# 311-SZ-CZ-Y367 or JEA approved equal. Wire specs are as follows:

Cable shall be manufactured by Spectrum Cable Corp., conductor size 18 AWG, 16/30 TC insulation is .010 polyethylene cable is two conductor together with a 19 AWG drain wire and an overall aluminum Mylar Wrap. Cable jacket is .035 Black Polyurethane, nominal O.D. is .215. Color of conductors shall be red and black or JEA approved equal.

VI.4.3. Force Main Pressure Transducer:

Every Lift Station shall have a Force Main Pressure Transducer.

VI.4.3.1. Transducer is to be rated 0-100PSI.

VI.4.3.2. Transducer shall be a United Electric Controls model number TX200B or equivalent.

VI.4.3.3. Shall have a minimum 3 year warranty.

VI.4.4. Potable Water Pressure Transducer:

~~Not~~ Every Lift Station is required to have a Potable Water Pressure Transducer. Refer to design for site for requirements.

VI.4.4.1. Transducer shall be rated 0-100PSI.

VI.4.4.2. Transducer shall be a United Electric Controls model number TX200B or equivalent.

VI.4.4.3. Shall have a minimum 3 year warranty.

VI.4.5. Demarcation Box:

A Demarcation box shall be used as an isolation point between the wet well and the motor control center panel. All wiring between the motor control center and wet well shall be interconnected at this point. Demarcation Box is divided into a base that is vented and a top that is NEMA 4X rated. Demarcation Box shall be fabricated from .125 Marine Grade Brushed Aluminum. Box shall be mounted so that doors face away from wet well. Only one pulling 90 degree ell at the base of the demarcation box is allowed. Conduit shall be stubbed up 3" from the base. The wire shall run in the open air at the base of the demarcation box with liquid tight cord connections at the bottom of the top demarcation box. Reference drawings and information below for more details.

VI.4.5.1. Demarcation Top – Shall be 24" Width x 24" Height x 12" Depth, NEMA 4X, hinged door, 3-Point Latch with a padlock feature.

VI.4.5.2. Demarcation Base – Shall be 24" Width x 36" Height x 12" Depth, vented on sides, hinged door and two padlocking ¼ turn wing latches on the front of the door.

VI.4.5.3. Terminals – Shall be mounted on removable back plate, terminal for each wire, terminal sized according to load and minimum terminal size shall be 4mm. Antioxidant compound shall be used on all terminals and wire connections, (Nolox or equal).

VI.4.5.4. Liquid Tight Cord Connections – Shall be made of cast aluminum.

VI.4.5.5. All wires including spares shall be identified with heat shrink labels. All control wires shall have spade lugs.

VI.4.6. Power Distribution Panel:

Panel to distribute power to devices external to the control panel. It shall be fabricated from .125 Marine Grade Brushed Aluminum or 316 stainless steel. Reference site drawings for details.

VI.4.7. Radio Pole / Tower:

The radio pole or tower shall provide communication to the SCADA cabinet to the remote master. To determine if a Pole or Tower is required a Radio Path Study shall first be conducted. The Radio Path Study shall be done using the same type of radio used in the SCADA panel and shall be a minimum of -86DB RSSI. If the height of the minimum -86DB RSSI level is less than or equal to 20' then a 20' Pole shall be used. If the height requirements are over 20' then a Tower shall be used. Refer to drawings for specifications on Pole and Tower.

VI.5. SERVICE:

The manufacturer or representative shall provide two hour on site emergency service for the first 12 months after commissioning. The manufacturer shall stock replacement components locally for emergency replacement as needed.

VI.6. START UP:

The manufacturer or representative shall be present for startup at time designated by JEA.

VI.7. OPERATING PROCEDURES:

MCC supplier shall provide written "Standard Operating Procedures" to JEA.

VII. PREFABRICATED CONCRETE ENCLOSURE**VII.1. PREFABRICATED CONCRETE ENCLOSURE:**

The prefabricated building system shall be factory assembled, pre-tested, shipped to the site, and suitably anchored to the respective concrete foundations. In the case of a conflict between this specification section and the current JEA Standards, the more stringent of the two requirements shall apply.

The enclosure shall be manufactured by Old Castle Precast, Inc. of Newnan, GA (770) 304-4648, or JEA approved equal. The enclosure design and construction shall conform to all applicable federal, state, and local building codes and standards including the current Florida Building Code, D1.1 Structural Welding Code, ACI-318-02 and ACI-318R-02.

The enclosure shall be guaranteed to be completely weather-tight under all weather conditions for a period of three (3) years (min). Leaks, which occur during the period, whether through roofs, walls, doors, accessory equipment, or materials, shall be repaired to the satisfaction of JEA at no additional cost to JEA.

CONTRACTOR shall verify all openings and penetrations, and shall coordinate with the manufacturer prior to casting.

VII.2. DESIGN REQUIREMENTS:

The enclosure shall be constructed of solid, one-piece concrete panels. Minimum outside dimensions of the building shall be 11'-8" x 28'-0". The minimum interior clear height shall be 10'-0". Panels shall be bolted or welded together and joints caulked inside and out to make the building weatherproof. The wall panels shall be minimum 3-1/2" thick solid panels of concrete with primary structural reinforcement of steel bars and welded wire fabric. Wall panel assembly shall develop strength to resist the design wind loads. Wall panels shall be continuous from base to leave with no horizontal joints.

The roof shall have a gable profile with the ridge parallel to the long dimension and shall have a minimum 4" thick concrete panel extending over the walls to act as a drip edge. The roof shall contain primary reinforcement of steel bars and welded wire fabric as well as secondary reinforcement of polypropylene fibers.

The interior finish on the walls shall be ¾" plywood panels with plastic laminate suitable for equipment mounting and insulated to R-14. The ceiling shall be 5/8" gypsum and insulated to R-21. All fasteners and nails shall be 316 stainless steel.

The exterior surfaces of the walls shall have a stucco texture finish. The exterior shall be finished with a cementitious base coating and a topcoat of textured 100% acrylic. The topcoat shall be of the same manufacturer as the cementitious base coating. Coatings shall be Thoro System Products; "Thoroseal with Acryl 60" and "Thoroseal". Colors will be selected after the award of the contract. Exterior flashing and fasteners shall be 316 stainless steel.

Caulking shall be provided at all bases, corners, eaves, doors, and other openings to provide a completely weather-tight installation. Sill angles and doorframes shall be caulked in place and sealed.

All necessary erection hardware, fasteners, trim, flashing, closures and other accessories necessary for a complete building shall be furnished. The enclosure shall be assembled in accordance with the building manufacturer's instructions. All members shall be carefully leveled. All welding shall be in accordance with AWS D1.1 Structural Welding Code.

VII.3. DOORS AND HARDWARE (REFERENCE THE SHARED SERVICES STANDARDS MANUAL DIVISION 8)

The building shall be provided with a pair of 2'-6" x 7'-0" fiberglass reinforced plastic (FRP) doors for equipment installation and a 3'-0" x 7'-0" FRP personnel door as indicated on the drawings. The color of the door shall be selected after award of the contract.

Hardware shall be furnished and installed by the door manufacturer. The hardware shall be 316 stainless steel provided for the building and shall include mortise locks on each door set Corbin Russwin interchangeable core cylinders. Interchangeable core shall have Contractor's core in cylinder. Contractor core shall be provided with control key and registered change keys. Contractor to coordinate door hardware lock mechanism with the JEA representative. Hinges shall be heavy duty stainless steel. The location of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware".

Hardware shall be stainless steel and furnished complete with machine screws, bolts, and other attachments as required. The CONTRACTOR shall furnish complete specifications and catalog cuts of each item offered.

VII.4. ELECTRICAL:

The manufacturer of the building shall provide to the CONTRACTOR any requirements necessary for the installation of the electrical equipment and conduits by the CONTRACTOR as indicated on the drawings. This shall include recommended conduit penetration and sealing methods to ensure the weather-tight integrity of the building.

VII.5. STRUCTURAL DESIGN:

The applicable building code shall be the latest Florida Building Code. The enclosure shall be designed to resist overturning and sliding forces resulting from wind loading. Embedments to be cast into the slab for anchorage shall be designed and provided by the building supplier. Structural design shall be performed by a Professional Engineer registered in the State of Florida and submittal of building components shall bear his/her seal.

The building shall be designed for the following criteria (at a minimum):

Roof live load, lb per sq. ft. of horizontal projection (no live load reduction is permitted)	20 psf
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Wind Load	120 mph, 3 second gust
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VII.6. PAINTING AND FINISHES:

All surfaces to receive paint shall be cleaned of any grease, dust, or dirt. Pre-finished surfaces shall be masked or otherwise protected to avoid damage from spilled paint, overspray, or spatter.

Factory finished surfaces, which have become damaged during shipping, assembly, or erection shall be touchup painted with materials supplied by the building manufacturer. No other finish shall be accepted. All touchup painting shall produce a final finish satisfactory to JEA.

VII.7. DRAWINGS AND DATA TO BE SUBMITTED:

Complete specifications and drawings covering the doors and a complete hardware schedule shall be submitted in accordance with the Submittals section. Drawings shall indicate an elevation of the door, details of construction, assembly and erection details, profiles and thickness of materials, anchors, reinforcements, hardware coordination, and finish. Drawings shall be accompanied by the manufacturer's installation manual, indicating standard recommendations and details of erection. The hardware schedule shall indicate each item of hardware required, manufacturer's name, manufacturer's number or symbol, and finish.

Complete drawings and data shall be furnished showing anchor bolt locations, sizes, and projections; details of sidewall, end wall, and roof framing; transverse cross-sections; locations of all openings; details of louver; flashing details; and erection instructions. Color samples of manufacturer's standard finishes shall be submitted. Drawings and data shall be in accordance with the Submittals section.

VII.8. CERTIFICATION:

A letter of certification signed and sealed by a Professional Engineer registered in the State of Florida shall be submitted for the structural framing, anchorage and covering panels of the building system.

VIII. VALVES**VIII.1. GENERAL:**

The contractor shall furnish and install check valves, plug valves, and appurtenances as shown on the drawings and as specified in JEA Water and Wastewater Standards Manual.

VIII.2. CHECK VALVES (LEVER & WEIGHT STYLE):

Check valves shall be as generally specified in JEA Water and Wastewater Standards Chapter IV. 4. - Section 430, and shall also meet the following additional requirements. Rubber disc facing shall operate on a 316 stainless steel shaft connected to a steel outside lever and cast iron adjustable weight. Check valve shall include renewable seat and disc. Valves shall meet AWWA Standard C508 and rated at 150 psi (min.) working pressure.

IX. TESTING**IX.1. PUMP FACTORY TESTS:**

The pump manufacturer shall perform the following tests on each pump prior to shipment.

IX.1.1. Megger the pump motor and cable for insulation breaks or moisture intrusion.

IX.1.2. Prior to submergence, run pump dry and check for correct rotation.

IX.1.3. Pump shall be run continuously for 30 minutes in a submerged condition, with a minimum submergence of 10 feet.

IX.1.4. Pump shall be removed from test tank, meggered immediately for moisture and all seals checked for water intrusion.

IX.1.5. Pumps shall be operated at a minimum of 6 points to establish the hydraulic curve. KW input shall be monitored and recorded. One test point shall be performed with discharge valve closed. Pumps shall develop appropriate capacity and head within Hydraulic Institute Standards without

excessive noise, vibration or cavitation. If specifically requested by JEA, a vibration test shall be performed on each pump to demonstrate compliance.

IX.1.6. For pumps less than 100 HP, the pump supplier shall submit copies of certified Hydraulic Institute test reports including factory pump curves of identical model pump (s) provided to JEA (in lieu of written certified test reports for each pump supplied).

IX.1.7. For pumps 100 HP and greater, the above certified pump performance test (at a minimum) must be completed on each actual pump supplied. A JEA representative(s) shall be present to witness the certified test (JEA's travel expenses by JEA).

IX.2. FIELD ACCEPTANCE TESTING:

IX.2.1. Pre-Final Inspection:

Prior to final inspection, the Contractor shall conduct a pre-final site inspection (including energizing each pump), in the presence of a JEA representative. Any deficiencies noted at this time shall be corrected prior to scheduling of the final inspection.

IX.2.2. Final Inspection:

The Contractor shall be responsible for conducting the following field acceptance tests and start-up procedures in the presence of a JEA representative. The Contractor shall notify JEA, the Engineer and the pump manufacturer's representative 48 hours prior to start-up. The time and date of this final inspection shall be scheduled by JEA. The Contractor shall furnish all labor, piping, equipment, water and materials required to perform the acceptance testing. The Contractor shall ensure the force main is full of water prior to the pump test. The contractor shall submit proof of compliance with electric site grounding requirements. JEA will complete a final inspection checklist for acceptance.

IX.2.2.1. The Contractor shall demonstrate that the pump mounting and guide rail systems are operational. The Contractor shall remove and reinstall the pumps in the presence of the JEA representative, prior to conducting the performance test.

IX.2.2.2. Pump Performance:

Prior to acceptance, as part of the final inspection, and prior to placing the station in operation, the Contractor shall conduct a pump performance test. Pumps shall operate according to the operating conditions indicated on the drawings without excessive vibration or overheating. Testing shall be performed using clean water. The Contractor shall supply water at its own expense to perform the required testing. Pumping rates shall be determined by pumping a calculated volume of water in a specified time interval. Head and flow conditions shall be measured and recorded. Water levels during testing shall fall within the pump control levels shown on the drawings. Amperage draws shall be monitored to determine effectiveness and efficiency of equipment. The test shall be repeated until satisfactory results are obtained. The test results shall be recorded on the Pump Test Report sheet included in the appendix section herein. If the Contractor is unable to demonstrate to JEA that the pumping unit performs satisfactorily, the unit shall be rejected. The Contractor shall then remove and replace the defective unit at its own expense. Satisfactory performance includes, but is not limited to, the following:

IX.2.2.2.1. Pumps:

Pumps shall deliver rated GPM at rated TDH.

IX.2.2.2.2. Motors:

Running amperage shall be noted and recorded on each leg of power cord while pump is operating under full load.

- IX.2.2.2.3. All self-test trip relays shall demonstrate ability to simulate a fault condition. All test results shall be recorded on the pump test report and be submitted to the Engineer.
- IX.2.2.2.4. Pumps shall operate within 5 % of the approved, certified, head-capacity curve.
- IX.2.2.2.5. Following performance testing, pumps shall be meggered for pump-moisture intrusion.
- IX.2.2.2.6. Pump spare parts are not required unless specifically noted otherwise.
- IX.2.2.2.7. For dry-pit submersible pumps, the closed loop cooling system shall provide adequate cooling, in accordance with pump manufacturer's recommendation, throughout the pumping range.

IX.2.3. SCADA Inspections:

A JEA representative shall conduct the following field acceptance test and start up procedures in the presents of the contractor.

X. REFERENCE POINTS AND LAYOUT

The Contractor shall be responsible for setting all grade stakes, lines and levels. The Contractor or Contractor's Surveyor will provide centerline of construction and will establish a benchmark. Any reference points, points of intersection, property corners, or benchmarks, 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.

XI. PRECAST CONCRETE WET WELL

XI.1. MATERIALS:

Wet well bases, sections and miscellaneous structures shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall meet the requirements of ASTM C150 (specification for Portland cement, type II). Concrete shall meet the minimum requirements for Class "A" as specified in JEA Water and Wastewater Standards Chapter II. 5. - Section 437- Concrete Work. Minimum wall thickness shall be 1/12 the inside diameter in inches plus 1 inch. Rings shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. The Contractor shall submit shop drawings consisting of manufacturer's standard details of various sections, for approval, before placing order for structures.

XI.2. BASES:

Bases for wet wells shall be cast integrally with the bottom section. The base section shall be set in a 12-inch (minimum) leveling course of granular material (57 stone) as shown on the drawings. For concrete base and riser's the reinforcing steel shall be designed, signed and sealed by a Florida Registered Structural Engineer and shall be submitted with the shop drawings.

XI.3. JOINTS:

Joint contact surfaces shall be formed with machined castings and shall be exactly parallel and specifically designed by a professional engineer. Joints shall be sealed with JEA approved joint sealer over the entire joint surface, with joints pre-primed. Joints shall be watertight. Upon completion of installation, excess joint sealer shall be trimmed flush with inside and outside surface of structure.

XI.4. FLEXIBLE PIPE CONNECTOR:

A flexible pipe connector shall be used to connect the wastewater influent pipe to the precast concrete wet well.

XI.4.1. Material:

The Neoprene-EPDM material the connector is manufactured from shall conform to ASTM C443 and shall be a minimum of 3/8 inches (9.4mm) thick or greater. The material shall be resistant to ozone, weathering, aging, and chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products.

XI.4.2. Bands:

The stainless steel band and screw assembly shall be a totally non-magnetic series 304 stainless steel.

XI.4.3. Connector:

The connector shall be of a size specifically designed for the specified pipe material and size. The connector may be installed in the wet well wall by the precast manufacturer in strict accordance with the recommendations of the connector manufacturer. During the invert construction stage, the interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout by the Contractor.

XI.5. INSTALLING SECTIONS:

Precast concrete sections shall be set so the wet well will be vertical and with sections in true alignment. If not approved otherwise by JEA, the construction schedule for setting wet well base and riser sections shall be approved by a JEA representative. The JEA representative shall be present, on site, during this installation.

Installing Wet Well Sections and Lids:

- XI.5.1.1. During the handling of all wet wells, the contractor shall protect the wet well and not allow a chain, cable or other lifting line to damage the joint surfaces. Spreader bars, wood blocks or other devices shall be utilized to prevent damage to the wet well. Any wet well section or lid found to have defects, included but not limited to leaks and cracks shall be removed and replaced.
- XI.5.1.2. The wet well sections shall be set so the manhole will be vertical and with section in true alignment. Construction shall include:
 - XI.5.1.2.1. Cleaning all joint surfaces (remove all sand, oil, debris & other foreign items) and provide additional primer if recommended by the joint manufacturer.
 - XI.5.1.2.2. The joint sealant (Ram-Neck, ConSeal or other JEA approved joint sealant) and the manhole surfaces shall be dry during the installation period (shall not be installed if wet or during rain events).
 - XI.5.1.2.3. Joint sealant is applied to both the top & bottom joint surfaces (Double Ring Method). The joint sealant shall be installed continuously around all joints with the ends placed butt-to-butt (not overlapped & no open gaps between sealants).
 - XI.5.1.2.4. The excess joint sealant shall be trimmed flush to the inside surfaces of the manhole. Trim the outside surfaces if an exterior joint sealant/tape is applied.
- XI.5.1.3. Apply a special primer and an "Exterior Joint Sealant Membrane" to the outside surfaces of all manhole joints/seams, which are located below the top cone section. Apply the primer and joint membrane in accordance with the recommendations of the membrane manufacturer.
- XI.5.1.4. Wet well with leaking joints (infiltration of ground water) will not be accepted by JEA. JEA will not accept leak repairs on new construction of wet wells. The leaking wet well is to be removed and replaced.

XI.6. METALLIC NON-SHRINK MORTAR:

All holes in sections used for their handling and the annular space between the wall and entering pipes shall be thoroughly plugged with an approved, non-shrinking mortar or grout, applied and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.

XI.7. EXTERIOR JOINT SEALANT MEMBRANE, TAPE:**XI.7.1. General:**

All exterior joints of precast concrete wet well shall be sealed with a 12-inch wide (minimum) exterior joint sealant membrane tape.

XI.7.2. Manufacturer:

All exterior joints of precast concrete wet wells shall be sealed with one 12 inch wide exterior joint sealant membrane centered on joint. The tape shall be capable of sealing joints against groundwater infiltration. The installation of the membrane shall be in conformance with the recommendations of the manufacturer. Surface must be smooth, clean, dry and free of voids, loose aggregate, dirt or other matter that will hinder the adhesion of the membrane. A primer shall be used in accordance with the recommendations of the membrane manufacturer. If recommended by the manufacturer, heat shall be applied to all areas being sealed. The membrane shall be the type listed in the JEA Water and Wastewater Approved Materials Manual (See AS-501, but utilize 12 inch wide tape).

XI.8. CORROSION PROTECTION:

Precast concrete wet well interior shall be lined as specified in JEA Water and Wastewater Standards Chapter IV. 6. - Section 446 Specialty Coatings and Linings. The exterior of the wet well (below grade), shall be given two coats of bituminous water proofing materials which meets the coating requirements as specified for sewage manholes (Specification Chapter IV. 1. - Section 427).

XII. PRECAST CONCRETE MANHOLES

The precast concrete junction manholes (nearest wet well) and all precast concrete manholes receiving force mains shall conform to the JEA Water and Wastewater Standards Chapter IV. 1. - Section 427-Manholes and shall be lined as specified in JEA Water and Wastewater Standards Chapter IV. 6. - Section 446 - Specialty Coatings and Linings. Junction manholes for pump stations shall be 5 feet inside diameter minimum. Junction manholes for Reduced Capacity pump stations shall be 4 feet inside diameter.

XIII. FIBERGLASS WET WELL – (ALTERNATE WET WELL CONSTRUCTION)**XIII.1. GENERAL:**

Unless noted otherwise by JEA, the contractor may construct a fiberglass wet well in lieu of a precast concrete wet well. The fiberglass wet well shall be designed (signed and sealed) by a Florida Professional Engineer. The design shall include the operating conditions as noted on the drawings, a 24 inch (minimum) thick (12 inch thick inside the wet well and 12 inches thick outside the wet well) reinforced concrete hold-down base which extends 24 inches beyond the outside of the wet well, a 6 inch (minimum) thick reinforced concrete top slab, pump access frame and cover and other standard wet well features as shown on the drawings. Pumps shall be anchored to a 1-inch thick steel plate (see details on the drawings). The complete design (designed by a Florida Professional Engineer) must be submitted in the form of a shop drawing for JEA's review and approval. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements. Unless approved otherwise by JEA, the wet well shall be a one-piece unit.

XIII.2. MATERIALS:**XIII.2.1. Resin:**

The resins used shall be commercial grade unsaturated polyester resins.

XIII.2.2. Reinforcing Materials:

The reinforcing materials shall be a commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcements and the resin.

XIII.2.3. Surfacing Materials:

If reinforcing materials are used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.

XIII.2.4. Fillers and Additives:

Fillers, when used, shall be inert to the environment and wet well construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

XIII.3. FABRICATION:**XIII.3.1. Exterior Surface:**

The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

XIII.3.2. Interior Surface:

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

XIII.3.3. Defects Not Permitted:

- XIII.3.3.1. Exposed fibers: glass fibers not wet out with resin.
- XIII.3.3.2. Resin runs: runs of resin and sand on the surface.
- XIII.3.3.3. Dry areas: areas with glass not wet out with resin.
- XIII.3.3.4. Delamination: separation in the laminate.
- XIII.3.3.5. Blisters: light colored areas larger than 1/2 inch in diameter.
- XIII.3.3.6. Crazing: cracks caused by sharp objects.
- XIII.3.3.7. Pits or Voids: air pockets.
- XIII.3.3.8. Wrinkles: smooth irregularities in the surface.
- XIII.3.3.9. Sharp Projection: fiber or resin projections necessitating gloves for handling.

XIII.3.4. Installation of Brackets:

Manufacturer or manufacturer certified field personnel shall glass in all stainless steel fasteners and brackets, discharge piping brackets, etc. Manufacturer of wet well shall be responsible for integrity of all field glassing.

XIII.3.5. Marking and Identification:

Each wet well shall be marked with the following information.

- XIII.3.5.1. Manufacturer's name or trademark
- XIII.3.5.2. Manufacturing special number
- XIII.3.5.3. Total length and nominal diameter

XIII.4. PHYSICAL REQUIREMENTS:

XIII.4.1. Load Rating:

The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs when tested in accordance with ASTM 3753, Section 8, test methods D 790 and D 695. To establish this rating the complete wet well shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

XIII.4.2. Stiffness:

The wet well cylinder shall have a minimum pipe-stiffness value as shown in Table 1 (at a minimum) when tested in accordance with ASTM D3757, Section 8.

Table 1: Stiffness Requirements (Minimum)	
Length, Ft.	F/Y psi
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

Physical Properties:

		Hoop Direction	Axial Direction
a.	Tensile Strength (psi)	18,000	5,000
b.	Tensile Modulus (psi)	0.8 x 10 E6	0.7 x 10 E6
c.	Flexural Strength (psi)	26,000	4,500
d.	Flexural Modulus (psi) (no ribs - 48", 60", 72") (with ribs - 96", 144")	1.4 x 10 E6 7.0 x 10 E6	0.7 x 10 E6 0.7 x 10 E6

XIII.5. FIBERGLASS CONSTRUCTION METHODS:

XIII.5.1. Handling:

XIII.5.1.1. The wet well shall not be dropped or impacted. Wet wells shall be chocked if stored horizontally. If wet wells must be moved by rolling, the ground transverses shall be smooth and free of rocks, debris, etc.

XIII.5.1.2. FRP wet wells may be lifted by the installation of three lifting lugs as specified by the manufacturer on the outside surface near the top or by a sling or "choker" connection around the center. Use of chains or cables in contact with the wet well surface is prohibited. Wet wells may be lifted horizontally using one support point.

XIII.5.2. Wet Well Installation:

Bottom of excavation should be compacted to 95% Standard Proctor Density. Pour reinforced concrete base a minimum of one foot deep and at least two feet larger than the fiberglass wet well outside diameter. As soon as the concrete has set-up enough to support the fiberglass wet well, lower the wet well into place. (Wet wells with fiberglass bottoms, should have rebar inserted into bottom reinforcement.) Pour a minimum of one foot of reinforced concrete on the inside, also a minimum of one foot deep and two feet from the fiberglass wet well wall on the outside of the fiberglass wet well.

Insert "RAMNEK" type sealant on the outside of the fiberglass wet well around the bottom where the fiberglass and concrete come together.

XIII.5.3. Wet Well Cutouts:

Cutouts in wet well wall should be made with proper cutting tools such as jigsaw or hole saw. Do not use axe or other impact-type tools.

XIII.5.4. Pipe Installation:

Make the cutout in the wet well wall equal to the outside diameter of pipe, plus 1/2 inch maximum. Grind the outside surface of the pipe and both the inside and the outside surfaces of the cutout in the wet well wall. Apply a priming agent to any PVC pipe that might be used before fiberglass lay-up. Insert the pipe through the cutout in the wall of the wet well. Apply fiberglass putty to the inside and the outside of the wet well wall cutout, filling openings between pipe and cutout. Make a good radius for the fiberglass lay-up. After putty has set-up, fiberglass the pipe into place. Use one layer of woven roving sandwiched between two layers of fiberglass mat. Allow fiberglass to completely set-up before backfilling. Manufacturer of wet well shall be responsible for integrity of field glassing.

XIII.6. DESIGN FEATURES:

XIII.6.1. Top Slab Support:

Pour reinforced concrete slab support a minimum of two feet outside of fiberglass wet well wall and minimum of six inches thick.

XIII.6.2. Design:

Fiberglass wet well system to be designed, signed and sealed by a Professional Engineer registered in the State of Florida. Resistance to uplift and traffic loading requirements shall be addressed in the design.

XIII.6.3. Wet Well Top:

Wet well top shall be concrete and designed for H-20 Traffic loading. Hatches shall be as specified in this specification and as detailed on the contract drawings. Bottom of top slab and around side of hatch opening shall be fiberglass lined and shall meet all the requirements of this specification.

XIII.7. WARRANTY:

The fiberglass manufacturer shall warrant the fiberglass wet well against defects for at least ten years after the date of acceptance by JEA. Defects are defined as cracking, delaminating, or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of JEA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

XIV. EXCAVATION

XIV.1. GENERAL:

The limit of excavation shall be such to allow for placing and removing forms, installing sheeting, shoring, bracing, etc. The Contractor shall pile excavated material in a manner that will not endanger the work and will avoid obstructing sidewalks, driveways, power poles, etc. Drainage shall be kept clear.

XIV.2. VERTICAL SIDES (SHEETING, SHORING AND BRACING):

When necessary to protect existing or proposed structures or other improvements, the Contractor shall maintain vertical sides of the excavation. The limit shall not exceed three feet outside the footing on a vertical plane parallel to the footing except where specifically approved otherwise by the Engineer. The Contractor shall provide and install any sheeting, shoring, and bracing as necessary to provide a safe work area as required protecting workers, structures, equipment, power design and adequacy of all sheeting, shoring, and bracing. For excavations deeper than 20 vertical feet, which utilize sheeting, shoring or bracing, the sheeting,

shoring and bracing plan shall be designed by a Florida Professional Engineer, (signed and sealed). This plan shall be submitted to JEA for review and approval, prior to construction. The construction of sheeting, shoring and bracing shall be in accordance with the approved plan. All major field modifications shall be approved by the professional engineer. The sheeting, shoring, and bracing shall be removed, as the excavation is backfilled in such manner as to prevent injurious caving. Excavation shall meet the Florida Trench Safety Act (an OSHA requirement) and OSHA Excavation Standards (29 CFR sub-part P 1926.650) at a minimum.

XIV.3. SLOPING SIDES:

Where sufficient space is available, the Contractor shall be allowed to back slope the sides of the excavation. The back slope shall be such that the excavation shall be safe from caving. The type of material being excavated shall govern the back slope used, but in any case, the back slope shall be no steeper than 1 foot horizontal to 1 foot vertical without sheeting or shoring.

XIV.4. DE-WATERING:

The Contractor shall keep excavation free from water by use of cofferdams, bailing, pumping, well pointing, or any combination as the particular situation may warrant. All de-watering devices shall be installed in such a manner as to provide clearance for construction, removal of forms, and inspection of exterior of formwork. It is the intent of these specifications that the foundation be placed on a firm dry bed. The foundation bed shall be kept in a de-watered condition a sufficient period of time to insure the safety of the structure. The excavation shall be protected from excessive rainfall, drainage and drying. The excavation shall be inspected and approved by JEA's representative before work on the structure is started. It is the intent of these specifications that the Contractor provides a relatively smooth, firm foundation bed for footing and slabs that bear directly on the undisturbed earth without additional cost, regardless of the soil conditions encountered. The Engineer will be the sole judge as to whether these conditions have been met.

XIV.5. UNAUTHORIZED EXCAVATION:

Excavation for slabs, footings, etc., that bear on earth shall not be carried below the elevation shown on the drawings. In the event the excavation is carried on below the indicated elevation, the Contractor shall bring the slab, footing etc., to the required grade by filling with concrete having a minimum compressive strength of at least 3,000 PSI at 28 days.

XV. BACKFILL

XV.1. BACKFILL MATERIAL:

Unless shown otherwise on the drawings, suitable soil (A-3 sand only, no clay or rocks larger than 3/4" size) shall be used for backfill around the wet well for a distance of two feet from the outside surface and extending from bottom of the excavation to the bottom of the top slab. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer. Backfill material shall be free of vegetation or other extraneous material. Excavation materials which are to be used for fill or backfill may be stockpiled on site. Top soil should be stockpiled separately and used for finish grading around the structure.

XV.2. SCHEDULE OF BACKFILLING:

The Contractor may begin backfilling of wet well as soon as the concrete has been allowed to cure and the forms removed.

XV.3. BACKFILL:

Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to at least 95% Standard Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

XVI. WASHDOWN STATION**XVI.1. WATER SERVICE PIPING:**

Water service piping shall be 1½-inch diameter (minimum). Water meter, shall be 1½-inch diameter (minimum). Materials and installation shall meet JEA's standards for typical water service construction.

XVI.2. BACKFLOW PREVENTOR:

The Contractor shall furnish and install a 1½ inch reduced pressure backflow preventer, which meets the requirements of JEA's Cross Connection Control Policy (see details on drawings).

XVI.3. WATER SERVICE & METER:

The contractor/developer shall secure the water for the pump station site by applying for either a commercial 1 ½-inch water only meter (if no irrigation water use is included with meter) or commercial 1 ½ inch irrigation meter (if irrigation water use is included with this meter). The contractor/developer is responsible for all JEA fees. The Contractor shall install the meter box and service in accordance with all applicable JEA Standard Details and Specifications and JEA will install the meter. The Contractor shall be responsible for the cost of all water used during construction and testing. The water service will then be transferred to JEA upon final acceptance of the pump station.

XVI.4. HOSE:

Wash-down hose to be white cover paper mill creamery wash-down hose with tapered nozzle, model number T260LL-150 as manufactured by Goodyear or JEA pre-approved equal. Hose length shall be sufficient to reach bottom of wet well from hose station.

XVII. SITE WORK**XVII.1. SITE PLAN:**

The site plans shall be designed site specific. The site plan shall indicate the actual site and orientation of all structures, panels and piping, at a minimum.

XVII.2. GENERAL:

All work shall be in accordance with the following specification sections, at a minimum: Chapter II. 1. - Section 406 - Site Preparation, Cleanup and Restoration, Chapter II. 2. - Section 407- Demolition and Abandonment, Section 408 - Excavation and Earthwork and Chapter II. 5. - Section 437 – Concrete Work. Slope concrete and site to drain towards street or other adjacent, JEA or City owned drainage facility.

XVII.3. DRIVEWAYS AND SITE:**XVII.3.1. Concrete:**

All work under this section shall be of 3,000 PSI concrete with reinforcing wire or fiber mesh. Thickness of concrete shall be 5 inches (minimum).

XVII.3.2. Expansion Joints:

Expansion joints shall be performed joint fillers meeting the requirements of AASHTO M153 or AASHTO 213 and cut to the true shape of the cross section, set to line and grade and held true while the concrete is being placed. The joint shall be edged and finished in a competent manner. These strips shall be left in place and shall be placed adjacent to the paving, curb driveway aprons, structures and pads, or as specified by the Engineer. Expansion Joints which are not adjacent to the structures listed above may be 1 inch by 4 inch pressure treated lumber or other approved materials and shall appear every 18 feet, at a minimum or be placed between truckloads of concrete that exceed the time limits specified in the JEA Water and Wastewater Standards Chapter II. 5. - Section 437 Concrete Work.

XVII.3.3. Contraction and Construction Joints:

XVII.3.3.1. Contraction and construction joints shall be placed and formed by means of an approved jointer template. The stem of the jointer shall be pressed into the freshly finished concrete forming a groove 1/2 inch deep.

XVII.3.3.2. The edges of the groove and adjacent surface shall be neatly finished. Unless otherwise shown on the plans or designated by the Engineer, these joints shall be placed at 6-foot intervals between expansion joints.

XVII.3.4. Surface Requirements:

The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten-foot straight edge, nor more than 1/8 inch on a five foot transverse section. The edge of the concrete shall be carefully finished with an edging tool having a radius of 1/2 inch.

XVII.4. ROCK COVER:

When indicated on the drawings, the Contractor shall furnish and install 6 inches of No. 57 (1" nominal diameter) crushed limestone placed over a 10 mill plastic membrane.

XVII.5. FENCING:

Fencing shall be furnished and installed in accordance with details on the drawings.

XVIII. PERMITS

The Engineer will supply the land-clearing permit. The Contractor shall secure and pay for all plumbing, electrical, right-of-way and other required permits. The Contractor shall make application and pay applicable fees for electric and water meters. The Contractor shall be responsible for all costs associated with utilities used during construction and testing of the pump station. Upon final acceptance or, if approved, following substantial completion of the project, the JEA Pump Station Manager shall, by letter to JEA, transfer services to JEA.

XIX. LANDSCAPING**XIX.1. PLANT MATERIALS:**

Plants shall be of the types and placed in the locations as indicated on JEA's Minimum Standards for Landscaping as included in the Sewage Pump Standard Details (Latest revision) and as approved by local landscape code enforcement.

XX. SPRINKLER SYSTEM**XX.1. GENERAL:**

Sprinkler system shall consist of a single main traveling around the perimeter of the pump station site. Sprinkler system shall form a complete loop and be connected to the hose station downstream of the backflow preventer, as indicated on the drawings. Sprinkler system shall be operated by a single stage timer located in the control panel. Sprinkler system shall be designed by the sprinkler supplier, which shall be a firm regularly engaged in the design and supply of sprinkler systems.

XX.2. COMPONENTS:

XX.2.1. Sprinkler system shall consist of mister heads on 2-foot tall, black, risers around perimeter of pump station paving at site. System shall provide 100% cover over the buffer zone (plant zone), while minimizing the over spray to less than 5% of the volume of water delivered. Provide irrigation to land between pump station and road paving.

XX.2.2. Commercial grade, 12 inch pop-up, gear driven sprinklers may be used if necessary for this area only. Mister heads on risers shall be required around pump station perimeter. Acceptable:

Nelson. Nelson spray nozzles, PRO-6300 Series pop-up nozzles, PRO-5500 and PRO-6000 Series gear driven sprinklers and 9000 Series Control Valve.

XX.3. SUBMITTALS:

Shop drawing submittals will be required on sprinkler system design and components.

XX.4. DRAIN VALVE:

Sprinkler system shall include 1/2-inch solid brass automatic drain valves, Nelson #8819 or JEA pre-approved equal. Drain valve shall carry a 5-year warranty against failure and be installed in a plastic landscape valve box as depicted on drawings.

XX.5. WATER SERVICE:

If applicable, an irrigation water meter service shall be provided for the sprinkler system. In this case, the Contractor may be required to secure the irrigation meter by submittal of a JEA irrigation meter application and payment of applicable fees. If available, reclaimed water should be utilized for all irrigation.



PUMP TEST REPORT

PROJECT _____ DATE _____

STREET ADDRESS _____

LONGITUDE / LATITUDE _____

WATER METER NO: _____

ELECTRIC METER NO: _____

AUXILARTY GENERATOR _____ YES _____ NO _____ Size _____

PUMP DATA

Manufacturer _____ Model _____

Impeller Size _____ Motor HP _____ Pump Discharge size _____ RPM _____

Pump Full Load Amps _____ Run Amps _____ Volts _____ Phase _____

DESIGN DATA

Wetwell Diameter & Depth _____ Gals/V. Ft. _____

Pump Design Point _____ GPM @ _____ Feet
T.D.H.

Wet Well Top Elevation _____

TEST DATA

Pump No.: _____

Serial No.: _____

Water Elevation Start
(HWL) (ft.) _____

Water Elevation Stop
(MWL) (ft.) _____

Net Draw down (ft.) _____
(Subtract water El. Stop from water start El.)

Total Gallons _____

Gallons/Minute (divide total gallons by minutes) _____

Pressure Gauge Reading (ft.) _____

Total Head @ Pump (ft.) _____

Ammeter Reading (amps) _____

Pump Shut off TDH _____

Contractor Representative _____

JEA Inspection Representative _____

JEA Maintenance Representative _____

Pump Manufacturer's Representative _____

Engineering Representative _____

MECHANICAL

JEA Final Inspection Checklist

Project Name: _____		
Street/Intersection/Address Location: _____		
Checked		
1	All valves operate from the closed to the fully open position	<input type="checkbox"/>
2	All valves seal when closed	<input type="checkbox"/>
3	All valves open turning to the left, and an indicating arrow is cast into the metal	<input type="checkbox"/>
4	All valves are easy to operate and have no sharp protrusions on hand wheels	<input type="checkbox"/>
5	All fasteners are SS, and mountings are tightened correctly	<input type="checkbox"/>
6	Discharge piping is installed plumb with both horizontal and vertical alignment provided	<input type="checkbox"/>
7	Pressure gauge provided	<input type="checkbox"/>
8	All pipework within the pump well complete, suitably anchored and guide rails in place	<input type="checkbox"/>
9	Check that the pump cables are installed clear of guide rails and not such as to impede removal of the pumps	<input type="checkbox"/>
10	Turn the pump impellers by hand to ensure they are free to rotate	<input type="checkbox"/>
11	One piece flanged SS discharge piping provided in wetwell	<input type="checkbox"/>
12	Pumps are clear of the well bottom, and securely mounted at the base plate	<input type="checkbox"/>
13	Check valve has vertical support	<input type="checkbox"/>
14	No rubbish at the bottom of the well which is likely to damage the pump when it is started	<input type="checkbox"/>
15	Check for correct pump rotation as indicated by the arrow on the pump casings	<input type="checkbox"/>
16	Turn the circuit breaker for each pump and that the correct pump starts	<input type="checkbox"/>
17	Lower/raise the pumps to ensure they pass freely through the hatch opening with 4 inch clearance all sides; checking that pumps slide smoothly on each guiderail and sit properly onto the discharge stand	<input type="checkbox"/>
18	With one valve open, start the associated pump in manual mode and check for leaks, pump/motor vibrational noise, and well level drop	<input type="checkbox"/>
19	Shut valve and restart pump, checking for any leaks in piping/valves	<input type="checkbox"/>
20	Wetwell frame and cover constructed of aluminum with stainless steel assembly	<input type="checkbox"/>
21	Wetwell frame and cover constructed flush with top slab elevation	<input type="checkbox"/>
22	Drop bowl installed in wetwell and secured to wetwell wall	<input type="checkbox"/>
23	Site light installed in gravel pit	<input type="checkbox"/>
24	All above ground pipe/fittings/valves have approved coating applied(two coats)	<input type="checkbox"/>
25	Provide electronic photos of pump station showing overall site, valves, panels, etc.	<input type="checkbox"/>

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

GENERATOR

JEA Commissioning Checklist

Project Name: _____	
Street/Intersection/Address Location: _____	
Station: _____	Offset: _____
Check the following as applicable:	
Verify diesel tank is sized per JEA W & S standards manual section 472 VII.2 and is fully fueled after manufacturer's representative has performed load run	<input type="checkbox"/>
Run generator in "manual" mode; check hertz, voltage, etc; verify operation of load bank	<input type="checkbox"/>
Verify certified affidavit of start-up and load testing from manufacturer's representative	<input type="checkbox"/>
Receipt of manufacturer's warranty (5-year)	<input type="checkbox"/>
Test "auto shut-down" on overspeed circuit	<input type="checkbox"/>
Test to see if genset meets decibel requirements of <i>Specifications</i>	<input type="checkbox"/>
Simulate power failure (disconnect main breaker); verify automatic start of genset	<input type="checkbox"/>
Verify automatic transfer of power to emergency source; check for proper time delay between sequences.	<input type="checkbox"/>
Verify fuel tank and generator anchor bolts and related hardware is stainless steel.	<input type="checkbox"/>
Let run for ten (10) minutes	<input type="checkbox"/>
Restore utility power source; verify automatic transfer, cool-down cycle time, and shut down	<input type="checkbox"/>
Test load bank for proper operation	<input type="checkbox"/>
Ensure that separate circuits are provided for battery charger and block heater	<input type="checkbox"/>
Test block heater and battery charger for proper operation	<input type="checkbox"/>
Check for leaks	<input type="checkbox"/>
Check fuel monitoring gauges and interstitial gauges are accurate and working properly.	<input type="checkbox"/>
Check for bent, kinked, or dented supply or return	<input type="checkbox"/>
Check to make sure fuel tank shipped with a level indicator probe and an inch per gallon laminated fuel level chart.	<input type="checkbox"/>
Verify a handle and step is installed on the control panel door.	<input type="checkbox"/>
Verify the radiator has been coated with a bronze-glow corrosion resistive coating.	<input type="checkbox"/>
Verify the ball valves are installed on the Jacket Water Heater hoses, supply and return.	<input type="checkbox"/>
Verify the Jacket Water Heater hose is a silicone type.	<input type="checkbox"/>
Ensure that there is an oil vapor recovery box installed.	<input type="checkbox"/>
Confirm there is a spill response plan (SPCC) filed and a spill response kit installed on site for tanks larger than 1320 gallons.	<input type="checkbox"/>
Check for any threaded connections on tank are touched up with the supplied touch up kit. Any and all exposed uncoated metal should be coated.	<input type="checkbox"/>
External Piping is welded stainless steel	<input type="checkbox"/>
Verify Greenleaf system interface with SCADA for generator run sequences and fuel level.	<input type="checkbox"/>
Digital copies of warranties and Manuals	<input type="checkbox"/>



Inspect fuel filters for dirt, water, or other foreign matter	<input type="checkbox"/>
Check for water in the fuel filter	<input type="checkbox"/>
Inspect the entire air-intake system for openings that could draw in unfiltered air	<input type="checkbox"/>
Inspect dry element type filters and replace if clogged. Inspect for damaged seams and pleats.	<input type="checkbox"/>

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

Commissioned this date: _____

BUILDING OPS

JEA Commissioning Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Checked	
_____	Fence installed with approved materials in the manner specified
_____	Fence installed free of any large gaps (those greater than 6 in.) at sides/corners
_____	Fence installed with maximum clearance of 6 in. above finished grade
_____	Fence installed with a minimum 12 in. mow strip, with galvanized anchors every 3-5 ft.
_____	Maximum fence post span 10 ft. or less
_____	Fence at least 6 ft. high, chainlink mesh (9 ga minimum) with 3 strands of barbed wire extended outwards from top of fence at a 45-degree angle with the smooth side of the fence on the outside wall. Materials approved by Security and Facilities
_____	Inspect fence posts and fabric for correct material (vinyl coated black or green)
_____	Gate installed with approved materials in the manner specified
_____	Gate installed free of any large gaps at sides
_____	Gate installed with maximum clearance of 6 in. above finished grade
_____	Gate has an adequate catch to ensure the gate cannot be pushed in or pulled out
_____	Gate installed with minimum height 72 in. for fence fabric (usually chain link), plus 3 strands of barbed wire, or using fabric/material with a minimum height of 96 in.
_____	Gate operates smooth and freely, without undo stress on gate operator
_____	Operator appears to be adequately anchored
_____	Operator is the unit specified
_____	Exit/Safety loops installed at required distances and function properly
_____	Limit switches appear to be set appropriately
_____	Inspect asphalt; check slope for proper drainage (no puddles)
_____	Card readers are appropriate models, installed appropriately, and function correctly
_____	Storm drain gates clean and open
_____	Ensure that all debris has been removed from the site
_____	Ensure that all required signage has been installed (incl. Pump Station I.D. sign)
_____	Fire hydrant as specified and operating (if applicable)
_____	All landscaping is to JEA standards
_____	Irrigation is installed and functions properly (Establishment Only)
_____	Copy of BackFlow Certification sent Building Ops

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

Commissioned this date: _____

ELECTRICAL PRE-COMMISSIONING CHECKLIST

1	Check that all defects from switchboard inspection have been addressed	<input type="checkbox"/>
2	Electricity supply has been connected and energized. And confirm that a Certificate of Compliance for Electrical Work (CCEW) and associated paperwork has been supplied	<input type="checkbox"/>
3	Pump with the lowest serial number is installed as Pump 1 (i.e. nearest to switchboard)	<input type="checkbox"/>
4	Specified pump number labels are correctly installed adjacent to the pumps	<input type="checkbox"/>
5	"DANGER ELECTRIC" marker bricks installed at ground level and painted yellow	<input type="checkbox"/>
6	Earth electrode installed as specified	<input type="checkbox"/>
7	Earth pit, main earth electrode and water service bond installed	<input type="checkbox"/>
8	Meter panels are equipped and wired to requirements	<input type="checkbox"/>
9	Cable supports within the pump well are correctly located and properly fixed	<input type="checkbox"/>
10	No cable stocking has more than one cable installed in it	<input type="checkbox"/>
11	Motor cables are supported so as to avoid damage when removing other pump/pumps	<input type="checkbox"/>
12	Motor cables have minimal slack and do not present undue stress on motor cable glands	<input type="checkbox"/>
13	Check that the cable duct cover is held firmly under the edge of the concrete plinth by the well sliding cover. Also, check that it is held firmly under the edge at the switchboard end.	<input type="checkbox"/>
14	Appropriate lugs fitted to all field cables, and cables correctly identified at terminations	<input type="checkbox"/>
15	Confirm sufficient terminals installed to allow an individual terminal for every incoming field wire	<input type="checkbox"/>
16	Confirm all field wiring holes are mechanically protected (bushes, sleeves, etc.)	<input type="checkbox"/>
17	Motor terminations are in accordance with the connection diagram	<input type="checkbox"/>
18	All power cable terminations tested for tightness	<input type="checkbox"/>
19	Where parallel cables may be installed on site, provision has been made to ensure only one cable lug needs to be installed on each side of terminal lug	<input type="checkbox"/>
20	SCA rating plate complying with AS 3439 has been fixed	<input type="checkbox"/>
21	Confirm motor and pump details displayed on all labels are identical to the manufacturer's information. Take a copy of name plate information	<input type="checkbox"/>
22	Correct orientation and fixing of the switchboard as per design	<input type="checkbox"/>
23	Switchboard plinth and all gland plates sealed	<input type="checkbox"/>
24	<u>Check continuity of Earthing system:</u> Main Earth Water pipe bond Pump 1 connection box Pump 2 connection box Pump 1 Motor Pump2 Motor	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
25	With the motor circuit breakers open and the control isolators off, turn the main switch on, and check that the supply monitoring relay picks up	<input type="checkbox"/>
26	Check operation of phase failure/phase reversal function of the power meter by removing one phase of supply. Also check by reversing the supply rotation to	<input type="checkbox"/>
27	Measure the voltages both phase to phase and phase to neutral. Compare the actual voltages relative to typical no-load voltage of 400/230V, and the voltage variation between phases should be less than 2%	<input type="checkbox"/>

28	Check settings of Starters(VSD or Soft starter)	<input type="checkbox"/>
29	If fitted, check operation of by-pass contactor	<input type="checkbox"/>
30	Check the motor and pump nameplates for all details and for compliance with the data shown on the pump rating plate. Take a copy of name plate information	<input type="checkbox"/>
31	Check that the level switches have been adjusted to the required settings and are functional	<input type="checkbox"/>
32	Check that level transmitters give an analogue output for the full level range of the device. Simulate a pressure/water level of zero to full (or part of) span and check the reading on the level display	<input type="checkbox"/>
33	For the <u>following tests</u> , test for <u>pump 1</u> & pump 2:	
		P1 P2
	E-Stop	
	Overload	
	Motor Thermal Protection	
	Other: Check operation of all safety/protective devices for correct operation	
34	With the main switch, pump circuit breakers and control isolating switches off, conduct an insulation test with a megometer (megger test) on all motors at 500V. This must give greater than 10MΩ. Record Results:	<input type="checkbox"/>
	415 Bus	RW WB BW RE WE
	BE	
	Pump 1 cables	RW WB BW RE WE
	BE	
	Pump 2 cables	RW WB BW RE WE
	BE	
	GPO RE =	
35	For each pump turn the circuit breaker on and with personnel clear of all pumps, momentarily turn the control switch to ON and check for correct. Switch pump circuit breaker off.	<input type="checkbox"/>
36	Confirm that the Power Meter is configured for CT's and that the readings on the local display are appropriate.	<input type="checkbox"/>
37	Inspect telemetry and radio supply cable connections for correct polarity	<input type="checkbox"/>
38	Measure telemetry supply voltage and back-up battery voltage (should be 13.6V). Ensure appropriate voltages are detected as per electrical drawings	<input type="checkbox"/>
39	Check for mains voltage rated insulation on data cables where mixed with mains voltage cables	<input type="checkbox"/>
40	Check configuration of the PLC I/O against electrical drawings	<input type="checkbox"/>
41	Confirm that the telemetry unit has been configured	<input type="checkbox"/>
42	Confirm that the RTU calibration certificate has been supplied	<input type="checkbox"/>
43	Visual check of antenna installation, clearance from surroundings, mountings secure, and all cables connectors fitted and taped.	<input type="checkbox"/>
44	Check antenna mounted with weep hole to bottom	<input type="checkbox"/>
45	Check antenna bearing and polarization	<input type="checkbox"/>
46	Check for secure earth on radio coax surge protection (if applicable) and coax continuity	<input type="checkbox"/>
47	Check radio is marked with frequency in use as per electrical drawings	<input type="checkbox"/>
48	Check radio signal strength against fade margin figures	<input type="checkbox"/>
49	Check telemetry transmit-level to network device. Set as required by network device	<input type="checkbox"/>



Water & Wastewater Standards

50	Check telemetry receive level from network device, and set as required by the network device (or if not adjustable, ensure level is below telemetry threshold level)	<input type="checkbox"/>
	Monitor telemetry messages for errors	<input type="checkbox"/>
	Monitor radio audio clarity and set audio control off or to min volume	<input type="checkbox"/>
	Enable SCADA RTU and check telemetry unit is configured correctly	<input type="checkbox"/>
	Check that correct locks are fitted	<input type="checkbox"/>
	Monitor SCADA pull and error counters for satisfactory operation over a period of time until error rate is below 3%	

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

Commissioned this date: _____

INSTRUMENTATION

JEA Commissioning Checklist

Project Name: _____	
Street/Intersection/Address Location: _____	
Station: _____	Offset: _____
Circle the following as applicable:	<i>Checked</i>
Probe in Oil	Yes / No
Normal Switch State	Open / Closed
Do latches on control panel work smoothly?	Yes / No
Are all connections tight?	Yes / No
Is the interior of the panel dry?	Yes / No
High water alarm light and horn activate with test button?	Yes / No
Horn silences with silence button?	Yes / No
High water alarm light and horn activate with float?	Yes / No
All electrical components are locally available	Yes / No
SCADA:	
Auto control	<input type="checkbox"/>
Hand/Manual control	<input type="checkbox"/>
Pump 1 status	<input type="checkbox"/>
Pump 1 start	<input type="checkbox"/>
Pump 2 status	<input type="checkbox"/>
Pump 2 start	<input type="checkbox"/>
Pump 3 status	<input type="checkbox"/>
Pump 3 start	<input type="checkbox"/>
Generator run status	<input type="checkbox"/>
Power fail	<input type="checkbox"/>
Generator fail	<input type="checkbox"/>
Battery fail	<input type="checkbox"/>
Transducer fail	<input type="checkbox"/>
High wet well level alarm	<input type="checkbox"/>
Station Intrusion	<input type="checkbox"/>
SCADA:	
Turn off main switch. On the overview page of the SCADA confirm that the <i>POWER</i> changes from <i>NORMAL</i> to <i>FAIL</i> . And back again when the power is restored	<input type="checkbox"/>
For each pump:	
Turn the pump from OFF to HAND. Check on the SCADA that <i>LOCAL HOA</i> changes from <i>OFF</i> to <i>HAND</i> .	<input type="checkbox"/>
Turn pump from HAND to AUTO. Check on the SCADA that <i>LOCAL HOA</i> changes from <i>HAND</i> to <i>AUTO</i> . NB: Pump may stop if not called by the controller.	<input type="checkbox"/>

Turn pump from AUTO to OFF. Check that <i>LOCAL HOA</i> changes to <i>OFF</i> and <i>PUMP STATUS</i> changes (or already has changed) back to <i>STOP</i>	<input type="checkbox"/>
Bridge out terminals for the seal fail probe on the pump until the seal fail relay is activated (may be referred to as "Pump Warning Healthy"). Check on the SCADA that <i>PUMP WARNING</i> changes from <i>NORMAL</i> to <i>ALARM (FAIL)</i> & the "SEAL FAIL" label is ON. Reset the relay and check that <i>PUMP WARNING</i> returns to <i>NORMAL</i> & the "Pump Warning" lamp is OFF. NB: This will not trip the pump.	<input type="checkbox"/>
Test operation of overload relay by winding down trip point. Check on the SCADA that the pump becomes unavailable and the pump status is <i>FAILED</i> & the "Drive Fault" lamp is ON. Reset the relay. Reset the alarm condition by switching pump to OFF, then AUTO. Check Alarm clears	<input type="checkbox"/>
Using a manual trip on the pump temperature sensor relay (may be referred to as "Pump Protection"). Ensure that the drive trips and becomes unavailable on the SCADA, and check that the "OVER TEMP" label is ON. Remove the trip condition and reset by pump inhibit OR switch pump to Off, then Auto.	<input type="checkbox"/>
With pumps running, ensure that the correct current readings are recorded in SCADA.	<input type="checkbox"/>
Check on the SCADA that Pump Hours Run is calculated and displayed correctly. NB: Change clock on PLC to test as value resets at 8 am.	<input type="checkbox"/>
Check on the SCADA that Pump Starts for the previous hour is calculated and displayed correctly.	<input type="checkbox"/>
Ensure that an appropriate "Fail to Start" time has been entered. Remove the Pump Start feedback from PLC and call the pump to run in Auto. After the "Fail to Start" time, ensure that an Alarm is raised, and the pump is <i>FAILED</i> & the "Drive Fault" lamp is ON. Reset the relay. Reset the alarm condition reset by pump inhibit OR switch pump to OFF, then Auto. Check that the pump is no longer <i>FAILED</i> & the "Drive Fault" lamp is OFF.	<input type="checkbox"/>

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TABLE OF CONTENTS

Listed below are the Sections and the Chapters that make-up the Water and Wastewater Standards.

SECTION I. TABLE OF CONTENTS

- CHAPTER I.1. TITLE PAGE – JANUARY 1, 2017
- CHAPTER I.2. SUMMARY OF CHANGES FOR 2017
- CHAPTER I.3. TABLE OF CONTENTS – WATER AND WASTEWATER STANDARDS

SECTION II. GENERAL SPECIFICATIONS

- CHAPTER II.1. SITE PREPARATION, CLEANUP AND RESTORATION - SECTION 406
- CHAPTER II.2. DEMOLITION AND ABANDONMENT - SECTION 407
- CHAPTER II.3. EXCAVATION AND EARTHWORK - SECTION 408
- CHAPTER II.4. NONFERROUS METALWORK - SECTION 436
- CHAPTER II.5. CONCRETE WORK - SECTION 437
- CHAPTER II.6. GENERAL EQUIPMENT REQUIREMENTS - SECTION 439
- CHAPTER II.7. GRASSING - SECTION 441
- CHAPTER II.8. PAVING - SECTION 490
- CHAPTER II.9. SIDEWALK, DRIVEWAY, CURB AND GUTTER - SECTION 491
- CHAPTER II.10. FENCING - SECTION 492
- CHAPTER II.11. DRAINAGE - SECTION 493

SECTION III. WATER SPECIFICATIONS

- CHAPTER III.1. POTABLE WATER PIPING - SECTION 350
- CHAPTER III.2. WATER METERS, VALVES, HYDRANTS AND APPURTENANCES - SECTION 351

SECTION IV. WASTEWATER SPECIFICATIONS

- CHAPTER IV.1. WASTEWATER MANHOLES - SECTION 427
- CHAPTER IV.2. GRAVITY WASTEWATERS - SECTION 428
- CHAPTER IV.3. WASTEWATER FORCE MAINS - SECTION 429
- CHAPTER IV.4. WASTEWATER VALVES AND APPURTENANCES - SECTION 430
- CHAPTER IV.5. SUBMERSIBLE WASTEWATER PUMPING STATIONS - SECTION 433
- CHAPTER IV.6. IN-LINE BOOSTER WASTEWATER PUMPING STATIONS - SECTION 435
- CHAPTER IV.7. PUMP STATION OPERATION AND MAINTENANCE DATA SUBMISSION REQUIREMENTS SECTION 445
- CHAPTER IV.8. SPECIALTY COATINGS AND LININGS - SECTION 446
- CHAPTER IV.9. WATER WASTEWATER PROTECTIVE COATINGS-SECTION 447
- CHAPTER IV.10. EXISTING CONCRETE PREPARATION AND REPAIR- SECTION 448

TABLE OF CONTENTS (CONT)

CHAPTER IV.11. EMERGENCY PUMP ENGINES - SECTION 470

CHAPTER IV.12. EMERGENCY GENERATOR (LESS THAN 600KW) - SECTION 472

SECTION V. RECLAIMED WATER SPECIFICATIONS

CHAPTER V.1. RECLAIMED WATER PIPING - SECTION 701

CHAPTER V.2. RECLAIMED WATER VALVES & APPURTENANCES - SECTION 702

SECTION VI. OTHER SPECIFICATIONS

CHAPTER VI.1. AS-BUILT DRAWINGS - SECTION 501

CHAPTER VI.2. HORIZONTAL DIRECTIONAL DRILLING - SECTION 750 (SMALL
DIAMETER PIPE 12 INCHES OR LESS)

CHAPTER VI.3. HORIZONTAL DIRECTIONAL DRILLING - SECTION 755 (LARGE
DIAMETER PIPE GREATER THAN 12 INCHES)

SECTION VII. MEASUREMENT AND PAYMENT

CHAPTER VII.1. MEASUREMENT AND PAYMENT - SECTION 801

SECTION VIII. WATER & RECLAIMED CONSTRUCTION DETAILS

CHAPTER VIII.1. WATER & RECLAIMED CONSTRUCTION DETAILS

SECTION IX. WASTEWATER CONSTRUCTION DETAILS

CHAPTER IX.1. WASTEWATER CONSTRUCTION DETAILS

SECTION X. WATER & RECLAIMED APPROVED MATERIALS

CHAPTER X.1. WATER & RECLAIMED APPROVED MATERIALS

SECTION XI. WASTEWATER APPROVED MATERIALS

CHAPTER XI.1. WASTEWATER APPROVED MATERIALS

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SITE PREPARATION, CLEAN UP AND RESTORATION – SECTION 406

I. SCOPE OF WORK

The work under this section includes the site preparation, clean up and restoration work for all sections of the entire project as set forth on the plans and as outlined herein.

II. SITE MAINTENANCE

The Contractor shall keep the working area free at all times of materials and equipment not essential to the progress of the work.

III. DISPOSITION OF DEBRIS

- III.1. All trees, brush, logs, leaves, sawdust, bark, and refuse shall be collected and completely burned or otherwise disposed of in a manner satisfactory to the engineer.
- III.2. Debris shall be burned or removed from the site as soon as practical and shall not be left to accumulate until the completion of the job.
- III.3. If debris is burned, all precautions necessary shall be exercised to prevent the spread of fire. Burning shall be done only at approved locations and in conformity with the regulations and requirements of agencies and officials having jurisdiction. The Contractor shall obtain and pay for any and all permits required thereof.
- III.4. If the Contractor should fail to do this, JEA will make the necessary arrangements to effect the clean-up by others and will back charge the costs to the Contractor. If such action becomes necessary on the part of and in the opinion of JEA, JEA will not be responsible for the inadvertent removal of material which the Contractor would not have disposed of had he effected the required clean-up.

IV. DISTURBANCES TO EXISTING IMPROVEMENTS

- IV.1. The Contractor will be responsible for protection and preservation of existing improvements including necessary removal and storage of such improvements and subsequent replacement to obtain to the fullest extent possible, the undisturbed condition.
- IV.2. Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the process of the work, and the ditches, channels, drains, etc. kept in a clean and neat condition.
- IV.3. The Contractor shall restore or replace, when and as directed, any public or private property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of its operations. To this end the Contractor shall do as required all necessary highway, driveway, walk or landscaping, etc. Suitable materials, equipment and methods shall be used in such restoration.

V. SHRUBS

Shrubs within the limits of excavation not shown or directed to be removed shall be taken up with sufficient root ball and soil, suitably stored and watered and replaced as soon as backfilling permits.

Shrubby mishandled or damaged during construction operations so that it does not survive upon completion of the work shall be replaced with similar vegetation and maintained until survival is assured.

VI. TREES

Trees, stumps and roots within limits of trench excavations designated to be removed shall be removed to a depth of 12 inches minimum below bottom of trench excavation. Stump and root holes shall be refilled to existing grade and compacted by tamping. Trees not to be removed shall be limited as to root and limb removal to the minimum clearance necessary by making clean, unbroken cuts.

VII. CLEARING AND GRUBBING

The area within limits shown on the plans shall be cleared of fences, trees, logs, stumps, brush, vegetation, rubbish and other perishable or objectionable matter; specifically excepting certain fences, trees and shrubs which are to remain undisturbed and protected as directed or as indicated on the plans. No stumps, roots, or perishable matter of any description shall remain under concrete slabs or footings.

VIII. FENCES AND RETAINING WALLS

If the construction work so requires, affected fences and/or retaining walls shall be carefully removed and later re-installed by personnel qualified to accomplish such work. The condition of the re-installed facilities shall be equal to the original facilities.

IX. REMOVAL OF TEMPORARY STRUCTURES AND IMPROVEMENTS

On or before the completion of the work, the Contractor shall, unless otherwise directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools and machinery or other construction equipment furnished by him; shall remove portable bathroom facilities, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations, in a neat and satisfactory condition.

X. CLEANUP OF NEW MATERIALS AND EQUIPMENT

The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors and upon completion of the work shall deliver it undamaged and in fresh and new appearing condition.

DEMOLITION AND ABANDONMENT – SECTION 407

I. SCOPE OF WORK

The Contractor shall furnish all materials, labor, supervision, and equipment required for the orderly demolition, abandonment, removal, and/or salvaging of existing structures, piping, valves, fittings, appurtenances, and other equipment, as shown on the drawings and described herein. All references to industry standards (AWWA, ASTM, etc.) shall be to latest version unless otherwise noted.

II. GENERAL REQUIREMENTS

Structures, equipment, piping and other improvements to be demolished or removed shall be as detailed on the drawings. Demolition shall be accomplished in a neat and careful manner so as not to damage adjacent structures, or unnecessarily interfere with existing operations. Fill shall be provided to match existing grades and the area spot sodded and grassed or replacement pavement provided as specified in these specifications. All demolition and abandonment work to be completed by the contractor shall be specifically noted on the project documents. The following table may only be used by the design engineers during the design phase of the project. It shall be noted that the contractor shall complete the demolition and abandonment work as noted in the contract documents.

<u>Item</u>	ALLOWABLE DEMOLITION AND ABANDONMENT METHODS			
	<u>Sealing Ends</u>	<u>Grout Fill</u>	<u>Rem oval</u>	<u>Crushed in-Place</u>
A. Pressure Mains:				
1. Piping not under roadway:				
a) 12-inch and smaller	x	x	x	x
b) Larger than 12-inch		x	x	x
2. Piping under roadway:				
a) 6-inch and smaller	x	x	x	x
b) Larger than 6-inch		x	x	x
B. Gravity Wastewater Mains:				
a) 8-inch and smaller	x	x	x	x
b) Larger than 8-inch		x	x	x

III. ABANDONMENT

III.1. PIPELINES:

III.1.1. Abandonment By Plugging:

Abandonment of 2" mains shall include a new galvanized plug fitting installed directly into the tee fitting or corporation stop located on the remaining active

main. The bid amount for abandonment of 2" mains shall include this work. When called for on the Contract Drawings, abandoned mains 3" and larger shall be plugged with a plugged fitting at points specified. All plugs shall be appropriately sized and shall conform as applicable to Chapters III. 1., IV. 2., IV. 2. of V. 1 (Sections 350, 428, 429 or 701) of these specifications.

III.1.2. Abandonment By Grout Filling:

When called for on the Contract Drawings, the abandoned main shall be grout filled by pumping a grout mixture into the main with an approved grout. The main shall be completely filled, leaving no voids or air spaces. Grout mix shall be as specified in this specification section. A pressure grout pump (of suitable size) shall be utilized in the grouting of existing pipes. Unless approved otherwise by JEA, the grout shall be pumped into the pipe from the inlet end to the receiving end (exit end). Samples of the outgoing water (exit end) shall be made until the existing grout mix is observed which is similar (i.e.: within 90% of same density or other JEA approved method) to the grout being injected at the inlet end. The cost of the testing, including labor and testing equipment (scales) shall be provided by the contractor and the associated testing cost shall be included in the contractor's unit price for the grouting work. If requested by JEA, the contractor shall provide a comprehensive grouting plan which details all of the means and methods for completing this work. This grouting plan, including the grout mix design shall be reviewed and approved by JEA prior to initiating this work.

III.1.3. Abandonment By Sealing:

All below grade pipe to be abandoned by sealing, either as noted on the Contract Drawings or as a result of demolition of a structure, shall be sealed with grout, Class "C" concrete or brick and mortar. The grout, concrete or brick and mortar shall extend into the pipe for at least 12 inches, forming a solid waterproof plug completely bonded to the pipe.

III.1.4. Abandonment Of Asbestos Pipe:

The Contractor shall comply with all work site, air emission, solid waste and personal safety and protection regulations as related to the excavation, exposure, cutting, handling, containment and disposal of existing pipe material. The removal, encapsulation or enclosure, storage and disposal of pipe materials containing asbestos shall be in accordance with Sections 455.301 through 455.309 of the Florida State Statutes, American Water Works Association Manual of Water Supply Practices No. M16 "Work Practices for Asbestos-Cement Pipe," OSHA 29 CFR 1910.100, 1926.1101 Appendix F, Asbestos NESHAP; 40CFR 61-Subpart M, 40CFR 763-Appendix D and all requirements delineated in the latest edition of the JEA Contractor Safe Work Practices Manual Chapter 6, Section V entitled - Asbestos Handling Procedures.

Abandonment of asbestos piping shall be by either grout filling or sealing. While cutting asbestos pipe the operator must wear a HEPA type particle mask and adhere to all applicable safety standards for handling asbestos containing material.

III.2. STRUCTURES:

The structure shall be removed to a point 36 inches below grade or as noted on the drawings. The remaining structure shall be filled with AASTHO Class A-3 soil, free of organic matter or other deleterious material, compacted to 100% of maximum density as determined

by the Laboratory Standard Procter Test, ASTM D698. A tolerance of minus 2% will be allowed in the compactive effort. All pipes leading in and out of the structure to be abandoned shall be sealed or grout filled in accordance with this specification section and as indicated on the Contract Drawings. The portion of the structure to be removed shall be removed from the site and disposed of at an approved disposal facility

IV. REMOVAL

IV.1. PIPELINES:

IV.1.1. Below Grade:

When called for on the Contract Drawings, removal of existing pipelines shall mean complete removal of the existing pipeline and disposal of the pipe and appurtenances (valves, fittings, thrust blocks, etc.) not indicated to be salvaged. Backfill and compaction shall conform to Chapter II. 3. - Section 408, Excavation and Earthwork of this specification.

IV.1.2. Above Grade:

All existing piping and appurtenances (valves, fittings, etc.) located above ground shall be removed to a minimum of 36 inches below the finish grade. The abandoned pipe ends, below grade, shall be sealed with Class "C" concrete or completely grout filled as specified in this section and as indicated on the Contract Drawings.

IV.1.3. Asbestos Pipe:

Removal of asbestos pipe shall be in accordance with Paragraphs 4.1.1 and 4.1.2 above. While cutting asbestos pipe, the operator must wear a HEPA type particle mask and adhere to all applicable safety standards for handling asbestos containing material. Asbestos pipe may be disposed of in an approved landfill site. The removal, encapsulation or enclosure, storage and disposal of pipe materials containing asbestos shall be in accordance with Sections 455.301 through 455.309 of the Florida State Statutes, American Water Works Association Manual of Water Supply Practices No. M16 "Work Practices for Asbestos-Cement Pipe," OSHA 29 CFR 1910.100, 1926.1101 Appendix F, Asbestos NESHAP; 40CFR 61-Subpart M, 40CFR 763-Appendix D and all requirements delineated in the latest edition of the JEA Contractor Safe Work Practices Manual Chapter 6, Section V entitled - Asbestos Handling Procedures.

The Company shall fully comply with all safety related federal, state, and local laws, statutes, ordinances, rules, regulations, requirements, guidelines. The Company shall retain or provide a "competent person" as defined by OSHA's Subpart Z, 29 CFR 1926 1101 to oversee the AC Pipe Removal and Disposal work via a valid Negative Exposure Assessment work plan and to monitor for compliance with all applicable regulations including; but not limited to, OSHA's Subpart Z, 29 CFR 1926 1101, CFR 40 Part 61, Subpart M, Chapter 469, F.S. and Rule 376.60, Florida Administrative Code. This requires; but is not limited to, the preparation of a Negative Exposure Assessment work plan, Delineation of the "Regulated Area", "Demarcation" of the Regulated Area, Periodic Monitoring, Record Keeping, and Signage for the Regulated Area as well as for the AC pipe disposal containers.

To comply with Federal NESHAP Regulations, the Contractor must complete, sign and submit (via certified US Mail) to the COJ Environmental Quality Division the latest version of FDEP Form 62-257.900(1) titled "Notice of Demolition or Asbestos Renovation". Form must be received by the COJ at least 10 days prior to the commencement of the asbestos abatement and/or demolition.

Contractor will contact JEA safety representative one week in advance for air monitoring requirements. Cost incurred by the Contractor to coordinate the work, provide competent person, and compliance shall not be paid for separately, but shall be included in the cost of the associated removal and disposal item.

IV.2. STRUCTURES:

Removal of existing structures, where designated on the drawings, shall be the complete removal of the existing structures. The existing structures shall be removed from the site. Any or all existing pipes in and out of the structure to be removed shall be plugged, grout filled, sealed or connected to the new structure as specified and as indicated on the Contract Drawings. The void left by the structure removal shall be filled and compacted in accordance with Chapter III. 3. - Section 408, Excavation and Earthwork of this specification.

V. DISPOSAL OF DEBRIS

All material not salvable shall be considered debris and disposed of by hauling to an approved disposal site. The Contractor shall be responsible for the disposition of all debris.

VI. SALVABLE MATERIAL

All equipment, piping, fittings, valves and appurtenances to be removed or abandoned shall be inspected by JEA or its representative immediately prior to removal or abandonment. JEA's decision as to the solvability shall be final. Such material which is, in the opinion of JEA or its representative, salvable shall be removed and transported to a location within the City of Jacksonville, Florida as designated by JEA. If the equipment is not wanted by JEA, the Contractor shall become the owner of the equipment and shall dispose of same. Under no circumstances may existing structures, piping or equipment be removed or demolished without obtaining approval from JEA or its representative. The Contractor shall be responsible for transporting the salvable material to the desired location.

VII. GROUT MIX

Grout for filling abandoned mains shall comply with flowable fill material as defined in Chapter II. 3. - Section 408

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EXCAVATION AND EARTHWORK – SECTION 408

I. SCOPE

- I.1. The Contractor shall make all excavations for piping and appurtenant structures in any material encountered to the depth and grades indicated on the plans, shall backfill such excavations and dispose of excess or unsuitable materials from such excavations, and shall provide and place necessary borrow material to properly backfill excavations, all as indicated on the drawings, specified herein or as directed by the Engineer.

II. GENERAL REQUIREMENTS

- II.1. The contractor shall provide suitable and safe temporary bridges, crossings or access ways during construction to maintain traffic and/or provide access to private property, and shall remove said structures after construction is complete.
- II.2. The extent of excavation open at any one time will be held to a minimum consistent with normal and orderly prosecution of the work but shall always be confined to the limits set by the engineer for the prevailing conditions.
- II.3. All references to industry standards (ASTM, ANSI, AWWA, etc.) Shall be to the latest revision unless otherwise stated.

III. CUTTING PAVEMENT

- III.1. Bituminous pavement shall be removed to clean straight lines by saw cutting. Where bituminous pavement adjoins a trench, the edges adjacent to the trench will be trimmed to neat straight lines before resurfacing to ensure that all areas to be resurfaced are accessible to rollers or tampers used to compact the sub-grade or paving materials.
- III.2. Concrete pavement shall be removed to neatly sawed edges. Saw cuts shall be made to a minimum depth of 1½ inches. If a saw cut in concrete pavement falls within 3 feet of a construction joint, cold joint, expansion joint or edge, the concrete shall be removed to the joint or edge. The edges of existing concrete pavement adjacent to trenches, which had been damaged subsequent to saw cutting of the pavement, shall be saw cut to neat straight lines for the purpose of removing the damaged pavement areas. Such saw cuts shall be parallel to the original saw cuts or shall be cut on an angle which departs from the original saw cut not more than 1 inch in 6 inches.
- III.3. Concrete curb, walk, gutters and driveways shall be removed to neatly sawed edges with saw cuts to a minimum depth of 1½ inches. Concrete sidewalk or driveway to be removed shall be neatly sawed in straight lines parallel to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than 3 feet in either length or width. If the saw cut in sidewalk or driveway should fall within 3 feet of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge except that where the saw cut would fall within 12 inches of a score mark, the saw cut shall be made in and along the score mark. Curb and gutter shall be sawed to a depth of 1½ inches on a neat line at right angles to the curb face.

IV. SHEETING, SHORING AND BRACING

- IV.1. The Contractor shall provide and install such sheeting and shoring as may be required to support the sides of any excavation to prevent earth movement that could endanger the work, workers, or any existing structures, or to confine the construction within a specified area such as an easement or street right-of-way. It shall be the Contractor's responsibility to place this sheeting and shoring for such protective purposes without the Engineer's instructions.
- IV.2. All excavation work shall be in accordance with OSHA safety standards, including OSHA Excavation Standards (29 CFR Subpart P 1926.650).
- IV.3. Steel sheeting shall be left in place only when so authorized by the Engineer. The top of steel sheeting left in place shall be no less than 30 inches below grade unless otherwise shown on the drawings, or directed by the Engineer.
- IV.4. All sheeting extending below the level of 1 foot above the top of pipelines shall be cut off as directed by the Engineer and left in place. All sheeting to be removed shall be carefully extracted in such manner as not to endanger other structures and all voids left shall be immediately backfilled with approved material and compacted as required.
- IV.5. Steel drag shields or trench boxes may be used. Voids left by the advancement of the drag shield shall be carefully backfilled and compacted in accordance with trench backfill requirements.

V. DEWATERING

- V.1. The Contractor shall at all times during construction provide ample means and devices with which to promptly remove and dispose of all water entering trench and structure excavations and shall keep said excavations acceptably dry (as approved by JEA's representative), until the pipe and/or structures to be built therein are installed and backfilling is completed. All water pumped or drained from the site shall be disposed of in a suitable manner without damage to storm wastewater, pavement, pipes, electrical conduits, or any other work or property.
- V.2. Drainage for the excavation shall be adequate. No pipe shall be laid in water and no water shall be allowed to rise above the bottom of any pipe while it is being jointed, except as otherwise permitted in writing. No masonry shall be placed in water and no water shall be allowed to rise over masonry until the concrete or mortar has attained its initial set. Water shall not be allowed to run over completed masonry for 4 days. In no event shall water be allowed to rise so as to set up unequal pressures in the structures until the concrete or mortar has set at least 24 hours and also, until any danger of flotation has been removed.
- V.3. Upon completion of dewatering with a sock, the sock shall be removed to 3 feet below grade and the top plugged with a plug made of the same material as the sock. Contractor shall remove sock drain ends to a depth of 48 inches below finished grade, and seal/cap each end. The Contractor shall locate the ends of all capped sock drains and show the limits of the abandoned drains on the as-built plans. No separate payment shall be made for seals/caps, but all cost shall be included in the associated item of work.
- V.4. The Contractor shall be responsible for utilizing acceptable means and methods, as necessary to place and completely backfill to finished grade new mains and structures in a water free excavation. The means and methods of dewatering the excavation shall comply with all regulatory requirements for temporary diversion of groundwater and its discharge

(including FAC Chapter 62-621 "General Permit for the Discharge of Produced Ground Water from Any Non-contaminated Site Activity"). The cost associated with excavation dewatering is to be included in all items of work requiring same.

VI. TRENCH EXCAVATION

- VI.1. All excavation for piping shall be open cut. Tunneling will not be permitted unless specifically called for on the Plans. Trench sides shall be approximately vertical between an elevation of 1 foot above the top of the pipe and the center line of the pipe; otherwise, trench sides shall be as vertical as possible or as required by OSHA Standards. Trench may be excavated by machinery to a depth that will not disturb the finished grade. All trench and excavation cutting requiring protective sheeting, shoring, trench shields and boxes, and other OSHA required means, methods and devices shall be designed by a Florida licensed Professional Engineer for live and dead loads and groundwater conditions. The cost associated with this design effort(s), furnishing and installation of sheeting, shoring, trench shield and boxes is to be included in all items of work requiring same unless provided otherwise on the bid form.
- VI.2. Trench width shall be as narrow as practicable or as required by OSHA Standards.
- VI.3. Bell holes shall be dug to permit the entire straight barrel of the pipe to rest on the undisturbed trench bottom. Boulders or loose rocks which might bear against the pipe will not be permitted in the trench bottom. Embedment material shall be worked in under the haunches of the pipe to ensure complete contact with the pipe bottom.
- VI.4. If rock is encountered, excavation shall be made to at least 6 inches below the finished grade of the pipe and the resultant over-excavation shall be filled and compacted with suitable bedding material. No section of pipe shall rest directly on rock.
- VI.5. Excavated material consisting of muck, mud or other undesirable material shall not be stockpiled for backfill. The Contractor shall remove such material from the site as it is excavated and shall dispose of it in areas provided by the Contractor.
- VI.6. The Contractor's attention is directed to the existence of service piping crossing the new construction as indicated in general on the drawings. The locations shown are approximate only and the Contractor will be responsible for locating these and other utilities which may not be shown. The Contractor shall be required to maintain uninterrupted service to the buildings along the project, but the methods used to accomplish this shall be left to the Contractor's discretion, subject to approval of the Engineer. Services damaged or removed to facilitate construction shall be replaced as specified in the applicable section of this specification.

VII. EXCAVATION FOR STRUCTURES

- VII.1. The Contractor will be held responsible for prosecuting the Work in accordance with the lines and grades shown on the Contract Drawings. Banks of excavation shall be sloped at a safe angle or shoring shall be used.
- VII.2. The Contractor shall do all the excavating of every description of whatever substance encountered, to the dimensions and depths indicated on the drawings.
- VII.3. Excavations shall be made wide enough to allow for inspection.
- VII.4. Where structures are not supported on piles, all loam, organic, or other unsuitable material shall be removed and replaced with suitable material as defined by the specifications.

VIII. EXCAVATION BELOW NORMAL GRADE

In the event the Contractor through error or otherwise excavates below the elevation required, the Contractor shall at its own expense backfill with AASHTO Class A-3 soil or granular backfill, if approved by the Engineer, and compact to obtain a suitable pipe bedding or structure support as defined in the specifications.

IX. BACKFILL MATERIAL**IX.1. EXCAVATED MATERIAL (NATIVE BACKFILL):**

- IX.1.1. Excavated native earth free from perishable and objectionable objects and containing no stones or clods larger than 2 inches in diameter and not comprised of fully granular material (unless authorized by the Engineer) shall be used for backfilling and such grading on site as is required. Any excess material shall be removed and disposed of by the Contractor.
- IX.1.2. Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall be responsible for obtaining the sites to be used and shall so maintain the operations as to provide for natural drainage and not present an unsightly appearance. No excavated material shall be placed on private property without the written consent of the property owner.
- IX.1.3. Material from the excavations suitable for topsoil shall be deposited in piles separate from other excavated material. Piles of topsoil shall be located so that the material can be used readily for the finished surface grading or as directed by the Engineer, and shall be protected and maintained until needed. At the option of the Contractor, topsoil material for use in finished grading may be obtained from other locations, upon approval.
- IX.1.4. Where materials unsuitable for backfill are excavated within the limits of excavation shown on the drawings, and as directed by the Engineer, the unsuitable material shall be removed from the job site and disposed of by the Contractor. If the stockpiled suitable excavated material is insufficient, suitable Class A-3 soil shall be provided to replace the unsuitable materials, with measurement and payment made on the basis of unit price set forth in the Contract for Class A-3 soil. In no event shall amount of measurement exceed the quantity defined in Measurement and Payment or authorized to be excavated by the Engineer.
- IX.1.5. Unsuitable material shall include pile foundations, concrete, railroad tracks, debris, muck, clay, large clods, stones, wood, stumps, roots or other deleterious material, etc. All unsuitable materials must be verified by the Engineer prior to removal and replacement.

IX.2. AASHTO CLASS A-3 SOIL BACKFILL:

The Contractor shall furnish, place, and compact AASHTO Class A-3 soil, free of organic or other unsuitable material in quantities which would render the soil unsuitable for backfill or bedding as specified herein, in authorized excavation above or below normal grade and in other locations as indicated on the drawings, or as specified, and where ordered by the Engineer for miscellaneous backfill.

IX.3. GRANULAR BACKFILL:

- IX.3.1. In lieu of the above specified AASHTO Class A-3 soil material for backfill and bedding, the Contractor may use granular backfill as specified hereinafter, if approved by the Engineer.
- IX.3.2. Granular backfill shall consist of well-graded crushed stone or crushed gravel meeting the requirements of ASTM Designation C33, Gradation 67 (3/4 inch to No. 4). Air cooled blast furnace slag, alone or in combination with crushed stone and/or crushed gravel, conforming to ASTM Designation C33, may also be used.

IX.4. FLOWABLE FILL:

IX.4.1. Flowable Fill:

Flowable fill shall be in accordance with FDOT specification section number 121 (latest version), unless approved otherwise by JEA. The use of chemicals to accelerate the curing time may be utilized at the contractor's option.

IX.4.2. Mix Design:

Flowable Fill is a mixture of Portland cement, fly ash, fine aggregate, air entraining admixture and water. Flowable fill contains a low cementitious content for reduced strength development. Submit mix designs to the JEA Engineer for approval. The following are suggested mix guides for excavatable and non-excavatable flowable fill. Non-excavatable flowable fill shall be utilized in filling abandoned mains and structure. Excavatable flowable fill shall be utilized around active (in-use) mains and structures.

	EXCAVATABLE	Non-EXCAVATABLE
Cement Type	75 – 100 lb/yd ³ [45 – 60 kg/m ³]	75 – 150 lb/yd ³ [45 – 90 kg/m ³]
Fly Ash	None	150 – 600 lb/yd ³ [90 – 355 kg/m ³]
Water	*	*
Air**	5 – 35%	5 – 15%
28 Day Compressive Strength**	Maximum 100 psi [690 kPa]	Minimum 125 psi [860 kPa]
Unit Weight (Wet)**	90 – 110 lb/yd ³ [1,440 – 1,760 kg/m ³]	100 – 125 lb/yd ³ [1,600 – 2,000 kg/m ³]
* Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement.		
** The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements.		
Fine Aggregate shall be proportioned to yield 1 yd ³ [1 m ³].		

IX.4.3. Construction Requirements:

Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur. Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40°F [4°C]. Take all necessary precautions to prevent any damages caused by the hydraulic

pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

X. BACKFILL – TRENCHES

- X.1. The Contractor shall be responsible for obtaining the necessary inspections before, during, and after backfilling and shall re-excavate, refill, and perform all such related work to obtain satisfactory test results.
- X.2. Backfilling shall be carefully performed in order not to put undue strains on the pipe. Ground surface shall be restored to the elevation shown on the plans. In unpaved areas the surface of trenches shall conform and be equal in quality, character, and materials to the surface immediately prior to making the excavation.

XI. BACKFILL – STRUCTURES

- XI.1. Backfilling shall be accomplished as soon as practical after underground work on the structure is completed. No trash shall be allowed to accumulate in the space to be backfilled. Particular care shall be taken to avoid leaving wood where it will be buried. The space to be backfilled shall be well cleaned before backfilling commences.
- XI.2. Ground surface shall be restored to the elevation shown on the plans.

XII. COMPACTION AND DENSITY

Backfill and compaction shall be conducted to achieve densities as specified herein. Methods for backfill placement and compaction shall be subject to approval by the Engineer. Compaction “under paving” shall refer to installations immediately under paving and also to installations within a plane described as 1 (horizontal) to 1 (vertical) slope downward from the edge of roadway or back of curb.

XII.1. COMPACTION INSIDE OF CITY OF JACKSONVILLE RIGHT-OF-WAYS AND IN ALL EASEMENTS:

XII.1.1. On Fill Below Pipe/Structures:

Where pipe is laid or structures built on fill materials in lieu of undisturbed earth, backfill material up to the bottom of pipe or structures shall be placed in 6 inch compacted thickness layers and shall be compacted to 95% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.

XII.1.2. Under Paving, Up To 1 Foot Over Top Of Pipe/Bottom Of Structure:

Backfill material up to a level 1 foot over the top of pipe or bottom of structures shall be placed in 6 inch compacted thickness layers and shall be compacted to 98% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.

XII.1.3. Under Paving, Over 1 Foot From Top Of Pipe/Bottom Of Structure To Grade:

Backfill material from 1 foot over the top of the pipe or bottom of structures to finished grade shall be placed in layers not to exceed 12 inches compacted thickness and shall be compacted to 95% of maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be

made on every compacted lift and at grade, located at 150 foot intervals and at every structure.

XII.1.4. Not Under Paving, Up To 1 Foot Over Top Of Pipe/Bottom Of Structure:

Backfill material up to a level 1 foot over the top of pipe or bottom of structures shall be placed in 6 inch compacted thickness layers and shall be compacted to 98% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 3000 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.

XII.1.5. Not Under Paving, Over 1 Foot From Top Of Pipe/Bottom Of Structure To Grade:

Backfill material from 1 foot over the top of the pipe or bottom of structures to finished grade shall be placed in 12 inch compacted thickness layers and shall be compacted to match existing conditions but not less than 95% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 3000 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.

XII.2. COMPACTION IN NEW SUBDIVISIONS:

XII.2.1. Up To 1 Foot Over Top Of Pipe/Bottom Of Structure:

Backfill material up to a level 1 foot over the top of pipe or bottom of structures shall be placed in 6 inch compacted thickness layers and shall be compacted to 98% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure for the first 600 feet. If the density testing meets these density requirements and the contractor does not change the method of placing and compacting, the remaining density testing shall be at 3000 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.

XII.2.2. Over 1 Foot From Top Of Pipe/Bottom Of Structure To Grade:

Backfill material from 1 foot over the top of the pipe or bottom of structures to finished grade shall be placed in 12 inch compacted thickness layers and shall be compacted to match existing conditions but not less than 95% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure for the first 600 feet. If the density testing meets these density requirements and the contractor does not change the method of placing and compacting, the remaining density testing shall be made on every compacted lift and at grade located at 3000 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.

XII.3. COMPACTION IN STATE ROAD RIGHT-OF-WAY:

XII.3.1. On Fill Below Pipe/Structures:

Where pipe is laid or structures built on fill materials in lieu of undisturbed earth, backfill material up to the bottom of pipe or structures shall be placed in 6 inch compacted thickness layers and shall be compacted to 100% of its maximum

density as determined by the Laboratory Standard Proctor Test, ASTM D698. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.

- XII.3.2. Under Paving, Up To 1 Foot Over Top Of Pipe/Bottom Of Structure:
Backfill material up to a level 1 foot over the top of pipe or bottom of structures shall be placed in 6 inch compacted thickness layers. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.
- XII.3.3. Under Paving, Over 1 Foot From Top Of Pipe/Bottom Of Structure To Grade:
Backfill material from 1 foot over the top of the pipe or bottom of structures to finished grade shall be placed in layers not to exceed 12 inches compacted thickness. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.
- XII.3.4. Not Under Paving, Up To 1 Foot Over Top Of Pipe/Bottom Of Structure:
Backfill material up to a level 1 foot over the top of pipe or bottom of structures shall be placed in 6 inch compacted thickness layers. Density testing shall be made on every compacted lift and at grade, located at 500 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.
- XII.3.5. Not Under Paving, Over 1 Foot From Top Of Pipe/Bottom Of Structure To Grade:
Backfill material from 1 foot over the top of the pipe or bottom of structures to finished grade shall be placed in 12 inch compacted thickness layers. Density testing shall be made on every compacted lift and at grade, located at 500 foot intervals, at road crossings, at 20% of all manholes/structures and at 3 random locations as determined by the JEA Inspector.
- XII.3.6. If a conflict exists between the Florida D.O.T. Standard Specifications for Road and Bridge Construction and this specification, the more stringent requirement shall apply.
- XII.3.7. Compaction of backfill for pipe trenches:
Pipe backfill densities of at least 100% of the Standard Proctor maximum density as determined by AASHTO T99, Method C shall be required except where the cover height 1) below the bottom of base under asphalt pavement, 2) below concrete pavement, or 3) below unpaved ground, exceeds 15 inches, then pipe backfill densities of at least 95% of the Standard Proctor maximum density (as determined by AASHTO T99, Method C) shall be required.
- XII.3.8. For density requirements around drainage structures, obtain a minimum quality control density (in any one lift of backfill material placement) of 100% of the Standard Proctor maximum density as determined by AASHTO T99 for a distance of one pipe diameter but not less than 3 feet from the outside face of the structure.

XII.4. COMPACTION IN RAILROAD RIGHT-OF-WAY:

- XII.4.1. All backfill operations within the railroad right-of-way shall be placed in 8 inch maximum layers, loose measure, and thoroughly tamped with mechanical tampers to 98% of its maximum density as determined by the Laboratory Modified Proctor Test, ASTM D1557. Density testing shall be made on every compacted lift and at grade, located at 150 foot intervals and at every structure.

XII.4.2. If a conflict exists between the Railroad's Specification and this specification, the more stringent requirement shall apply.

XII.5. COMPACTION METHOD:

The method of compacting backfill material shall be the contractor's option provided the compaction requirements herein before specified are obtained. If tests for in-place density consistently fail to meet the requirements, the engineer may require the contractor to change its method of compaction without claiming additional compensation. Compaction by flooding will not be allowed except with written authorization by the engineer.

XII.6. MOISTURE CONTENT:

The material shall be compacted at a moisture content such that the specified density can be attained. If necessary to attain the specified density, add water to the material, or lower the moisture content by manipulating the material or allowing it to dry.

XIII. TESTING

XIII.1. The Contractor shall retain an independent testing laboratory to make in-place density tests of excavation backfill as specified herein and as located by the Engineer or JEA representative.

XIII.2. Structure excavations shall require one test as located by the Engineer or JEA representative, for each compacted lift and one test at grade. If perimeter of structure exceeds 50 feet, additional tests shall be required for each compacted lift at 50 foot intervals around perimeter.

XIII.3. Density test reports shall be submitted to the Engineer and the JEA representative for approval, in duplicate, within 72 hours of the test. Test reports shall be transmitted directly from the laboratory to the Engineer and the JEA. Test reports shall be identified by the project title, project number, project location and location and depth of each on-site test submitted.

XIII.4. Placing permanent construction over fill that has not been tested and approved may require the Contractor to remove permanent work, re-compact the fill and replace the work at the Contractor's expense.

XIII.5. Any failed test shall be re-tested at the Contractor's expense.

XIV. BACKFILL MAINTENANCE

The Contractor shall refill settlement in all backfilled areas. The surfaces of backfilled areas shall be maintained in a safe and satisfactory condition at all times until the expiration of the two year warranty period.

XV. DUST CONTROL

If, in the opinion of the Engineer, it is necessary to control dust from time to time during the progress of the work, the Contractor shall do so with no additional compensation.

XVI. SEWAGE SPILLS

XVI.1. JEA recognizes that sewage may be released from pipes in the course of performing the work. Contractor shall minimize the amount of sewage released into excavations by notifying affected parties (homeowners or businesses) of the service interruption, pre-draining affected

lines, ensuring pump station (non) operating status, etc. Contractor shall take precautions to prevent sewage from contacting the ground. If sewage contacts the ground, Contractor shall take appropriate measures to disinfect the affected area where the sewage release occurred. When pooling sewage is observed, Contractor shall vacuum remove the sewage or remove the sewage by other means acceptable to the JEA Inspector and dispose of the sewage in accordance with environmental and public health regulations. This can include pumping to the nearest available sanitary manhole. Sanitary systems found plugged due to this type of pumping activity shall be cleaned at the Contractor's expense.

- XVI.2. Contractor shall inform the JEA Inspector of spills which contact the ground estimated to be in excess of five (5) gallons. Spills less than five gallons, which contact the ground, shall be noted in the Contractor's field log book. Notification of the inspector does not mitigate Contractor's responsibility to take corrective action. If JEA is fined as a result of a sewage spill associated with the work, JEA will require Contractor to reimburse JEA for the fine amount.

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NONFERROUS METALWORK – SECTION 436

I. SCOPE OF WORK

The work under this section shall include the furnishing, fabrication, delivery and erection of all miscellaneous nonferrous metalwork as indicated on the drawings and specified in this section. All referenced to industry standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated.

II. GENERAL REQUIREMENTS

II.1. Aluminum work shall be fabricated of plates and rolled or extruded shapes conforming (unless otherwise approved) to the following alloy designations of the aluminum company of America, or JEA pre-approved equal:

II.1.1.	Rolled shapes	6061-T6
II.1.2.	Extruded shapes	6063-T5
II.1.3.	Smooth plates	6061-T6
II.1.4.	Gratings	6061-T6
II.1.5.	Sheet	3003

III. WORKMANSHIP

III.1. Aluminum shall be well formed to shape and size with sharp lines and angles. Shearing and punching shall leave clean, true lines and surfaces. Permanent connections shall be welded or riveted.

III.2. The workmanship shall conform to the best practice and shall be subject to the approval of the Engineer. Where welding is used, it shall conform to the current requirements of the American Welding Society for the applicable type of work.

IV. SHOP AND ERECTION DRAWINGS

The Contractor shall submit, for approval, completely detailed and certified shop and erection drawings of the miscellaneous nonferrous metalwork. Such drawings shall show the alloy and temper to be used; the finish, if any, to be applied; and the nature and location of all coating or other protection against corrosion to be applied at the shop or in the field.

V. RESPONSIBILITY FOR DIMENSIONS

The general dimensions and details of the aluminum work are indicated on the drawings, but the Contractor shall be responsible for the correctness of the dimensions and details and shall carefully check the same in order to avoid possible error.

VI. ALUMINUM NOSINGS

Abrasive aluminum treads, saddles and nosings shall be of the size and contour indicated, not less than 3/8 inch thick and shall be equipped with suitable anchors. Exposed parts of adjacent nosings and thresholds shall match in contour and texture.

VII. ALUMINUM GRATINGS AND FRAMES

Gratings shall be serrated, extruded type. Deflection shall be no greater than specified for aluminum checkered plates and frames in subparagraph 9.

- VII.1. The gratings shall be fabricated in easily removable sections but securely attached to supports. Frames for gratings in concrete shall have mitered corners, with welded joints ground smooth where exposed, and welded anchors.
- VII.2. The tread surfaces of all main bars shall have a nonskid surface. All openings for fixtures or pipe which require the cutting of three main bars or more, shall be finish banded. Discontinuous edges shall also be banded.
- VII.3. Frames set in concrete shall be placed as the concrete is being poured.

VIII. ALUMINUM RAILINGS

Aluminum railings shall be fabricated, as indicated on the drawings.

- VIII.1. Unless otherwise indicated, stanchions and rails shall be 1½ inch diameter, iron pipe size, extra heavy weight aluminum pipe for stanchions and standard weight for rails of 6063T832 alloy and temper. Railings shall be fabricated in sections as large as practicable, and joints between sections shall be made in a neat and inconspicuous manner as approved. Aluminum railings shall have welded joints using aluminum alloy 5056 welding rod. All exposed welds shall be ground smooth.
- VIII.2. The aluminum handrails shall receive an applied alumilite finish.

IX. ALUMINUM CHECKERED PLATES, FRAMES AND COVERS

- IX.1. Aluminum checkered plates, frames and covers shall be designed to carry a live uniform load of 300 pounds per square foot with a factor of safety of 5 based on the ultimate strength of the material and be suitably reinforced to prevent deflections greater than 1/160 of the span. Plates shall have an approved nonskid surface with approved flush lift rings or handholes, as indicated.
- IX.2. Covers and plates shall be made to fit into the frames neatly and accurately. Hinges shall be heavy-duty, stainless steel with removable stainless steel pins. The butts shall be fastened to the covers and frames with stainless steel rivets or by welding.
- IX.3. Frames shall have mitered corners with welded joints ground smooth where exposed, and welded anchors. Frames shall be built into the concrete as the concrete is being placed.
- IX.4. All holes necessary to be drilled in place shall be ground smooth.

X. OTHER ITEMS

- X.1. Other items of miscellaneous nonferrous metalwork not particularly specified shall be of the shape, size, details and finish indicated on the drawings or suitable for the purposes specified (as approved).

XI. PROTECTION

- XI.1. Aluminum surfaces which, after erection, would otherwise be in contact with concrete or brick masonry shall be protected from contact therewith by a coat of approved primer. Areas where W-3 coating has been damaged by abrasion or other cause shall be cleaned and

recoated so that the aluminum will have a complete, protective paint film when brought into contact with the material against which it is being protected.

- XI.2. Before application of the coating, the surface shall be cleaned free of all dirt, heavy deposits of grease or oil, and other foreign substances immersed in or swabbed with a solution of phosphoric acid and organic solvents such as Deoxidine No. 670, Sol-Klean No. 110-3, or Oakite No. 35, diluted with water in the ratio of 1:3 and then rinsed with clear water and thoroughly dried. The cleaning solution shall be at a temperature between 50° F and 90° F and shall remain in contact with the metal (without being allowed to dry) for at least five minutes. On sections more than 1/8 inch thick a mild sandblast may be used in lieu of the solution-rinsing procedure specified above.
- XI.3. Where aluminum is to be used in connection with dissimilar metals, suitable insulation, such as impregnated roofing felt, shall be provided between contact surfaces so as to eliminate direct contact and the resultant electrolysis, or the aluminum surface shall be cleaned and painted with the coatings specified in paragraph 11.1 above.
- XI.4. During construction, care shall be taken to prevent damage to the aluminum work from splashing or the accumulation of paint, plaster, mortar, etc.
- XI.5. Surfaces of aluminum which receive Alumilite finish, and other items of decorative aluminum, shall be given two shop coats of methacrylate protective lacquer. Protective coatings of lacquer worn off due to handling or erection shall be replaced by new coatings of lacquer of the same type.

XII. CLEANING

After aluminum has been erected, it shall be cleaned by use of a mild soap and water, followed by a clear water rinse.

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CONCRETE WORK – SECTION 437

I. SCOPE OF WORK

The scope of work under this section includes all materials, equipment and labor, and performing all operations for constructing the concrete work as shown on the drawings, called for herein, or necessary for the proper completion of the work. The work shall be performed in accordance with these specifications and to the lines, notes, and dimensions indicated on the drawings or specified herein. All references to industry standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated.

II. GENERAL REQUIREMENTS

All concrete shall be proportioned, mixed, placed, finished and cured in accordance with the requirements of Standard Specifications of the American Concrete Institute, ACI 301-66, as modified herein, except that concrete for pavement replacement, including sidewalks, driveways and curb and gutter, shall be placed, finished and cured in accordance with ACI 617-58.

III. MATERIALS

All concrete shall be ready-mixed, normal weight, as produced by a plant acceptable to the Engineer. Job mixed concrete may be used for small quantities upon specific approval of the Engineer.

IV. CEMENT

- IV.1. Cement shall be a single brand of Portland Cement conforming to the ASTM Standard Specifications for Portland Cement, Designation C150, for type I cement, type II cement, or type III (high-early-strength) cement.
- IV.2. Air entraining cement shall not be used.
- IV.3. When no Type cement is specified, Type I shall be used.
- IV.4. Type III (high-early-strength) cement may be used only with the written permission of the Engineer, but no additional payment will be made to the Contractor for the use thereof.
- IV.5. In addition to the requirements of the above mentioned specifications, cement to be used in exposed concrete shall exhibit no efflorescence when tested in accordance with the ASTM Standard Methods of Sampling and Testing Brick, Designation C-67, but employing 2 inch x 7 inch x 1/2 inch mortar slabs, comprising a 1:3 mixture by weight of the cement in question and Ottawa Sand, mixed with local tap water to a flow of 100 percent and aged one week before test.
- IV.6. All cement to be used in the work shall be subject to testing to determine whether it conforms to the requirements of these specifications. The methods of testing shall conform to the appropriate specification, but the place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular conditions of this project. Cement which is partially set or which is lumpy or caked shall not be used, and the entire contents of the sack of cement or the container of bulk cement which contains damages, partially set, or lumps of caked cement will be rejected for use.

- IV.7. If required, the Contractor shall furnish sworn certificates of mill tests of cement, in triplicate, at least 7 days before the cement will be used. JEA reserves the right to make such independent tests as he may deem necessary at any time.

V. AGGREGATES

- V.1. Fine aggregate shall be washed sand; clean, sound, sharp, screened and well-graded with no grain larger that will pass a No. 4 sieve. No less than 15 percent are more than 30 percent by weight shall pass a No. 50 sieve. No fine aggregate shall be used if it contains more than 2 percent of silt or which shows a color darker than Plate 2 when tested according to the ASTM Standard Method of Test for Organic Impurities in Sands for Concrete, Designation C40.
- V.2. Coarse aggregate shall be washed, hard, tough and durable screened gravel or crushed stone having not more than 5% by weight of deleterious substances and soft fragments. Aggregate shall be well graded from the largest which shall pass a 1 inch mesh to the smallest which shall pass a 3/8 inch mesh and be retained by a 1/4 inch mesh. No coarse aggregate shall be used if it contains more than 1 percent of silt or which shows a color darker than Plate 1 when tested as above specified for fine aggregate.
- V.3. Both fine and coarse aggregate shall conform to the requirements of ASTM Standard Specification C33. The Contractor shall submit clearly labeled samples of aggregates to the Engineer when requested.

VI. ADMIXTURES

- VI.1. Admixtures causing accelerated setting of cement in concrete shall NOT be used.
- VI.2. The particular admixture to be used shall meet with the approval of the Engineer. Recognized and approved admixtures are:
- VI.3. Vinsol Resin:
Manufactured by the Hercules Powder Company of Wilmington, Delaware: This product requires preparation on the job by dissolving in a solution of sodium hydroxide according to the manufacturer's directions.
- VI.4. Darex AEA:
Manufactured by the Dewey and Almy Chemical Company, Cambridge, Mass: This product is furnished in liquid form ready for use.
- VI.5. Pozzolith:
Manufactured by the Master Builders Company, Cleveland, Ohio: This product is furnished in Powder form ready for use. The use of pozzolith shall be contingent on its entraining the specified amount of air with not more than one pound of the admixture per bag of cement.
- VI.6. Aerocrete:
Manufactured by L. Sonneborn Sons, Inc., 80 Eighth Avenue, New York, New York, 10011: This product is furnished in liquid form ready for use.

VII. WATER

The water for concrete shall be clean, fresh, and free from injurious amounts of oil, acid alkali, organic matter, or other deleterious substances.

VIII. CONCRETE PROPORTIONING

- VIII.1. Materials shall be proportioned in accordance with ACI-613.
- VIII.2. Air content, determined in accordance with ASTM C173, shall be 5% ($\pm 1\%$) by volume.
- VIII.3. SLUMP SHALL BE AS LISTED BELOW:
- VIII.3.1. Class A $2\frac{1}{2} \pm 1$ inch
 - VIII.3.2. Class B 3 ± 1 inch
 - VIII.3.3. Class C $3\frac{1}{2} \pm 1\frac{1}{2}$ inch
- VIII.4. Concrete shall be of plastic consistency such that it can be worked readily into all parts of the forms and around embedded work without segregation of constituent materials or collection of free water on the surface. Cement, fine aggregate, coarse aggregate, and water for concrete shall be measured separately and with accuracy.

IX. PLANT APPROVAL

The Engineer shall have the right to inspect the plant of the manufacturer and the proportioning and mixing of the concrete. The materials method of proportioning, mixing, and delivering are to be satisfactory and in accordance with the above specifications. The manufacturer shall furnish, from an independent testing laboratory and through the Contractor, appropriate certificates of tests, materials, proportions, mixing and strengths if requested by the engineer.

X. MIXING AND DELIVERY

- X.1. The quantity of concrete to be mixed or delivered in any one batch shall not exceed the rated capacity of the mixer or agitator as stated on the nameplate for the type of mixer in use.
- X.2. Attention is directed to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting. Concrete shall be discharged into forms within $1\frac{1}{2}$ hours after water was first added to the mix, and shall be mixed at least 5 minutes after all water has been added.

XI. QUALITY

Concrete for slabs on grade (not tank bottoms) shall have a compressive strength of not less than 3,000 psi at 28 days; concrete for fill shall have compressive strength of not less than 2,500 psi at 28 days; concrete for all other work shall have compressive strength of not less than 4,000 psi at 28 days. Concrete of 4,000 psi strength shall be designated Class "A", 3,000 psi concrete shall be designated Class "B", and 2,500 psi concrete shall be designated Class "C".

XII. REINFORCING STEEL

- XII.1. Concrete reinforcement in sizes No. 3 ($\frac{3}{8}$ inch) and larger shall be deformed steel bars of the shapes and sizes indicated on the drawings.
- XII.1.1. Deformations shall conform to ASTM Tentative Specifications for Minimum Requirements for the Deformations of Deformed Steel Bars for Concrete Reinforcement, Designation A305.
 - XII.1.2. The steel shall be newly rolled stock, substantially free from mill scale, rust, dirt, grease, or other foreign matter. Bars shall be domestic billet steel or rail steel.

- XII.1.3. Billet steel bars shall be intermediate grade conforming to the ASTM Tentative Specifications for Concrete Reinforcement, Designation A615.
- XII.1.4. Rail steel bars, if used, shall conform to ASTM Tentative Specifications for Rail Steel Bars for Concrete Reinforcement, Designation A16.
- XII.1.5. In the case of rail steel bars, the bars shall be re-rolled by an approved mill. If requested by the engineer, the Contractor shall submit at his expense certified copies of tests of rail steel bars furnished. The tests shall be as specified in the appropriate ASTM Specifications above referred to, and shall be made by an approved laboratory. To be accepted for use, the bars shall show an elongation of at least 8 inches as required by the ASTM Specifications, but not less than 10.5 %.
- XII.2. If requested by the engineer, the Contractor shall submit for approval shop drawing submittals for cutting and bending drawings and schedules for all reinforcement to be furnished by him.
- XII.3. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than two times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness except for bars larger than 1 inch in which case the bends shall be made around a pin of eight bar diameters. All bars shall be bent cold. Bars shall be shipped to the project site fastened in bundles of the same size and shape, with identification tags, giving size and mark, securely attached thereto.
- XII.4. Before being placed in a position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings, including ice, that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.
 - XII.4.1. Reinforcement shall be accurately positioned as indicated on the drawings, and secured against displacement by using annealed iron wire ties or suitable clips at intersections. Bar splices, laps, etc., shall be as called for on the drawings, or if not called for, laps shall be not less than 24 times the nominal diameter of the bar. Wire mesh sheets shall have a side lap of not less than 2 inches and an end lap of not less than 6 inches. Concrete blocks having a minimum bearing area of 2 inches by 2 inches and equal in quality to that specified for the slab shall be used for supporting spacers, or hangers may be used. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
 - XII.4.2. Reinforcement which is to be exposed to the atmosphere for a considerable length of time after having been placed shall be painted with a heavy coat of cement grout if required by the Engineer.

XIII. FORMS

- XIII.1. Forms shall be securely braced, substantial and unyielding, and of sufficient strength to hold the concrete without bulging between supports, or without other deviation from the neat lines as shown on the plans. Forms shall be mortar-tight and shall be constructed of dressed lumber of uniform thickness, with or without a form liner.
- XIII.2. The spacing of joints and wales shall be such as to prevent warp and bulging and to produce true and accurate surfaces. All lumber shall be free from knot holes, loose knots, cracks, splits, warps, or other defects affecting its strength or the appearance of the finished concrete

surface. Fiberboard or other artificial lumber, approved by the Engineer, may be used as a lining for forms.

- XIII.3. The interior surfaces of forms shall be adequately oiled, greased or soaped, to prevent adhesion of mortar. Form oil for exposed work shall be non-staining. Before placing of concrete, the forms shall be cleaned of all dirt, saw dust, shavings or other debris, and the surfaces shall be dampened.
- XIII.4. Special care shall be exercised to secure smooth and tight-fitting forms which can be rigidly held to line and grade and removed without injury to the concrete. All corners in the finished work shall be true, sharp and clean-cut. Alignment of forms and grade of top chamfer strips shall be checked immediately after the placing of concrete in the forms.
- XIII.5. Forms shall not be removed until the product of the elapsed number of days after placement and the average daily air temperature at the surface of the concrete equals 100 for walls and vertical surfaces and 500 for slabs.
- XIII.6. Shores under beams and slabs shall not be removed until the concrete has attained at least 60 percent of the specified cylinder strength and also sufficient strength to safely support its own weight and the CONSTRUCTION LIVE LOADS upon it. Shores under cantilevers shall remain in place at least 14 days after concrete is placed.

XIV. EMBEDDED ITEMS

- XIV.1. All sleeves, inserts, hangers, anchor bolts, dowels, nailing strips, or other embedded items, shall be accurately set, and firmly held in place while the concrete is deposited. Anchors and ties for masonry shall be provided as shown on the drawings or called for in the masonry specifications.
- XIV.2. Pipes, conduits and other items embedded in the concrete shall be so placed and held that they do not misplace the reinforcing or weaken the concrete at points of maximum stress or where the concrete section is not sufficient to permit the reduction of area caused by the embedment.

XV. PLACING CONCRETE

- XV.1. All concrete shall be placed during daylight hours allowing sufficient time for adequately finishing the concrete surfaces during daylight hours unless approved by JEA representative for night time construction. No concrete shall be placed until the forms have been approved by the Engineer and until all the reinforcement is in place and has been inspected and approved by the Engineer. No concrete shall be placed in water, and forms shall be free from water, dirt, debris, or any foreign matter when concrete is placed. Normal weather limitations for placing concrete shall be adhered to and no concrete shall be exposed to the action of water before final setting.
- XV.2. The method and manner of placing concrete shall be such as to avoid the possibility of segregation or separation of the aggregates. If the quality of concrete as it reaches its final position is unsatisfactory, the concrete as placed shall be discontinued or adjusted until the quality of the concrete as placed is satisfactory. Open troughs or chutes shall be of metal or metal-lined. Where steep slopes are required the chutes shall be equipped with baffles or shall be in short lengths that reverse the direction of movement. Where placing operations would involve dropping the concrete freely more than five feet, it shall be deposited through pipes, sheet metal or other approved material. Troughs, chutes or pipes with a combined

length of more than 30 feet shall be used only on written authority from the Engineer. All troughs, chutes and pipes shall be kept clean and free from coatings or hardened concrete by being thoroughly flushed with water after each run, or in its final position. Depositing a large quantity at any point and running or working it along the forms shall not be done. Special care shall be taken to fill each part of the forms and to work the coarse aggregate back from the face and to force the concrete under and around the reinforcing bars without displacing them. The concrete consistency as measured by slump shall be as specified above.

- XV.3. Concrete shall be compacted by continuous working with a suitable tool in an acceptable manner and by vibrating. Vibration shall be done by experienced operators under close supervision and the duration shall be held to a minimum necessary to produce thorough compaction without segregation. Where vibrators are not used all thin section work shall be thoroughly worked with a steel slicing rod. All faces shall be well spaded and the mortar flushed to the surface by continuous working with a concrete spading implement.
- XV.4. In all cases where, on account of the obstructions produced by reinforcing metal, shapes or forms, or any other uncontrollable condition, difficulty is encountered in puddling the concrete adjacent to the forms, the mortar content of the mix shall be brought into proper contact with the interior surfaces by vibrating the forms. The vibrations shall be produced by striking the outside surfaces of the forms with wooden mallets or by other means satisfactory to the Engineer.

XVI. TEST SPECIMENS

If required by JEA, for each class of concrete, one set of three cylinders shall be made by the Testing Laboratory selected by JEA for each day's placement of concrete but not less than one specimen for each 150 cu. yd. One of these cylinders shall be tested at the age of 7 days, and one at the age of 28 days, to determine the quality of concrete obtained. The costs for performing such tests will be paid for by JEA when the test results are in conformity with these specifications. However, those which show no conformity or a failure will be paid for by the contractor. It shall be the responsibility of the contractor to properly inform the Testing Laboratory as to when concrete will be placed into the forms.

XVII. WATER STOPS

Water stops shall be furnished where shown on the drawings and shall be furnished in the longest lengths possible. They shall be rigidly supported and accurately positioned with the center at the joint interface. All water stops shall be approved 5 inch polyvinyl chloride at the dumb-bell, or ribbed type, and a minimum of 3/16 inch thick. They shall be continuous along the concrete joint. Ends and corners shall be spliced to provide water tightness.

XVIII. CURING & PROTECTION

- XVIII.1. All concrete work shall be protected against damage from the elements and defacement of any nature during construction operations.
- XVIII.2. Water shall not be permitted to rise on concrete within 2 hours after it is placed, nor shall running water be allowed to flow over completed concrete within 4 days after it has been placed.
- XVIII.3. All concrete, particularly slabs and including finished surfaces, shall be treated immediately after concreting or cement finishing is completed to provide continuous moist curing for at

least 7 days, regardless of the adjacent air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap, or kept moist by other approved means. Horizontal surfaces, slabs, etc., shall be ponded to a depth of 1/2 inch wherever practicable, or kept continuously saturated wet by the use of lawn sprinklers, a complete covering of continuously saturated burlap, or by other approved means. Except on surfaces to which additional coatings or materials are to be bonded, the Contractor may, at his option, use an approved membrane curing compound in lieu of water curing of concrete. The compound shall be delivered to the job in the manufacturer's containers and shall be applied in strict accordance with the manufacturer's printed instructions.

XVIII.4. Curing compound for exposed surfaces shall be non-staining.

XVIII.5. For at least 7 days after having been placed, all concrete shall be so protected that the temperature at the surface will not fall below 50 degrees F.

XVIII.6. No manure, salt, or other chemicals shall be used for protection.

XVIII.7. The above mentioned 7 day period may be reduced to 3 days in each case if high-early-strength cement is used in the concrete.

XVIII.8. Wherever practical, finished slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

XVIII.9. When the temperature is below 40 degrees Fahrenheit, or predicted to go below 36 degrees in the next 24 hours, or predicted to go below 32 degrees in the next 72 hours, no concrete shall be poured without the express permission of the Engineer. Permission so granted shall be for the day and location only and must again be requested on subsequent days when temperatures are as stated above. The use of chemicals in the concrete mix to reduce temperature of freezing will not be permitted.

XIX. FINISHING

XIX.1. Strike off concrete surfaces to elevations and profiles indicated, and finish with wood or cork float as hereinafter specified, even and true, free from cracks, pockets, or other imperfections. Discontinue as soon as water appears on surface. Finished concrete, except at warped surfaces, shall be such that irregularities shall not exceed 1/4 inch as measured by a 10 foot straight edge.

XIX.2. Following removal of forms, thoroughly wet all surfaces to remain exposed. Fill all honeycombs, tie rod holes and areas damaged in form removal with grout composed of one part Portland cement to two parts sand, with water as required, and rub with abrasive stones to a smooth, uniform surface.

XIX.3. Any work not formed as indicated on drawings or that is out of alignment or level or shows a defective surface shall be corrected in a manner satisfactory to the Engineer.

XIX.4. It is expected that forms, concrete and workmanship shall be such that the quantity of trimming and repair work is kept to a minimum.

XX. BONDING AGENT

Where new concrete is to be placed against existing concrete, the existing concrete surface shall be coated with a bonding agent prior to placing new concrete. Application shall be in strict accordance with manufacturer's recommendations.

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GENERAL EQUIPMENT REQUIREMENTS – SECTION 439

I. SCOPE

The scope of this section is to provide, install and render ready for use, any and all equipment required by the Contract Documents. The Contractor shall consult the appropriate section(s) of the specifications for specific equipment.

II. EQUIPMENT

All items and equipment shall be new and of the highest quality. The supplier and manufacturer, in addition to the Contractor, shall assume responsibility for the proper functioning of the equipment furnished.

II.1. NAMEPLATE:

Each piece of equipment shall be provided with a substantial nameplate of non-corrodible metal, securely fastened in place, and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, rated capacity, electrical or other power characteristics and other appropriate nameplate data.

II.2. ANCHORAGE:

All anchor bolts, nuts and washers shall be of type 316 stainless steel unless otherwise specified and shall be furnished by the equipment manufacturer where applicable. The anchor bolts shall be placed by the Contractor in accordance with certified prints furnished by the equipment manufacturer.

II.3. LUBRICATION:

When possible, equipment shall be fully serviced prior to delivery. All exceptions shall be clearly marked to the effect that servicing is required before operation.

II.4. OPERATION MANUALS AND PARTS LIST:

The Contractor shall furnish 6 complete, bound sets of literature on the equipment furnished giving clear and concise instructions for operation, adjustment, and lubrication and other maintenance of the equipment. These instructions will include a complete lubrication chart.

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GRASSING – SECTION 441

I. SCOPE OF WORK

The work under this section includes the furnishing of all labor, material, equipment, and supervision required to grade, and install sod and grass in all areas shown on the Contract Drawings or specified herein.

II. GENERAL

All grassed areas that are disturbed or damaged by the construction operation shall be restored by re-sodding or seeding and mulching after fill has been graded to meet the existing contours. Sod shall be similar to the type of grass in place and shall be fresh, live and well rooted. Areas to be seeded and mulched shall be agreed upon and approved by the Engineer prior to excavation. The heavy, firm root structure of the sod shall be placed level with adjacent concrete structures (i.e.; sidewalks, driveways & curb and gutter) so that no drop-off results between the two surfaces. Unless approved otherwise by JEA, the sodded areas shall be uniform level and smooth without dips or holes.

III. SEEDING AND MULCHING

III.1. SEED:

The grass seed shall be scattered uniformly at a rate of 60 pounds per acre. During the period March 15 to October 15, the seed mixture shall be 30 pounds of Argentine Bahia and 30 pounds of hulled Bermuda. During the remainder of the year the mixture shall be 20 pounds each of Bahia, Bermuda and Rye grass seed. All grass seed shall be mixed with soil prior to sowing in a manner insuring an even distribution and retainage of the seed on the site. The seed shall then be lightly raked into the ground.

III.2. MULCH:

The mulch material shall be straw or hay, consisting of oats, rye or wheat straw, or a Pangola, Peanut, Bermuda or Bahia grass hay. Immediately after completion of seeding, dry mulching shall be uniformly applied over the seeded area. The mulch shall be spread at a rate of 9 tons per acre and cut into the soil or anchored in a satisfactory manner. Mulch shall be free from undesirable weed and other undesirable grasses.

IV. SPRIGGING

Where specified, after placing the top soil, the entire area shall be grassed by planting sprigs. St. Augustine grass or other types, as directed by the Engineer, shall be cut into stolons approximately 4 inches long and planted endwise in furrows 2 inches deep. The furrows shall be 8 inches apart and stolons planted 6 inches apart in the furrows. Other methods of planting sprigs that will provide an equal stand of grass may be approved.

V. SODDING

When called for in the plans and special conditions, grass sod shall be furnished and placed in the areas to be grassed and shall be maintained to assure a healthy stand of grass.

V.1. MATERIAL:

Sod shall be St. Augustine, Centipede or Bahia to match existing grass type. The sod shall be live, fresh and uninjured at the time of planting. Sod shall be free of weeds and other

grasses. Sod with mesh backing shall not be allowed in residential locations or any areas common to foot traffic such as sports fields, parks, etc.

V.2. PLACEMENT:

Sodding shall be incorporated into the project at the earliest practical time in the life of the contract. No sod which has been cut for more than 72 hours shall be used unless specifically authorized by the Engineer after his careful inspection thereof. Any sod which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained properly moistened.

V.2.1. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results. The sod shall be placed on the prepared soil surface and shall be clear of trash, debris, roots, branches, stones and clods in excess of 1 inch in diameter, or 2 inches in length. Sod shall not be applied to gravel or other non-soil surfaces. Any irregularities in the soil surface shall be filled or leveled in order to prevent the formation of depressions. Place sod in straight (not curved) parallel rows with edges butting to form a solid mass with tightly fitted joints, without stretching or overlapping. Lateral joints shall be staggered to promote more uniform growth and strength. Entire sodded area shall be firmly and smoothly embedded by light tamping with appropriate tools or rolled with a 200-lb roller. The finished elevation of the sod shall be smooth and even with the adjacent existing areas. The sub-grade shall be moist but not wet when sod is laid.

If gaps in the new sod are found during inspection, the Contractor may be allowed to fill in the gaps with proper growing soil from clean/select backfill only if authorized by the Engineer; otherwise, the sod placement in question shall be removed and reinstalled after finish grading correction.

V.2.2. The sod shall not be placed on top of existing grade as to create high points. All disturbed areas shall be stripped of any grassing, grade lowered as required to allow the new sod elevation to match the pre-existing finish grade, and placed on the prepared soil surface.

V.2.3. Where sodding is used in drainage ditches, the setting of the pieces shall be staggered, laying sod across the direction of flow such as to avoid a continuous seam along the line of flow. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces shall be tamped so as to produce a featheredge effect. In critical areas including water-carrying channels, secure sod with chicken wire, jute or other netting by pegging or stapling flush over the sod for extra protection during the establishment period. Netting installation shall be parallel to the direction of flow. Upslope ends of net shall be buried in a slot or trench no less than 6 inches deep.

V.2.4. On slopes 3:1 and greater, or wherever erosion may be problematic, the sod shall be laid with staggered joints and secured with pegging or other approved methods. Sod shall be installed with the length perpendicular to the slope, beginning at the bottom of the slope and working uphill. Any pieces of sod which, after placing, shows an appearance of extreme dryness shall be removed from the work.

V.2.5. Any pieces of sod which, after placing, shows an appearance of extreme dryness shall be removed and replaced.

- V.2.6. Within two (2) hours after installing sod and before rolling, the sod shall be lightly irrigated. Immediately after rolling, the sodded area shall be thoroughly watered to sufficiently moisten the soil to a depth of four (4) inches

VI. FERTILIZING

Immediately before seeding, sodding or sprigging, fertilizer shall be applied at a rate of 600 pounds per acre and scarified into the surface to a depth of approximately 1 inch. Fertilizer shall be 8-8-8, organic analysis as follows:

- VI.1. TOTAL NITROGEN: NOT LESS THAN 8.00%
VI.2. AVAILABLE PHOSPHORIC ACID: NOT LESS THAN 8.00%
VI.3. WATER SOLUBLE POTASH: NOT LESS THAN 8.00%

VII. HYDRO SEEDING:

All seed shall meet the requirements of the State Department of Agriculture and Consumer Services and all applicable state and local laws. The Contractor shall submit to the Engineer a certification tag for each type of seed used prior to sowing of seed. The certification tag shall have the following information:

- 140.4.3.1 Grass Type and Variety
140.4.3.2 Percent of Inert Matter
140.4.3.3 Germination Percentage
140.4.3.4 Percent of Weed Seed

VII.1. PREPARATION OF GROUND:

Final grading and cleaning shall be completed prior to the preparation of ground for grassing. The areas to be grassed shall be scarified or-loosened to a depth of at least six (6) inches. All areas shall be smooth and free of large clods, roots and other materials which may interfere with the work or future mowing and maintenance operation. No subsequent operations shall be commenced until the Engineer has approved the condition of prepared areas.

VII.2. APPLICATION AND RATES:

The grass seed shall be applied at a rate of 60 pounds per acre in combination with cellulose fiber mulch at a rate of 750 pounds per acre. During the period March 15 to October 15, the seed mixture shall be 30 pounds of Argentine Bahia and 30 pounds of hulled Bermuda. During the remainder of the year the mixture shall be 20 pounds each of Bahia, Bermuda and Rye grass seed.

Apply the hydro seeding in the form of a slurry consisting of commercial fertilizer, hydro mulch and seed. When hydraulically sprayed onto the soil, the mulch shall form a blotter-like material. Contractor shall save all seed and fertilizer tags and fiber mulch bags for the Engineer to verify compliance with the drawings and specifications.

Do not let the hydro slurry components rest in the hydro seeding machine for more than two (2) hours because of possible seed destruction. All mixtures more than eight (8) hours old

must be disposed, off-site, at the contractor's expense. Slurry applied onto hardscapes including concrete walks, fences, walls, buildings, etc. shall be removed at the contractors expense.

VIII. NON GRASSED AREAS

Grassing will not be required along pipeline locations falling within areas not covered by a stand of grass or other suitable growth at the time of construction. Such areas shall be established and agreed upon by the Engineer prior to excavation.

IX. SOIL MOISTURE

Seed, sod and sprigs shall be placed only when the soil is moist and in proper condition to induce growth.

X. MAINTENANCE

The Contractor shall be responsible to see that all planted areas, including seeded, sprigged and solid sodded areas, receive sufficient water and maintenance during the life of this contract or until a satisfactory growth of grass is established acceptable to the Engineer. Maintenance shall include the filling, leveling and repairing of any washed or eroded areas, as may be necessary.

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PAVING – SECTION 490

I. GENERAL

The work under this section includes the furnishing and installation of paving for the entire project as set forth on the plans and as outlined herein.

II. REFERENCE

All paving work within City of Jacksonville right-of-way shall conform to the applicable City of Jacksonville Standard Specifications and Details for Paving and Striping. All paving work within the Florida Department of Transportation right-of-way shall conform to the applicable Florida Department of Transportation Specifications for Paving. Paving outside of D.O.T. or City of Jacksonville right-of-way shall be as specified by the Engineer.

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SIDEWALK, DRIVEWAY, CURB AND GUTTER – SECTION 491

I. GENERAL

The work under this section includes the furnishing and installation of sidewalk, driveway, curb and gutter for the entire project as set forth on the plans and as outlined herein.

II. REFERENCE

All sidewalk, driveway, curb and gutter work within City of Jacksonville right-of-way shall conform to the applicable City of Jacksonville Standard Specifications and Details for sidewalk, driveway, curb and gutter. All sidewalk, driveway, curb and gutter work within the Florida Department of Transportation right-of-way shall conform to the applicable Florida Department of Transportation Specifications for sidewalk, driveway, curb and gutter. All sidewalk, driveway, curb and gutter work not in the City of Jacksonville or Florida Department of Transportation right-of-way shall conform to City of Jacksonville standards unless specified otherwise. Handicapped ramps shall be constructed in accordance with Chapter 11 of the Florida Accessibility Code and American with Disabilities Act Accessibility Guidelines (ADAAG). All new sidewalks installed shall include handicap ramps. Handicap ramps shall not be installed if sidewalk is not being disturbed.

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FENCING – SECTION 492

I. SCOPE OF WORK:

The work under this section includes furnishing all labor, material, equipment, and the erection of chain link fencing complete with all appurtenances as indicated in the Contract Documents or as specified herein. All references to ASTM Specifications shall mean the latest edition published prior to Contract Bid Date. Unless noted otherwise on the contract documents, the fencing shall be 6 feet high (MIN), one inch off ground and meet the specifications as noted below.

I.1. MATERIALS:

I.1.1. BASE METAL:

Unless specified otherwise, the fabric for fencing shall be No. 9 gauge galvanized steel wire 2-inch mesh (1, 290 lb breaking load wire) with black (PVC) vinyl coating. All other appurtenances (post, gate and other) shall be galvanized with black vinyl coating.

I.1.2. ZINC COATING:

Zinc coating shall be Class I, hot dipped galvanized with a coating of 1.2 ounces per square foot of fabric, per ATSM A392. The weight of zinc coating on the fabric shall be determined in accordance with the method described in ASTM Designation A90.

I.1.3. VINYL COATED FABRIC:

Class 2, bonded PVC-coated wire shall have the PVC coating thermally fused and bonded to a primer which is thermally cured onto galvanized steel core wire. Galvanized steel core wire shall have been coated with zinc as per ASTM A641 (9 gauge – 0.30 oz. per square foot of fabric).

I.1.4. VINYL PRIVACY SLATS:

Slats shall be black vinyl or PVC material and provide an 85% capacity (min).

I.1.5. VINYL COATED POSTS AND RAILS:

Polymer coated framework shall have a PVC coating fused and adhered to the exterior zinc coating of the post or rail. PVC coatings shall have a minimum thickness of 10-mils (0.254 mm) per ASTM F1043. Color to match the fabric.

I.1.6. VINYL COATED TENSION WIRE:

Polymer coated steel tension wire: 7 gauge wire complying with ASTM F1664. Class 2b, fused and adhered. Color to match the fabric.

I.1.7. VINYL COATED FITTINGS:

In compliance with ASTM F626, polymer coating minimum thickness 0.006 in. (0.152 mm) fused and adhered to zinc coated fittings. Color to match the fabric.

II. SELVAGE:

Fabric 72 inches high (MIN) shall be furnished with knuckling on top selvage and twisting on the bottom end.

III. FABRIC CONNECTIONS:

The chain link fabric shall be securely fastened to all terminal posts using 3/16 inch by ¾ inch tension bars. Posts with a 2-1/2 inch O.D. and under shall use 14 gauge tension bands and posts from 2-1/2

inches to 8 inches shall use 12 gauge tension bands. All connections shall have a finish applied which matches the fabric.

IV. POSTS:

IV.1. ZINC COATING:

All steel and iron parts shall be zinc coated by the hot-dipped method, using zinc Grade "E". The weight of zinc coat on the rail, post and brace with black vinyl exterior coating shall have less than 1.8 ounces per square foot. Zinc weight shall be determined in accordance with ASTM A90.

IV.2. REQUIREMENTS

All posts and rails shall meet the following minimum bending moment requirements:

<u>Fence Industry O.D.</u>	<u>Min. Bending Moment – In. Lbs.</u>
1-5/8" (Top Rail)	8,225
2"	11,410
2-1/2" (Line post)	19,635
3" (Corner post)	37,100
3-1/2"	60,200
4"	83,650

V. INSTALLATION:

V.1. Posts shall be spaced equidistant in the fence line on a maximum of ten (10) foot centers. The distance between pull posts shall not exceed 500 feet. Posts shall be plumb with the tops of the posts and properly aligned. Pull posts shall be installed at breaks in vertical grades of fifteen (15%) percent or more. The maximum interval may be reduced by the Engineer where the degree of break is greater than three (3) degrees. Corner posts are to be installed at all horizontal breaks in fence of fifteen (15) degrees or more. Gate posts shall be spaced as required for walk and roadway openings. All posts shall be set in concrete. Post holes shall be bell shaped.

V.2. Line posts shall be thirty (30) inches deep below finished grade, with a minimum diameter of nine (9) inches at the top. Terminal, corner and gate post holes shall be thirty-six (36) inches deep below finished grade with a minimum diameter of twelve (12) inches at the top. All posts shall be set twenty-four (24) (MIN) inches in the hole with four (4) inches of concrete below the end of the post. The top exposed surface of the concrete footing shall be sloped to shed water and provide a neat appearance when completed. Barbed wire supporting arms (when specified) shall be firmly seated on the top of the posts, set outside at a 45 degree angle up and perpendicular to the fence line.

VI. TOP RAILS:

Top rails shall be fitted with couplings or wedged for connecting the lengths into a continuous run. The couplings shall be not less than six (6) inches long, with .070 minimum wall thickness, and shall allow for expansion and contraction of the rail. Open seam outside sleeves shall be permitted only with a minimum wall thickness of .100 inches. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding two (2) feet. Means

shall be provided for attaching the top rail to each gate, corner, pull and end post. All fencing shall have a 1-5/8 inch O.D. top rail, unless specified otherwise.

VII. POST BRACES:

Post Braces shall be provided for each gate, corner, pull, and end post and shall consist of a 1-5/8" O.D. round tubular brace extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a rod not less than 5/16" nominal diameter from the line post back to the gate, corner, pull or end post, with a turnbuckle or other equivalent provision for adjustment. Truss rods may be eliminated in any line of fence where there is a continuous center rail. The braces and truss rods shall have the same finish as the posts.

VIII. POST TOPS:

Post tops shall consist of ornamental tops. The top shall be provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of posts and shall exclude moisture from posts.

IX. GATES:

Gates shall be swing or sliding as specified, complete with latches, stops, keepers and hinges.

IX.1. GATE FRAMES:

Gate frames shall be constructed of tubular members welded at all corners or assembled with fittings. On steel, welds shall be painted with zinc-based paint. Where corner fittings are used, gates shall have truss rods of 5/16" minimum nominal diameter to prevent sag or twist. Gate leaves shall have vertical intermediate bracing as required, spaced so that no members are more than eight (8) feet apart. Gate leaves ten (10) feet or over shall have a horizontal brace or one 5/16" minimum diagonal truss rod.

IX.2. GATE FABRIC:

Gate fabric shall be of the same type used in the fence construction. The fabric shall be attached securely to the gate frame at intervals not exceeding 15 inches.

GATE HINGES:

Gate hinges shall be of adequate strength for gate, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

IX.3. GATE LATCHES:

Gate latches, stops and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates of openings less than ten (10) feet wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

IX.4. GATE POSTS

Posts for swing gates shall be pipe of the following nominal sizes for each gate leaf:

<u>Gate Leaf Size</u>	<u>Minimum Post Size</u>	<u>Minimum Bracing Required</u>
Gate Leaf up to 6 ft. Wide	3" O.D.	(None)
Gate Leaf over 6 ft. to 13 ft. wide	4" O.D.	1 Cross Brace and 1 Truss Rod
Gate Leaf over 13 ft. to 18 ft. wide	6-5/8" O.D.	Vertical Bracing at 1/3 points & 3 Truss Rods

X. TENSION WIRE:

Tension wire shall be Marcellled (spiraled or crimped) #7 gauge (.177 in.) plus or minus 0.005 inches in diameter. Zinc Coated tension wire shall be Class III (0.80 oz. of zinc per square foot of uncoated wire surface). Aluminum tension wire shall have 0.40 oz. of aluminum per square foot of wire surface. Tension wire shall have the same surface as the fabric.

DRAINAGE – SECTION 493

I. GENERAL

The work under this section includes the furnishing and installation of drainage improvements for the entire project as set forth on the plans and as outlined herein.

II. REFERENCE

All drainage work within the City of Jacksonville right-of-way shall conform to the applicable City of Jacksonville Standard Specifications and Details for Drainage. All drainage work within the Florida Department of Transportation right-of-way shall conform to the applicable Florida Department of Transportation Specifications for Drainage.

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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 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 INSPECTION CHECKLIST:

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" 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.

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, Class 150, 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.1.3. 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, 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.1.4. 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.1.5. 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.1.6. 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.1.6.1. Nominal size
- II.1.6.2. Pressure rating
- II.1.6.3. NSF seal
- II.1.6.4. Manufacturer's name or trademark
- II.1.6.5. Standard dimension ratio
- II.1.6.6. ASTM specification

II.1.7. 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, 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 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. 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 Fitting:

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 (250 psi 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:

- 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).
- 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.

- 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.

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

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

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

$P^{1/2} = 12.25$, 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 certified tester and approved testing equipment. The Certified Testing Company must be pre-approved by JEA and listed within JEA's GC11 listing under 18-H category. 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 Certified Test Company a copy of the project site drawings (as-builts preferred). 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 certified 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 (statement by the certified tester), shall be submitted to JEA for review and approval. The report shall include a signed statement from the certified 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/repairs, depths (if installed outside the acceptable cover limits), and other applicable field remarks by the certified tester. A

Certified copy of the report 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. Certified Tester:

A person or that has been certified by the Manufacturer of the approved testing equipment 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 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). 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 unless it is unavoidable. 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: DEYCONN, P/N 90120 - DB Lug Yellow, 5pc. Bag or JEA approved equal.

III.7. 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.8. 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.9. 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.10. 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.11. RENEWAL AND TRANSFER OF WATER SERVICE:

III.11.1. 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. A renewal and transfer of water service shall include saddle, corp stop, service tubing, curb stop, no-lead brass adapter and meter coupling.

III.11.2. Special Construction for 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 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.11.3. Service Line Size:

If shown on the drawings, a double one (1) inch water service line is acceptable for long side services utilizing 1-1/2 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"

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 should 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.3.4. 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.3.5. 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.3.6. 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 should 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) should 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)

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)
			0.0001655	
			0.0001655	
			0.0001655	
			0.0001655	
			0.0001655	
Total Allowable Leakage Amount (Gallons):				

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):

$$\text{FORMULA NO. 1} \quad L = \frac{SD P^{\frac{1}{2}}}{148,000}$$

(PVC AND D.I.P.)

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



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)

TYPE OF PIPE PVC (1)	DIAMETER OF PIPE (INCHES) (2)	NUMBER OF JOINTS (3)	2-HOUR TEST FACTOR (4)	TOTAL ALLOWABLE LEAKAGE (2x3x4) (5)
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC (Sum of Above):				
D.I.P. (From Formula 3:				
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):

$$\text{FORMULA NO. 2} \quad L = \frac{ND P^{\frac{1}{2}}}{7,400}$$

(PVC ONLY)

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



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)

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)
D.I.P.			0.0001839	
D.I.P.			0.0001839	
D.I.P.			0.0001839	
D.I.P.			0.0001839	
D.I.P.			0.0001839	
D.I.P. (Sum of Above):				
PVC (From Formula 2):				
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):

$$\text{FORMULA NO. 3} \quad L = \frac{SD P^{\frac{5}{2}}}{133,200}$$

(D.I.P. ONLY)

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

Revised: January 1, 2017

Revised By: KGL

Approved By: CDR

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

☐

Location:

☐

Paved Area

☐

Grassed Area

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

Comments: _____

Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____

WATER METERS, VALVES, HYDRANTS AND APPURTENANCES – SECTION 351

I. GENERAL

I.1. SCOPE OF WORK:

The Contractor shall furnish, install and test all gate valves, check valves and other special valves and appurtenances as shown on the drawings and herein specified. 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. If not approved otherwise by JEA, the typical valve spacing shall be 800 (maximum) feet intervals within residential areas and 500 (maximum) feet intervals within industrial and commercial areas. If possible, gate valves shall be installed nearest a TEE or CROSS fitting (exceptions may include work within DOT right-of-way and work outside of Duval County). The contractor shall field check all exposed bolts on all valves to insure that they are tight prior to installation. All water meters shall be installed by JEA.

I.2. 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. 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.3. LOCATING MARKERS FOR VALVES:

A 'V' cut shall be carved in the curb/asphalt closest/adjacent to a below grade valve. This 'V' cut shall be painted blue. Water services serving vacant lots (service not in use), shall include a "W" cut in the curb (closest to the meter box), and painted blue.

I.4. WARRANTY:

The Contractor shall supply to JEA a Two (2) year unconditional warranty after substantial project completion or acceptance or any designated portion thereof. 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.5. INSPECTION CHECKLIST:

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/operation of each new and rehabilitated fire hydrant, meter box and valve. The Contractor's representative shall complete the associated JEA Final Inspection Checklist for each new or rehabilitated fire hydrant, meter box and valve, 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.

II. WATER METERS 5/8" THRU 1"

II.1. ELECTROMAGNETIC FLUID OSCILLATOR METERS:

The following specification shall apply to JEA 5/8", 5/8"x3/4", 3/4" and 1" electromagnetic of fluid oscillator technology, Type Cold Potable Water Meters. Meters furnished under these specifications shall be capable of measuring cold water flow by means of electromagnetic of fluid oscillator technology with no moving parts and shall be equipped with a field programmable, tamperproof and hermetically sealed electronic register with LCD display.

II.1.1. Specifications:

- II.1.1.1. Electromagnetic of fluid oscillator technology type cold potable water meters shall be manufactured in accordance with the latest revision of the NSF/ANSI Standard-61 Annex F and G, American Water Works Association Standard C700, C710, C713. With particular reference to flow capacity, pressure loss, accuracy, physical dimensions, design, and material of construction.
- II.1.1.2. Meters shall be compliant with JEA's current Automated Meter Reading System and Automated Meter Reading Transmitter.
- II.1.1.3. The meters shall be new, unused and the most current production model at the time of the procurement.
- II.1.1.4. All meter registers shall be tamper proof or tamper resistant.
- II.1.1.5. Meters shall be touch read capable and registers shall be equipped with a pit lid style touch pad to plug into the current Automated Meter Reading Transmitter.
- II.1.1.6. The outer surface of the meter main case shall be permanently marked with meter serial number, size, model, and direction of flow.
- II.1.1.7. The meter main case shall have the manufacturer's serial number marked/etched upon the register lid and on top of the main case. The serial number shall be 8 digits and indicate or otherwise represent the date of manufacture.
- II.1.1.8. A 2 D bar code representing the 8 digit serial number shall be permanently and clearly marked/etched/labeled on the register face under the glass and be able to be read by barcode scanning devices.
- II.1.1.9. The 5/8" to 1" size meters shall have a male pipe thread connection with dimensions as indicated in AWWA C700-9.
- II.1.1.10. The meter register shall be constructed of heat tempered glass, permanently hermetically sealed meeting the IP-68 requirements and tamper resistant with sufficient strength and hardness to resist destructive force and scratching. The register housing shall be constructed and equipped with a hinged lid, which shall be recessed or designed to overlap the register to protect the reading area. The register lid shall be securely attached to the register housing. Fogging

shall not occur during the warranty period. Glass registers must be designed to prohibit water and mud from collecting over reading area.

- II.1.1.11. All meters shall register in US gallons and must be clearly marked.
- II.1.1.12. The meter shall be supplied with a straight reading odometer-type indicator that contains a minimum of nine (9) number digits. Eight (8) number digits shall be electronically activated to read into the current JEA Automated Meter Reading System starting at the one gallon increment. The number digits reading less than one (1) US gallon shall not be electronically activated.
- II.1.1.13. Meters shall have the ability to log and store data for a period no less than thirty (30) days at an hourly interval and must be able to have data extracted while meter is in service by field personnel.
- II.1.1.14. Meter register shall include a direction of flow indicator registering both forward and reverse flow.
- II.1.1.15. Meters shall pass JEA's current bench testing standard operating procedure in accordance with AWWA C-700 accuracy standards for new water meters.
- II.1.1.16. Reclaimed meters shall be supplied with a pantone 522C colored reclaimed package consisting of a pantone 522C color faced register stating "No Drink" in English and Spanish with the international no drink logo. The main case shall have a permanent stamp also stating "No Drink".
- II.1.1.17. All meters shall be accompanied with a tag attached to the meter including documentation of actual manufacturer test results to include high, medium and low flow test results for each individual water meter, a 2 D bar code representing the 8 digit serial number, manufacture date, manufacturer's part number and meter description at the time of delivery. Manufacturer shall be responsible for the delivery of all meters in a first class condition. Inspection and testing of meters shall be made by JEA at the time of delivery. Any shipments failing to pass such inspection and/ or tests shall be returned to the manufacturer and replaced by the manufacturer, all at no cost to JEA.
- II.1.1.18. In the event that a particular meter model, register or any part thereof is discontinued or superseded, a sample of the alternative or successor model shall be submitted to JEA for testing and evaluation prior to approval and a bid award as an acceptable alternate meter model, register or any part thereof .

II.1.2. METER WARRANTY:

The following minimum warranty shall be required for meter sizes 5/8" thru 1" and shall be in addition to the manufacturer's standard warranty.

- II.1.2.1. The sealed register shall be guaranteed against defects in materials, battery life and workmanship from the date of acceptance by JEA for a period not less than twenty (20) years. All registers failing during this period shall be replaced at absolutely no cost to JEA for the first ten (10) years and pro-rated thereafter.

- II.1.2.2. The manufacturer shall warranty that all meters will perform to American Water Works Association (AWWA) new meter accuracy standards for a period of twenty (20) years from date of acceptance by JEA from the manufacturer. The meter shall be considered not performing as warranted if it fails to pass JEA's current bench testing standard operating procedure in accordance with AWWA C-700 accuracy standards for new water meters.
- II.1.2.3. All meters that do not meet these accuracy requirements shall be returned to the manufacturer at their expense and shall be replaced with new meters.

II.2. BRASS POSITIVE DISPLACEMENT METERS:

The following specification shall apply to JEA 5/8", 5/8"x3/4", 3/4" and 1" Positive Displacement Type Cold Potable Water Meters.

II.2.1. Specifications:

- II.2.1.1. Brass positive displacement type cold potable water meters shall be manufactured in accordance with the latest revision of the American National Standards Institute/American Water Works Association C700 Standard. With particular reference to flow capacity, pressure loss, accuracy, physical dimensions, design, and material of construction.
- II.2.1.2. Meters shall be compliant with JEA's current Automated Meter Reading System and Automated Meter Reading Transmitter.
- II.2.1.3. The meters shall be new, unused, and the most current production model at the time of the procurement.
- II.2.1.4. All meter registers shall be tamper proof or tamper resistant.
- II.2.1.5. Meters shall be touch read capable and registers shall be equipped with a pit lid style touch pad to plug into the current Automated Meter Reading Transmitter.
- II.2.1.6. The outer surface of the meter main case shall be permanently marked with meter serial number, size, model, and direction of flow.
- II.2.1.7. The meter main case shall have the manufacturer's serial number marked/etched upon the register lid and on top of the main case. The serial number shall be 8 digits and indicate or otherwise represent the date of manufacture.
- II.2.1.8. A 2 D bar code representing the 8 digit serial number shall be permanently and clearly marked/etched/labeled on the register face under the glass and be able to be read by barcode scanning devices.
- II.2.1.9. The 5/8" to 1" size meters shall have a male pipe thread connection with dimensions as indicated in AWWA C700-9.
- II.2.1.10. The meter register shall be constructed of heat tempered glass, permanently hermetically sealed meeting the IP-68 requirements and tamper resistant with sufficient strength and hardness to resist destructive force and scratching. The register housing shall be constructed and equipped with a hinged lid, which shall be recessed or designed to overlap the register to protect the reading area. The register lid shall be securely attached to the register housing. Fogging

shall not occur during the warranty period. Glass registers must be designed to prohibit water and mud from collecting over reading area.

- II.2.1.11. All meters shall register in US gallons and must be clearly marked.
- II.2.1.12. The meter shall be supplied with a straight reading odometer-type indicator that contains a minimum of nine (9) number digits. Eight (8) number digits shall be electronically activated to read into the current JEA Automated Meter Reading System starting at the one gallon increment. The number digits reading less than one (1) US gallon shall not be electronically activated. No change gears shall be allowed for accuracy calibration.
- II.2.1.13. Meter register shall include a direction of flow indicator registering both forward and reverse flow.
- II.2.1.14. Meters shall pass JEA's current bench testing standard operating procedure in accordance with AWWA C-700 accuracy standards for new water meters.
- II.2.1.15. Reclaimed meters shall be supplied with a pantone 522C colored reclaimed package consisting of a pantone 522C color faced register stating "No Drink" in English and Spanish with the international no drink logo. The main case shall have a permanent stamp also stating "No Drink".
- II.2.1.16. All meters shall be accompanied with a tag attached to the meter including documentation of actual manufacturer test results to include high, medium and low flow test results for each individual water meter, a 2 D bar code representing the 8 digit serial number, manufacture date, manufacturer's part number and meter description at the time of delivery. Manufacturer shall be responsible for the delivery of all meters in a first class condition. Inspection and testing of meters will be made by JEA at the time of delivery. Any shipments failing to pass such inspection and/ or tests shall be returned to the manufacturer and replaced by the manufacturer, all at no cost to JEA.
- II.2.1.17. In the event that a particular meter model, register or any part thereof is discontinued or superseded, a sample of the alternative or successor model shall be submitted to JEA for testing and evaluation prior to approval and a bid award as an acceptable alternate meter model, register or any part thereof.
- II.2.1.18. The meter main case shall be made of an American Water Works Association C700 bronze casting composition standard material meeting the 2014 EPA standards for lead free brass, with a bolted split case arrangement and bottom plate that meets American Water Works Association C700 4.1 and 4.2 non-breakable standards with stainless steel bolt fasteners.
- II.2.1.19. All meters shall be the nutating disc or oscillating piston type with the measuring chamber manufactured with a nickel mix bronze (consisting of a minimum of 19% and a maximum of 21.5% nickel), tinned bronze or a corrosion resistant thermoplastic material.

II.2.2. METER WARRANTY:

The following minimum warranty shall be required for meter sizes 5/8" thru 1" and shall be in addition to the manufacturer's standard warranty.

- II.2.2.1. The sealed register shall be guaranteed against defects in materials and workmanship from the date of acceptance by JEA for a period not less than ten (10) years. All registers failing during this period shall be replaced at absolutely no cost to JEA. The manufacturer shall warranty that all meters will perform to American Water Works Association (AWWA) new meter accuracy standards for a period of fifteen (15) years or 1.5 million gallons from date of acceptance by JEA from the manufacturer. The meter shall be considered not performing as warranted if it fails to pass JEA's current bench testing standard operating procedure in accordance with AWWA C-700 accuracy standards for new water meters.
- II.2.2.2. All meters that do not meet these accuracy requirements shall be returned to the manufacturer at their expense and shall be replaced with new meters.

III. COMMERCIAL RATED DOMESTIC WATER METERS, FIRE RATED WATER METERS AND RECLAIMED WATER METERS

III.1. GENERAL:

These Specifications set forth the JEA design criteria and performance requirements for Commercial Rated Domestic, Fire Rated and Reclaimed Water Type Cold Water Meters. These meters will be utilized in commercial and industrial applications for water measurement and critical billing where a wide flow range is anticipated. JEA is requiring meters that shall meet or exceed all the requirements of ANSI/AWWA Standard C701 for Class II Turbine, C702 for Compound and C703 for Fire Rated Water meter assemblies. Meters purchased in accordance with this specification shall be designed, manufactured and tested to meet performance capabilities of continuous operation from low flow up to the rated maximum flows without affecting the meters long-term accuracy or causing any undue component wear.

III.2. COMMERCIAL DOMESTIC RATED WATER METERS.

- III.2.1. The meters required per this specification shall be the 3", 4" and 6" sizes.
 - III.2.1.1. 3" Potable Compound
 - III.2.1.2. 3" Potable Turbine
 - III.2.1.3. 4" Potable Compound
 - III.2.1.4. 4" Potable Turbine
 - III.2.1.5. 6" Potable Compound
 - III.2.1.6. 6" Potable Turbine
- III.2.2. The meter maincase shall meet the 2014 lead free standards, consisting of brass, stainless steel or single ductile iron composition with a fusion-bonded epoxy coating which adheres to NSF (National Science Foundation) for non-lead regulation compliance.
- III.2.3. Meters shall be supplied with an integral strainer and a test port, both accessible from the top of the meter.
- III.2.4. The Strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be identical

to that of the meter's maincase. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and physical dimensions:

Meter Size	Maximum Operating Pressure	Centerline to Strainer Base	Overall Length (Not to Exceed)
3"	200 psig	4-1/8 inches	17 inches
4"	200 psig	4-3/4 inches	20 inches
6"	200 psig	5-3/4 inches	24 inches

- III.2.5. Meters purchased in accordance with this specification shall meet or exceed all requirements of ANSI/AWWA Standard C701 and C702 for Class II compound meter lay lengths and turbine meter assemblies. Each meter assembly shall be factory performance tested prior to shipment to ensure standard compliance.
- III.2.6. Meter assemblies shall be manufactured to operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).
- III.2.7. All meters shall have low flow measuring capabilities per the meter operating characteristics requirement chart listed below to accurately measure consumption for billing and water conservation.
- III.2.8. The meter assemblies shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum head-loss through the meter / strainer assembly shall not exceed those listed in the following table per each meter size:

Meter operating characteristics requirements:

Meter Size	Low Flow (95% Min.)	Operating Range (98.5 - 101.5%)	Intermittent Flows	Pressure Loss (Not to Exceed)
3"	0.5 gpm	1.0 to 400 gpm	500 gpm	3.2 psi @ 400 gpm
4"	0.75 gpm	1.5 to 800 gpm	1000 gpm	6.4 psi @ 800 gpm
6"	1.5 gpm	3.0 to 1600 gpm	2000 gpm	5.5 psi @ 1600 gpm

- III.2.9. The 3", 4" and 6" meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.
- III.2.10. The meters shall be equipped with all-electronic register and no mechanical gearing.
The electronic register shall include the following list of features:
 - III.2.10.1. AMR resolution units fully programmable
 - III.2.10.2. Pulse output frequency fully programmable
 - III.2.10.3. Display of total consumption
 - III.2.10.4. Integral data logging capability for at least thirty one days
 - III.2.10.5. Integral resettable accuracy testing feature
 - III.2.10.6. Large, easy-to-read LCD display

III.2.10.7. 10-year battery life guarantee

- III.2.11. All meters shall have a direct magnetic drive between the motion of the measuring element blade position and the electronic register. Any and all additional intermediate, magnetic or mechanical drive couplings shall not be acceptable.
- III.2.12. The meter register shall read 8 numbers and have Touch Read (TR) proven interface. The meter shall also have the capabilities to connect with a plug and play type touch couple connection to the JEA's current Automated Meter Reading System and Automated Meter Reading Transmitter.
- III.2.13. The meters shall be supplied with a straightening vane assembly that is positioned directly upstream of the measuring element. The straightening vane shall be an integral component of the measuring chamber.
- III.2.14. All meter packages shall display the sizes, model, manufacturer name, and direction of flow. Such displays shall also be cast on the side of the meter maincase.
- III.2.15. Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment.
- III.2.16. All meters received by JEA will be tested. Any meter that does not meet this specification will be rejected.

IV. COMMERCIAL FIRE RATED WATER METERS:**IV.1. GENERAL:**

These Specifications set forth the JEA design criteria and performance requirements for Fire Rated Water Meters. These Water meters shall be Combination Dual Fire Service Type, consisting of two (2) Class II turbine type meters, a ductile iron strainer assembly and a weighted detector check valve. This meter assembly is intended for use where an extremely wide flow range is required and where measurement of both domestic and fire service water usage is essential. The meter assembly package shall comply with the latest ANSI/AWWA Standard C-703. Meters purchased in accordance with this specification shall be designed, manufactured and tested to meet performance capabilities of continuous operation from low flow up to the rated maximum flows without affecting the meters long-term accuracy or causing any undue component wear.

IV.2. COMMERCIAL FIRE RATED METERS.

- IV.2.1. The Commercial Fire Rated meters required per this specification shall be the 4", 6", 8" and 10" sizes.
 - IV.2.1.1. 4" Potable/Fire
 - IV.2.1.2. 6" Potable/Fire
 - IV.2.1.3. 8" Potable/Fire
 - IV.2.1.4. 10" Potable/Fire

Each Fire Rated meter assembly shall have a separate UL (Underwriters' Laboratories) listed and FM (Factory Mutual Research) approved external fire service strainer as a part of the meter package. The strainer's screen shall have a minimum net open area of at least four (4) times the pipe opening and be a V-shaped stainless steel screen for the purpose of maintaining a full unobstructed

flow pattern. The strainer body shall be coated ductile iron with stainless steel fasteners capable of maintaining the following static pressure ratings as listed in the table below.

The maximum overall length of the unit as listed below shall be the face-to-face dimensions:

Meter Size	Pressure Test Rating	Centerline To Strainer Base	Overall Length (Not To Exceed)
4"	350 psig	4-1/2 inches	33 inches
6"	350 psig	5-3/4 inches	45 inches
8"	350 psig	6-3/4 inches	53 inches
10"	350 psig	8-1/2 inches	68 inches

- IV.2.2. The bypass assembly piping size shall be 1-1/2" for 4" and 2" for 6", 8" and 10" sizes. The assembly piping shall be bronze with threaded connections. The assembly shall also consist of an 1-1/2" or 2" turbine meter with flanged connections, one (1) bronze body check valve downstream of the meter and two (2) bronze lockable ball valves one located upstream and one located downstream of the meter to be used as isolation valves. The detector check valve operation shall be considered critical to the overall performance of the meter assembly. The detector check valve shall be positioned directly downstream of the mainline turbine type.
- IV.2.3. The meter maincase shall meet the 2014 lead free standards, consisting of brass, stainless steel or single ductile iron composition with a fusion-bonded epoxy coating which adheres to NSF (National Science Foundation) for non-lead regulation compliance.
- IV.2.4. The flange size, model and direction of flow shall be cast in raised characters on both sides of the maincase. Straightening vanes shall be assembled in both meter maincases.
- IV.2.5. The measuring chambers shall consist of a measuring element, calibration device and register. The measuring element shall be mounted on a horizontal, stationary, stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring chamber shall be capable of operating within accuracy limits without calibration when transferred from one maincase to another of the same size.
- IV.2.6. All reduction gearing shall be enclosed in the permanently hermetically sealed register. The drive magnet shall be located in the measuring element, and the follower magnet shall be located inside the permanently hermetically sealed register. An intermediate magnetically active material shall be required to distribute the magnetic flux uniformly to the follower magnet, thereby improving service life, low flow sensitivity, extended flow capacity and overall accuracy of the entire combination meter assembly.
- IV.2.7. The standard totalizing register shall have a stainless steel cup and tempered glass lens. The register shall be permanently hermetically sealed; all registers of similar size and registration shall have a standard gear ratio reduction so as to permit complete register interchangeability. The register shall be assembled to the measuring chamber in a tamperproof manner so removal can be made only after the measuring chamber is removed from the maincase. Sweep-hand reading

and odometer wheel details shall conform to American Water Works Standard C-701. A low flow indicator shall be included in the register assembly and be visible on top of the register's dial face.

- IV.2.8. The meters shall operate properly without leakage, damage or malfunction up to a maximum pressure of 175 pounds per square inch (psig).
- IV.2.9. All meters, 4" to 10" sizes, must have internal straightening vanes installed and retained firmly in the inlet portion of the maincase to maximize meter performance and accuracy.
- IV.2.10. Fire rated meters shall be supplied with a built in test port.
- IV.2.11. Each fire rated meter shall be shipped to JEA fully assembled and ready to install.
- IV.2.12. The meter register shall read 8 numbers, read in gallons and have Touch Read (TR) proven interface. The meter shall also have the capabilities to connect with a plug and play type touch couple connection to the JEA's Landis and Gyr meter transmitting unit.
- IV.2.13. Meter assemblies shall have performance capabilities of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. All meter assemblies shall also have a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. In addition, the meter assemblies shall be capable of measuring a minimum of 90% of actual water consumption at prescribed crossover flow rates. Maximum head loss through the meter assemblies shall not exceed those listed in the following table based on meter size.

Meter Size	Continuous Flows	Intermittent Flows	Low Flows
4":	4 to 1000 gpm	1250 gpm	3 gpm
6"	4 to 2000 gpm	2500 gpm	3 gpm
8"	4 to 3500 gpm	4400 gpm	3 gpm
10"	4 to 5500 gpm	7000 gpm	3 gpm
Meter Size	Accuracy @ Crossover (Approx.)	Headloss (Not To Exceed)	N/A
4"	90% @ 30 gpm	8.5 psi @ 1000 gpm	N/A
6"	90% @ 50 gpm	9.4 psi @ 2000 gpm	N/A
8"	90% @ 50 gpm	13.4 psi @ 3500 gpm	N/A
10"	90% @ 60 gpm	12.5 psi @ 5500 gpm	N/A

V. COMMERCIAL RECLAIMED RATED WATER METERS:

V.1. GENERAL:

These specifications set forth the JEA design criteria and performance requirements for Turbine-type cold water meters. These meters shall be utilized in commercial and industrial applications for Reclaimed Water Measurement and critical billing where a wide flow range is anticipated. The meter package shall meet or exceed all requirements of ANSI/AWWA Standard C701 for Class II turbine meter assemblies. Each meter assembly shall be performance tested to ensure compliance

Meters purchased in accordance with this specification shall be designed, manufactured and tested to meet performance capabilities of continuous operation from low flow up to the rated maximum flows without affecting the meters long-term accuracy or causing any undue component wear.

V.2. COMMERCIAL RECLAIMED RATED WATER METERS

V.2.1. The meters required per this specification shall be 1-1/2", 2", 3", 4" and 6" sizes.

V.2.1.1. 1.5" Reclaim

V.2.1.2. 2" Reclaim

V.2.1.3. 3" Reclaim

V.2.1.4. 4" Reclaim

V.2.1.5. 6" Reclaim

The meter maincase shall meet the 2014 lead free standards, consisting of brass, stainless steel or single ductile iron composition with a fusion-bonded epoxy coating which adheres to NSF (National Science Foundation) for non-lead regulation compliance.

V.2.2. The meter assembly shall operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psi).

V.2.3. The meter's register shall be all-electronic and shall not contain any mechanical gearing to display flow and accurate totalization.

The electronic register shall include the following partial list of features:

V.2.3.1. AMR (Automatic Meter Reading) resolution units fully programmable

V.2.3.2. Pulse output frequency fully programmable

V.2.3.3. Display total consumption

V.2.3.4. Integral data logging capability for at least thirty one days

V.2.3.5. Integral resettable accuracy testing feature

V.2.3.6. Large, easy-to-read LCD display

V.2.3.7. 10-year battery life guarantee

V.2.4. Any and all additional intermediate, magnetic or mechanical drive couplings are not acceptable.

V.2.5. Registers shall be 8 digits and colored pantone purple.

V.2.6. A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber. Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3", 4", and 6" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

V.2.7. All sizes of meter packages shall display the sizes, model, manufacturer name, and direction of flow. Such display shall be cast on the side of the meter maincase. Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment. In addition, the meter supplier shall submit nationally published literature clearly outlining its factory maintenance program and current price schedule covering complete measuring chamber exchange.

- V.2.8. The meter strainer shall be integral and cast as a part of the main case. The Strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-bonded epoxy identical to that of the meter's main case. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and physical dimensions:

Meter Size	Maximum Operating Pressure	Centerline to Strainer Base	Overall Length (Not to Exceed)
1-1/2"	200 psig	2-5/16 inches	13 inches
2"	200 psig	2-5/16 inches	17 inches
3"	200 psig	4-1/8 inches	19 inches
4"	200 psig	4-3/4 inches	23 inches
6"	200 psig	5-3/4 inches	27 inches

V.2.9. 1-1/2"-2" RECLAIMED METERS

- V.2.9.1. Reclaimed Meters shall be supplied with the 2 bolt oval flange configuration for installation purposes.
- V.2.9.2. The meter register shall read 8 numbers and have Touch Read (TR) proven interface. The meter shall also have the capabilities to connect with a plug and play type touch couple connection to the JEA's current Automated Meter Reading System and Automated Meter Reading Transmitter.
- V.2.9.3. The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum headloss through the meter / strainer assembly shall not exceed those listed in the following table per meter size

Meter operating characteristics requirements:

Meter Size	Low Flow (95% Min.)	Operating Range (98.5 - 101.5%)	Intermittent Flows	Pressure Loss (Not to Exceed)
1-1/2"	.75 gpm	1.25 to 160 gpm	200 gpm	6.9 psi @ 160 gpm
2"	1.0 gpm	1.5 to 200 gpm	250 gpm	7.0 psi @ 200 gpm

V.2.10. 3"-6" RECLAIMED METERS

- V.2.10.1. Shall have flanged ends with a built in test port for installation purposes.
- V.2.10.2. The meter register shall read 8 numbers and have Touch Read (TR) proven interface. The meter shall also have the capabilities to connect with a plug and play type touch couple connection to the JEA's current Automated Meter Reading System and Automated Meter Reading Transmitter.

- V.2.10.3. The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum headloss through the meter / strainer assembly shall not exceed those listed in the following table per meter size

Meter operating characteristics requirements:

Meter Size	Low Flow (95% Min.)	Operating Range (98.5 - 101.5%)	Intermittent Flows	Pressure Loss (Not to Exceed)
3"	1.5 gpm	2.5 to 500 gpm	650 gpm	5.1 psi @ 500 gpm
4"	2.0 gpm	3.0 to 1000 gpm	1250 gpm	8.7 psi @ 1000 gpm
6"	2.5 gpm	4.0 to 2000 gpm	2500 gpm	8.2 psi @ 2000 gpm

V.3. AUTOMATED METER READING TRANSMITTER:

- V.3.1. Radio read devices shall communicate, operate and be approved by Landis and Gyr. Meter transmitting units shall be designed for pit set installation of the dual port type so they may be touch read compatible as well as send a radio read.
- V.3.2. Radio read devices shall be labeled with its Lan ID No., version in series, date manufactured and barcode.
- V.3.3. The components of the radio read device shall be contained in water proof housings with no openings.
- V.3.4. The connection from the meter register to the meter transmitting unit shall be a plug and play touch couple connection.
- V.3.5. The device shall be made to fit a JEA approved water meter box and cover with 2" holes, see plate W-3 of the JEA Water and Wastewater Standards Manual.
- V.3.6. The radio read device shall be no larger than 4.43" W x 5.09" H x 4.6" D and be detachable. Any updates that are done to the programming shall first be tested with the current and past meters to confirm its compatibility.
- V.3.7. The Warranty on the Meter Transmission Unit or Radio Frequency Water device shall be guaranteed against defects in materials and workmanship from the date of acceptance by JEA for a period not less than ten (10) years. All failing units during this period shall be replaced at absolutely no cost to JEA.

VI. GATE VALVES

VI.1. GENERAL:

Gate valves shall be designed for 250 psi minimum working pressure. When full open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. The operating nut or wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydraulic pressure equal to 500 psi (twice the specified working pressure).

VI.2. BURIED VALVES:

Buried gate valves shall be iron body bronze mounted, all exterior mounted bolts and nuts shall be stainless steel, rubber or EDPM encapsulated, resilient seat, solid wedge, non-rising stem type with operating nuts and adjustable valve boxes and covers. Operating nuts shall be two inches square. Resilient seat or wedge type gate valves shall conform to applicable sections of AWWA Standards C509 (250 psi) or C-515. All gate valves 24 inches or larger must be geared for horizontal (bevel) or vertical (spur) installations. All valves 20 inch and smaller shall be installed vertically unless additional depth of bury is impossible due to physical obstructions. Valves 24 inch and larger may be installed vertically or horizontally (see construction plans).

VI.3. ABOVE GROUND VALVES:

Gate valves located above ground or inside structures shall be hand wheel operated, non-rising stem type with flanged ends and be of the same general construction as buried valves.

VI.4. VALVE JOINTS:

All gate valves shall have mechanical joint ends, flanged ends, or screw joints to fit the pipe run in which they are used, except valves installed on push-on joint pipe shall have mechanical joint ends unless otherwise specified.

VI.5. ROTATION OF OPENING:

All valves shall open by turning to the left or counter clockwise, when viewed from the stem.

VI.6. EXTENSION STEMS:

Where extension stems are required, substantial, adjustable wall brackets and extension stems shall be furnished and located as directed. Extension stems shall be provided on all buried valves when the operating nut is deeper than 30 inches below the final grade. Sufficient stem extension shall be provided so that the nut will be no more than 30 inches below finished grade.

VI.7. PAINTING OF VALVES AND VALVE BOX LIDS:

The top side of all water valve box covers and the inside of the top section of the valve box shall be painted blue except for gate valves at fire hydrants. The top of valve box covers and the inside of the top section of the valve box at fire hydrants shall be painted yellow. Oil based, traffic-rated paint shall be used. Privately owned and maintained fire hydrants and valves/valve box lids shall be painted red unless approved otherwise by the local Fire Marshall.

VI.8. HYDROSTATIC AND LEAKAGE TEST:

The Contractor shall be required to perform a separate hydrostatic/leakage field test on each valve installed to insure it is bubble tight. The duration of this test shall be 15 minutes at 150 psi and conform to AWWA C504. The method of performing this test shall be left up to Contractor with the Engineer's approval. The failure of the valve to perform will result in its removal from the job site and replacement by the Contractor at the contractor's expense.

VI.9. LOCATING MARKERS FOR VALVES:

A 'V' cut shall be carved in the curb/asphalt closest/adjacent to a below grade valve. This 'V' cut shall be painted blue. Water services serving vacant lots (service not in use), shall include a "W" cut in the curb (closest to the meter box), and painted blue.

VII. CHECK VALVES

Check valves shall conform to the requirements of AWWA C508. Check valves larger than 2 inch nominal size shall be iron body with stainless steel bolts and nuts, flanged ends, outside lever, spring loaded (stainless steel spring if available), swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc. Check valves larger than 2 inches shall be 150 psi working pressure. Check valves 2 inches and smaller nominal size shall be all brass swing check valves, 200 psi working pressure. Buried check valves shall be installed in an access box with traffic rated cover.

VIII. MISCELLANEOUS VALVES AND APPURTENANCES**VIII.1. TAPPING SLEEVES:**

To be utilized only for live tap applications or where specifically approved by JEA. No taps (all sizes) shall be made within 5 feet of a fitting, joint or tap. Unless approved otherwise by JEA, size-on-size taps are limited on PVC mains to 12 inch size and smaller. Size-on-size taps are acceptable on D.I.P. (all sizes). For size-on-size taps, on 8" and larger mains, the actual tap hole size shall be reduced by 1-inch.

VIII.1.1. Cast Iron, Mechanical Joint:

Cast Iron mechanical joint tapping sleeves shall be rated for 200 psi minimum for 4 inch through 12 inch and 150 psi minimum for sizes 14 inch through 24 inch and shall conform to ASTM A126. In lieu of a ductile tee fitting, a tapping sleeve may be utilized on 24 inch and larger D.I.P. for outlets 12 inch and smaller. Tapping flange conforming to ANSI B16.1, Class 125 with MSS SP-60. Tapping sleeves 8 inch and smaller may have outlet connection to fit a mechanical joint tapping valve. This sleeve shall not be utilized on PVC pipe larger than 12-inch.

VIII.1.2. Stainless Steel:

Stainless steel tapping sleeves may be used on 4 inch pipe and larger. Stainless steel tapping sleeves shall be all 304 stainless steel, including flanges, bolts and nuts and shall be rated for 150 psi minimum operating pressure and 200 psi minimum test pressure. The tapping sleeve shall have a pilot flange recessed for tapping per MSS SP-60. The pilot flange shall be pressure rated Class D according to AWWA C207 with 125 pound drilling conforming to ANSI B16. Each sleeve shall be supplied with a flanged gasket bonded to the flange. The body gasket shall be a full circle, grid pattern, converting the entire length of the sleeve, cloth reinforced with attached stainless steel bridge to support the gasket at the lugs. The gasket shall be made of SBR rubber or similar material, compounded for use with water, salt solution, mild acids, bases and sewage. The sleeve shall have a ¾ inch NPT bronze or stainless steel test plug. All welds shall conform to ASTM A380 and shall be fully passivated. Tapping sleeves 8 inch and smaller may have outlet connection to fit a mechanical joint tapping valve.

VIII.1.3. Carbon Steel:

Fabricated mechanical joint tapping sleeve may be used on 30 inch pipe and larger. Sleeve shall be rated for 150 psi (minimum), body shall meet ASTM 283 Grade C and be epoxy coated (10 mils minimum), alloy steel lug bolts, SBR wedge type gaskets and include ¾ NPT (minimum) test plug.

VIII.2. TAPPING VALVES:**VIII.2.1. General:**

Tapping valves shall be iron body with stainless steel bolts and nuts, bronze mounted gate valves, non-rising stem, open left, resilient seat, 2 inch square operating nut, for vertical mounting in approximately level setting on buried water lines. The valve ends shall be mechanical joint for use with ductile iron pipe on one side and standard flanged (Class 125) on the other. Tapping valves 8 inch size and smaller may be MJ by MJ valve ends to match sleeve (standard MJ gate valve). Valves shall conform to the applicable section of these specifications.

VIII.2.2. Disinfection of Tapping or Drilling Machine:

Prior to tapping a potable water main, the drilling machine's pilot drill, shell cutter and cutter hub shall be sterilized in accordance with the following procedure:

Four gallons of potable water shall be combined with 8 oz. of sodium hypochlorite (household bleach); the pilot drill, shell cutter and cutter hub shall be swabbed until clean or totally immersed in the sterilizing solution and allowed to remain wet at least five minutes before tapping operation commences. It is not necessary to rinse the sterilizing solution from tapping components prior to use.

VIII.2.3. Hydrostatic And Leakage Test:

After installing a tapping sleeve and valve, and prior to tapping of a pressurized water main, a hydrostatic and leakage test shall be performed. The test will be conducted by introducing water into a tap or test hole located at the neck of the outlet half of the sleeve, on sleeves furnished with said tap, and with the tapping valve in the closed position. Sleeves shall be provided with a test plug. The sleeve and valve shall be capable of maintaining a test pressure of 150 psi for 15 minutes duration, with no sign of visible leaks. All leaks shall be repaired by removing and replacing defective items with items free of defects, after which the sleeve and valve shall be re-tested. Such repair and re-testing shall be done until the installation passes the specified test. The Contractor shall furnish and install any necessary temporary restraints, gauges, pumps and other incidental and appurtenant items necessary to complete this work, and shall remove same upon completion of the test. A watertight plug (bronze or stainless steel), shall then be inserted into the test hole.

VIII.3. CORPORATION STOPS:

Corporation stops shall be required on all services, regardless of size, and shall be manufactured from cast bronze with machined fitting surfaces, and in accordance with AWWA C800 in sizes 3/4 inch through 2 inches. The inlet connection shall be AWWA standard corporation stop thread or iron pipe (IPT) thread. The outlet connection shall be a flare nut fitting for Type K copper tubing or a pack joint (or compression joint) outlet for copper or polyethylene tubing. Corporation stops shall be installed directly into the service saddle (no nipple between saddle and corp stop).

VIII.4. CURB STOP:

Curb stops shall be manufactured from cast bronze with machined fitting surfaces and in accordance with AWWA C800 in sizes 3/4 inch through 2 inches. Curb stop shall be full-port ball valve with check, combined cap and tee, with lock wing cast on stop body and operating tee cap to provide for locking the stop in closed position. Curb stops for use with copper services shall have an inlet connection with a flare nut fitting for Type K copper tubing. Curb

stops utilizing poly tubing shall have an inlet connection with a pack joint or compression joint. Curb stops for use with Schedule 40 PVC pipe shall have inlet connections with female iron pipe threads. All curb stops shall have an outlet connection with female iron pipe thread.

VIII.5. BALL VALVES:

Ball valves shall be limited to 3/4 inch through 2 inches in size and shall have cast bronze body, bronze tee head, stem with check, full round way opening and provisions for locking in a closed position. Ball valves for use with copper services shall have an inlet connection with a flare nut fitting for Type K copper tubing and an outlet connection with female iron pipe thread, or shall have an inlet connection with a compression joint (insert stiffener will be used with plastic service connections) and an outlet connection with female iron pipe thread. Ball valves for use with Schedule 40 PVC pipe shall have an outlet connection with female iron pipe threads and an inlet connection with either a compression joint or female iron pipe threads. The latter will require the use of an approved Schedule 40 PVC Adapter (MIPT X SLIP). Compression joints will require insert stiffeners. Below grade ball valves on water mains must have 2 inch operating nuts and be installed in standard valve boxes.

VIII.6. SERVICE SADDLE OR SERVICE TAPPING SADDLE:

VIII.6.1. Stainless-Steel Band Saddles:

Service saddles shall include stainless steel bands with either 3 mil thickness (minimum) epoxy or poly coated (malleable or ductile) iron body or 85 – 5 – 5 – 5 bronze body. Single band saddles may be utilized on new 1 inch water services which are installed on a dry 10 inch size or smaller water main. For wet taps or water mains 12 inch size and larger, a double band saddle is required. Outlet sizes shall be 1 inch through 2 inches and have iron pipe threads (IPS). The outside diameter range of the saddle shall be properly sized to conform to the type of pipe being tapped without placing undue stress on the pipe. Pipe shavings or cuttings, including coupon, shall not enter the host pipe during the tapping operation.

VIII.6.2. Brass Saddles:

Brass saddles may be utilized on new 1 inch and smaller water services which are installed on a dry 10-inch size or smaller PVC water main. The body and strap shall be 85 – 5 – 5 – 5 cast bronze and shall be specifically sized for C900 (OD) PVC pipe. Bolts shall be silicon bronze grade or stainless steel. The strap shall be hinged or 2-piece design and tapped to eliminate the need for a nut (no loose nuts). Gasket shall be grade 60 "O" ring or equal and cemented in place.

VIII.7. AIR RELEASE VALVES:

Air release valve shall be automatic float operated, all stainless steel trim and shall be designed for air release only (a check valve on the outlet is required to prevent air from re-entering the pressurized water main). Valve shall be stainless steel or Nylon body including 1" inlet (min.), stainless steel compound lever design and compliance with AWWA C-512. Install air valve with double stainless steel band saddle and corporation stop (connected directly into saddle with no nipples). All 2' and smaller piping associated with this installation shall be galvanized (SCH 40) or stainless steel. Piping larger than 2" size shall be ductile iron. If the installation of the ARV requires a manhole, then the manhole shall be installed similar to the requirements of wastewater construction detail S-29, including off-set piping, support bracket and other appurtenances as shown (no specialty interior manhole lining; stainless steel pipe is optional). Acceptable air valve: ARI D-025-P or JEA approved equal.

IX. FIRE HYDRANTS**IX.1. GENERAL:**

Fire hydrants shall be 5 1/4 inch ductile iron body, dry-barrel, fully bronze mounted, for minimum 150 psi working pressure, complying with ANSI/AWWA Standard C502, Associates Factory Mutual Fire Insurance Companies and listed with Underwriters Laboratories. The inlet connection shall be 6-inch mechanical joint type. All nut and bolts shall be 304 stainless steel. The integral shut-off valve shall be compression type opening against water pressure and open left (counter-clockwise) as marked on the bonnet. The main valve seat and the threaded portion of the hydrant into which it screws shall be bronze or stainless steel. The hydrant barrel drain valve and port shall be bronze. The hydrant barrel drain shall be actuated by operation of the main valve stem. The stem operating threads and thrust bearing shall be sealed, by "O" rings, from exposure to moisture and shall be provided with means for lubrication. The hose nozzles shall be bronze with National Standard fire hose coupling screw threads, one 4½ inch pumper nozzle and two 2½ inch hose nozzles. The hydrant operating nut and nozzle cap nuts shall be pentagon shaped (5-sided) measuring 1½ inches from point to flat. The nozzle caps shall be securely chained to the hydrant barrel and be constructed of heavy duty corrosion-resistant material. The hydrants shall be "Traffic" type with a frangible flange or lugs and operating stem section at the ground level. The outside surface of the upper barrel (top) of the hydrant and all above ground piping shall be primed and then painted with "Traffic Yellow" color (RUS-KIL Enamel – International yellow or equal). The base (shoe) shall be painted with a minimum 4 mils thick epoxy (inside and outside surfaces). The lower barrel (inside and outside surfaces) and the inside surface of the upper barrel shall be asphaltic or epoxy coated.

IX.1.1. Fire Hydrants Located Outside of Duval County:

Fire Hydrants located outside of Duval County shall meet the specific requirements (material and location) of that county, fire department or municipality.

IX.2. RAISED PAVEMENT MARKERS:

- IX.2.1. The blue reflective markers shall consist of a molded methyl methacrylate or an acrylonitrile butadiene-styrene (ABS) shell filled with a mixture of an inner thermostating compound and filler material.
- IX.2.2. The marker shall have a maximum width of five (5) inches and a maximum height of 0.75 inch. The minimum area of each reflective face shall be 1.5 square inches. The outer surface shall be smooth and all corners and edges exposed to traffic shall be rounded. The base shall be substantially free of glass or substances that may reduce their bond to adhesive.
- IX.2.3. The marker shall support a minimum load of 2,000 pounds when tested in accordance with a manufacturer developed test approved by the Florida Department of Transportation.
- IX.2.4. Bituminous adhesive as recommended by the marker manufacturer shall be used for bonding the markers to the pavement. The adhesive used shall be one of the products included on the Florida Department of Transportation (F.D.O.T.) Qualified Products List. Reflective markers shall be installed in such a manner that the reflective face of the marker is perpendicular to a line parallel to the roadway centerline. The blue reflective markers shall be placed in the center of the travel lane, directly across from and adjacent to each fire hydrant.

X. VALVE BOXES**X.1. GENERAL (CONCRETE COLLAR AND VALVE TAGS):**

The Contractor shall furnish, assemble and install a valve box for each buried valve. Each valve box installed in un-paved areas shall be installed with a 24 inch round or square, 6 inch thick concrete collar with #4 reinforcing rebar rings, poured around the top of the valve box cover. The concrete shall have a minimum strength of 3000 psi. In lieu of a poured concrete collar, a pre-cast concrete valve pad may be utilized which meets the requirements below. Provide brass identification tag with "Water", valve size, valve type and direction and number of turns to open. Provide a ¼ inch hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2 inch diameter and ⅝ inch thick brass with a ¼ inch hole.

X.2. VALVE BOXES:

Adjustable valve boxes of suitable length shall be used. Cover shall be marked "Water". The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade. The base shall be centered over the valve and shall be on line with nut at top of valve stem and the entire assembly shall be plumb. Boxes shall be cast iron. Cast iron castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM Designation A48, Class 20B, Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, or other harmful defects and shall be coated with a single thin coat of coal tar epoxy. The cover will not rock after it has been seated in any position in its associated jacket.

X.3. PRECASE CONCRETE VALVE PAD:

The concrete valve pad shall consist of the following:

- X.3.1. Concrete rated at 4,000 psi (minimum). Fiber mesh re-enforcement is optional. Concrete shall be smooth and in one piece, with no cracks.
- X.3.2. Pad must include two #2 (minimum) steel rebar rings for structural support.
- X.3.3. Concrete thickness shall be 4 inches at the center and tapered to 2 inches at the outside edges.
- X.3.4. The dimensions shall be 23-1/2 inches OD (minimum) with a 10 inch OD centered hole.

This installation shall include applying grout in the annular space between the OD of the valve box and concrete pad. For support and adhesion, the grout shall be placed in the entire 4 inch vertical annular area within the pad open hole space. The concrete pad must be placed on firm compacted sand. The top of the concrete pad shall be level with the top of the cast iron valve box and level with grade. The required brass valve identification tag shall be attached to wire with electric tie straps to the inside of the cast iron valve cover.

X.4. VALVE BOX DEBRIS SHIELD:

- X.4.1. All buried valves 3-inch through 12-inch requiring a valve box shall be furnished with a valve box shield (alignment device). The device shall minimize debris infiltration and center the valve box over the operating nut. The device shall be of HDPE or plastic and colored white or black. It shall be furnished in two pieces that will lock together under the operating nut without requiring the removal of the op nut. The device shall not affect the operation of the valve. No one-piece device will be accepted. The device shall be Box Lok American Flow Control (AFC) or approved equal.

XI. METER BOXES**XI.1. POLYMER CONCRETE (FOR 2 INCH AND SMALLER METERS):**

Polymer Concrete (for 2 inch and smaller meters) meter boxes and lids shall be manufactured using fiberglass reinforced materials and polymer concrete. The body of the box shall be manufactured using fiberglass reinforced materials, comprised from polyester resins and fiberglass matting. The top color of the box shall be manufactured from poured polymer concrete and shall be off-white color to match cover. The top (cover shall be manufactured using polymer concrete (off-white color). The size of the meter box and load ratings shall be as specified in the standard details (plates). To obtain approval by JEA, the load ratings shall be certified by a professional engineer or state certified testing lab. The lid shall also be certified by Cellnet Technology and Sensus Metering Systems to be "RF" compatible with the Sensus MTU.

XI.2. LARGE METER BOXES (FOR 3 INCH AND LARGER METERS) :

The large meter box shall meet the specification requirements as shown on water construction Detail No. W-8.

XII. BACKFLOW PREVENTION DEVICES

Where called for on the drawings, the backflow prevention devices shall be the type as listed in JEA's "Rules and Regulations for Water and Wastewater Services" manual. If reclaimed water is available for irrigation use, the potable water customer is required to install and maintain a JEA approved cross-connection device on their potable water service line (see water construction detail W-15). Operation and maintenance of this cross-connection device shall comply with JEA's cross-connection control program and associated operating policies. All reduced pressure assemblies shall be mounted above grade.

XIII. DUCTILE IRON BODY INSERT VALVE**XIII.1. XI.I. GENERAL:**

The Ductile Iron 250 p.s.i.g. rated Insert Valve shall be a Resilient Wedge Gate Valve designed for use in potable water, raw water, reclaimed water, sewage, irrigation and backflow control systems. The design will allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service. The insert valve shall be a Team Industrial Services Insert Valve or JEA approved equivalent.

XIII.2. DUCTILE IRON BODY:

XIII.2.1. The ductile iron body, bonnet and wedge shall meet or exceed the requirements of AWWA C515 with 250 psig maximum working pressure. The pressure rating markings must be cast into the body of the insert valve. The Insert Valve shall be ductile iron construction meeting ASTM A536 Grade 65-45-12.

XIII.2.2. Valve bodies sized 12" and smaller shall be capable of installation on Cast/Grey Iron or Ductile Iron Class A B C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body.

XIII.2.3. Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.

XIII.3. RESILIENT WEDGE GATE ASSEMBLY:

XIII.3.1. The construction of the Resilient Wedge shall comply with AWWA C509.

- XIII.3.2. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process.
- XIII.3.3. The resilient wedge shall seat on the valve body and not the carrier pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe.
- XIII.3.4. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal.
- XIII.3.5. Pressure equalization on the down or upstream side of the closed wedge shall not be necessary to open the valve.
- XIII.3.6. The wedge shall be symmetrical and seal equally with flow in either direction.
- XIII.3.7. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. The resilient wedge must have more support than the operating stem as the resilient wedge enters and exits the water (fluid) way
- XIII.4. FUSION BOND EPOXY COATING:
 - XIII.4.1. The insert valve shall be shop epoxy coated on the interior and the exterior. The fusion-bonded coating shall be applied prior to assembly so that all casting surfaces, including the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated.
 - XIII.4.2. Valve shall be coated with a minimum of 8 mils fusion bond epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61.
- XIII.5. GASKETS AND O-RING STEM SEALS:
 - XIII.5.1. The inset valve shall have O-Ring stem seals. Two O-Rings shall be located above, and one O-Ring shall be located below the thrust collar. The lower two O-Rings shall provide a permanently sealed lubrication chamber. The upper O-Ring shall protect the lower O-Rings.
 - XIII.5.2. Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross-sectional shape.
- XIII.6. VALVE STEM AND THRUST WASHERS:
 - XIII.6.1. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. The gate valve stem and wedge nut shall be a copper alloy in compliance with AWWA Standard 515, Section 4.4.5.1.
 - XIII.6.2. Two thrust washers are used. One is located above, and one is located below the stem thrust collar.
 - XIII.6.3. The valve shall be operated by 2" square wrench nut according to ASTM A126 CL.B – open left (counter-clockwise).
- XIII.7. SPLIT JOINT RESTRAINT:
 - XIII.7.1. Shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

- XIII.7.2. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.
 - XIII.7.3. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
 - XIII.7.4. The mechanical joint restraint shall retain full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.
 - XIII.7.5. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Pressure point set screw type hardware shall not be used.
 - XIII.7.6. Restraint devices shall be Listed by Underwriters Laboratories and Approved by Factory Mutual (3" through 12" inch size).
- XIII.8. PRESSURE TESTING:
- XIII.8.1. After the installation of the insert valve body on to the existing pipe a pressure test of 150 P.S.I.G. shall sustained for 15 minutes. Once the pressure test is affectively achieved the insert valve body shall not be moved as per AWWA Standards. If the insert valve is moved the pressure test must be completed again. The insert valve must not be moved or repositioned once the pressure test is satisfactorily completed and approved by the Owner/ Engineer

METER BOX (2 inch meter and smaller)

JEA Final Inspection Checklist

*Note: For Grid and Joint Projects only.

Project Name: _____

Address Location: _____

Sta: _____

Offset: _____

Check the following as applicable:

Water

☐
☐
☐

Irrigation

Reclaimed

Location:

☐
☐

Paved Area

Grassed Area

Box Cover

☐
☐

Cover at finish grade

Cover above/below finish grade--adjust per spec.

Located within residential driveway or sidewalk:

☐
☐

Flared wall meter box

Straight wall meter box--replace per spec

Curb stop accessible:

☐
☐

Yes

No--reset box as necessary and clean out excess debris

Curb stop set close to interior wall (1/2" to 2"):

☐
☐

Yes

No, poly service inside box--install per JEA detail

Curb stop located in horizontal position:

☐
☐

Yes

No, service coming into box at angle--install per JEA detail

"W" or "C" cut in curb:

☐
☐

Yes

No, provide cut in curb and install P.T. post per detail



Curb stop manually exercised to observe flow ☐ Yes

Comments: _____

Contractor Representative: _____
Signature & Printed Name

JEA Inspector: _____
Signature & Printed Name

JEA O&M representative: _____
Signature & Printed Name

Commissioned this date: _____

METER BOX (2 inch meter and smaller)**JEA Final Inspection Checklist**

*Note: For Development Projects only.

Project/Subdivision Name: _____

Street Names: _____

Meter Box manufacture: _____

Check the following as applicable:

Water

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Irrigation

Reclaimed

All meter boxes adjusted to grade

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

All meter boxes provided with correct lids

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

All service connections located near lot lines per JEA Plate W-1

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

All services observed to have flow

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

All services at correct depth at meter boxes

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Curb stop set close to interior wall (1/2" to 2")

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Curb stop located in horizontal position

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No



"W" or "C" cut in curb, P.T. post provided

☐
☐

Yes

No

Comments: _____

Contractor Representative: _____
Signature & Printed Name

JEA Inspector: _____
Signature & Printed Name

JEA O&M representative: _____
Signature & Printed Name

Commissioned this date: _____

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:

Water

☐

Wastewater

☐

Reclaimed

☐

Location:

☐

Paved Area

☐

Grassed Area

Cover at Finish Grade:

☐

Cover at finish grade

☐

Cover above/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

Comments: _____

Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____

VALVES**JEA Final Inspection Checklist**

Project Name: _____

Street/Intersection/Address Location: _____

Sta: _____

Offset: _____

Check the following as applicable:

Water

☐

Wastewater

☐

Reclaimed

☐

Location:

☐

Paved Area

☐

Grassed Area

Pad:

☐

Concrete

☐

Asphalt

☐

N/A

"V" carved in curb/asphalt and painted:

☐

Yes

☐

No

Cover at Finish Grade:

☐

Yes

☐

Cover below finish grade-adjust per spec.

Colored coded cover per spec:

☐

Yes

☐

No--provide color code per spec.

Brass Tag affixed:

☐

Yes

☐

No

If No, is this a fire hydrant branch line?:

☐

Yes

☐

No--provide per spec.

Valve Size (inches): _____:

Valve Type:

<input type="checkbox"/>	Gate
<input type="checkbox"/>	Plug

Valve nut accessible:

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Valve Depth to Nut (inches): _____

Extension Provided (> 30 inches depth to nut)

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No--provide extension per spec.

Open direction:

<input type="checkbox"/>	Left
<input type="checkbox"/>	Right--replace per spec.

Valve exercised(Start in closed position, then open fully):

<input type="checkbox"/>	Yes
--------------------------	-----

Number of Turns(counted) to open: _____

(all valves < 20" shall be manually operated)

Valve use: _____Mainline _____ Independent _____Stub _____Fireline

Valve position(after exercised):
Open(mainline/independent/fire)

Partially closed-(Stub)

Locate wire accessible in jacket

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Locate wire color coded

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Electronic ball marker

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Comments: _____



Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____

FIRE HYDRANT
JEA Final Inspection Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Sta: _____

Offset: _____

County: _____ Duval _____ St. Johns _____ Nassau _____ Clay

Check the following as applicable:

Fire hydrant located in:

- ☐ Paved Area
☐ Grassed Area

Breakable flange located 1 inch min. above finish grade?

- ☐ Yes
☐ No - Replace per Spec

Hydrant operating nut (top elevation) is located 48 inches max. above finish grade?

- ☐ Yes
☐ No - Correct per Spec

Open direction:

- ☐ Left
☐ Right

Fire Hydrant barrel Size meets 5.25 inches:

- ☐ Yes
☐ No - Replace per Spec

Hydrant painted:

- ☐ Traffic yellow (public)
☐ Red (private)
☐ No--paint per spec

Crimp chains installed at nozzles:

- ☐ Yes
☐ No--furnish and install per spec

Raised pavement marker installed in pavement(2 at intersections):

- ☐ Yes
☐ No--furnish and install marker per spec



Hydrant re-oiled and greased:

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Hydrant operated to observe flow:

<input type="checkbox"/>	Yes
--------------------------	-----

Trees or permanent structures within 10 feet:

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No - Replace per Spec

Obstructions (fence, landscaping, signs, etc.) within 5 feet:

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No - Relocate per Spec

Hydrant Manufacturer: _____

Contractor Representative: _____
Signature & Printed Name

JEA Inspector: _____
Signature & Printed Name

JEA O&M representative: _____
Signature & Printed Name

Commissioned this date: _____

WASTEWATER MANHOLES – SECTION 427

I. GENERAL

I.1. SCOPE OF WORK:

The work under this section shall include all labor, material and equipment necessary for the construction and installation of all new wastewater manholes and the removal of existing wastewater manholes as called for on the drawings. 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 limitation on the JEA systems, JEA will require the contractor to perform work outside 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. The Contractor shall submit shop drawings consisting of individual manholes showing invert elevations, pipe sizes and similar details for approval before placing order for wastewater manholes.

I.4. AS-BUILT DRAWINGS:

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 specifications 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.

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.

I.6. MANHOLE INSPECTION CHECKLIST:

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 and rehabilitated manhole interior. The Contractor's representative shall complete the JEA Final Inspection Checklist for each new or rehabilitated manhole structure, 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.

II. MATERIALS:**II.1. PRECAST CONCRETE WASTEWATER MANHOLES:**

Wastewater manhole bases, sections and cones shall conform to the requirements of ASTM C478, "Specification for Precast Reinforced Concrete Manhole Sections" with the exception of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150, "Specification for Portland Cement Type H". Concrete shall meet the minimum requirements for Class "A" as specified in Chapter II. 5. - Section 437- Concrete Work. Minimum wall thickness shall be 1/12 the inside diameter of the manhole in inches plus 1 inch. If requested by JEA, the required minimum strength of concrete shall be confirmed by making and testing 4 standard cylinders at seven days in accordance with Chapter IV. 1. - Section 437- Concrete Work. Rings shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. Junction manholes (the manhole closest to the wetwell/pump station) shall be 5 foot diameter (minimum).

II.1.1. Bases:

Bases for concrete manholes shall be cast integrally with the bottom manhole section.

II.1.2. Joints:

Joints shall be tongue and groove configuration formed with machined castings. Joint surfaces shall be as detailed on JEA Standard Details. The joint shall be sealed using an approved pre-molded plastic joint sealer. Prior to placement of the joint sealer the joint surfaces shall be primed in accordance with the recommendations of the sealer manufacturer. Joints shall be water tight. Upon completion of installation, excess joint sealers shall be trimmed flush with the inside and outside surface of the manhole.

II.1.3. Exterior Joint Sealant Membrane:

All exterior joints below the top cone section of precast concrete manholes (including base and risers sections) shall be sealed with one 6-inch wide (minimum) exterior joint sealant membrane centered on joint. The tape shall be capable of sealing manhole joints against groundwater and sand infiltration. The installation of the membrane shall be in conformance with the recommendations of the manufacturer. Surface must be smooth, clean, dry and free of voids, loose aggregate, dirt or other matter that will hinder the adhesion of the membrane. A primer shall be used in accordance with the recommendations of the membrane manufacturer. If recommended by the manufacturer, heat shall be applied to all areas being sealed. See Approved Materials Manual for a list of approved tape manufacturers.

II.1.4. Coating:

The interior and exterior surfaces of each concrete manhole, including adjusting rings, shall be given 2 coats of bitumastic coating. Total minimum dry film thickness shall be 12 mils. Each coat shall be applied at a rate not to exceed one gallon per 100 square feet. In lieu of a bitumastic coating, an acrylic polymer base coating may be applied on all areas listed above. Three coats of acrylic polymer base coating shall be used with a total dry film thickness of 3.5 mils. The waterproofing materials shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the additional coat has no effect on the previous coat. Field applications of coatings for precast structures are not acceptable, but are acceptable for applicable field repairs only. All junction manholes (manhole located closest to wet well/PS), manholes which include a 24" or larger pipe and manholes receiving a force main shall be coated internally as outlined in Chapter IV. 6. - Section 446-Specialty Coatings and Linings instead of the interior bitumastic coating. The exterior of all manholes shall receive the bitumastic coating as specified above.

II.1.5. PVC Sand Sleeve:

The PVC sleeve shall have the same SDR rating as the connecting pipe (SDR-26 at a minimum). The outside surface shall have a rough building sand finish. No internal pipe stop is required. A minimum of one internal rubber gasket is required.

II.1.6. Flexible Manhole Connector (Rubber Boot):

As an alternate method of connecting the wastewater pipe to the precast concrete manhole, a flexible pipe to manhole connector may be used. The connector shall be the sole element to assure a flexible watertight seal of the pipe to the manhole.

II.2. FIBERGLASS WASTEWATER MANHOLES:**II.2.1. General:**

Fiberglass reinforced polyester manhole shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements. Manhole shall be a one piece unit manufactured to meet or exceed all specifications of ASTM D3753. Fiberglass manhole shall be designed for H-20, traffic applications (withstand 40,000 lb wheel load) at a minimum.

II.2.2. Manufacture Criteria:**II.2.2.1. Resin:**

The resins used shall be a commercial grade unsaturated polyester resin.

II.2.2.2. Reinforcing Materials:

The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, and chop roving, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

II.2.2.3. Interior Surfacing Material:

The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010 to 0.020 inches thick. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5 inches (13 mm) to maximum length of 2.0 inches (50.8 mm) and shall be applied uniformly to an equivalent weight of 3 oz/ft². Each pass of chopped roving shall be well-rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inches (2.5 mm).

II.2.2.4. Wall Construction Procedure:

After the inner layer has been applied, the manhole wall shall be constructed with a chop and continuous strand filament wound manufacturing process which insures continuous reinforcement and uniform strength and composition. The cone section, if produced separately, shall be affixed to the barrel section at the factory with a resin-glass reinforced joint resulting in a one piece unit. Seams shall be fiberglass on the inside and the outside using the same glass-resin jointing procedure. Field joints shall not be acceptable.

II.2.2.5. Exterior Surface:

For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added for a minimum thickness .125 inches. The exterior surface shall be relatively smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 0.5 inches in diameter, delaminating or fiber show.

II.2.2.6. Interior Surface:

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delaminating, blisters larger than 0.5 inches in diameter and wrinkles of 0.125 inches or greater in depth. Surface pits shall be permitted if they are less than 0.75 inches in diameter and less than 0.0625 inches deep. Voids that cannot be broken with finger pressure and that are entirely below the resin surface shall be permitted if they are less than 0.5 inches in diameter and less than 0.0625 inches thick.

II.2.2.7. Stub-Outs And Connections:

Stub-outs must be installed per manufacturer's instruction. Installation of smooth exterior PVC wastewater pipe must be performed by sanding, priming, and using resin fiber-reinforced hand lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the fiberglass manhole. Special fittings or boots may be installed by manhole manufacturer.

II.2.2.8. Manhole Bottom:

When indicated on the drawings, manholes shall have resin fiber-reinforced bottoms. Bottom shall have a minimum of three 1½ inch deep x 3½ inch wide stiffening ribs completely enclosed with resin

fiber-reinforcement and have a minimum of 3 inch anti-flotation ring. Manhole bottom shall be a minimum of 5/16 inches thick.

II.2.2.9. Fillers And Additives:

Fillers, when used, shall be inert to the environment and manhole construction. Sand shall not be accepted as an approved filler. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used to meet the requirements of this standard. The resulting reinforced-plastic material must meet the requirements of this specification.

II.2.3. Design Properties:

II.2.3.1. Interior Access:

All manholes shall be designed so that a ladder or step system can be supported by the installed manhole.

II.2.3.2. Manway Reducer:

Manway reducers will be concentric with respect to the larger portion of the manhole diameters through 60 inches. Larger manholes may have concentric or eccentric manway reducer openings.

II.2.3.3. Cover And Ring Support:

The manhole shall provide an area from which a typical ring and cover plate can be supported without damage to the manhole (32 inch opening).

II.2.3.4. Manhole Lengths:

Manhole lengths shall be in 6 inch increments +/- 2 inches.

II.2.3.5. Diameter Tolerance:

Tolerance of inside diameter shall be +/- 1% of required manhole diameter.

II.2.4. Physical Requirements:II.2.4.1. Physical Properties:

	Hoop Direction	Axial Direction
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modules (psi)	0.6×10^6	0.7×10^6
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modules (psi)	1.4×10^6	0.7×10^6
e. Compressive (psi)	18,000	12,000

II.2.4.2. Load Rating:

The complete manhole shall have a minimum dynamic-load rating of 16,000 lbs. When tested in accordance with ASTM D3753 8.4 (note 1). To establish this rating the complete manhole shall not leak, crack or suffer other damage when load tested to 40,000 lbs and shall not deflect vertically downward more than 0.25 inch at the point of load application when loaded to 24,000 lb.

II.2.4.3. Stiffness:

The manhole cylinder shall have the minimum pipe-stiffness values shown in the table below when tested in accordance with ASTM D3753 8.5 (note 1).

MANHOLE LENGTH IN FEET	PSI
3 – 6.5	0.75
7 – 12.5	1.26
13 – 20.5	2.01
21 – 25.5	3.02
26 – 35	5.24

II.2.4.4. Soundness:

In order to determine soundness, apply an air or water pressure test to the manhole test sample. Test pressure shall not be less than 3 psig or greater than 5 psig. While holding at the established pressure, inspect the entire manhole for leaks. Any leakage through the laminate is cause for failure of the test. Refer to ASTM D3753 8.6.

II.2.4.5. Chemical Resistance:

When tested in accordance with ASTM D3753 8.7 the log of percent retention of each property after immersion testing when plotted against the log of immersion time, and extrapolated to 100,000 hours, shall assure retention of at least 50% of initial properties.

II.2.4.6. Required Thickness For Buried Manholes:

Assumptions: Hoop Modulus = 4,000,000 psi
 Soil Modulus = 1000 psi (minimum)

Diameter (Inches)	Wet Soil Depth (max) (Feet)	Minimum Thickness (Inches)
48	10	.25
	20	.3125
	30	.375
60	10	.375
	20	.4375
	30	.5
72	10	.4375
	20	.5
	30	.5625
96	10	.5625
	20	.625
	30	.75

II.2.4.7. Test Methods:

All tests shall be performed as specified in ASTM D3753 Section 8. Test method D-790 (see note 5) and test method D-695.

II.2.4.8. Certification:

As a basis of acceptance, the manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report and a copy of the test results that the manhole has been sampled, tested and inspected in accordance with the provision of this specification and meets all requirements.

II.2.4.9. Marking And Identification:

Each manhole shall be marked on the inside and outside with the following information:

II.2.4.9.1. Manufacturer's Name or Trademark

II.2.4.9.2. Manufacturer's Factory Location

II.2.4.9.3. Manufacturer's Serial Number

II.2.4.9.4. Total Length

II.2.5. Acceptable:

II.2.5.1. L.F. Manufacturing, Inc.

II.2.5.2. Containment Solutions, Inc. (Flowtite Fiberglass Manhole)

II.2.5.3. Associated Fiberglass Enterprises

II.2.5.4. JEA Approved Equal

II.3. CAST IRON WASTEWATER MANHOLE FRAME AND COVER:

Cast iron wastewater manhole frame and cover shall be of the type as shown in JEA Standard Details and as listed within JEA Approved Materials Manual. Manhole cover shall be 32 inches in diameter. Castings shall be even grained cast iron and shall be smooth, free

from scale, lumps, blisters, sandholes and defects of any nature which would render them unfit for the service for which they are intended. They shall be thoroughly cleaned. Castings shall meet the requirements of ASTM A48, "Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12" and Ductile Iron meeting the requirements of ASTM A536, "Standard Specification for Ductile Iron Castings". In either case, manhole frame and cover shall be designed to withstand an HS20-44 loading defined in the AASHTO Specifications. Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be removed and replaced at no additional cost. A neoprene gasket shall be an integral part of the cover to provide a water tight seal. Cover shall set flush with rim of frame and shall have no larger than an 1/8 inch gap between frame and cover.

II.4. ADJUSTMENT RINGS (MANHOLE COLLARS):

Adjustment rings shall be 8" wide (48" OD X 32" diameter opening) concrete. Concrete adjustment rings shall be 4000 psi (minimum) concrete, Type II cement. Minimum height of rings shall be 2 inches. Rings shall be grouted in place. Concrete mortar (1/2" thick) shall be applied to the interior and exterior surfaces of the concrete adjustment rings. The interior of the concrete ring shall be coated as specified above. In lieu of precast concrete rings, bricks may also be utilized (mortar in place) with 1/2 inch thick mortar layer on interior and exterior surfaces. High Density polyethylene (HDPE) rings may be utilized for manholes located in non-traffic areas only (not in streets, parking areas, drive ways etc.). HDPE adjustment rings shall be stackable and have a minimum height of 2 inches and be installed with silicone sealant as per the manufacturer's directions. Apply heavy amount (covering the entire joining surfaces) of silicone sealant between the manhole cone section and HDPE rings, between all stackable rings and between HDPE ring and manhole frame (note: do not use concrete grout during the assembly of HDPE rings). During the installation of HDPE rings, the contractor shall apply downward pressure on the rings to squeeze out the excess silicone (tight fit).

III. INSTALLATION

III.1. PRECAST CONCRETE WASTEWATER MANHOLES:

III.1.1. Setting Wastewater Manhole Bases:

Wastewater manhole bases shall be set level on bedding consisting of 12 inches (at a minimum) of granular material (57 stone) as detailed in the JEA Water and Wastewater Details. For all manholes deeper than ten(10) feet (from the finish elevation to the invert), the Contractor shall be required to schedule the JEA representative to be in attendance and observe/inspect the bedding foundation prior to the base being set. The JEA representative shall provide written "no objection" to the Contractor for the setting of the manhole base.

III.1.2. Installing Manhole Sections:

III.1.2.1. During the handling of all manholes, the contractor shall protect the manhole and not allow a chain, cable or other lifting line to damage the joint surfaces. Spreader bars, wood blocks or other devices shall be utilized to prevent damage to the manhole. Any manhole section found to have defects, included but not limited to leaks and cracks shall be removed and replaced.

III.1.2.2. The manhole sections shall be set so the manhole will be vertical and with section in true alignment. Construction shall include:

- III.1.2.2.1. Cleaning all joint surfaces (remove all sand, oil, debris & other foreign items) and provide additional primer if recommended by the joint manufacturer.
- III.1.2.2.2. The joint sealant (Ram-Neck, ConSeal or other JEA approved joint sealant) and the manhole surfaces shall be dry during the installation period (shall not be installed if wet or during rain events).
- III.1.2.2.3. Joint sealant is applied to both the top & bottom joint surfaces (Double Ring Method). The joint sealant shall be installed continuously around all joints with the ends placed butt to butt (not overlapped & no open gaps between sealants).
- III.1.2.2.4. The excess joint sealant shall be trimmed flush to the inside surfaces of the manhole. Trim the outside surfaces if an exterior joint sealant/tape is applied.
- III.1.2.3. Apply a special primer and an "Exterior Joint Sealant Membrane" to the outside surfaces of all manhole joints/seams which are located below the top cone section. Apply the primer and joint membrane in accordance with the recommendations of the membrane manufacturer.
- III.1.2.4. Manholes with leaking joints (infiltration of ground water) will not be accepted by JEA. JEA will not accept leak repairs on new construction of manholes. The leaking manhole is to be removed and replaced.
- III.1.2.5. The gravity wastewater pipes and rubber boots shall be clean and lubricated during assembly to provide for a leak free connection at the manhole. To protect the inside surfaces of the rubber manhole boots, a non-shrink grout (not regular concrete) coated with bituminous waterproofing shall be applied to the void/open areas around the boot. All rubber boots observed to be leaking shall be removed and replaced by the Contractor prior to final acceptance by JEA. No repair shall be allowed. All cost for removal and replacement shall not be paid for separately but shall be merged with the associated item of work.
- III.1.3. Metallic Non-Shrink Mortar:
All holes in sections used for handling and the annular space between the wall and entering pipes shall be thoroughly plugged with non-shrinking mortar or grout applied and cured in strict conformance with the manufacturer's recommendations so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces. Provide interior and exterior coating as specified above.
- III.1.4. Grade Adjustment:
For grade adjustment in setting the manhole frame concrete adjustment rings shall be used on top of manhole slabs and precast concrete manhole cones in accordance with the drawings.

III.1.5. Setting Wastewater Manhole Frames:

Wastewater manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Engineer. Frames on manhole cones shall be set concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole and the bottom flanges of the frame shall be completely filled and made water tight. A ring of mortar at least 1 inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend to the outer edge of the concrete adjustment rings and shall be finished smooth and flush with the top of the flange.

- III.1.6. The neoprene gasket (T-Gasket seal on the underside of the manhole cover) on the new JEA manhole covers shall be protected from damage during the construction period. Should the gasket be damaged, it shall be repaired by the contractor in accordance with the cover manufacturer's recommendation. The condition of all neoprene gaskets shall be inspected for damage during the final inspection of the project. Damaged gaskets/covers will not be accepted by JEA.

III.2. FIBERGLASS WASTEWATER MANHOLES:

III.2.1. General:

Installation shall be in accordance with the JEA Standards, Details, and Materials Manual and manufacturer's recommendations.

III.2.2. Shipping And Handling:

The fiberglass wastewater manhole shall not be dropped or impacted. Fiberglass wastewater manhole may be lifted by inserting a 4" x 4" x 30" timber into the top of the manhole with cable attached or by a sling or "choker" connection around center of manhole. Use of chains or cables in contact with the manhole surface is prohibited.

III.2.3. Backfill:

III.2.3.1. Backfill Material:

Unless shown otherwise on drawings and approved by the Engineer, sand, crushed stone, or pea gravel shall be used for backfill around the manhole for a minimum distance of one foot from the outside surface and extending from the bottom of the excavation to the top of the reducer section. Suitable material chosen from the excavation may be used for the remainder of the backfill. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer.

III.2.3.2. Backfill Procedure:

Backfill shall be placed in layers of not more than 12 loose inches and mechanically tamped to 95% Standard Proctor Density, unless otherwise approved by the Engineer. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the fiberglass manhole structure.

III.2.4. Concrete:**III.2.4.1. Fiberglass Bottom:**

Concrete may be used to form bench area and invert. Concrete may also be used on top of anti-flotation ring and around reducer section as required for buoyancy.

III.2.4.2. Concrete Bottom:

Lower manhole into wet concrete until it rests at the proper elevation, with a minimum of 4 inches of fiberglass manhole inserted into the wet concrete below flow line, then move manhole to plumb. The concrete shall extend a minimum of one foot from the outside wall of the manhole and a minimum of 6 inches above incoming lines. On the inside, concrete shall form the bench and invert area and rise a minimum of 4 inches above incoming lines. If required by Engineer, concrete may be used around reducer section for buoyancy.

III.2.4.3. Repairs:

Any manhole repair is required to meet all requirements of this specification.

III.3. FLOW CHANNELS:

Flow channels in the manhole base shall be formed of Class "C" concrete, while the manhole is under construction. Flow channels shall be solid concrete or concrete with solid filler blocks. No rubble shall be allowed. Cut off pipes at inside face of the manhole and construct the invert to the shape and size of pipe indicated. All inverts shall follow the grade of the pipe entering the manhole. A change in direction of the wastewater and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is tangent to the center lines of adjoining pipelines.

III.4. DROP INLETS:

Where shown on the drawings, drop inlets to the manhole shall be constructed as shown on the JEA Standard Details and specified herein.

III.5. CONNECTIONS TO EXISTING STRUCTURES:**III.5.1. Opening:**

The Contractor shall core suitable openings using a coring machine, jigsaw or hole saw into the existing structure or remove the existing pipe to accommodate the pipelines as indicated on the Contract Drawings and as specified. The portion of each existing structure removed for new installation shall be confined to the smallest opening possible, consistent with the work to be done. Fiberglass manholes shall have the cut out in the wall equal to the outside diameter of pipe, plus ½ inch maximum. The connection to existing manhole shall comply with wastewater detail S-15.

III.5.2. Repair – Concrete Structures:

After the pipe is installed the Contractor shall carefully close up the openings around the pipe, using non-shrink mortar and repair the existing structure invert, if necessary, in a manner satisfactory to the Engineer. If the existing structure has a specialty coating, repair that coating using coating manufacturer's product and installation requirements. See Chapter IV. 6. - Section 446 - "Specialty Coatings and Linings".

III.5.3. Repair – Fiberglass Structures:

Grind the outside surface of the pipe and both the inside and the outside surfaces of the cutout in the structure wall. Apply a priming agent to any PVC pipe that might be used before fiberglass lay-up. Insert the pipe through the cutout in the wall. Apply fiberglass putty to the inside and the outside of the wall cutout, filling openings between pipe and cutout. Make a good radius for the fiberglass lay-up. After the putty has set up, fiberglass the pipe into place. Use one layer of woven roving sandwiched between two layers of fiberglass mat. Allow fiberglass to completely set up before backfilling. Manufacturer of structure shall be responsible for integrity of field glassing.

IV. MANHOLE INSPECTION:

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.

V. WASTEWATER MANHOLE ABANDONMENT AND REMOVAL**V.1. WASTEWATER MANHOLE ABANDONMENT:**

Wastewater manhole abandonment shall be in accordance with Chapter II. 2. - Section 407, 'Demolition and Abandonment'.

V.2. WASTEWATER MANHOLE REMOVAL:

Removal of existing manholes shall include the complete removal of said manholes where so noted on the contract drawings.

V.2.1. Removal Only:

Where no new structure is designated to replace the removed manhole, the void, left by the manhole removal shall be filled and compacted in accordance with Chapter II. 3. -Section 408- Excavation and Earthwork.

V.2.2. Remove And Construct:

Where a new structure is designated to replace an existing manhole, complete removal of the existing manhole shall be achieved so as to permit the construction of a new manhole at approximately the same location.

V.2.3. Disposal Of Structure:

The existing manhole to be removed shall be removed from the site. The rubble shall be disposed of without damage to any of the new or existing facilities at the site. The debris shall be hauled to a disposal site to be designated or approved by the Engineer.

WASTEWATER MANHOLES

JEA Final Inspection Checklist

Project Name: _____

Street/Intersection/Address Location: _____

STA: _____

Offset: _____

Check the following as applicable:

Frame:	<input type="checkbox"/>	At finished grade/below finish grade-- adjust per spec
Manhole cover:	<input type="checkbox"/>	JEA logo w/ neoprene gasket
	<input type="checkbox"/>	Not JEA logo w/ neoprene gasket - Provide lid per spec
Manhole cover(gap between frame and cover):	<input type="checkbox"/>	Range of gap no larger than 1/8 inch
	<input type="checkbox"/>	Range of gap larger than 1/8 inch - Provide lid per spec.
Frame condition:	<input type="checkbox"/>	Good
	<input type="checkbox"/>	Cracked/broken--provide replacement
	<input type="checkbox"/>	Offset--needs resetting/regrouting
Adjustment rings grouted/sealed in place:	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No--provide per spec
Wall condition:	<input type="checkbox"/>	Good
	<input type="checkbox"/>	Damaged/cracks/holes/leaking joints-- see spec for resolution
2 coats of bituminous waterproofing from frame to base:	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No, this is lined or fiberglass
	<input type="checkbox"/>	No--provide per spec
Inside drop assembly (JEA Plate S-4)-- Stainless steel brackets/bolts located vertically at 4 feet max.:	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No--provide per detail



Constructed flume formed for Inside drop
< 2 feet:

Yes
No--provide per detail
N/A

Pipe seal:

Good
Leaking--remove & replace per spec

Bench condition:

Good, solid bench per tap test
Cracked/broken--provide repair per spec
Clean free of debris

Flow channel condition:

Invert formed
No invert formed/cracks/broken--repair per spec

Flow channel hydraulics:

Good
Uneven shape/radius/standing water -
repair per spec.
Clean free of debris

Contractor Representative:

Signature & Printed Name

JEA Inspector:

Signature & Printed Name

JEA O&M representative:

Signature & Printed Name

Commissioned this date:

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
<p>Note No.1: The maximum "Depth of Cut" shall be no greater than 15 feet for mains without laterals.</p> <p>Note No. 2: The maximum "Depth of Cut" shall be no greater than 12 feet with laterals.</p>				

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 meet 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 2 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) shall be installed to mark the location of the 6-inch plug. Where required by JEA or no concrete curb exist, an electronic "sewer" marker shall also be installed. For projects where no concrete curb exists, an electronic marker is required for all laterals which are "NOT IN USE". 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 exiting (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.

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 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 free of any dirt, sand or debris, prior to beginning CCTV inspection. The wastewater line shall be introduced with water at the high point in the system in the presence of an authorized JEA representative immediately prior to TV inspection. 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 Inspection:

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.

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.

WASTEWATER FORCE MAINS – SECTION 429

I. GENERAL

I.1. SCOPE OF WORK:

The Contractor shall furnish and install a sewage force main 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. For the supply of domestic water during construction, the contractor shall utilize a JEA meter assembly (meter & back flow device). In most cases, domestic water will be supplied from a jumper line between the potable water main, through a JEA meter assembly and to the new wastewater force main. Un-accountable water quantities shall be minimized where possible.

For projects where pipelines are twenty four (24) inch and larger, contractor experience in the installation of large diameter (24-inches and larger) polyvinyl chloride (PVC) pipe is required. The Contractor shall thoroughly familiarize himself with all specific manufacturing and installation requirements of the PVC pipe for bid.

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 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 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.3.1. Material Submittals:

Submit shop drawings per the specifications for the materials (restrained joints, PVC pipe and construction equipment) proposed for installation of pipelines 20 inch and larger.

I.3.2. PVC Pipe:

Industry reference standards, product description and data sheets, gaskets, spigot insertion mark dimension, installation instructions, and other items to allow a complete review by the Engineer.

I.3.3. Construction Equipment:

Equipment proposed for the installation of the pipeline: machinery and calibrated torque wrenches/gauges.

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. - 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.

I.5. WARRANTY:

The Contractor shall provide to JEA a two (2) year unconditional warranty after substantial project completion or acceptance or any designated portion thereof. 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. FIELD DATA SHEETS:

Provide field data sheets that contain the following information for recording data during installation of the pipe (every joint), fittings, valves, specials, and restraining devices: Spigot reference mark dimension, distance between restrainer rings on each side of pipe joint, and torque values for bolts and threaded rods.

I.7. LOCATE WIRE BOX INSPECTION CHECKLIST:

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 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.

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 force main lines in sizes up to and including 48 inches shall be polyvinyl chloride (PVC), fiberglass or high density polyethylene (HDPE), as shown on the drawings and as herein specified. Pipe for force main lines larger than 48 inches shall be fiberglass as shown on the drawings and herein specified. 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, fused or mechanical joint type. Pipe installed on bridges, piles or other above ground installations shall be Stainless Steel. PVC pipe shall not be used in above ground applications unless incased. 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 unless incased. Pipe sizes and applications shall conform to the following chart.

PIPE	PIPE SIZE	JOINT TYPE	APPLICATION
PVC DR18	4 inches and larger*	Push-on joint	below ground
PVC DR18	4 to 12 inches	Fusible PVC	below ground
PVC DR 25	16 inches and larger*	Push-on joint	below ground
PVC (Sch. 40)	3 inches and smaller	Solvent Weld	below ground
PVC (Sch. 80)	3 inches and smaller	Solvent Weld	below ground
Polyethylene (HDPE)	4 inches and larger	Fused	directional drill, pipe bursting or approved JEA (below ground)
Fiberglass Reinforced Polymer Mortar Pipe	24 inches and larger	Bell-spigot joint	above or below ground
Stainless Steel	4 inches and larger	Welded, flanged	above or below ground
Steel	4 inches and larger	Welded	casing only

*Pipe sizes 14" and 18" shall not be utilized unless specifically approved by JEA excluding HDEP.

II.1.1. Polyvinyl Chloride Pressure Pipe:

Pipe shall be virgin polyvinyl chloride (PVC) pipe for force main 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's 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 DR 18 and DR 25 pipe shall be green.

II.1.1.1. PVC 1120, Class 100, DR 25 Pipe:

Pipe shall conform to AWWA Standard C905 for 14 inch through 36 inch pipe. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters.

- II.1.1.2. PVC 1120, Class 150, DR 18 Pipe:
Pipe shall conform to AWWA Standard C900 for 4 inch through 12 inch pipe, and AWWA Standard C905 for 14 inch through 36 inch pipe. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters.
- II.1.1.3. PVC 1120, Schedule 40 and Schedule 80 Pipe:
Pipe shall conform to ASTM D1784 and D1785. Green color pipe. Pipe is to be manufactured to I.P.S. (Steel) Standard Pipe equivalent outside diameters. Pipe shall be marked NSF-PW approved. To insure a water-tight connection, the contractor shall utilize "purple primer" and "rain or shine glue" or JEA approved equal.
- II.1.2. Fiberglass Reinforced Polymer Mortar Pipe:
 - II.1.2.1. Products:
 - II.1.2.1.1. Materials:
 - II.1.2.1.1.1. Resin Systems:
The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
 - II.1.2.1.1.2. Glass Reinforcements:
The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
 - II.1.2.1.1.3. Silica Sand:
Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
 - II.1.2.1.1.4. Additives:
Resin additives, such a curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used shall not detrimentally affect the performance of the product.
 - II.1.2.1.1.5. Elastomeric Gaskets:
Gaskets shall be supplied by qualified gasket manufacturers and be suitable for the service intended.
 - II.1.2.1.2. Manufacture and Construction:
 - II.1.2.1.2.1. Pipes:
Manufacture (CCFRPM) pipe by the centrifugal casting process to result in a dense nonporous, corrosion-resistant,

consistent composite structure. The pipe nominal pressure class (PN) shall be equal to or greater than the maximum sustained operating pressure of the line (PN 150 minimum). The maximum transient (operating plus surge) pressure of the line shall not exceed the pipe nominal pressure class by more than 40%. No exterior pipe color required.

II.1.2.1.2.2. Joints:

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain joint watertightness. The joints must meet the performance requirements of ASTM D4161. Tie-ins, when needed, may utilize gasket-sealed mechanical couplings. Restrained joints may be provided by reinforced fiberglass materials as per the pipe manufacturer's recommendation and as approved by JEA. Other restraint devices must be approved by JEA (follow the D.I.P. Restraint Joint Schedule, at a minimum).

II.1.2.1.2.3. Fittings:

Flanges, elbows, reducers, tee, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. If approved by JEA, properly protected standard ductile iron fittings may also be used. Unbalanced thrust forces shall be restrained with thrust blocks, axial restraint systems or other suitable methods as approved by JEA. Fiberglass tees, wyes, laterals, or other similar fittings shall be fully encased in reinforced concrete designed to withstand the pressure forces. The pipe manufacturer shall be consulted during the design of the restraint system.

II.1.2.1.2.4. Acceptable Manufacturer:

HOBAS Pipe USA, Inc., or JEA approved equal.

II.1.2.1.3. Dimensions:**II.1.2.1.3.1. Diameters:**

The actual outside diameter (18" to 48") of the pipes shall be in accordance with AWWA C950. For other diameters, OD's shall be per manufacturer's literature.

II.1.2.1.3.2. Lengths:

Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.

II.1.2.1.3.3. Wall Thickness:

The minimum wall thickness shall be the stated design thickness. For pipe sizes 27 inch thru 36 inch utilize PN 150 minimum. For pipe sizes larger than 36 inch utilize PN 100 minimum.

II.1.2.1.4. Testing:**II.1.2.1.4.1. Pipes:**

Pipes shall be manufactured in accordance with the applicable standard.

II.1.2.1.4.2. Joints:

Coupling joints shall meet the requirements of ASTM D4161.

II.1.2.1.4.3. Stiffness:

Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 36 psi.

II.1.2.1.4.4. Tensile Strength:

Pipe hoop tensile strength for pressure pipe shall be verified as specified in applicable standard (ASTM D3754 or AWWA C950) or by random burst testing at the same sampling frequency. All pipes shall be capable of withstanding a test pressure of two (2) times the maximum sustained operating pressure of the line without leaking or cracking. This performance shall be verified as agreed between the buyer and seller.

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, 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.1.4. 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. Stainless Steel Pipe and Fitting System

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 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.1.6. 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:**

Pipe furnished except as follows or as otherwise specified. PVC fittings 3 inch and smaller shall be solvent weld. Fittings 4 inches and larger on push-on joint pipe installed underground shall be PVC with restrained push-on bell type joint pressure rating to match the

pipe, at a minimum. Fittings 4 inches and larger installed above ground shall be ductile iron with flanged ends or restrained joints unless shown otherwise on the drawings. Large tee fittings (16 inches and larger) shall be ductile iron only.

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 inches and smaller.

II.2.2. Polyvinyl Chloride Fittings:

Fittings that are 3 inch and smaller 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, DR 18 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's approved type) or rieber ring.

II.2.2.2. PVC Fabricated Fittings (14" And Larger):

Fittings (except TEE fittings) shall be fabricated from PVC pipe meeting the requirements of AWWA C-905. The component pipe segments and bonds between fittings shall be free from voids,

cracks, inclusions and other defects. The joining surfaces of the spigots and bells shall be free from imperfections that could cause leaks. When component segments are joined using solvent cement, the procedure shall conform with the standard practice for making pressure joints outlined in ASTM D2855. Reinforcement may be applied and permanently bonded to the outside surfaces of the filling. Reinforcement overwrap shall be in compliance with the appropriate sections of AWWA C-905. Tee fittings must be ductile iron. The elastomeric gasket shall comply with the requirements as specified in ASTM-F472 and shall be attached to the bell utilizing glue (AWWA and manufacturer's approved type) or rieber ring. Fittings shall be tested in accordance with the appropriate sections of AWWA C-905. All fittings shall include the following markings: nominal size, PVC pressure rating, pressure class and manufacturer name and/or trademark. Fittings color shall be green or white.

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 and white, grey or green color.

II.2.2.4. HDEP Fittings:

See "Horizontal Directional Drilling", (Chapter VI. 2. - Section 750 and 755), for technical specifications for this product and associated construction standards.

II.2.3. Non-Standard 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.2.4. Stainless Steel Fittings:

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.

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. 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:

II.3.4.1. Stainless Steel Flanges:

Flanged pipe and fitting ends shall be made up of type 316L stainless steel welded on flanges drilled to ANSI 16.1 class 125 standard. The flange shall be continuously welded on both sides to the pipe or fitting. Bolts and other hardware shall be 316L stainless steel. Gaskets shall be 1/8" full face SBR Rubber.

II.3.4.1.1. Flanged Couple Adapter:

A restrained ductile iron flanged coupling adapter (flanged X MJ) with special interior coating may be utilized to transition between different pipe materials (PVC to S/S). Acceptable is a Romac PVC-RFCA restrained flange coupling adapter or JEA approved equal.

II.3.4.1.2. Threaded Connections:

Threaded pipe (2" size and smaller), gauge or instrument connections shall be 316 stainless steel 150-pound threaded conforming to ASTM A-182 or ASTM A-276.

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.

II.3.6. 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. For field welds, the joints to be welded shall be tapered (approximately 45 degree taper).

II.3.7. 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.

II.3.8. Restrained Joints:

II.3.8.1. 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. 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.3.9. 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.3.10. 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 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 manufacturer's recommendations. Couplers and adapters for polyethylene pipe shall be brass conforming to AWWA C800 and shall be female IPT, pack joint or compression nut.

II.3.11. 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.3.12. Stainless Steel Flexible Joint:

Flexible Joints are intended for use in joining stainless steel pipe in a piping system where axial movement due to thermal expansion and contraction is required. The design engineer shall provide summary of design axial movement calculations on the construction plans and specific installation instructions for the contractor regarding the impact of outdoor temperature during the construction period. The actual construction shall be in accordance with the flexible joint manufacturer. Flexible Joints shall be flexible expansion joint type manufactured of ductile iron conforming to ASTM A-536. Flexible Joints shall have flanged ends meeting ANSI Class 125. Each flexible expansion joint shall consist of an expansion joint designed and encast as an integral part of a ball and socket type flexible joint with deflection capability. All integral surfaces (wetted parts) shall be lined with 12 mils (min) of fusion bonded epoxy. The exterior surfaces shall be lined with 6 mils (min) of fusion bonded epoxy. Sealing gaskets shall be constructed of EPDM. Bolts and other hardware shall be 316L stainless steel. Acceptable flexible joint shall be EBAA Flex-Tend, EBAA Forced Balanced Flex-Tend, Romac FlexiJoint or JEA approved equal.

II.3.13. Stainless Steel Air Release Valves:

Air Release Valves: All ARVs installed on the stainless steel pipe shall be Stainless steel body type meeting JEA approved materials (see specification section 430).

II.4. CORROSION PROTECTION FOR DUCTILE IRON FITTINGS:

II.4.1. Interior Lining:

The interior of all ductile iron pipe and fittings shall be furnished with an approved amine cured novalac epoxy coating. Acceptable coatings include protecto 401 ceramic epoxy, SP 2000 ceramic epoxy, poly bond plus or JEA approved equal.

II.4.1.1. Lining Material:

The material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The lining material shall comply with the following properties:

II.4.1.1.1. A permeability rating of 0.00 when tested according to the procedure described in Method A of ASTM E96-93, Procedure A with a test duration of 30 days.

II.4.1.1.2. The following test must be run on coupons from factory lined Ductile Iron Pipe.

II.4.1.1.2.1. ASTM B 117-85 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.

II.4.1.1.2.2. ASTM G95-87 Cathodic Disbondment (1.5 volts@ 77°F) – Results to equal no more than 0.5mm under-cutting after 30 days.

II.4.1.1.2.3. Immersion Testing rated using ASTM D714-87.

- II.4.1.1.2.3.1. 20% Sulfuric Acid – No effect after two years.
 - II.4.1.1.2.3.2. 140°F-25% Sodium Hydroxide – No effect after two years.
 - II.4.1.1.2.3.3. 160°F Distilled Water – No effect after two years.
 - II.4.1.1.2.3.4. 120°F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.
 - II.4.1.1.3. Abrasion Resistance – Less than 4 mils loss after one million cycles on a + 22.5° sliding aggregate slurry abrasion tester using a sharp natural siliceous gravel with a particle size between 2mm and 10mm.
- II.4.1.2. Application:
 - II.4.1.2.1. Applicator:

The lining shall be applied by a competent firm, who has been certified acceptable by the manufacturer with a successful history of applying linings to the interior of ductile Iron Pipe and Fittings.
 - II.4.1.2.2. Surface Preparation:

Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil or grease is present, or any substance which can be removed by solvent, shall be solvent cleaned using the guidelines outlined in DIPRA-1 Solvent Cleaning. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc, are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before lining must be re-blasted. Abrasive blasting of previously lined pipe or fitting (including cement lined materials), is not acceptable. Only virgin metal materials will be utilized in the lining process.
 - II.4.1.2.3. Lining:

Within 8 hours of surface preparation, the interior of the pipe shall receive 40 mils (minimum), normal dry film thickness of the approved lining. No lining shall be applied when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flange pipe or fittings are

included in the project, the ling shall not be used on the face of the flange.

II.4.1.2.4. Number of Coats:

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printer literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

II.4.1.2.5. Touch-Up & Repair:

Joint Compound shall be used for touch-up or repair in accordance with liner manufacturer's recommendations.

II.4.1.3. Inspection and Certification:

II.4.1.3.1. JEA may require the contractor to provide the following inspection if a quality concern exists in the field.

II.4.1.3.2. Ductile Iron Pipe and Fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPCPA-2 Film Thickness Rating.

II.4.1.3.3. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Any defects found shall be repaired.

II.4.1.3.4. Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

II.4.1.4. Handling (at the factory and in the field):

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.

II.4.1.5. Warranty:

A two (2) year warranty shall be furnished by the manufacturer on the serviceability of the lining. This warranty shall include but not be limited to, statements that at any time up to the end of the year from the date of project acceptance:

II.4.1.5.1. The lining shall not have disbanded.

II.4.1.5.2. The lining shall not have suffered any appreciable underfilm migration.

II.4.1.5.3. The interior pipe metal, at points of pinholes or holidays, shall not have suffered detrimental deterioration.

II.4.1.5.4. The lining shall have maintained its smooth surface characteristics. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty within the limits as stated in this section of these specifications.

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 finish coating shall be continuous smooth, neither brittle when cold nor sticky when exposed to the sun, and be strongly adherent to the fitting. If the pipe is installed in corrosive soils, then 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. 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.4.3.1. Material:

The polyethylene material shall meet or exceed the requirements of 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 tape. The polyethylene wrap shall include industrial standard repeatable message (green color).

II.4.3.2. 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 Section 5.4 of AWWA C105, subject to approval by the engineer and the manufacturer.

II.4.4. Marking For 2" PVC Pipe:

All 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 pipe above ground (including bridge crossing) shall be color labeled "WASTEWATER" stenciled in the center of each joint of pipe utilizing an oil based paint. Stenciled lettering shall be 4" (minimum), high lettering and be green color. All fittings (above ground or below ground) shall be labeled "WASTEWATER", or marked with green paint (6 inch diameter solid circle, minimum), within 48 hours after site delivery. By properly marking the ductile fittings, this will assure that only wastewater fittings will be utilized on the force main system.

II.5. PIPING SUPPORTS:

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.

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

II.5.1. Stainless Steel Pipe Support:

Pipe Supports: Pipe supports shall be in accordance with JEA Water and Wastewater Standards Manual, but modified to match the outside diameters (OD) of stainless steel pipe. The design engineer shall also provide base support to handle the weight of the flexible joint, if required (especially for couplings larger than 8" size). Other pipe support systems must be approved by JEA prior to construction.

II.5.2. 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 14 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 and HDPE wastewater 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 green. 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 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:

Transport, handle and store pipe materials and other products specified herein in a manner recommended by the respective manufacturers to prevent damage and defects. Handling and storage shall be in accordance with Chapter 6 of AWWA Manual M23 and AWWA C605. Procedures "recommended" in these AWWA publications shall be mandatory. 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. All PVC pipe shall be inspected by the JEA Representative prior to installation.

III.3. PIPE INSTALLATION:**III.3.1. General Requirements:**

The JEA Representative will perform supplemental inspection as described herein for all PVC pipe sections (each 20 ft or less pipe length) installed by the Contractor for the following tasks: unloading, storage, pipe stringing, joint preparation, lowering pipe in trench, assembly, installation of joint restraints, and testing. Any damaged pipe shall be replaced at no additional cost to the JEA. Force 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 JEA. If, in the opinion of the JEA representative, significant quantities of sand or foreign materials enter the new sewage force main during the construction period, the contractor will be required to flush the system with clean water. The flushing operation, if required, shall be as directed by JEA and shall be accomplished at no additional cost to JEA. The water utilized in the flushing operation shall be provided and paid for by the contractor. 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 locate 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 24 inch and Larger PVC Pipe:

III.3.2.1. Experience:

The Contractor shall provide an experienced PVC pipe Superintendent/Foreman and submit to the JEA Representative their experience record.

III.3.2.2. Trenches:

The laying of PVC pipe, fittings, specials, closures and appurtenances (called pipe hereinafter) in trenches shall be to the lines and grades shown on the Drawings and in accordance with the applicable requirements JEA Water and Wastewater Standards Manual:

III.3.2.2.1. Clean:

All pipes shall be checked and cleaned of all dirt, dust, grease, oil, water, debris, etc. before it is lowered into the trench. It shall be placed directly into position. If any dirt enters the pipe during placement operations, it shall be immediately removed. In no case shall the pipe be allowed to slide along the bottom of the trench. It shall be placed directly into position.

III.3.2.2.2. Details:

All trenching and backfill operations shall be in accordance with the details on the Drawings and JEA Water and Wastewater Standards Manual: Excavation and Earthwork-Section 408.

III.3.2.2.3. Lay Schedule:

The open trench shall be no more than the footage of pipe that can be laid in a day. All pipe shall be assembled in the pipe trench to predetermined lines and grades as indicated by the Drawings or established in the field by the JEA Representative with an absolute minimum of three feet of cover, unless shown differently on the Drawings or approved in isolated areas by the JEA Representative.

III.3.2.2.4. Line and Grade:

The trench bottom shall be brought to specified and indicated line and grade as outlined in JEA Water and Wastewater Standards Manual: Sewage Force Mains-Section 429, and Excavation and Earthwork-Section 408 and as shown on the Drawings. Holes on the bottom and side of the trench shall be dug at no additional cost to the JEA to accommodate joint assembly (pipe bells, mechanical couplings, or mechanical restraints as specified). Final line and grade shall be accomplished through the excavation or the addition of approved material adequately compacted. In no case shall pressure be applied directly to the pipe by mechanical means, such as the use of backhoe buckets, to accomplish final line and grade.

III.3.2.2.5. Trench Width:

Trench width shall be in accordance with the details on the Drawings and JEA Water and Wastewater Standards Manual: Excavation and Earthwork-Section 408, except that the minimum width shall be wide enough to accommodate the compaction equipment within the haunch zone between the pipe wall and trench side.

III.3.2.2.6. Bedding and backfill:

Pipe embedment and backfilling shall closely follow the installation and jointing of PVC pipe in the trench, to prevent flotation of the pipe by water which may enter the trench and to prevent longitudinal movement caused by thermal expansion or contraction of the pipe.

III.3.2.2.7. Removal:

Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid. The joint gasket shall be removed and a new one installed. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe at no additional cost to the JEA.

III.3.2.2.8. Plugs:

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by gasketed watertight plugs. Plywood is not acceptable for this purpose.

III.3.2.3. Stringing Pipe:

The Contractor shall place the pipe near the trench on the opposite side of the excavated earth. Point the bell end in the direction of work progress.

III.3.2.3.1. Pipe Ovality Check:

Prior to placing the pipe in the trench, the JEA Representative shall inspect the pipe segment at both ends to check for pipe ovality. If the pipe reflects this condition, it is defective and shall be removed from the Work, and replaced with a new section at no additional cost to JEA.

III.3.2.3.2. Spigot Insertion Mark:

Prior to placing the pipe in the trench, the Contractor shall place a permanent mark at the spigot end around the circumference of the pipe at the distance specified by the manufacturer for insertion into the bell end. This must be done in the presence of the JEA Representative, who will verify the distance specified by the manufacturer. If the insertion mark is incorrect, the JEA Representative will place an "X" over the mark, and the Contractor shall completely remove it, and repeat the procedure to place a new mark at the correct location.

III.3.2.4. Gaskets:

Before assembly of the pipe in the trench, the JEA Representative shall inspect every gasket to confirm that it is positioned properly. If it is twisted or pushed out of its seat ("fish mouthed"), the Contractor shall reinsert the gasket so that it is positioned properly. If the gasket cannot be reinserted, then it shall be replaced at no additional cost to the JEA.

III.3.2.5. Lubrication:

Prior to lubrication, the pipe gasket, and spigot and bell ends, shall be checked and cleaned of all dirt, dust, grease, oil, water, debris, etc. before applying lubricant. Once cleaned, an even, uniform application of gasket lubricant must be applied to the bevel and spigot to the insert reference mark as well as the contact surface of the gasket. Gasket lubricant may be applied with a swab, brush, or roller. The joint lubricant must be supplied by the pipe manufacturer. Application of lubricant shall be as recommended by the manufacturer. Lubrication must be done in the presence of the JEA Representative for every pipe joint.

III.3.2.6. Construction Equipment:

During pipe assembly, if construction equipment will be used to "push" the spigot end into the pipe bell, it must be approved

by the JEA Representative prior to use. In no case, shall the equipment be of such a size as to cause the spigot end to be over inserted beyond the reference mark.

III.3.2.7. Pipe Assembly:

Assembly of the pipe is made by sliding the lubricated spigot end into the gasketed bell end. Assembly of all pipe sections, fittings, specials and valves must be done in the presence of the JEA Representative.

III.3.2.7.1. Step 1:

Align the spigot and bell ends and insert the spigot end into the bell so that it is in near contact with the gasket. Keep the pipe lengths in proper alignment. Do not allow the lubricated section touch the dirt or backfill as foreign material could adhere to the surface and compromise joint integrity.

III.3.2.7.2. Step 2:

Brace/Anchor the pipe bell while the spigot end is pushed through the gasket so that previously completed joints in the line will not be "stacked," "over-belled", or inserted past the reference mark. The method of bracing/anchoring the pipe bell shall be approved by the JEA Representative prior to use.

III.3.2.7.3. Step 3:

Push the spigot end in until the reference mark on the spigot end is flush with the end of the bell and is clearly visible outside the entry lip of the socket.

III.3.2.7.4. Step 4:

If the pipe joint requires barring to seat the joint, use a wood block to protect the end of the pipe. A come-a-long is recommended to seat the joint. The method of using a swinging stab is not allowed.

III.3.2.8. Over-Insertion of Spigot End:

If the insertion mark is not visible after assembly, the pipe was over-inserted. The Contractor shall disassemble the joint, and the JEA Representative shall inspect both the spigot and bell ends to verify the interiors are clean and that no damage was done to the pipe or gasket. If the gasket is twisted or pushed out of its seat ("fish mouthed"), determine if it can be repaired, and if not, replace with a new one. If the pipe is damaged, the Contractor shall remove the damaged section and replace with a new one at no additional cost to the JEA. If there is no damage to the pipe, the Contractor shall reassemble the joint in accordance with the procedures described herein.

III.3.2.9. Pipe Restraints:

Restraints for pipe joints (bell/spigot), fittings, couplings, specials, and valves shall be installed per the manufacturer's recommendations. The Contractor shall provide a calibrated torque

wrench/gauge for accurately measuring the torque on all bolts and threaded rods used to secure the restraints. Assembly of all restraints must be done in the presence of a JEA Representative.

III.3.2.9.1. Pipe Joints (Bell/Spigot):

The split retainer ring or non-split retainer ring type of restraint must be installed on the assembled pipe bell and spigot ends per the manufacturer's recommendations. If the restraint uses machined serrations for positive restraint, it must be oriented in the proper direction to resist pullout of the joint or fitting. Do not exceed the maximum distance between the retainer rings on each side of the joint. The threaded rods used to connect the restraints must contain two (2) nuts on each end of the rod. One nut on each rod shall be installed on the "inside" of each retainer ring to insure proper spacing and alignment and to provide a "stop" when torquing the "outside" nut, thereby preventing over homing of the pipe joint. The second nut ("outside" one) on the threaded rod must be tightened to the "seating" torque value for the size of rod used as shown in Table 1 herein. The "inside" nuts may be "hand" tightened. Tighten all "outside" nuts on threaded rods evenly using a calibrated torque wrench/gauge to recommended torque values. Locking washers shall be used on both "inside" and "outside" nuts. Loctite or equal shall be applied to both the "inside" and "outside" threaded rods.

III.3.2.9.2. Fittings, Couplings, Specials and Valves:

Mechanical joint restraining glands at fittings, couplings, specials and valves must be installed per the manufacturer's recommendations. Tighten all bolts and threaded rods evenly using a torque wrench/gauge to recommended torque values.

III.3.2.9.3. Seating Torque for Threaded Rods:

The table below gives values for "seating" torque for rods to be used for securing the restrainer ring on each side of a pipe joint. Tighten all bolts and threaded rods evenly using a calibrated torque wrench/gauge to "seating" torque values.

Table 1 Seating Torque for Threaded Rods

Threaded Rod Dia. (inch)	Seating Torque (ft-lbs)
1 x 40	75
1-1/4 x 32	90

III.3.2.10. Field-Cutting Pipe and Ends:

III.3.2.10.1. Field Conditions:

Closures and short sections of pipe shall be installed by the Contractor as found necessary due to deviating field conditions at no additional cost to the JEA

III.3.2.10.2. Field-Cut:

If the pipe must be field-cut to achieve the proper pipe length or closure piece, the Contractor shall use the proper equipment for making square cuts and bevels (if necessary). Prior to cutting the pipe, the Contractor shall mark the entire circumference of the pipe to ensure a square cut. After the cut is completed and the bevel cut or rounded, the Contractor shall place a permanent mark at the spigot end around the circumference of the pipe at the distance specified by the manufacturer for insertion into the bell end. All work shall be done per the manufacturer's recommendations.

III.3.2.11. Backfill:

Backfill shall be done in accordance with the applicable requirements of the JEA Water and Wastewater Standards Manual: Excavation and Earthwork-Section 408. The JEA Representative must be present throughout the entire backfill operation and at all density testing.

III.3.2.12. PVC pipe 20 inch and larger:

For PVC 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. All spool pieces between 20 inch and larger stainless steel fittings and valves shall be at least 5 feet long. 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.3.2.13. Construction Sequence:

The Contractor shall install the force main pipe and complete all testing in lengths no longer than allowed in the JEA Water and Wastewater Standards. Contractor shall not install sleeves in the pipeline that are not shown on the drawings.

Pipeline segments consist of a gate valve on each end with the connecting pipe in-between. In some cases, the Contractor shall furnish and install temporary plugs/caps, pipe end (stub-outs) sections, and other items as necessary to accommodate the testing sequence at no additional cost to the JEA.

III.3.2.14. Pipeline Testing:

Following the installation and completion of each pipeline segment, including trench backfill, the Contractor shall immediately test that segment of pipeline. The Contractor may continue to install pipe in the next segment during the testing phase. If the pipe segment undergoing testing fails any one test, then the pipe laying in the next segment shall be immediately stopped. No further pipe laying shall be allowed until the pipeline segment undergoing testing passes all three tests. Pipeline testing consists of pressure and leakage; locate wire; and density tests. The tests shall be done in accordance with the JEA Water & Wastewater Standards Manual: Excavation and Earthwork-Section 408, and Sewage Force Mains-Section 429, latest edition. All tests shall be done in the presence of a JEA Representative."

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. Thrust Restraint:

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

- III.3.4.1. 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 No. S-38A), at a minimum.
- III.3.4.2. 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 as follows, at a minimum:

PIPE SIZE	NO. OF RODS	ROD SIZE
4	2	¾
6	2	¾
8	2	¾
10	4	¾
12	4	¾
14	6	¾
16	6	¾
18	8	¾
20	8	¾
24	12	¾
30	14	1
36	14	1
42	16	1 ¼
48	16	1 ¼
54	18	1 ¼

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.3.4.3. 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. S-45). The JEA Standard Details show minimum size thrust blocks for use in good soil. Poor soils will require larger thrust blocks.

III.3.5. 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.3.6. 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. SEWAGE FORCE MAIN AND WATER MAIN SEPARATION REQUIREMENTS:

- III.4.1. The minimum separation requirements between sewage force mains and water mains shall be as outlined in specification Chapter III. 4 - Section 350 and Detail Nos. S-26 and S-27.
- III.4.2. The table below provides the minimum horizontal separation requirements between the proposed utility and structures (see notes).

Pressure Main (water & wastewater) Nominal Size (inches) (See note 1)	Horizontal Separation Requirements (min)
up to 6"	10 feet
8"	14 feet
10"-12"	18 feet
14" 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 2 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.4.3. 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 0.7 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 include the following, at a minimum:

Ilex Attenuata, East Palatka/Savannah Holly, Magnolia Spp., Magnolia Family, Pyrus Calleryana, Bradford Pear, Juniperus Silicicola, Red Cedar, Gordonia Lasianthus, Loblolly Bay, Quercus Stellata, Post Oak, Palmaceae 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 Wastewater System and transfer of services will be performed by the contractor under supervision of the JEA's representative.

III.6. FORCE MAIN CONNECTION TO EXISTING MANHOLE:

Where a new force main is connected into an existing manhole the manhole shall be properly prepared to receive the new force main and repaired or replaced as indicated or specified. Manhole inverts shall be reshaped as required by the new connection to provide a smooth flowing channel of the exact shape of the wastewater to which it connects. Manholes shall receive a protective coating as specified in Chapter IV. 6. - Section 446 of these specifications. An approved gate valve or plug valve must be installed immediately prior to the 45° bends going into the manhole and shall be constructed in accordance with Detail S-18.

III.7. TAPPING SLEEVE AND VALVE 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 shall be made within 5 feet of a joint.

III.8. PRIVATE WASTEWATER PUMP STATION:

III.8.1. If the wastewater force main is constructed per JEA standards (i.e.: 4" minimum pipe size, PVC DR-18 Pipe, D.I. Fittings, Iron Valves, etc.) and if these utilities are dedicated and accepted by JEA, all piping within the City R/W will be O&M by JEA. A JEA approved gate valve (4" minimum) shall be provided at the R/W line (just outside the pump-out box) for all force main piping which exceeds 15 linear feet within the City R/W area. The gate valve at the R/W line is not required on force main piping where the connection (connection at JEA main) is located on the same side of the street as the pump-out box (short side service connection) and consist of 15 linear feet or less within the City R/W area. The Gate Valve or, if no gate valve exist, the R/W line will define the "JEA Point of Service".

III.8.2. Wastewater Pump-Out Box shall be constructed on private property and located at the R/W line. The Pump-Out box shall provide a pump-out connection including a 4" isolation valve and 4" hose connection (quick disconnect with cap). The preferred construction layout is as shown on JEA plate #S-46. The

box may be utilized by JEA or the private owner for maintenance or emergency use. JEA shall have access to the pump-out box at all times. O&M of this box (located on private property) shall be by the private owner.

- III.8.3. Low pressure wastewater station connections to a standard force main larger than 4 inches are not allowed. Connection must be either a gravity point or a force main designed and permitted for low pressure wastewater systems.

III.9. 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 stainless steel pipe shall not include HDPE main piping. Pressure testing of HDPE main piping shall be completed separately with no PVC or stainless steel 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 and 755). 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.9.1. 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.

- III.9.1.1. 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.9.1.2. 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.9.1.3. 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.9.1.4. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.
 - III.9.1.5. 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.9.1.6. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
 - III.9.1.7. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.
 - III.9.1.8. 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.9.1.9. 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.9.1.9.1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
 - III.9.1.9.2. Swabbing speed shall range between two and five feet per second.
 - III.9.1.10. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.
- III.9.2. Unless it has already been done, the section of pipe to be tested shall be filled with domestic 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. Unless approved otherwise by JEA, the contractor shall be responsible for providing and paying for the domestic water utilized in filling the main and, if required, any flushing of the system. 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 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.9.3. 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 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. 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.9.4. 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.9.5. All piping shall be pressure and leakage tested for a minimum of two hours duration at 150 psi minimum or 2 times the 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. 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. Repairing, replacing and retesting shall be done 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 joint.

III.9.6. 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.9.6.1. Formula No. 1: shall be utilized to determine the allowable leakage amount for the test section constructed with PVC pipe (based upon the number of rubber gaskets). Pressure and Leakage Test form for the formula is provided in the back of Chapter III. 1. - Section 350.

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

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

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. The total length of pipe within the test section shall not exceed 5,000 linear feet, unless approved otherwise by JEA.

III.9.7. 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.9.8. 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.

III.9.9. HDPE: For leakage and pressure testing for high density polyethylene (HDPE, PE), Pipe and fittings, see "Horizontal Directional Drilling" (Chapter VI. 2. - Section 750 and 755), 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 PVC pipe sections (see Chapter VI. 2. - Section 750 and 755 for clarification).

III.10. LOCATE WIRE:

III.10.1. 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 certified tester and approved

testing equipment. The Certified Testing Company must be pre-approved by JEA and listed within JEA's GC11 listing under 18-H category. 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 Certified Test Company a copy of the project site drawings (as-builts preferred). 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 certified 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 are installed within the acceptable cover limits, no remarks are required. All lateral stub-outs shall be marked and recorded. A final Locate Wire Report (statement by the certified tester), shall be submitted to JEA for review and approval. The report shall include a signed statement from the certified 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/repaired, depths (if installed outside the acceptable cover limits), and other applicable field remarks by the certified tester. A Certified copy of the report and marked-up drawings shall be furnished prior to final acceptance of the project or as approved otherwise by JEA.

III.10.1.1. 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.10.1.2. Certified Tester:

A person or company that has been certified by the Manufacturer of the approved testing equipment 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.10.2. Locate Wire Installation:

Contractor shall furnish and install locate wiring on all force mains (see Detail S-49 for other locate wire requirements). Locate wire must be attached to force mains 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). 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 unless it is unavoidable. 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: DEYCONN, P/N 90120 - DB Lug Yellow, 5pc. Bag or JEA approved equal.

III.11. 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.

III.12. 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 force 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.13. 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 force main shall be placed in steel casing pipe under all railroad crossings whether installed by open cutting or jacking and boring. The force 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.

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

☐

Location:

☐

Paved Area

☐

Grassed Area

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

Comments: _____

Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____



RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

PROJECT: _____

TEST SECTION: _____

JEA REPRESENTATIVE: _____ SIGNATURE _____

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

OTHER TEST PHASE ATTENDEE'S:

PRESSURE AND LEAKAGE TEST CALCULATIONS: _____ WASTEWATER FORCE MAIN

Line Pressure Test:

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

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

TYPE OF HDPE PIPE (DR RATING) (1)	DIAMETER OF PIPE (INCHES) (2)	LINEAR FEET (3)	2-HOUR TEST FACTOR (see JEA TABLE) (4)	TOTAL ALLOWABLE LEAKAGE (3x4) (5)
Total Allowable Leakage Amount (Gallons):				

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. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

JEA 2-HOUR TEST FACTORS						
NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14" – 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48" – 0.1350	54" – 0.1570	

FILE No. _____

RECORD of PRESSURE and LEAKAGE TEST Based on Formula for PVC Material Only

PROJECT: _____

TEST SECTION: _____

JEA REPRESENTATIVE: _____ SIGNATURE _____

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

OTHER TEST PHASE ATTENDEES:

Pressure and Leakage Test Calculations: _____ WASTEWATER FORCE 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)

TYPE OF PIPE PVC (1)	DIAMETER OF PIPE (INCHES) (2)	NUMBER OF JOINTS (3)	2-HOUR TEST FACTOR (4)	TOTAL ALLOWABLE LEAKAGE (2x3x4) (5)
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC			0.00331	
PVC (Sum of Above):				
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 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):

$$L = \frac{ND P^{\frac{1}{2}}}{7,400}$$

Formula 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, the leakage test is acceptable (test passes). If the actual leakage amount is greater than the allowable leakage amount, the leakage test fails. 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, 2016

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WASTEWATER VALVES AND APPURTENANCES – SECTION 430

I. GENERAL

I.1. SCOPE OF WORK:

The contractor shall furnish, install, joint, and test all gate valves, check valves and other special valves and appurtenances as shown on the drawings and herein specified. In general, gate valves shall be utilized on wastewater force mains, except at the pump station site, where plug valves are required. 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. The contractor shall field check all exposed bolts on all valves to insure that they are tight prior to installation. All manifold connections into a JEA force main system shall be 4" size, at a minimum.

I.2. 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.3. ROTATION OF OPENING:

All valves shall open by turning to the left or counter clockwise, when viewed from the stem.

I.4. EXTENSION STEMS:

Where extension stems are required, substantial, adjustable wall brackets and extension stems shall be furnished and located as directed. Extension stems shall be provided on all buried valves when the operating nut is deeper than 30 inches below the final grade. Sufficient stem extension shall be provided so that the nut will be no more than 30 inches below finished grade.

I.5. PAINTING OF VALVES AND VALVE BOX LIDS:

The interior and exterior surfaces of all valves shall be epoxy coated, if not otherwise noted. The top side of all wastewater valve box covers and the inside of the top section of the valve box shall be painted green. Oil based, traffic-rated paint shall be used.

I.6. HYDROSTATIC AND LEAKAGE TEST:

The Contractor shall be required to perform a separate hydrostatic/leakage field test on each valve installed to insure it is bubble tight. The duration of this test shall be 15 minutes at 150 psi and conform to AWWA C504. The method of performing this test shall be left up to Contractor with the Engineer's approval. The failure of the valve to perform will result in its removal from the job site and replacement by the Contractor at the contractor's expense.

I.7. LOCATING MARKERS FOR VALVES:

A 'V' cut shall be carved in the curb closest/adjacent to a below grade valve. This 'V' cut shall be painted green.

I.8. WARRANTY:

The Contractor shall supply to JEA a two (2) year unconditional warranty after substantial project completion or acceptance or any designated portion thereof. 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.9. INSPECTION CHECKLIST:

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/operation of each new and rehabilitated air release valve, meter box and valve. The Contractor's representative shall complete the associated JEA Final Inspection Checklist for each new or rehabilitated air release valve, meter box and valve, 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.

II. GATE VALVES**II.1. GENERAL:**

Gate valves shall be designed for 250 psi minimum working pressure. When full open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. The operating nut or wheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydraulic pressure equal to 500 psi (twice the specified working pressure).

II.2. BURIED VALVES:

Buried gate valves shall be iron body bronze mounted, all exterior mounted bolts and nuts shall be stainless steel, rubber or EDPM encapsulated, resilient seat, solid wedge, non-rising stem type with operating nuts and adjustable valve boxes and covers. Operating nuts shall be two inches square. Resilient seat or wedge type gate valves shall conform to applicable sections of AWWA Standards C509 (250 psi) or C-515. Gate valves 24 inch and larger may be double disc type meeting AWWA C-500. All gates valves 24 inches or larger must be geared for vertical (spur) installations. All valves shall be installed vertically unless additional depth of bury is impossible due to physical obstructions. If a horizontal gate valve is required and approved by JEA, then the gate valve shall only be a double disc type (with rollers, scrapers and tracks) and be geared (bevel geared).

II.3. ABOVE GROUND VALVES:

Gate valves located above ground or inside structures shall be hand wheel operated, non-rising stem type with flanged ends and be of the same general construction as buried valves.

II.4. VALVE JOINTS:

All gate valves shall have mechanical joint ends, flanged ends, or screw joints to fit the pipe run in which they are used, except valves installed on push-on joint pipe shall have mechanical joint ends unless otherwise specified.

III. PLUG VALVES**III.1. GENERAL:**

All plug valves, unless specifically shown otherwise on the drawings, shall be of non-lubricated, eccentric plug type with Buna "N" neoprene, epoxy or fusion bonded, nylon faced plugs. Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be stainless steel. Port areas of 4 inch through 20 inch valves shall be at least 80% full pipe area and 24 inch and larger valves shall be at least 70% full pipe area. The valve seat material shall consist of either a welded in 1/8 inch overlay of 90% pure nickel, or 316 stainless steel screwed into the cast iron body. Upper and lower plug stem bearings shall be sleeve-type of a stainless steel or other non-corrosive bearing material. The packing shall be adjustable and the bonnet shall be bolted. All bolts, nuts and washers shall be 316 stainless steel for buried, non-buried, and pit installed service. All buried valves on push-on joint pipe shall have mechanical joint ends and meet the requirements of ANSI A21.11. All exposed (non-buried) valves shall have flanged ends in accordance with American Standard B16.1, Class 125. The valves shall be rated for a minimum of 150 psi, non-shock cold W.O.G. and shall provide drip-tight shut off with this pressure in either direction. The operating nut or hand wheel shall have an arrow cast in the metal indicating direction of opening. The valve manufacturer shall furnish certified copies of performance, leakage and hydrostatic testing as outlined in AWWA C504. The interior of all plug valves shall be epoxy coated.

III.2. OPERATORS/ACTUATORS:

All plug valves 8 inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each non-buried, gear-actuated valve.

III.3. BURIED VALVES:

Buried valves shall have seals on all shafts and gaskets on the valve covers. Buried valves shall be provided with 2 inch square operating nuts.

III.4. VALVE JOINTS:

All plug valves shall have mechanical joint ends if buried on push-on joint pipe or flanged ends if above ground on flanged pipe.

IV. CHECK VALVES

Check valves shall conform to the requirements of AWWA C508. Check valves larger than 2 inch nominal size shall be iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to a steel outside lever and weight, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc. Check valves larger than 2 inches shall be 150 psi working pressure. Check valves 2 inches and smaller nominal size shall be all brass swing check valves, 200 psi working pressure.

V. MISCELLANEOUS VALVES AND APPURTENANCES**V.1. TAPPING SLEEVE:**

To be utilized only for live tap applications or where specifically approved by JEA. No taps (all sizes) shall be made within 5 pipe diameters or 5 feet (whichever is smaller) of a joint. Unless approved otherwise by JEA, size-on-size taps are limited on PVC mains to 12 inch size and smaller. Size-on-size taps are acceptable on D.I.P. (all sizes). For size-on-size taps, on 8" and larger mains, the actual tap hole size shall be reduced by 1-inch.

V.1.1. Stainless Steel:

Stainless steel tapping sleeves may be used on 4 inch pipe and larger. Stainless steel tapping sleeves shall be all 304 stainless steel, including flanges, bolts and nuts and shall be rated for 150 psi minimum operating pressure and 200 psi minimum test pressure. The tapping sleeve shall have a pilot flange recessed for tapping per MSS SP-60. The pilot flange shall be pressure rated Class D according to AWWA C207 with 125 pound drilling conforming to ANSI B16. Each sleeve shall be supplied with a flanged gasket bonded to the flange. The body gasket shall be a full circle, grid pattern, converting the entire length of the sleeve, cloth reinforced with attached stainless steel bridge to support the gasket at the lugs. The gasket shall be made of SBR rubber or similar material, compounded for use with water, salt solution, mild acids, bases and sewage. The sleeve shall have a ¾ inch NPT bronze or stainless steel test plug. All welds shall conform to ASTM A380 and shall be fully passivated. Tapping sleeves 8 inch and smaller may have outlet connection to fit a mechanical joint tapping valve.

V.2. TAPPING VALVES:**V.2.1. General:**

Tapping valves shall be iron body with stainless steel bolts and nuts, bronze mounted gate valves, non-rising stem, open left, resilient seat, and 2 inch square operating nut. Valves 24-inch and larger may be double disc type meeting AWWA C-500. All gate valves 24-inches or larger must be geared for vertical (spur) installations. All valves shall be installed vertically unless additional depth of bury is impossible due to physical obstructions. If a horizontal gate valve is required and approved by JEA, then the gate valve shall only be a double disc type (with roller, scrapers and tracks) and be geared (bevel geared). The valve ends shall be mechanical joint for use with ductile iron pipe on one side and standard flanged (Class 125) on the other. Tapping valves 8 inch size and smaller may be MJ by MJ valve ends to match sleeve (standard MJ gate valve). Valves shall conform to the applicable section of these specifications.

V.2.2. Hydrostatic And Leakage Test:

After installing a tapping sleeve and valve, and prior to tapping of a pressurized water main, a hydrostatic and leakage test shall be performed. The test will be conducted by introducing water into a tap or test hole located at the neck of the outlet half of the sleeve, on sleeves furnished with said tap, and with the tapping valve in the closed position. Sleeves shall be provided with a test plug. The sleeve and valve shall be capable of maintaining a test pressure of 150 psi for 15 minutes duration, with no sign of visible leaks. All leaks shall be repaired by removing and replacing defective items with items free of defects, after which the sleeve and valve shall be re-tested. Such repair and re-testing shall be done

until the installation passes the specified test. The Contractor shall furnish and install any necessary temporary restraints, gauges, pumps and other incidental and appurtenant items necessary to complete this work, and shall remove same upon completion of the test. A watertight plug (bronze or stainless steel), shall then be inserted into the test hole.

V.3. TAPPING SADDLE (2 INCH AND SMALLER OUTLET):

Stainless steel service saddles shall include stainless steel double bands. Outlet sizes shall be 1 inch through 2 inches and have iron pipe threads (IPS). The outside diameter range of the saddle shall be properly sized to conform to the type of pipe being tapped without placing undue stress on the pipe. Pipe shavings or cuttings, including coupon, shall not enter the host pipe during the tapping operation. The hole cut in the host pipe shall be 1/16 inch diameter smaller than the outside diameter of the saddle outlet.

V.4. TAPPING SADDLE (GREATER THAN 2 INCH OUTLET):

Saddles which require an outlet larger than 2 inch size shall utilize a "tapping sleeve" with a flanged outlet, as specified above.

V.5. AIR VALVES:

In most cases, an air release valve shall be utilized in lieu of a combination (air release and vacuum) valve. Combination valves shall only be utilized if a major vacuum condition exist and is specified by the design engineer. This will assist JEA in minimizing wastewater odor complaints within our wastewater service area. See the Approved Materials Manual for a list of approved air valves. For construction standards see Detail S-29.

V.5.1. Air Release Valve:

Air release valve shall be 2 inch inlet (minimum), stainless steel internal trim (including float, lever arm, leakage, etc.), stainless steel assembly bolts, stainless steel backwash accessories including quick disconnects and stainless steel ball valves (gate valve are also acceptable). The body of the air valve shall be 316 stainless steel or nylon plastic. Short body style shall only be substituted for the standard size when head clearance (for the standard style) is not available.

V.5.2. Combination Air Valve:

Combination (air release and vacuum release valve) air valves shall meet the requirements as stated above for air release valves, at a minimum.

V.6. BALL VALVES:

Ball valves shall be stainless steel, including the handle, rated at 1,000 psi WOG (minimum), threaded or flanged connections and TFI seats and seals.

VI. VALVE BOXES

VI.1. GENERAL (CONCRETE COLLAR AND VALVE TAGS):

The Contractor shall furnish, assemble and install a valve box for each buried valve. Each valve box installed in un-paved areas shall be installed with a 24 inch round or square, 6 inch thick concrete collar with #4 reinforcing rebar rings, poured around the top of the valve box cover. The concrete shall have a minimum strength of 3000 psi. In lieu of a poured concrete collar, a pre-cast concrete valve pad may be utilized which meets the requirements below. Provide brass identification tag with "WASTEWATER", valve size, valve type and direction and number of turns to open. Provide a ¼ inch hole in brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2 inch diameter and ½ inch thick

brass with ¼ inch hole. SEE SECTION 429, III.10.1. LOCATE WIRE AND DETAIL S-49 FOR MORE INFORMATION

VI.2. VALVE BOXES:

Adjustable valve boxes of suitable length shall be used. Cover shall be marked "WASTEWATER". The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade. The base shall be centered over the valve and shall be on line with nut at top of valve stem and the entire assembly shall be plumb. Boxes shall be cast iron. Cast iron castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM Designation A48, Class 20B, Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, or other harmful defects and shall be coated with a single thin coat of coal tar epoxy. The cover will not rock after it has been seated in any position in its associated jacket.

VI.3. DEBRIS CAP:

The debris cap (if noted on the construction documents as required), shall be comprised of a hollow member having a cylindrical outer surface, a closure for one end and three point resilient contact pads projecting from the outer surface. One contact pad shall be movable by means of a cam having a low angle of advance whereby external forces applied to the cam via the movable contact pad will not cause rotation of said cam. The cap shall have a flexible skirt providing an outward seal preventing debris from getting past the cap. The cap must withstand without slippage, a minimum vertical force of 50 lbs. at a loading rate of 1.0 inches/minute. The cap shall have retaining prongs to retain a standard locating coil, and shall be capable of installing a standard fitting for "Lock-out/Tag-out" in compliance to all standards and requirements of State and Federal OSHA guidelines

VI.4. PRECASE CONCRETE VALVE PAD:

The concrete valve pad shall consist of the following:

- VI.4.1. Concrete rated at 4,000 psi (minimum). Fiber mesh re-enforcement is optional. Concrete shall be smooth and in one piece, with no cracks.
- VI.4.2. Pad must include two #2 (minimum) steel rebar rings for structural support.
- VI.4.3. Concrete thickness shall be 4 inches at the center and tapered to 2 inches at the outside edges.
- VI.4.4. The dimensions shall be 23-1/2 inches OD (minimum) with a 10 inch OD centered hole.

This installation shall include applying grout in the annular space between the OD of the valve box and concrete pad. For support and adhesion, the grout shall be placed in the entire 4 inch vertical annular area within the pad open hole space. The concrete pad must be placed on firm compacted sand. The top of the concrete pad shall be level with the top of the cast iron valve box and level with grade. The required brass valve identification tag shall be attached to the inside of the cast iron valve cover.

VI.5. VALVE BOX DEBRIS SHIELD:

- VI.5.1. All buried valves 3-inch through 12-inch requiring a valve box shall be furnished with a valve box shield (alignment device). The device shall minimize debris infiltration and center the valve box over the operating nut. The device shall be of HDPE or plastic and colored white or black. It shall be furnished in two pieces that will lock together under the operating nut without requiring the removal of the op nut. The device shall not affect the operation of the valve. No one-piece

device will be accepted. The device shall be Box Lok American Flow Control (AFC) or approved equal.

VII. METER BOXES (SERVICE ACCESS POINTS)

VII.1. POLYMER CONCRETE:

Polymer Concrete meter boxes shall be manufactured using fiberglass reinforced materials and polymer concrete. The body of the box shall be manufactured using fiberglass reinforced materials, comprised from polyester resins and fiberglass matting. The top color of the box shall be manufactured from poured polymer concrete and shall be off-white color to match cover. The top (cover) shall be manufactured using polymer concrete (off-white color). The size of the meter box and load rating shall be as specified on the drawings, one inch meter box size (at a minimum). To obtain approval by JEA, the load ratings shall be certified by a professional engineer or state certified testing lab. The lid shall also be certified by Cellnet Technology and Sensus Metering Systems to be "RF" compatible with the Sensus MTU.

VIII. DUCTILE IRON BODY INSERT VALVE

VIII.1. XI.I. GENERAL:

The Ductile Iron 250 p.s.i.g. rated Insert Valve shall be a Resilient Wedge Gate Valve designed for use in potable water, raw water, reclaimed water, sewage, irrigation and backflow control systems. The design will allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service. The insert valve shall be a Team Industrial Services Insert Valve or JEA approved equivalent.

VIII.2. DUCTILE IRON BODY:

- VIII.2.1. The ductile iron body, bonnet and wedge shall meet or exceed the requirements of AWWA C515 with 250 psig maximum working pressure. The pressure rating markings must be cast into the body of the insert valve. The Insert Valve shall be ductile iron construction meeting ASTM A536 Grade 65-45-12.
- VIII.2.2. Valve bodies sized 12" and smaller shall be capable of installation on Cast/Grey Iron or Ductile Iron Class A B C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body.
- VIII.2.3. Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.

VIII.3. RESILIENT WEDGE GATE ASSEMBLY:

- VIII.3.1. The construction of the Resilient Wedge shall comply with AWWA C509.
- VIII.3.2. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process.
- VIII.3.3. The resilient wedge shall seat on the valve body and not the carrier pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe.
- VIII.3.4. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal.
- VIII.3.5. Pressure equalization on the down or upstream side of the closed wedge shall not be necessary to open the valve.

- VIII.3.6. The wedge shall be symmetrical and seal equally with flow in either direction.
- VIII.3.7. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. The resilient wedge must have more support than the operating stem as the resilient wedge enters and exits the water (fluid) way
- VIII.4. FUSION BOND EPOXY COATING:
 - VIII.4.1. The insert valve shall be shop epoxy coated on the interior and the exterior. The fusion-bonded coating shall be applied prior to assembly so that all casting surfaces, including the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated.
 - VIII.4.2. Valve shall be coated with a minimum of 8 mils fusion bond epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61.
- VIII.5. GASKETS AND O-RING STEM SEALS:
 - VIII.5.1. The inset valve shall have O-Ring stem seals. Two O-Rings shall be located above, and one O-Ring shall be located below the thrust collar. The lower two O-Rings shall provide a permanently sealed lubrication chamber. The upper O-Ring shall protect the lower O-Rings.
 - VIII.5.2. Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross-sectional shape.
- VIII.6. VALVE STEM AND THRUST WASHERS:
 - VIII.6.1. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. The gate valve stem and wedge nut shall be a copper alloy in compliance with AWWA Standard 515, Section 4.4.5.1.
 - VIII.6.2. Two thrust washers are used. One is located above, and one is located below the stem thrust collar.
 - VIII.6.3. The valve shall be operated by 2" square wrench nut according to ASTM A126 CL.B – open left (counter-clockwise).
- VIII.7. SPLIT JOINT RESTRAINT:
 - VIII.7.1. Shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
 - VIII.7.2. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.
 - VIII.7.3. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
 - VIII.7.4. The mechanical joint restraint shall retain full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.
 - VIII.7.5. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Pressure point set screw type hardware shall not be used.

VIII.7.6. Restraint devices shall be Listed by Underwriters Laboratories and Approved by Factory Mutual (3" through 12" inch size).

VIII.8. PRESSURE TESTING:

VIII.8.1. After the installation of the insert valve body on to the existing pipe a pressure test of 150 P.S.I.G. shall sustained for 15 minutes. Once the pressure test is affectively achieved the insert valve body shall not be moved as per AWWA Standards. If the insert valve is moved the pressure test must be completed again. The insert valve must not be moved or repositioned once the pressure test is satisfactorily completed and approved by the Owner/ Engineer



VALVES

JEA Final Inspection Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Sta: _____

Offset: _____

Check the following as applicable:

Wastewater

☐

Location:

☐

Paved Area

☐

Grassed Area

Pad:

☐

Concrete

☐

Asphalt

☐

N/A

Cover at Finish Grade:

☐

Yes

☐

Cover below finish grade-adjust to spec.

Colored coded cover per spec:

☐

Yes

☐

No--provide color code per spec.

Brass Tag affixed:

☐

Yes

☐

No

If No, is this a fire hydrant branch line?:

☐

Yes

☐

No--provide per spec.

Valve Size (inches): _____

Valve Type:

☐

Gate

☐

Plug



Valve nut accessible:

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Valve Depth to Nut (inches): _____

Extension Provided (> 30 inches depth to nut)

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No--provide extension per spec.

Open direction:

<input type="checkbox"/>	Left
<input type="checkbox"/>	Right--replace per spec.

Valve exercised(Start in closed position, then open fully):

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Number of Turns(counted) to open: _____

(all valves < 20" shall be manually operated)

Valve use: _____ Mainline _____ Independent _____ Stub _____ Fireline

Valve position(after exercised):
Open(mainline/independent/fire)

Partially closed-(Stub)

Locate wire accessible in jacket

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Locate wire color coded

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Locate wire accessible in jacket

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Comments: _____

Contractor Representative: _____

Signature & Printed Name



JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____

AIR RELEASE VALVES

JEA Final Inspection Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Sta: _____

Offset: _____

Check the following as applicable:

Water

☐

Wastewater

☐

Reclaimed

☐

Connection:

☐

Offset connection

☐

Direct Connection (ie. vault over main)

Vault Cover elevation

☐

Finish Grade

☐

Below/above finish grade--adjust per spec

Vault box interior lined

☐

Yes

☐

No--line per spec

☐

Not applicable--water or reclaimed main

Clearance between bottom of vault cover and top of ARV

☐

8 inches or greater

☐

Less than 8 inches--adjust per detail

Air release Valve Size (inches):

Valve position (after exercised)

☐

Open

Stainless steel Ball Valves

☐

Yes

☐

No--replace per spec

Stainless steel piping or fittings

☐

Yes

☐

No--replace per spec



Comments: _____

Contractor Representative: _____

Signature & Printed Name

JEA Inspector: _____

Signature & Printed Name

JEA O&M representative: _____

Signature & Printed Name

Commissioned this date: _____



LOCATE WIRE BOX (UTILIZING CO-POLYMER METER BOX) JEA Final Inspection checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Check the following as applicable

Water ☐

Wastewater ☐

Reclaimed ☐

Location: ☐ Paved Area
☐ Grassed Area

Cover at Finish Grade: ☐ Cover at finish grade
☐ Cover above/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

Comments:

Contractor Representative:

Signature Print name

JEA Inspector:

Signature Print name

JEA O&M representative:

Signature Print name

Commissioned this date: _____



JEA Tracer Wire Certification Form

Project Name/Number:

Date(s) Tested:

Installed by: (Contractor Name)

Name of Tester:

Tester Company Name:

Name of JEA Inspector:

Pass:

:

Y

N

Fail:

Continuity/Signal strength between access points:

Marker Balls Installed / Located

Access pt #1 to access pt #2:

Color is for the utility type of Marker ball

Access pt #3 to access pt #4:

Installed

Located

Access pt #5 to access pt #6:

Installed

Located

Access pt #7 to access pt #8:

Installed

Located

Access pt #9 to access pt #10:

Installed

Located

Total footage tested	Water	Sewer / FM	Reclaimed Water	Fiber Optic

If any faults found List below (please indicate utility type and location)

Fault # 1:	
Fault # 2:	
Fault # 3:	
Fault # 4:	
Fault # 5:	

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SUBMERSIBLE WASTEWATER PUMPING STATIONS – SECTION 433

I. SCOPE OF WORK

All Pump Stations in JEA's service area shall conform to section 433.

The Contractor shall furnish, install, test and place in operation the submersible pumping station shown on the drawings and specified hereinafter. All applicable sections of the City of Jacksonville Standard Specifications and JEA Water and Wastewater Standards shall be considered part of this work. All references to Industry Standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated. Only those materials included in the JEA Water and Wastewater Standards Manual, (including, but not limited to, submersible pumps, VFD equipment and control panels), shall be installed. All materials shall be new unless specifically called for otherwise. All structures, pumps and panels shall require a complete shop drawing submittal, as detailed in this specification for JEA's review and approval prior to the start of construction.

II. WARRANTY

II.1. CONTRACTOR WARRANTY:

- II.1.1. The Contractor shall supply to JEA a two (2) year unconditional warranty effective on the date of the JEA's Operation and Maintenance Pump Station acceptance letter. 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 to insure safe and correct operation of the station.

II.2. SPECIALTY WET WELL LINER MANUFACTURER WARRANTY:

- II.2.1. The liner manufacturer shall warrant the liner against defects for at least ten (10) years after the date of acceptance by JEA. Defects are defined as cracking, delamination or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to satisfaction of JEA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

II.3. PUMP MANUFACTURER WARRANTY:

- II.3.1. The Pump Manufacturer shall warrant to JEA all permanently installed municipal sewage service Submersible Pumps and Motors against all defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years: Mechanical Seals, Bearings, Shafts, Motor Electrical Cables and Motor Stators. See section below entitled "Submersible Pumps" for additional requirements.

III. GENERAL REQUIREMENTS

III.1. PROJECT SCHEDULE AND COOPERATION:

The project schedule shall be established based on working a normal work schedule including five days per week, single shift, and 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 setting wet well (base and riser sections), field pump test, 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 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 systems limitations and provide such work or services at no additional cost to JEA. Unless approved otherwise, a JEA representative shall be present to observe the excavated area prior to setting (installing) the wet well. The date and time for setting (installing), the pre-cast wet well shall be reviewed and approved by JEA, prior to the actual work.

III.2. SHOP DRAWING SUBMITTALS:

Actual catalog data, brochures and descriptive literature will be required for wet well pumps and electrical and controls at a minimum as specified here-in.

III.3. AS-BUILT DRAWINGS:

As-built drawings shall be required on all Wastewater, force main and pump station 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" and as defined here-in. 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. The Contractor shall submit "As Built" drawings before pump station start-up.

III.4. WORKMANSHIP:

All work shall be proved to be in first class condition and constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor with no additional cost to JEA.

III.5. MATERIALS:

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.

III.5.1. Unless indicated otherwise on the drawings, all metal components in the wet well, with the exception of pumps and motors shall be ~~anodized aluminum~~ or 316 stainless steel as specified here in or on the plans.

III.5.2. The pump supplier to ensure unit compatibility shall supply the pumps, motors and guide rail system.

III.5.3. Station piping shall conform to JEA Water and Wastewater Standards Chapter IV. 3. - Section 429, entitled Wastewater Force Mains and Chapter IV. 4. Section 430 entitled Wastewater Valves and Appurtenances. Specifically, station piping for Class I, Class II, Class III and Class IV stations shall be plumbed and aligned according the latest ASTM, AWWA standards, any piping ill-regularities shall be removed and replaced.:

III.5.3.1. Piping within the wet well shall be flanged 316 stainless steel, (schedule 10, one-piece construction with no butt-welds with exception of pump-out pipe). Fittings within the wet well shall be flanged 316 stainless steel. All nuts, bolts and accessories within the wet well shall be 316 stainless steel.

~~III.5.3.2.~~ Pipe and fittings outside of the wet well and above ground shall 316 stainless steel (flanged, schedule 10 with no butt-welds). All bolts, washers and nuts shall be 316 stainless steel, threaded and shall be coated with "Never Seize" type coating.

III.5.3.3. Force main piping below ground, outside of the wet well shall be in accordance with Chapter IV. 3. - Section 429 and Chapter IV. 4. - Section 430 of this standards manual. No connections permitted into JEA force mains which are greater than 12" size unless the connection is from a class two

pump station or larger. All connections shall be 4" size or larger (no 2" size connections).

III.5.3.4. All Cam-locks shall be 316 stainless steel.

III.5.4. Minimum wet well size shall be 8-foot diameter. A 12 foot diameter wet well (minimum) shall be utilized in cases where the pump discharge piping (in the wet well) is 10-inch diameter or larger.

III.5.5. Refer to Chapter IV. 7. - Section 472, "Emergency Generator", for technical specifications on automatic standby emergency generator with diesel engine drive and above ground fuel storage tank. All generators shall be sized to run all pumps at station.

III.5.6. Emergency Pump Engines refer to section 470, for technical specifications on standby emergency pump engine with fuel storage tank. All emergency pump engines shall be sized to run all pumps at station.

III.6. SELECTION OF PUMP STATION STANDARDS:

JEA Pump Station Standards are available in Auto CAD format, on the jea.com website. The selection of a pump station type shall comply with the following:

Pump Station Type	Pump Station Maximum Peak Flow (GPM)	Pump Station Maximum ADF, & EDU	Emergency Operating System Required	Odor Control Required	Additional Design Requirements	Solids Removal
Class One	0 – 440 GPM	174,999 GPD 499 EDU	Generator or Pump Engine	Not required	Flow meter and Smart meter.	
Class Two	441 – 1000 GPM	175,000 – 436,450 GPD 500 - 1247 EDU	Generator or Pump Engine	Electrical sizing, piping and pad provided for future odor control.	Flow meter and Smart meter	
Class Three	1001 – 2000 GPM	436,451 - 971,250 GPD 1,248 – 2,775 EDU	Generator and 2 Pump Engines	Required	Flow meter and Smart meter Electric power, controls, building with ventilation. See section 11.6.10.	Required
Class Four	2001 GPM and Above	971,250 GPD and above 2,775 EDU and above	Generator and 2 Pump Engines	Required	Flow meter and Smart meter Electric power, controls, building with ventilation. See section 11.6.10.	Required

* Any station which discharges through a 12" or larger force main or whose maximum design is 440 GPM or greater shall have a generator.

III.6.1. Definition of Flow:

- III.6.1.1. Maximum Peak flow in GPM (gallons per minute) is the ultimate peak design flow of the pump station using the 10 State Standards peaking factor applied to 3.5 people per Equivalent Dwelling Units (EDU) and 100 GPD per person.
- III.6.1.2. The pump station Maximum Average Daily Flow (gallons per day) is the station's un-peaked maximum/ultimate average daily flow rate the station will be pumping.
- III.6.1.3. The pump station's number of EDU's is the number of Equivalent Dwelling Units it will be pumping, which equates to 350 GPD per EDU.
- III.6.1.4. The pump station maximum GPM excludes the flow from the permanently installed stand-by pump and any emergency standby by pump (pony).

III.6.2. Back Up Power Requirements:

- III.6.2.1. Pump Stations discharging through a 12" force main or larger, or which re-pump flow from another pump station, through a force main, shall include means for continued pumping operations (emergency operating system) during a power outage/failure. The emergency operating system shall be an Automatic Emergency Generator (see section 472, Emergency Generator).
- III.6.2.2. An emergency operating system shall be required for all pump stations. The emergency operating system shall be an Automatic Emergency Generator (see section 472, Emergency Generator) or Emergency Pump Engine (see section 470, Emergency Pump Engine).

III.6.3. All pumping stations shall have a Smart meter to monitor electrical conductivity. Meters shall be supplied the electrical provider.

III.6.4. All pumping stations emergency pump engine, separate or combined, are to be sized to the same rate as all permanent pumps, pumping simultaneous.

III.6.5. All Class One and Two pumping stations, both rehabilitation and new construction, shall include an ultrasonic flow meter (indicating, totalizing, data transmission via scada and recording capabilities).

III.6.6. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter (indicating, totalizing, data transmission via scada and recording capabilities) with bypass configuration located within the fenced area.

III.6.7. All Class Three and Four pumping stations, both rehabilitation and new construction, shall include an influent solids removal system with debris storage, offsite disposal method and odor control.

III.6.8. Odor Control Requirements:

- III.6.8.1. All stations with a maximum peak flow greater than 440 GPM shall include electrical service sizing, control panel sizing, piping and concrete pad for future odor control.
- III.6.8.2. All stations with a maximum peak flow greater than 1000 GPM shall include an odor control system.

III.6.9. Electrical Control Building required if any of the below conditions exists:

- III.6.9.1. Pumps larger than 75HP
- III.6.9.2. Station FLA > 400 amps
- III.6.9.3. Station HAS > 3 pumps

III.7. PUMP STATION INSPECTION CHECKLIST:

III.7.1. 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 (i.e. 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 station. The Contractor's representative shall complete the Inspection Checklists (e.g. electrical, start-up, generator, instrumentation, mechanical, etc.) for each new or rehabilitated pump station, and have the JEA attendees provide original signatures/names on the signature blocks. The JEA representative shall scan the checklists and ensure the documents are filed in the electronic file folder for the project.

IV. SUBMERSIBLE PUMPS**IV.1. OPERATING CONDITIONS AND UNIT SIZES:**

Operating conditions and unit sizes shall be as shown on the drawings. The pump design operating conditions shall be within 10% +/- of the best efficiency point, unless otherwise approved by JEA. When possible, the pump selection shall be made in the center of the family of curves.

IV.2. SHOP DRAWINGS AND PUMP TAGS:

Prior to commencing the pumping station installation and/or the furnishing of replacement pumps, the pump distributor shall submit for approval, detailed and dimensioned shop drawings for pumps including factory curves of identical model pumps provided to JEA. The pump distributor shall furnish and deliver at the time of acceptance for use of the pumping station and/or of the replacement pump(s) by JEA, 3 computer diskettes (Microsoft Word) containing Operation & Maintenance data and motor and pump nameplate data (including serial numbers) for each pump supplied. The pump supplier shall provide a vinyl or aluminum placard or tag which indicates all operating conditions of the pumps, including name plate data, impeller size and part number, design flow, TDH, and other pump related data. The tag shall be placed (with adhesive) inside the front panel of the pump control panel or as directed by JEA.

IV.3. PUMP EQUIPMENT:

Pumping equipment shall be as listed in AS-603 and premium quality submersible non-clog pumps for sewage service. Pumps shall be as listed in the Approved Materials section. Wet-pit pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide rails, motor electrical cable (minimum 50 feet in length) to connect at the demarcation box (no splicing allowed) and all other appurtenances specified or otherwise required for proper operation. Dry-pit pumps shall be complete with a submersible electric motor, electric cable (min. 50 feet in length), maintenance free cooling system, pump support legs and all other appurtenances specified or otherwise required for proper operation.

IV.4. GENERAL:

Equipment furnished and installed shall be fabricated, assembled, erected and placed in proper operating condition in full accordance with drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by JEA.

IV.5. SERVICE CONDITIONS:

Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component.

IV.6. MATERIALS:

Major pump components shall be of gray cast iron. All exposed nuts, bolts, washers, anchor bolts and other fastening devices shall be 316 stainless steel.

IV.7. SOLID HANDLING PUMP CONSTRUCTION (WET-PIT AND DRY-PIT PUMPS):**IV.7.1. Impeller:**

The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be a semi-open or enclosed one-piece casting with not more than two non-clog passages and must pass a minimum 3 inch solid Screw impellers are not acceptable. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut.

IV.7.2. Mechanical Seals (Upper and Lower Seals):

Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be either carbon-ceramic, tungsten carbide or silicon carbide material. Adjustable wearing rings shall be provided for all pumps 25 HP and larger.

IV.7.3. Mating Surfaces:

All mating surfaces (pump assembly), of major components shall be machined and fitted with O-rings where watertight sealing is required.

IV.7.4. Discharge Base and Elbow (for Wet-Pit Applications Only):

The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The base shall be sufficiently rigid to firmly support the guide rails, discharge piping and pump under all operating conditions. The base shall be suitable for bolting to the floor, (bolting to a standard 1" thick metal plate, see details on drawings), of the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a "quick disconnect" type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need for unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and guide rail-sliding bracket. The bracket shall be designed to obtain a leak proof seal between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions. Metal to metal mating surfaces are acceptable, if machined finished.

IV.7.5. Motors:

The pump shall be driven by a totally submersible electric motor at 1800 RPM (max.). Pump motor shall be of sufficient horsepower as to be non-overloading over the entire length of the pump curve. The stator housing shall be a watertight casing. Motor insulation shall be moisture resistant, Class F, 180 degree C. at a minimum. All motors shall be VFD rated including class H winding insulation. Motor shall be NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour. All motors over 3 HP shall be 3 phase. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be designed to operate in a totally, partially or non-submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assemble with grommet. An epoxy seal may be added to this cable entrance assembly to improve water tightness. The system used shall ensure a watertight submersible seal. Cable shall terminate in a junction chamber.

Junction chamber shall be sealed from the motor by a compression seal. For Dry-Pit applications, the pump shall be limited to 1800 RPM (max.).

IV.7.5.1. Cooling System and Supports (Dry-Pit Applications Only):

The pump should have a reliable, maintenance free cooling system that circulates a cooling liquid in a closed loop through a cooling jacket, and transfers the heat to the pumped liquid by heat exchange. A system that circulates the pumped liquid in a cooling system is not acceptable. The pump should be equipped with support base to secure the pump and facilitate the installation.

IV.7.6. Balance:

All rotating parts shall be accurately machined and shall be rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed.

IV.8. GUIDE RAILS(FOR WET-PIT APPLICATIONS ONLY):

Pump shall be equipped with one or more guide rails (no cable wire assembly). Guide rails shall be one piece welded design with all operating surfaces sanded and smooth (no couplings) and a minimum of 2 inch diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Intermediate rail braces shall be supplied and solidly secured to the wet well wall. Braces secured to the discharge piping shall not be accepted. Guide rails and brackets shall be 316 stainless steel.

IV.9. LIFTING CHAIN (FOR WET-PIT APPLICATIONS ONLY):

A heavy-duty chain and shackle appropriately sized (3/8" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. Unless approved otherwise by JEA, the lift chains shall be shackled to a heavy duty 316 stainless steel lifting bail (see details) attached to the pump/motor housing for removal and reinstallation. Three feet of excess chain above the top of the wet well shall be provided to expedite removal. A chain/motor electric cable holder shall be provided and appropriately sized to accommodate the lift chains and motor electrical cables provided without deformation. Chain/electric cable holder shall include extra heavy-duty 3/8" rod hooks for attaching control floats, lifting chains, and other wet well accessories (6 hooks minimum) and be located on the side of the wet well hatch opening opposite of the discharge piping. The chain, shackles, lifting bail, and cable holder shall be 316 stainless steel.

IV.10. PAINTING:

Exterior of pump shall be coated with manufacturer's standard finish (powder coated epoxy finish is preferred, not required).

IV.11. INSTALLATION (FOR WET-PIT APPLICATIONS ONLY):

Pump discharge base shall be leveled, plumbed and aligned into position to fit connecting piping. The discharge base shall be solidly secured to the wet well floor using a 1" thick steel hold-down plate (see details) and appropriately sized 316 stainless steel anchors then grouted after initial fitting and alignment and before final bolting of the discharge piping. This work shall be inspected by JEA prior to any liquid being allowed into the wet well. After final alignment and bolting, pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

IV.12. PUMP WARRANTY (SOLID HANDLING):

The following warranty conditions shall also apply to existing pump station pump replacements.

IV.12.1. The manufacturer shall warrant to JEA for permanent installation in municipal sewage service submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years, mechanical seals, bearings, shafts,

motor electrical cables and motor stators. The warranty shall include no less than 100% coverage for original equipment manufacturer (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to JEA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for use the pumping station and/or of the replacement pump by JEA.

IV.12.2. Verification of guarantees of performance and warranty certificate shall be indicated in the shop drawing submittal and in the Operation and Maintenance disc (Microsoft Word).

IV.12.3. The pump distributor shall employ and make available proficient manufacturer-authorized service technicians to perform service calls to pumps supplied to JEA on a 24-hour basis, 7 days a week. The pump distributor shall provide service technicians company-owned service vehicles equipped with lifts/booms capable of retrieving all sizes of submersible pumps from wet wells, all necessary tools, test and safety equipment, etc., that are required to make field repairs. Service personnel shall adhere to all JEA Safety Rules & Regulations and be trained and certified for confined space entries and carry liability and workers compensation insurance.

IV.12.4. During the warranty period, the pump distributor shall at no cost to JEA repair and re-install the subject pump within 24 hours or provide a loaner pumps which can be transported, installed, and capable of maintaining operation of JEA's sites. The location address, contact names, phone numbers, (including emergency, mobile, etc.) and fax numbers of the manufacturer-authorized warehouse and service center shall be indicated in the shop drawing submittal and in the Operation & Maintenance diskettes (Microsoft Word).

IV.13. LOW FLOW SIMPLEX PUMP STATIONS, APPROVED BY JEA, CASE BY CASE (FOR SINGLE RESIDENTIAL USE ONLY):

IV.13.1. Pump shall be of the grinder type with an integrally build grinder unit and submersible motor. The grinder unit shall be capable of macerating all material in normal domestic and sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like into a fine slurry that will pass freely through a pump and 1-1/4" discharge pipe connection, at a minimum. The minimum pump performance shall include a 0-40 GPM total flow range and a 25-100' total head range. The design engineer shall be responsible for the final design and pump selection to meet all operating conditions. Approved pumps and wet well shall meet or exceed these specifications. See Wastewater construction detail S-50 for additional construction details.

IV.13.2. Grinder Pump Motor:

Stator winding shall be of the open type with Class F insulation rated for 155°C (311°F) maximum operating temperature. Winding housing shall be filled with a clean, high dielectric oil that lubricates the bearing, seals, and transfers the heat from the winding and rotor to the outer shell. Air filled motors, shall not be considered equal. Motors shall have heavy-duty bearings to support the pump shaft, take the radial, and thrust loads. Single-phase motors shall have a heat sensor thermostat and overload attached to the top end of the motor windings to stop if the motor winding temperature reaches approximately 300°F. The high temperature shut off will cause the pump to cease operation should a control failure cause the pump to run in a dry wet well. The thermostat shall reset automatically when the motor coils to a safe operating temperature. NOTE: Contractor must verify and confirm motor voltage and phase before the equipment can be released to production and manufacturer. If not approved otherwise by JEA, the common motor, pump and grinder shaft shall be of 316 stainless steel, threaded, on the pump end, to accept the impeller and grinder assembly.

IV.13.3. Mechanical Seals:

The motor shall be protected by two seals mounted in tandem in a seal chamber. The seal chamber shall be oil filled to lubricate the seal faces and transmit the heat from the shaft to the

outer motor shell. Seal faces shall be carbon ceramic on the upper seal and tungsten carbide or silicon carbide on the bottom seal. An electrode shall be mounted in the seal chamber to detect any water from entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control box. The signal shall not stop the motor but act as a warning only, indicating that service is required.

IV.13.4. Impeller/Cutter Assembly:

The pump impeller shall be of the recessed type to provide an open and unobstructed passage through the volute for the ground solids. The impeller shall be constructed of cast iron, bronze or stainless steel and shall be threaded onto a stainless steel shaft. The grinder assembly shall consist of a grinder, an impeller, and a shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto a stainless steel shaft and shall be locked to the shaft with a screw and a washer.

Both the grinder and the shredding ring shall be constructed of 440C stainless steel hardened to 55 to 60 on the Rockwell C scale or JEA approved equal.

IV.13.5. Castings:

All iron casting shall be class 30 cast iron and the exterior shall be paint with epoxy coating. All pump and motor fasteners shall be 316 stainless steel.

IV.13.6. Mating Surfaces:

All mating surfaces of the pumps major components shall be machined and fitted with O-rings where seating is required.

IV.13.7. Power Cord:

The motor power and control cord shall be 40' long (min), multi-conductor type and shall be fastened by means of a cord grip in the top of the pump. The motor shall contain a waterproof junction box, which will provide space to connect the power cord to the motor leads. The motor leads shall seal between the motor housing and the junction chamber by means of an isolation fitting around each wire. The power cord shall have a green carrier ground conductor that attaches to the motor flange.

IV.13.8. Discharge Base and Elbow (Optional):

The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The bases shall be sufficiently rigid to firmly support the guide rails, discharge pipe and pump assembly under all pumping conditions. The base shall be bolted to the well floor and sealed on the wet well exterior to prohibit any intrusion or leakage from the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a quick disconnect type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need of unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and a guide rail sliding bracket. The bracket shall be designed to obtain a leak proof seal between the flange faces as final alignment of the pump occurs on the connected position. The bracket shall maintain proper contact and suitably sealed connection between flange faces under all operating conditions.

IV.13.9. Balance:

All rotating parts shall be accurately machined and shall be perfect rotational balance. Excessive vibration shall be sufficient for rejection of the equipment. The impellers shall be rebalanced after being trimmed.

IV.13.10. Guide Rails(Optional):

Pump may be equipped with guide rails. Guide rails shall be a minimum of ¾" diameter, or 1" square and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to that access hatch cover at the top of the wet well. Guide rails and brackets (including fasteners) shall be 316 stainless steel.

IV.13.11. Lifting Chains:

A heavy-duty chain or cable and shackle appropriately sized (3/8" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. The chain or cable shall be 316 stainless steel and attached to a stainless steel hook at the top of the wet well.

IV.13.12. Wet Well:

The basins shall be fiberglass, filament wound and with a minimum size of 36" in diameter, by 4' deep. Basins shall have consistent wall thickness (.25" min.) and provide impact resistance structural integrity with anti-floatation collar on bottom. Basins shall be corrosion resistant, and have either full skid-proof aluminum (3/8" thick min) or fiberglass top with 316 S.S. hold-down bolts rated at 200psi minimum live load. A 4"-(min.) flexible entry boot with 316 stainless steel fastener, compression ring and stainless steel bands or cast iron hub with rubber seals shall be provided.

IV.13.13. Electrical Controls:

Unless otherwise approved by JEA, the panel shall be as followings: a NEMA 4X fiberglass or plastic control panel shall be furnished with each pumping unit to be installed. The control panel enclosure shall be molded of glass reinforced polyester resins, which are chemically resistant to corrosive atmospheres. The resin system shall be pigmented to impart a gray color to the enclosure and be resistant to ultraviolet light. The enclosure shall be of one piece, weatherproof construction with smooth exterior and interior. The enclosure shall be fitted with a closed cell neoprene gasket cover. The enclosure shall be provided with back panel mounting provisions and be attached to the wall of the house or a 4x4 pressure treated post or 3" aluminum post anchored 24" (min) into the ground (bottom of panel located 18"-24" above finished grade). The cover shall be hinged with a heavy-duty corrosion resistant stainless steel piano hinge. The cover shall be lockable by means of two (2) high quality combination stainless steel latches and padlock hasps. The enclosure shall be provided with external mounting feet. These mounting feet shall be of fiberglass and molded as an integral part of the enclosure. The panel shall include a double pole 20 amp main disconnect breaker minimum, alarm circuit fuse, control circuit fuse, I.E.C. rated motor contractor, Klixon overload or an internal pump overload, pump hand-off auto switch, pump run light, seal leak light, start and run capacitors, start relay, terminal blocks, ground lug and all necessary wiring and brackets. The control panel shall be fitted with a red lexan (polycarbonate) alarm light. The light shall be approximately 3" high and 3-1/2" diameter. The globe shall be mounted on top of the enclosure with a neoprene gasket. The alarm shall have a bright glow and flash during high water conditions. The alarm light will go out when the water level drops. An internal wiring shall be neat and color-coded. Each wire shall be a different color or stripe (except for ground), and all incoming wires shall terminate into a box clamp type terminal block (except incoming power). A schematic diagram shall be permanently fastened to the inside of the enclosure. An Installation and Service Manual shall also be included with each control panel. The control panel shall be U.L. listed as an assembly. The wet well should contain two control (on, off) floats or one wide-angle float (single differential float switch) operating over a 90-degree swing with the tether length between the float body and the pivot point controlling the pre-set on-off range. A high water level alarm float shall also be provided. All floats shall be wired to the control panel for control of the pump.

IV.13.14.Warranty:**IV.13.14.1. Pump Warranty**

The following warranty conditions shall apply to new and existing pump station requirements. The manufacturer shall warrant to JEA for permanent installation in municipal sewage service submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years: mechanical seals, bearings, shafts, motor electrical cables and motor stators. The warranty shall include no less than 100% coverage for original equipment manufacturer (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to JEA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for maintenance by JEA (i.e., that the pump station is totally complete) of the pumping station and/or of the replacement pump by JEA.

Verification of guarantees of performance and warranty shall be indicated in the shop drawing submittal and in the Operation and Maintenance diskettes (Microsoft Word).

IV.13.14.2. Wet Well:

The manufacturer of the basin/structure and pump removal assembly shall warrant the materials against defects for at least five (5) years after the date of acceptance by JEA. Defects area defined, at a minimum, as cracking, delimitation or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials and equipment to repair defects to the satisfaction of JEA. The contractor and/or manufacturer shall not make any exemptions or exception to the above stated conditions or warranty.

V. FRAME AND COVERS

Access frame and covers shall be suitable size for pumping units furnished and shall be constructed of skid-proof aluminum with a minimum load rating of 300 lbs. /sq. ft. or H-20 traffic loading when called for on the drawings. Frame and covers shall be furnished complete with stainless steel staple assembly (not recessed) for the locking mechanism, hold-open device, upper guide holder and cable holder. If door is not within a private fenced area, the locking mechanism shall be recessed type. Access covers shall be double door for duplex stations and triple door for triplex stations. Access covers shall be hinged to open as indicated on the drawings. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system).

Minimum size total hatch opening shall be 36 inches by 48 inches for duplex stations and 36 inches by 96 inches for triplex stations. Class One pump station hatches shall be sized to adequately remove pumps and shall not be required to adhere to the minimum size requirements. All hinges, fasteners and miscellaneous hardware shall be 316 stainless steel. For tamper proof and security purposes, the hinges shall be bolted to the door(s) with stainless steel carriage bolts and nuts. The nuts shall be welded to the bolts on both the door(s) and frame with 316L. JEA will provide pad locks, as required.

VI. PUMP STATION ELECTRICAL**VI.1. STATION ELECTRICAL SERVICE**

The Contractor shall provide complete new electrical service for each lift station, including coordination of electrical service selection and approval by JEA and the serving electrical utility company. Each lift station electrical service shall include complete primary and secondary electrical service equipment, metering and installation in accordance with these standards and the serving electrical utility company requirements.

VI.1.1. Unless specifically unavailable from the serving electrical utility company, the electrical service to each lift station shall be three phase. The basis of design lift station electrical service to be requested from the serving electrical utility company shall be as follows:

- VI.1.1.1. 20 HP and below: 240/120 volt, 3 phase, open delta, full voltage motor starting, 15 starts per hour
- VI.1.1.2. 21 HP thru 40 HP: 480/277 volt, 3 phase, wye, full voltage motor starting, 15 starts per hour
- VI.1.1.3. 41 HP and above: 480/277 volt, 3 phase, wye, reduced voltage motor starting, 10 starts per hour
- VI.1.2. The lift station design engineer shall contact the serving electrical utility company and obtain written documentation of the availability of the service requested. The electrical service documentation to be obtained from the serving electrical utility company shall identify each of the following basis of design issues:
 - VI.1.2.1. Electrical service voltage and phase
 - VI.1.2.2. Electrical service point of connection
 - VI.1.2.3. Type of motor starting required (full voltage or reduced voltage)
 - VI.1.2.4. Maximum number of starts per hour permitted
 - VI.1.2.5. Maximum available fault current
- VI.1.3. The electrical service documentation obtained from the serving electrical utility company shall identify all applicable electrical utility company rules, regulations and fees. Additionally, the lift station electrical design engineer shall obtain a schedule that identifies when the requested electrical service would be available from the electrical utility company.
- VI.1.4. If it is determined that the requested electrical service is not available from the electrical utility company, the design engineer shall submit an alternate basis of design recommendation for review and approval by JEA before proceeding with the lift station electrical design.
- VI.1.5. The use of 208/120 volt, 3 phase, wye service shall not be permitted. For locations where the serving electrical utility company can only provide 3 phase wye services, the lift station electrical service shall be 480/277 volt, 3 phase, wye. For locations where the serving electrical utility company can only provide 240/120 volt single phase service, the pump motors shall be limited to a maximum of 7.5 HP. Three phase pump motors shall be provided. Variable frequency drive motor starters shall be used to operate the three phase motors from the single phase electrical service.
- VI.1.6. Electrical service size shall be based on these standards and N.E.C. requirements. The minimum electrical service size shall be 100 amps. Where the electrical service requirements exceed 100 amps, but are less than or equal to 200 amps, the electrical service size shall be 200 amps. Where the electrical service requirements exceed 200 amps, but are less than or equal to 400 amps, the electrical service size shall be 400 amps. Above 400 amps, the electrical service size shall be selected by the lift station electrical design engineer.

VI.2. CONTROL SELECTION GUIDE

Below is a selection guide to determine the type of panel required for a Lift Station.

Variable Frequency Drives (VFD)

A Cross Line contactors (ACL)

- VI.2.1.1. 0-7.5HP, 1P to 3P VFD Duplex only, Panel is to be sized for no AC.
- VI.2.1.2. 0-20HP, ACL, 240VAC Service, If larger than 20HP service shall be upgraded to 480VAC.
- VI.2.1.3. 0-40HP, ACL, 480VAC Service
- VI.2.1.4. 41-75HP or FLA < 400A, VFD, 480VAC, Panel is to be sized for no AC and Heat sinks vented out the back.

VI.2.1.5. 76-200HP or FLA \geq 400A or $>$ 3 Pumps, VFD, In a building. Please contact JEA for further details.

Note that 208VAC shall not be permitted

VI.3. OVERALL SPECIFICATIONS FOR SCADA EQUIPMENT

VI.3.1. Qualified Panel Manufacturers:

The electrical control panel shall only be manufactured by a JEA approved manufacturer as listed below. See section XI Wastewater Approved Materials, plate AS-604

VI.3.1.1. JEA approved control manufacturers shall provide shop UL Certification for all control panels prior to JEA site delivery.

VI.3.2. Drawings:

Drawings are provided for Across the Line and Variable Frequency Drive designs on the JEA web site. All panels shall be built based on the latest drawings. These drawings are a template of how the overall Control Panel is to be designed. Note the drawings will need to be changed based on the voltage, pump size and the number of pumps. Keep existing format of drawings and only change Title Block.

VI.3.2.1. Prior to building all drawings must shall be modified and submitted for approval in AutoCAD 2007 DWG format and PDF for review by JEA.

VI.3.2.2. Variables for the Across the Line design are wire size, enclosure size, main surge suppression, circuit breaker, contactor size, SIMOCODE volt/current module rating and generator disconnect switch.

VI.3.2.3. Variables for the VFD design are wire size, enclosure size, circuit breaker, VFD, reactors and generator disconnect switch.

VI.3.2.4. A Control Panel Detail List shall be provided for quotation and design purposes. List will include items as the voltage and FLA. Included shall be detail additional Inputs if required for such items as Generator Monitoring, Odor Control, Potable Water Presser and other inputs.

VI.3.2.5. Key electrical drawings as power distribution and I/O shall be laminated, attached to the door and in color. Drawings shall be printed on 8.5 x 11 if 11 x 17 is too large to fit on the door.

VI.3.2.6. Full set of electrical drawings printed with a Laser Printer and in color shall be inserted in the door pocket. Ink jet is not accepted.

VI.3.3. Panel Enclosures:

VI.3.3.1. All enclosures and heat shields shall be powder coated white. Before powder coating enclosures they shall be degreased, cleaned and treated with phosphate process.

VI.3.3.2. All insides of the Enclosures shall be Rated NEMA 12/3R with no ventilation to the outside.

VI.3.3.3. All Enclosures shall be fitted with 3-Point Latch.

VI.3.3.4. All enclosures shall have Marine Grade Aluminum heat shields on the top, front, back and side, unless mounted inside a building. They shall be fabricated from .125 Marine Grade Aluminum.

VI.3.3.5. Enclosures shall have pockets mounted on the inside of the door.

VI.3.3.6. The enclosure shall have a twelve gauge steel, formed, removable sub panel. The sub panel shall be degreased, cleaned, treated with phosphate process, then primed and painted with white industrial grade baked enamel.

- VI.3.3.7. The maximum size of an aluminum enclosure shall be no taller than 60" wide or 60" high with 12" floor stands for a total height of 60". Any enclosure that requires a larger size shall use 316 stainless steel. These enclosures shall be fabricated from .125 Marine Grade Aluminum.
- VI.3.3.8. Aluminum enclosures with free standing bases shall have the bases manufactured out of 316 stainless steel.
- VI.3.4. ACL Cabinet Requirements:
 - VI.3.4.1. The minimum size of an enclosure shall be 42" Height x 42" Wide x 10" Deep with a 36" Wide Door. These enclosures shall be mounted on poles. If panel requires a larger than 42 x 42 x 10 enclosure, a floor standing enclosure with 12" floor stands with an enclosure height of 48" shall be used. Enclosure a total height of 60"
- VI.3.5. 1P to 3P VFD Cabinet Requirements:
 - VI.3.5.1. Minimum enclosure size for 1P to 3P VFD cabinets shall be 48" high by 36" wide by 16" deep. These enclosures shall be fabricated from .125 Marine Grade Aluminum. Enclosure shall be mounted on 12" floor stands. Enclosure shall be sized to accommodate the heat load without Air Conditioning. Refer to Heat Load Calculations section of this document to size panel correctly. Above panel does not require heat sinks to protrude from rear.
- VI.3.6. 3P VFD Cabinet Requirements:
 - VI.3.6.1. Minimum enclosure size for a 40HP VFD cabinets shall be 60" high by 48" wide and 20" deep on 12" floor stands. The maximum enclosure height shall not exceed 72". The sides of the enclosure may be extended no more than three inches from the door. Refer to Heat Load Calculations section of this document to size panel.
 - VI.3.6.2. VFD's installed in an enclosure outside will be built in a NEMA 12/3R enclosure with the drives heat sinks vented. Refer to drawings for further details.
 - VI.3.6.3. VFDs shall be bolted to a removable plate that will then be connected to the back of the enclosure with a gasket. The back of the enclosure shall have studs to attach the plate to. This plate is to be adequately designed to support the VFD. Enclosure cutout shall be sized a minimum of 2.75" wider and 3.5" higher on each side of the manufacturer recommended cutout for 40HP VFDs. This will result in a cutout that is no less than 5.5" wider and 7" higher than the manufacturer's specification. Additionally this distance will increase proportionately with the size of the VFD. For example: 80HP VFDs require a cutout that is 5.5" wider and 7.0" higher on each side (a total of 11" wider and 14" higher) of the manufacturer specified cutout. This requirement is to ensure that a future replacement of a VFD will allow for different VFD dimensions.
 - VI.3.6.4. The rear sunshield shall have a removable cover with handles to allow access to the VFD heat sinks for cleaning and maintenance. The heat shield will have studs sticking out with wing nuts for the removable cover.
- VI.3.7. Components:

Components to build a control cabinet are classified as sole sourced or non sole sourced as listed below.

- VI.3.7.1. Sole Sourced items are items in the drawings bill of material that shall not be substituted. These items are the radio, PLC, Input/Output modules, SINAUT communication module, SIMOCODE intelligent motor controls, UPS and CITEL 4-20ma surge suppression.
- VI.3.7.2. Non sole sourced items such as Power Supply, Transformer, Circuit Protection and others may be substituted for an equivalent device. The specifications of the devices shall meet or exceed the items listed in the bill of material. Any items found to not meet specification must be replaced at the panel builder's expense.
- VI.3.8. Wiring:
 - Type and Identification:
 - VI.3.8.1. All Wire Colors in the panel shall follow the UL508A standards.
 - VI.3.8.2. Wire type #12 AWG and smaller shall be Hook-Up/Lead tinned copper, # 18 AWG stranded is minimum: BELDEN – 35612 Hook-Up Lead-UL AWM Style 3173-XL-DUR or equal.
 - VI.3.8.3. Control:
 - VI.3.8.3.1. All control cabinet wiring to the PLC and control devices shall be 18 AWG and terminated with ferrules.
 - VI.3.8.3.2. Control Wiring shall be numbered / lettered at each end. Wire numbers / letters shall be Flattened Polyolefin Heat Shrink Markers for Permanent Wire and Cable Identification (Panduit) or JEA approved equal. Pass & Seymore "Legrande" will no longer be acceptable.
 - VI.3.8.4. Power:
 - VI.3.8.4.1. Ampacity rating shall be a maximum of 75C.
 - VI.3.8.4.2. All wires going from Distribution Block to the Pump Breaker and Motor Contactor must be sized for 140% of Motors FLA.
 - VI.3.8.5. Field Wiring
 - VI.3.8.5.1. All field wiring shall be ground burial rated.
 - VI.3.8.5.2. All control wires shall be tin plated and #12 AWG with dielectric grease applied to both ends to prevent corrosion.
 - VI.3.8.5.3. All control wires shall be labeled at both ends for tracing.
 - VI.3.8.5.4. Analog wires shall tin plated with a foil and braided shield.
 - VI.3.8.5.5. VFD rated cable shall be used from the VFD to the demarcation box.
 - VI.3.8.5.6. Field wiring colors:
 - VI.3.8.5.6.1. Motor Wires:
 - VI.3.8.5.6.2. 240V = Blue, Orange, Black
 - VI.3.8.5.6.3. 480V = Brown, Orange, Yellow
 - VI.3.8.5.6.4. Over Temp:
 - VI.3.8.5.6.5. Hot = Black
 - VI.3.8.5.6.6. Common = White
 - VI.3.8.5.6.7. Seal Fail:
 - VI.3.8.5.6.8. Hot = Red:
 - VI.3.8.5.6.9. Common = Orange
 - VI.3.8.5.6.10. Ground = Green
 - VI.3.8.5.6.11. High Well:

VI.3.8.5.6.12. Hot = Blue

VI.3.8.5.6.13. Common = White/Blue Stripe

VI.3.9. Terminals:

Terminals shall be based on the WAGO Top Job S series terminals. The minimum size shall be 4mm. The spring portion of the clamp shall be fabricated of a chrome nickel spring steel of high tensile strength and shall be solid, without perforation. The chrome nickel spring steel spring tension mechanism shall provide the installer the opportunity to directly insert solid or ferruled conductors without having to utilize tooling to open the clamping mechanism. The terminal block shall be designed to accept solid and/or stranded copper conductors without requiring special preparation, such as crimps, ferrules or tinning. Proportional clamping shall ensure mechanical and electrical connection integrity without damage to the conductors of various sizes throughout the rated range. The design of the terminal block shall not prevent or interfere with the use of wire preparation methods, such as crimps, ferrules or tinning. The pullout force shall be a minimum of 6 times that specified in VDE 0611 (Resistance to Vibration Test for Terminal Block). The current bar and clamping yoke shall have traverse grooves to increase the force required for conductor pull out and "Gas tight" connection. The voltage drop also shall remain virtually unchanged. Gas tightness will be per DIN 41640, part 76.

VI.3.10. Generator Disconnect Switch:

A NEMA 3R enclosed generator disconnect switch shall be supplied and sized as follows.

VI.3.10.1. Approved manufacturer: Eaton quick-connect double-throw (QCDT) safety switch or approved equal.

VI.3.10.2. The Generator Disconnect Switch shall be sized greater than or equal to the current rating of the Main Circuit Breaker but not larger than 400A.

VI.3.10.3. The generator disconnect switch shall not be required if a generator set is installed on site.

VI.3.11. Across the Line Starter Specifications:

VI.3.11.1. Intelligent Motor Control

Across the Line Starter will be controlled by Siemens SIMOCODE Intelligent motor control.

The motor control shall consist of 4 discrete inputs and 2 discrete outputs.

Display interface shall display Warnings, Faults + History, Operational data such as Line Voltage, Current, Power and I/O Status. The display will also have the ability to control from the keypad and switch the modes from Hand, Off, Auto and Override. Profibus DP interface built into the device. This will allow JEA to read and write to all parameters inside the device and to program the device remotely.

VI.3.11.1.1. Decoupling modules shall be required on all non Wye power systems such as a Delta.

VI.3.11.1.2. Voltage/Current modules shall be sized based on Motors FLA.

VI.3.11.2. Contactors:

VI.3.11.2.1. All contactors shall be NEMA rated.

VI.3.11.2.2. Device shall be manufactured and tested as a NEMA device; IEC equivalent will not be accepted

VI.3.11.2.3. Minimum size contactor shall be NEMA Size 1.

VI.3.11.2.4. Fractional size contactors shall not be acceptable.

VI.3.11.2.5. Contactors shall be equipped with double break

VI.3.11.3. Thermal Magnetic Circuit Breakers:

Thermal Magnetic Circuit Breakers shall be used for the Main, Emergency and Pumps. As a minimum the breakers must comply with the standards as follows.

VI.3.11.3.1. Circuit breakers shall be minimum "E" frame.

VI.3.11.3.2. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device.

VI.3.11.3.3. Protector operators shall be quick make, quick break and trip free.

VI.3.11.3.4. Shall be rated a minimum of a 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18KAIC for 460/480 Volt systems.

VI.3.11.3.5. The thermal and magnetic elements shall operate independently and multiple pole breakers shall be designed with common trip bar breaking all poles when a fault is received on any pole.

VI.3.11.4. Main and Emergency Breakers

VI.3.11.4.1. The electric utility company servicing the utility shall provide the maximum available fault current rating for each electrical service. Each panel shall be UL rated for the maximum available fault current.

VI.3.11.4.2. The Trip Rating or Setting shall be calculated by taking the largest Pump Breaker's Amps + the Nameplate Amps of all the other Pumps + 10Amps (auxiliary loads) = Normal Main Breaker Trip Setting.

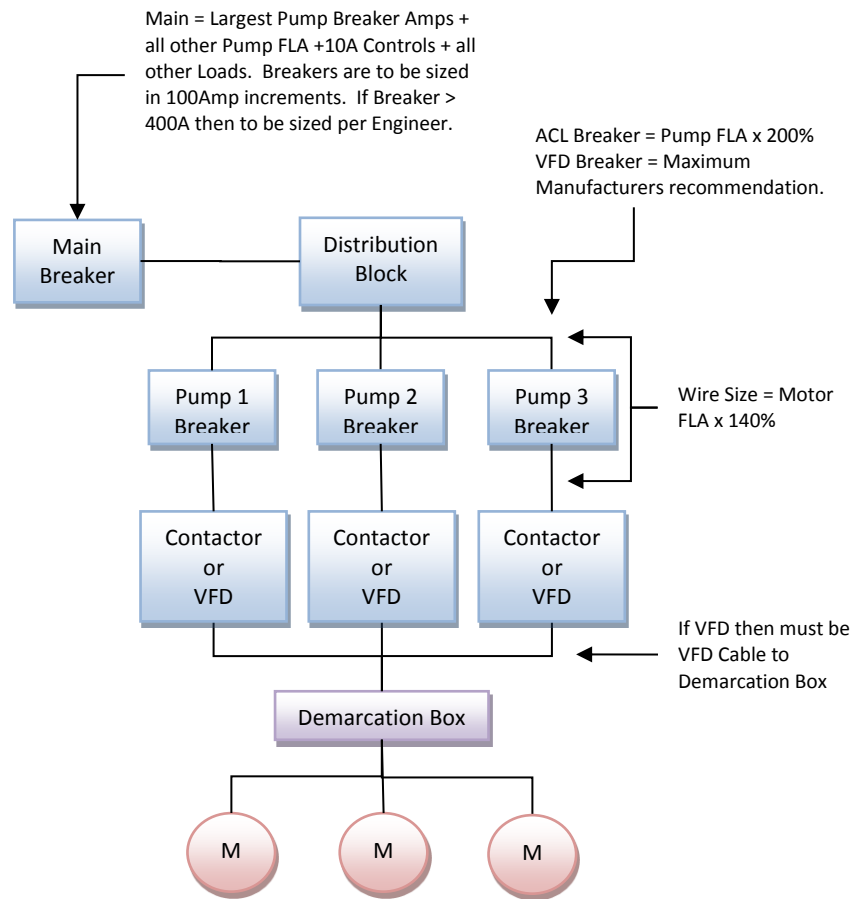
VI.3.11.4.3. The minimum size breaker will be 100A. Where the breakers trip setting is greater than 100 amps and less than or equal to 200 amps the breakers shall be rated at 200 amps. Where the breakers trip setting is greater than 200 amps and less than or equal to 400 amps the breakers shall be rated at 400 amps. Where the breakers trip setting is greater than 400 amps the main breaker shall be rated as determined by the lift station electrical design engineer.

VI.3.11.5. Across the Line Pump Breakers

VI.3.11.5.1. The Trip Rating or Setting shall be calculated using the Pump Motor Nameplate Amps x 200% for Across the Line Starters.

VI.3.12. Variable Frequency Drive Breakers

VI.3.12.1.1. Breakers shall be selected and sized for maximum ratings per manufacturer's recommendation.



VI.3.13. Variable Frequency Drive Specifications

VI.3.13.1. All VFD's shall be on the approved manufacturer list.

VI.3.13.1.1. Cutler Hammer – SVX9000

VI.3.13.1.2. Yaskawa – P7

VI.3.13.2. VFD's shall be sized for 110% continuous and 120% for 1 minute.

VI.3.13.3. VFD's shall have a minimum 3% Input Line Reactor on each of the drives.

VI.3.13.4. VFD's shall be rated for a minimum of 50 Celsius ambient temperature.

VI.3.13.5. VFD's in buildings shall have a DV/DT Output Filter on each drive.

VI.3.13.6. Each drive shall come with a Profibus DP module that supports "ProfiDrive" Communication not just Profibus DP. Each drive must support Profibus as a native protocol; a protocol translator between drives isn't acceptable. The drive shall be set up for PPO4 telegrams and data rates of 1.5 M.

VI.3.13.7. Each drive shall come with a keypad that supports Local/Remote, Jog, FWD/Rev, Run and Stop.

VI.3.13.8. Drives shall be rated a minimum of NEMA 12.

VI.3.13.9. Drive control boards shall be conformal coated.

VI.3.13.10. VFD's shall be flange mount capable.

VI.3.13.11. All VFD's shall come pre-programmed to the description of the VFD Float Backup Functional as described below.

VI.3.13.12. All drawings shall come with a parameter sheet, on the drawing, with instructions for drive set up on Profibus and have backup float capability.

VI.3.13.13. All drives shall come with a certified three year warranty with documentation showing proof.

VI.3.13.14. VFD Float Backup Functional

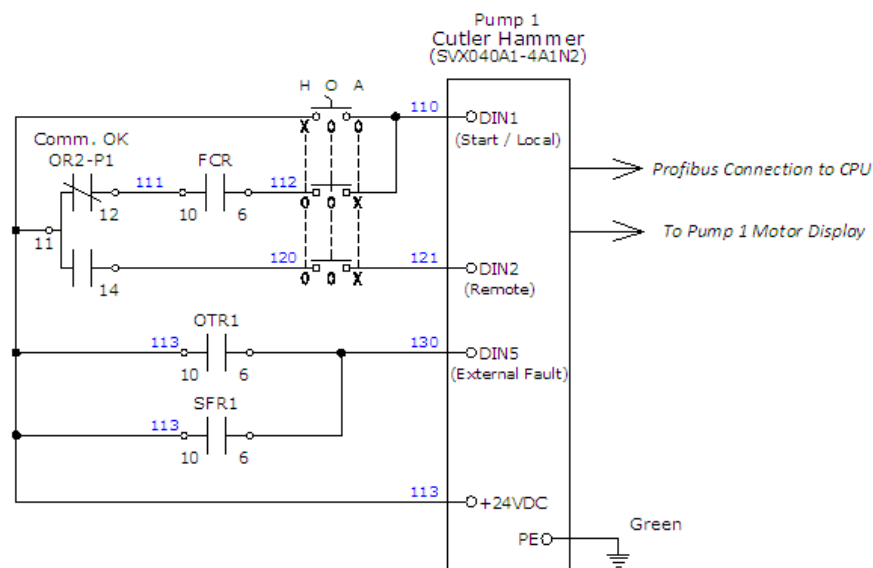
Each VFD shall be wired with a Hand, Off and Auto switch. The three modes of operation are described below.

VI.3.13.14.1. Off – The drive is disabled.

VI.3.13.14.2. Manual – The drive shall turn on and ramp up to maximum speed.

VI.3.13.14.3. Auto – If the VFD selector switch is put into Auto and PLC Communication to the drive is ok then the drive will be controlled over the Profibus communication. If communication is ever lost to the VFD the Communication OK relay will drop out and control the VFD from the Float Control Relay. The Communication OK relay is controlled by the PLC and is to be energized as long as the VFD Communication is ok.

Below is the connection diagram for the hardwired interface to the VFD.



VI.3.13.15. Heat Load Calculations for Gasketed / Unvented Enclosures

All heat calculations shall be provided showing surface area, internal heat load of components broken out, Watts per square foot and any other pertinent data. This data shall be submitted with the enclosure drawing for approval.

VI.3.13.15.1. The evaluation of the heat load on an enclosure, include the following:

VI.3.13.15.1.1.1. Total surface area of the enclosure

VI.3.13.15.1.2. Internal heat load [load and duty cycle to be considered in calculation]

VI.3.13.15.1.3. Maximum allowable internal temperature [113F]; with an assumed outside temperature[95F]

VI.3.13.15.2. Enclosure surface area is the primary factor in determining its ability to dissipate heat.

VI.3.13.15.2.1. Surface Area = $2[(A \times B) + (A \times C) + (B \times C)] \div 144$

VI.3.13.15.2.2. Where the enclosure size is A x B x C in inches.

VI.3.13.15.2.3. This equation includes all six surfaces of the enclosure.

VI.3.13.15.2.4. If any surface is not available for transferring heat (for example, an enclosure surface mounted against a wall), that surface's area should be subtracted.

VI.3.13.15.3. For any temperature rise calculation, the heat generated within the enclosure or internal heat load shall be known.

This information can be obtained from the supplier of the components mounted in the enclosure.

Any internal heat calculation shall include but is not limited to the following components:

VI.3.13.15.3.1. Transformer Power Supply UPS PLC Circuit Breakers Heat Load Main All Pump circuit breakers taking into consideration duty cycle.

VI.3.13.15.3.2. VFD Heat Load

VI.3.13.15.3.2.1.1. If VFD is inside the enclosure assume Heat Load = $(746W \times HP \times 3\%)$

VI.3.13.15.3.2.1.2. If VFD heat sink is out back assume Heat Load = $(746W \times HP \times 3\%) \times 10\%$

VI.3.13.15.3.2.1.3. Note: the 10% is from Cutler Hammers statement that with heat sinks out the back only 10% of the heat will be dissipated inside the enclosure. Other manufacturers may require a greater percentage and must adjust the formula accordingly.

VI.3.13.15.3.3. VFD Duty Cycle

VI.3.13.15.3.3.1.1. For two pumps VFD applications assume worst case of one pump running continuously.

VI.3.13.15.3.3.1.2. For three pumps VFD applications assume worst case of two pumps running continuously.

VI.3.13.15.4. Enclosure Temperature Rise (ΔT)

Example:

What is the temperature rise that can be expected from a 72 x 72 x 20 in. painted white enclosure designed to control 3 VFD's with external mounted heat sinks?

Solution:

$$\text{Surface Area} = 2[(72 \times 72) + (72 \times 20) + (20 \times 72)] \div 144 = 112 \text{ ft}$$

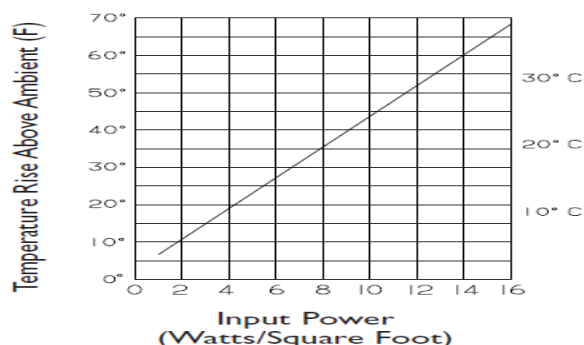
VI.3.13.15.5. Internal heat load (min.):

Component		PN	Load	Full Load Loss	Loss
Control Transformer	500VA	Siemens MT0500A	50%	21.5w	11w
24VDC Power Supply	5A	PULS CS5.241 89.4		15w	15w
CPU 313C-2DP	Siemens	6ES7 313-6CF03-0AB0		14w	14w
Analog Input Module	Siemens	6ES7 313-1KF01-0AB0		1w	1w
Communication Module	Siemens	SINAUT ST7, TIM 3V-IE		6w	6w
3 Pole 200 Amp [2]	Siemens	NFG3B200L	33% (65amps per drive)	80w per breaker at 200 amps	53w
[2] 50 HP VFD	Cutler-Hammer	SVX040A1-4A1N2	100%	112w per drive	224
Misc					13w
Total					337w

*Full Load loss data from component specifications sheets.

VI.3.13.15.6. Watts per Square Foot = total internal watts / surface area = 337/112 = 3 Watts/Square Foot

VI.3.13.15.7. Temperature Rise [ΔT] = 15 degrees F



VI.3.13.16. Air Conditioning (reference the Shared Services Standards Manual Division 23)

Only buildings will require air conditioning and shall meet the specifications below.

VI.3.13.16.1. Air conditioners shall be rated NEMA 4X and Corrosion Resistant.

VI.3.13.16.2. Buildings shall require heating strips.

VI.3.13.16.3. AC Units shall carry a minimum of a 3 year warranty in a corrosive environment.

VI.3.13.17. Surge Suppression:

Surge Protective Devices (SPD) for 120VAC and above shall be UL1449 Third edition.

VI.3.13.17.1. The Main Disconnect shall have a Type 1 SPD rated NEMA 4X. It will have a minimum surge capacity of 50kA at 8x20us

VI.3.13.17.2. The Control Panel shall have a minimum Type 2 SPD with a surge capacity of 40kA at 8x20us.or above.

VI.3.13.17.3. The 4-20ma surge suppression shall be CITEL part # DLAU-24D3. No other device will be accepted.

VI.3.13.18. Additional Field Wiring Requirements:

Some sites require additional inputs based on external field requirements. Below is a list of inputs for different field requirements.

VI.3.13.18.1. Generator Input requirements as listed.

Discrete Inputs – Generator Fault, Transfer Switch Normal, Transfer Switch Emergency, Generator Running, Normal Power Available and Fuel Leak, Analog Input 4-20ma – Fuel Level

VI.3.13.19. UL Labels:

The entire control system shall bear a UL 508A serialized label "Enclosed Industrial Control Panel". The use of the label "Industrial Control Panel Enclosure" without the UL508A serialized label shall not be acceptable.

VI.3.13.20. Warranty:

VI.3.13.20.1. The Panel Manufacturer shall supply to JEA a three (3) year (min.) unconditional warranty after completion or acceptance of MCC Panel on all parts supplied by the manufacturer, excluding parts supplied by JEA.

VI.3.13.20.2. 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 material or defective workmanship with new materials/workmanship conforming to the specifications.

VI.3.13.20.3. The Panel Manufacturer shall also be responsible to ensure that Component Manufacturer's Warranty which exceeds the Panel Manufacturer's warranty is honored.

VI.4. COMPONENTS EXTERNAL TO THE PANEL

VI.4.1. Floats:

VI.4.1.1. High Well Alarm – Shall have one S40NC that is red.

VI.4.1.2. Start – Shall be a S40NO with green electrical tape above the float to indicate start.

VI.4.1.3. Stop – Shall be a S40NO with red electrical tape above the float to indicate stop.

VI.4.2. Well Level Transducer:

The submersible level sensor shall be a solid state instrument designed to continuously measure and transmit liquid level data. The transducer shall have a 4-20ma output with 24VDC supply.

The transducer shall be calibrated for 0-24' of water. Transducer shall have conduit adapter, 100 feet of cable and be rebuildable. The transducer shall not have a breathing (vent line) or boxes. Transducers shall have manufacturer's three year warranty from date of installation. The transducer shall be in stainless steel housing. The transducer shall be GP:50 Model# 311-SZ-CZ-Y367 or JEA approved equal. Wire specs are as follows:

Cable shall be manufactured by Spectrum Cable Corp., conductor size 18 AWG, 16/30 TC insulation is .010 polyethylene cable is two conductor together with a 19 AWG drain wire and an overall aluminum Mylar Wrap. Cable jacket is .035 Black Polyurethane, nominal O.D. is .215. Color of conductors shall be red and black or JEA approved equal.

VI.4.3. Force Main Pressure Transducer:

Every Lift Station shall have a Force Main Pressure Transducer.

VI.4.3.1. Transducer is to be rated 0-100PSI.

VI.4.3.2. Transducer shall be a United Electric Controls model number TX200B or equivalent.

VI.4.3.3. Shall have a minimum 3 year warranty.

VI.4.4. Potable Water Pressure Transducer:

Every Lift Station is required to have a Potable Water Pressure Transducer. Refer to design for site for requirements.

VI.4.4.1. Transducer shall be rated 0-100PSI.

VI.4.4.2. Transducer shall be a United Electric Controls model number TX200B or equivalent.

VI.4.4.3. Shall have a minimum 3 year warranty.

VI.4.5. Demarcation Box:

A Demarcation box shall be used as an isolation point between the wet well and the motor control center panel. All wiring between the motor control center and wet well shall be interconnected at this point. Demarcation Box is divided into a base that is vented and a top that is NEMA 4X rated. Demarcation Box shall be fabricated from .125 Marine Grade Brushed Aluminum. Box shall be mounted so that doors face away from wet well. Only one pulling 90 degree ell at the base of the demarcation box is allowed. Conduit shall be stubbed up 3" from the base. The wire shall run in the open air at the base of the demarcation box with liquid tight cord connections at the bottom of the top demarcation box. Reference drawings and information below for more details.

VI.4.5.1. Demarcation Top – Shall be 24" Width x 24" Height x 12" Depth, NEMA 4X, hinged door, 3-Point Latch with a padlock feature.

VI.4.5.2. Demarcation Base – Shall be 24" Width x 36" Height x 12" Depth, vented on sides, hinged door and two padlocking ¼ turn wing latches on the front of the door.

VI.4.5.3. Terminals – Shall be mounted on removable back plate, terminal for each wire, terminal sized according to load and minimum terminal size shall be 4mm. Antioxidant compound shall be used on all terminals and wire connections, (Nolox or equal).

VI.4.5.4. Liquid Tight Cord Connections – Shall be made of cast aluminum.

VI.4.5.5. All wires including spares shall be identified with heat shrink labels. All control wires shall have spade lugs.

VI.4.6. Power Distribution Panel:

Panel to distribute power to devices external to the control panel. It shall be fabricated from .125 Marine Grade Brushed Aluminum or 316 stainless steel. Reference site drawings for details.

VI.4.7. Radio Pole / Tower:

The radio pole or tower shall provide communication to the SCADA cabinet to the remote master. To determine if a Pole or Tower is required a Radio Path Study shall first be conducted. The Radio Path Study shall be done using the same type of radio used in the SCADA panel and shall be a minimum of -86DB RSSI. If the height of the minimum -86DB RSSI level is less than or equal to 20' then a 20' Pole shall be used. If the height requirements are over 20' then a Tower shall be used. Refer to drawings for specifications on Pole and Tower.

VI.5. SERVICE:

The manufacturer or representative shall provide two hour on site emergency service for the first 12 months after commissioning. The manufacturer shall stock replacement components locally for emergency replacement as needed.

VI.6. START UP:

The manufacturer or representative shall be present for startup at time designated by JEA.

VI.7. OPERATING PROCEDURES:

MCC supplier shall provide written "Standard Operating Procedures" to JEA.

VII. PREFABRICATED CONCRETE ENCLOSURE

VII.1. PREFABRICATED CONCRETE ENCLOSURE:

The prefabricated building system shall be factory assembled, pre-tested, shipped to the site, and suitably anchored to the respective concrete foundations. In the case of a conflict between this specification section and the current JEA Standards, the more stringent of the two requirements shall apply.

The enclosure shall be manufactured by Old Castle Precast, Inc. of Newnan, GA (770) 304-4648, or JEA approved equal. The enclosure design and construction shall conform to all applicable federal, state, and local building codes and standards including the current Florida Building Code, D1.1 Structural Welding Code, ACI-318-02 and ACI-318R-02.

The enclosure shall be guaranteed to be completely weather-tight under all weather conditions for a period of three (3) years (min. Leaks, which occur during the period, whether through roofs, walls, doors, accessory equipment, or materials, shall be repaired to the satisfaction of JEA at no additional cost to JEA.

CONTRACTOR shall verify all openings and penetrations, and shall coordinate with the manufacturer prior to casting.

VII.2. DESIGN REQUIREMENTS:

The enclosure shall be constructed of solid, one-piece concrete panels. Minimum outside dimensions of the building shall be 11'-8" x 28'-0". The minimum interior clear height shall be 10'-0". Panels shall be bolted or welded together and joints caulked inside and out to make the building weatherproof. The wall panels shall be minimum 3-1/2" thick solid panels of concrete with primary structural reinforcement of steel bars and welded wire fabric. Wall panel assembly shall develop strength to resist the design wind loads. Wall panels shall be continuous from base to leave with no horizontal joints.

The roof shall have a gable profile with the ridge parallel to the long dimension and shall have a minimum 4" thick concrete panel extending over the walls to act as a drip edge. The roof shall contain primary reinforcement of steel bars and welded wire fabric as well as secondary reinforcement of polypropylene fibers.

The interior finish on the walls shall be $\frac{3}{4}$ " plywood panels with plastic laminate suitable for equipment mounting and insulated to R-14. The ceiling shall be $\frac{5}{8}$ " gypsum and insulated to R-21. All fasteners and nails shall be 316 stainless steel.

The exterior surfaces of the walls shall have a stucco texture finish. The exterior shall be finished with a cementitious base coating and a topcoat of textured 100% acrylic. The topcoat shall be of the same manufacturer as the cementitious base coating. Coatings shall be Thoro System Products; "Thoroseal with Acryl 60" and "Thoroseal". Colors will be selected after the award of the contract. Exterior flashing and fasteners shall be 316 stainless steel.

Caulking shall be provided at all bases, corners, eaves, doors, and other openings to provide a completely weather-tight installation. Sill angles and doorframes shall be caulked in place and sealed.

All necessary erection hardware, fasteners, trim, flashing, closures and other accessories necessary for a complete building shall be furnished. The enclosure shall be assembled in accordance with the building manufacturer's instructions. All members shall be carefully leveled. All welding shall be in accordance with AWS D1.1 Structural Welding Code.

VII.3. DOORS AND HARDWARE (REFERENCE THE SHARED SERVICES STANDARDS MANUAL DIVISION 8)

The building shall be provided with a pair of 2'-6" x 7'-0" fiberglass reinforced plastic (FRP) doors for equipment installation and a 3'-0" x 7'-0" FRP personnel door as indicated on the drawings. The color of the door shall be selected after award of the contract.

Hardware shall be furnished and installed by the door manufacturer. The hardware shall be 316 stainless steel provided for the building and shall include mortise locks on each door set Corbin Russwin interchangeable core cylinders. Interchangeable core shall have Contractor's core in cylinder. Contractor core shall be provided with control key and registered change keys. Contractor to coordinate door hardware lock mechanism with the JEA representative. Hinges shall be heavy duty stainless steel. The location of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware".

Hardware shall be stainless steel and furnished complete with machine screws, bolts, and other attachments as required. The CONTRACTOR shall furnish complete specifications and catalog cuts of each item offered.

VII.4. ELECTRICAL:

The manufacturer of the building shall provide to the CONTRACTOR any requirements necessary for the installation of the electrical equipment and conduits by the CONTRACTOR as indicated on the drawings. This shall include recommended conduit penetration and sealing methods to ensure the weather-tight integrity of the building.

VII.5. STRUCTURAL DESIGN:

The applicable building code shall be the latest Florida Building Code. The enclosure shall be designed to resist overturning and sliding forces resulting from wind loading. Embedments to be cast into the slab for anchorage shall be designed and provided by the building supplier. Structural design shall be performed by a Professional Engineer registered in the State of Florida and submittal of building components shall bear his/her seal.

The building shall be designed for the following criteria (at a minimum):

Roof live load, lb per sq. ft. of horizontal projection (no live load reduction is permitted)	20 psf
Wind Load	120 mph, 3 second gust

VII.6. PAINTING AND FINISHES:

All surfaces to receive paint shall be cleaned of any grease, dust, or dirt. Pre-finished surfaces shall be masked or otherwise protected to avoid damage from spilled paint, overspray, or spatter.

Factory finished surfaces, which have become damaged during shipping, assembly, or erection shall be touchup painted with materials supplied by the building manufacturer. No other finish shall be accepted. All touchup painting shall produce a final finish satisfactory to JEA.

VII.7. DRAWINGS AND DATA TO BE SUBMITTED:

Complete specifications and drawings covering the doors and a complete hardware schedule shall be submitted in accordance with the Submittals section. Drawings shall indicate an elevation of the door, details of construction, assembly and erection details, profiles and thickness of materials, anchors, reinforcements, hardware coordination, and finish. Drawings shall be accompanied by the manufacturer's installation manual, indicating standard recommendations and details of erection. The hardware schedule shall indicate each item of hardware required, manufacturer's name, manufacturer's number or symbol, and finish.

Complete drawings and data shall be furnished showing anchor bolt locations, sizes, and projections; details of sidewall, end wall, and roof framing; transverse cross-sections; locations of all openings; details of louver; flashing details; and erection instructions. Color samples of manufacturer's standard finishes shall be submitted. Drawings and data shall be in accordance with the Submittals section.

VII.8. CERTIFICATION:

A letter of certification signed and sealed by a Professional Engineer registered in the State of Florida shall be submitted for the structural framing, anchorage and covering panels of the building system.

VIII. VALVES**VIII.1. GENERAL:**

The contractor shall furnish and install check valves, plug valves, and appurtenances as shown on the drawings and as specified in JEA Water and Wastewater Standards Manual.

VIII.2. CHECK VALVES (LEVER & WEIGHT STYLE):

Check valves shall be as generally specified in JEA Water and Wastewater Standards Chapter IV. 4. - Section 430, and shall also meet the following additional requirements. Rubber disc facing shall operate on a 316 stainless steel shaft connected to a steel outside lever and cast iron adjustable weight. Check valve shall include renewable seat and disc. Valves shall meet AWWA Standard C508 and rated at 150 psi (min.) working pressure.

IX. TESTING**IX.1. PUMP FACTORY TESTS:**

The pump manufacturer shall perform the following tests on each pump prior to shipment.

IX.1.1. Megger the pump motor and cable for insulation breaks or moisture intrusion.

IX.1.2. Prior to submergence, run pump dry and check for correct rotation.

IX.1.3. Pump shall be run continuously for 30 minutes in a submerged condition, with a minimum submergence of 10 feet.

IX.1.4. Pump shall be removed from test tank, meggered immediately for moisture and all seals checked for water intrusion.

IX.1.5. Pumps shall be operated at a minimum of 6 points to establish the hydraulic curve. KW input shall be monitored and recorded. One test point shall be performed with discharge valve closed. Pumps shall develop appropriate capacity and head within Hydraulic Institute Standards without

excessive noise, vibration or cavitation. If specifically requested by JEA, a vibration test shall be performed on each pump to demonstrate compliance.

IX.1.6. For pumps less than 100 HP, the pump supplier shall submit copies of certified Hydraulic Institute test reports including factory pump curves of identical model pump (s) provided to JEA (in lieu of written certified test reports for each pump supplied).

IX.1.7. For pumps 100 HP and greater, the above certified pump performance test (at a minimum) must be completed on each actual pump supplied. A JEA representative(s) shall be present to witness the certified test (JEA's travel expenses by JEA).

IX.2. FIELD ACCEPTANCE TESTING:

IX.2.1. Pre-Final Inspection:

Prior to final inspection, the Contractor shall conduct a pre-final site inspection (including energizing each pump), in the presence of a JEA representative. Any deficiencies noted at this time shall be corrected prior to scheduling of the final inspection.

IX.2.2. Final Inspection:

The Contractor shall be responsible for conducting the following field acceptance tests and start-up procedures in the presence of a JEA representative. The Contractor shall notify JEA, the Engineer and the pump manufacturer's representative 48 hours prior to start-up. The time and date of this final inspection shall be scheduled by JEA. The Contractor shall furnish all labor, piping, equipment, water and materials required to perform the acceptance testing. The Contractor shall ensure the force main is full of water prior to the pump test. The contractor shall submit proof of compliance with electric site grounding requirements. JEA will complete a final inspection checklist for acceptance.

IX.2.2.1. The Contractor shall demonstrate that the pump mounting and guide rail systems are operational. The Contractor shall remove and reinstall the pumps in the presence of the JEA representative, prior to conducting the performance test.

IX.2.2.2. Pump Performance:

Prior to acceptance, as part of the final inspection, and prior to placing the station in operation, the Contractor shall conduct a pump performance test. Pumps shall operate according to the operating conditions indicated on the drawings without excessive vibration or overheating. Testing shall be performed using clean water. The Contractor shall supply water at its own expense to perform the required testing. Pumping rates shall be determined by pumping a calculated volume of water in a specified time interval. Head and flow conditions shall be measured and recorded. Water levels during testing shall fall within the pump control levels shown on the drawings. Amperage draws shall be monitored to determine effectiveness and efficiency of equipment. The test shall be repeated until satisfactory results are obtained. The test results shall be recorded on the Pump Test Report sheet included in the appendix section herein. If the Contractor is unable to demonstrate to JEA that the pumping unit performs satisfactorily, the unit shall be rejected. The Contractor shall then remove and replace the defective unit at its own expense. Satisfactory performance includes, but is not limited to, the following:

IX.2.2.2.1. Pumps:

Pumps shall deliver rated GPM at rated TDH.

IX.2.2.2.2. Motors:

Running amperage shall be noted and recorded on each leg of power cord while pump is operating under full load.

- IX.2.2.2.3. All self-test trip relays shall demonstrate ability to simulate a fault condition. All test results shall be recorded on the pump test report and be submitted to the Engineer.
- IX.2.2.2.4. Pumps shall operate within 5 % of the approved, certified, head-capacity curve.
- IX.2.2.2.5. Following performance testing, pumps shall be meggered for pump-moisture intrusion.
- IX.2.2.2.6. Pump spare parts are not required unless specifically noted otherwise.
- IX.2.2.2.7. For dry-pit submersible pumps, the closed loop cooling system shall provide adequate cooling, in accordance with pump manufacturer's recommendation, throughout the pumping range.

IX.2.3. SCADA Inspections:

A JEA representative shall conduct the following field acceptance test and start up procedures in the presents of the contractor.

X. REFERENCE POINTS AND LAYOUT

The Contractor shall be responsible for setting all grade stakes, lines and levels. The Contractor or Contractor's Surveyor will provide centerline of construction and will establish a benchmark. Any reference points, points of intersection, property corners, or benchmarks, 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.

XI. PRECAST CONCRETE WET WELL

XI.1. MATERIALS:

Wet well bases, sections and miscellaneous structures shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall meet the requirements of ASTM C150 (specification for Portland cement, type II). Concrete shall meet the minimum requirements for Class "A" as specified in JEA Water and Wastewater Standards Chapter II. 5. - Section 437- Concrete Work. Minimum wall thickness shall be 1/12 the inside diameter in inches plus 1 inch. Rings shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. The Contractor shall submit shop drawings consisting of manufacturer's standard details of various sections, for approval, before placing order for structures.

XI.2. BASES:

Bases for wet wells shall be cast integrally with the bottom section. The base section shall be set in a 12-inch (minimum) leveling course of granular material (57 stone) as shown on the drawings. For concrete base and riser's the reinforcing steel shall be designed, signed and sealed by a Florida Registered Structural Engineer and shall be submitted with the shop drawings.

XI.3. JOINTS:

Joint contact surfaces shall be formed with machined castings and shall be exactly parallel and specifically designed by a professional engineer. Joints shall be sealed with JEA approved joint sealer over the entire joint surface, with joints pre-primed. Joints shall be watertight. Upon completion of installation, excess joint sealer shall be trimmed flush with inside and outside surface of structure.

XI.4. FLEXIBLE PIPE CONNECTOR:

A flexible pipe connector shall be used to connect the wastewater influent pipe to the precast concrete wet well.

XI.4.1. Material:

The Neoprene-EPDM material the connector is manufactured from shall conform to ASTM C443 and shall be a minimum of 3/8 inches (9.4mm) thick or greater. The material shall be resistant to ozone, weathering, aging, and chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products.

XI.4.2. Bands:

The stainless steel band and screw assembly shall be a totally non-magnetic series 304 stainless steel.

XI.4.3. Connector:

The connector shall be of a size specifically designed for the specified pipe material and size. The connector may be installed in the wet well wall by the precast manufacturer in strict accordance with the recommendations of the connector manufacturer. During the invert construction stage, the interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout by the Contractor.

XI.5. INSTALLING SECTIONS:

Precast concrete sections shall be set so the wet well will be vertical and with sections in true alignment. If not approved otherwise by JEA, the construction schedule for setting wet well base and riser sections shall be approved by a JEA representative. The JEA representative shall be present, on site, during this installation.

Installing Wet Well Sections and Lids:

- XI.5.1.1. During the handling of all wet wells, the contractor shall protect the wet well and not allow a chain, cable or other lifting line to damage the joint surfaces. Spreader bars, wood blocks or other devices shall be utilized to prevent damage to the wet well. Any wet well section or lid found to have defects, included but not limited to leaks and cracks shall be removed and replaced.
- XI.5.1.2. The wet well sections shall be set so the manhole will be vertical and with section in true alignment. Construction shall include:
 - XI.5.1.2.1. Cleaning all joint surfaces (remove all sand, oil, debris & other foreign items) and provide additional primer if recommended by the joint manufacturer.
 - XI.5.1.2.2. The joint sealant (Ram-Neck, ConSeal or other JEA approved joint sealant) and the manhole surfaces shall be dry during the installation period (shall not be installed if wet or during rain events).
 - XI.5.1.2.3. Joint sealant is applied to both the top & bottom joint surfaces (Double Ring Method). The joint sealant shall be installed continuously around all joints with the ends placed butt-to-butt (not overlapped & no open gaps between sealants).
 - XI.5.1.2.4. The excess joint sealant shall be trimmed flush to the inside surfaces of the manhole. Trim the outside surfaces if an exterior joint sealant/tape is applied.
- XI.5.1.3. Apply a special primer and an "Exterior Joint Sealant Membrane" to the outside surfaces of all manhole joints/seams, which are located below the top cone section. Apply the primer and joint membrane in accordance with the recommendations of the membrane manufacturer.
- XI.5.1.4. Wet well with leaking joints (infiltration of ground water) will not be accepted by JEA. JEA will not accept leak repairs on new construction of wet wells. The leaking wet well is to be removed and replaced.

XI.6. METALLIC NON-SHRINK MORTAR:

All holes in sections used for their handling and the annular space between the wall and entering pipes shall be thoroughly plugged with an approved, non-shrinking mortar or grout, applied and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.

XI.7. EXTERIOR JOINT SEALANT MEMBRANE, TAPE:**XI.7.1. General:**

All exterior joints of precast concrete wet well shall be sealed with a 12-inch wide (minimum) exterior joint sealant membrane tape.

XI.7.2. Manufacturer:

All exterior joints of precast concrete wet wells shall be sealed with one 12 inch wide exterior joint sealant membrane centered on joint. The tape shall be capable of sealing joints against groundwater infiltration. The installation of the membrane shall be in conformance with the recommendations of the manufacturer. Surface must be smooth, clean, dry and free of voids, loose aggregate, dirt or other matter that will hinder the adhesion of the membrane. A primer shall be used in accordance with the recommendations of the membrane manufacturer. If recommended by the manufacturer, heat shall be applied to all areas being sealed. The membrane shall be the type listed in the JEA Water and Wastewater Approved Materials Manual (See AS-501, but utilize 12 inch wide tape).

XI.8. CORROSION PROTECTION:

Precast concrete wet well interior shall be lined as specified in JEA Water and Wastewater Standards Chapter IV. 6. - Section 446 Specialty Coatings and Linings. The exterior of the wet well (below grade), shall be given two coats of bituminous water proofing materials which meets the coating requirements as specified for sewage manholes (Specification Chapter IV. 1. - Section 427).

XII. PRECAST CONCRETE MANHOLES

The precast concrete junction manholes (nearest wet well) and all precast concrete manholes receiving force mains shall conform to the JEA Water and Wastewater Standards Chapter IV. 1. - Section 427-Manholes and shall be lined as specified in JEA Water and Wastewater Standards Chapter IV. 6. - Section 446 - Specialty Coatings and Linings. Junction manholes for pump stations shall be 5 feet inside diameter minimum. Junction manholes for Reduced Capacity pump stations shall be 4 feet inside diameter.

XIII. FIBERGLASS WET WELL – (ALTERNATE WET WELL CONSTRUCTION)**XIII.1. GENERAL:**

Unless noted otherwise by JEA, the contractor may construct a fiberglass wet well in lieu of a precast concrete wet well. The fiberglass wet well shall be designed (signed and sealed) by a Florida Professional Engineer. The design shall include the operating conditions as noted on the drawings, a 24 inch (minimum) thick (12 inch thick inside the wet well and 12 inches thick outside the wet well) reinforced concrete hold-down base which extends 24 inches beyond the outside of the wet well, a 6 inch (minimum) thick reinforced concrete top slab, pump access frame and cover and other standard wet well features as shown on the drawings. Pumps shall be anchored to a 1-inch thick steel plate (see details on the drawings). The complete design (designed by a Florida Professional Engineer) must be submitted in the form of a shop drawing for JEA's review and approval. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements. Unless approved otherwise by JEA, the wet well shall be a one-piece unit.

XIII.2. MATERIALS:**XIII.2.1. Resin:**

The resins used shall be commercial grade unsaturated polyester resins.

XIII.2.2. Reinforcing Materials:

The reinforcing materials shall be a commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcements and the resin.

XIII.2.3. Surfacing Materials:

If reinforcing materials are used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.

XIII.2.4. Fillers and Additives:

Fillers, when used, shall be inert to the environment and wet well construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

XIII.3. FABRICATION:**XIII.3.1. Exterior Surface:**

The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

XIII.3.2. Interior Surface:

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

XIII.3.3. Defects Not Permitted:

XIII.3.3.1. Exposed fibers: glass fibers not wet out with resin.

XIII.3.3.2. Resin runs: runs of resin and sand on the surface.

XIII.3.3.3. Dry areas: areas with glass not wet out with resin.

XIII.3.3.4. Delamination: separation in the laminate.

XIII.3.3.5. Blisters: light colored areas larger than 1/2 inch in diameter.

XIII.3.3.6. Crazing: cracks caused by sharp objects.

XIII.3.3.7. Pits or Voids: air pockets.

XIII.3.3.8. Wrinkles: smooth irregularities in the surface.

XIII.3.3.9. Sharp Projection: fiber or resin projections necessitating gloves for handling.

XIII.3.4. Installation of Brackets:

Manufacturer or manufacturer certified field personnel shall glass in all stainless steel fasteners and brackets, discharge piping brackets, etc. Manufacturer of wet well shall be responsible for integrity of all field glassing.

XIII.3.5. Marking and Identification:

Each wet well shall be marked with the following information.

XIII.3.5.1. Manufacturer's name or trademark

XIII.3.5.2. Manufacturing special number

XIII.3.5.3. Total length and nominal diameter

XIII.4. PHYSICAL REQUIREMENTS:

XIII.4.1. Load Rating:

The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs when tested in accordance with ASTM 3753, Section 8, test methods D 790 and D 695. To establish this rating the complete wet well shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

XIII.4.2. Stiffness:

The wet well cylinder shall have a minimum pipe-stiffness value as shown in Table 1 (at a minimum) when tested in accordance with ASTM D3757, Section 8.

Table 1: Stiffness Requirements (Minimum)	
Length, Ft.	F/Y psi
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

Physical Properties:

		Hoop Direction	Axial Direction
a.	Tensile Strength (psi)	18,000	5,000
b.	Tensile Modulus (psi)	0.8 x 10 E6	0.7 x 10 E6
c.	Flexural Strength (psi)	26,000	4,500
d.	Flexural Modulus (psi) (no ribs - 48", 60", 72") (with ribs - 96", 144")	1.4 x 10 E6 7.0 x 10 E6	0.7 x 10 E6 0.7 x 10 E6

XIII.5. FIBERGLASS CONSTRUCTION METHODS:

XIII.5.1. Handling:

XIII.5.1.1. The wet well shall not be dropped or impacted. Wet wells shall be chocked if stored horizontally. If wet wells must be moved by rolling, the ground transverses shall be smooth and free of rocks, debris, etc.

XIII.5.1.2. FRP wet wells may be lifted by the installation of three lifting lugs as specified by the manufacturer on the outside surface near the top or by a sling or "choker" connection around the center. Use of chains or cables in contact with the wet well surface is prohibited. Wet wells may be lifted horizontally using one support point.

XIII.5.2. Wet Well Installation:

Bottom of excavation should be compacted to 95% Standard Proctor Density. Pour reinforced concrete base a minimum of one foot deep and at least two feet larger than the fiberglass wet well outside diameter. As soon as the concrete has set-up enough to support the fiberglass wet well, lower the wet well into place. (Wet wells with fiberglass bottoms, should have rebar inserted into bottom reinforcement.) Pour a minimum of one foot of reinforced concrete on the inside, also a minimum of one foot deep and two feet from the fiberglass wet well wall on the outside of the fiberglass wet well.

Insert "RAMNEK" type sealant on the outside of the fiberglass wet well around the bottom where the fiberglass and concrete come together.

XIII.5.3. Wet Well Cutouts:

Cutouts in wet well wall should be made with proper cutting tools such as jigsaw or hole saw. Do not use axe or other impact-type tools.

XIII.5.4. Pipe Installation:

Make the cutout in the wet well wall equal to the outside diameter of pipe, plus 1/2 inch maximum. Grind the outside surface of the pipe and both the inside and the outside surfaces of the cutout in the wet well wall. Apply a priming agent to any PVC pipe that might be used before fiberglass lay-up. Insert the pipe through the cutout in the wall of the wet well. Apply fiberglass putty to the inside and the outside of the wet well wall cutout, filling openings between pipe and cutout. Make a good radius for the fiberglass lay-up. After putty has set-up, fiberglass the pipe into place. Use one layer of woven roving sandwiched between two layers of fiberglass mat. Allow fiberglass to completely set-up before backfilling. Manufacturer of wet well shall be responsible for integrity of field glassing.

XIII.6. DESIGN FEATURES:

XIII.6.1. Top Slab Support:

Pour reinforced concrete slab support a minimum of two feet outside of fiberglass wet well wall and minimum of six inches thick.

XIII.6.2. Design:

Fiberglass wet well system to be designed, signed and sealed by a Professional Engineer registered in the State of Florida. Resistance to uplift and traffic loading requirements shall be addressed in the design.

XIII.6.3. Wet Well Top:

Wet well top shall be concrete and designed for H-20 Traffic loading. Hatches shall be as specified in this specification and as detailed on the contract drawings. Bottom of top slab and around side of hatch opening shall be fiberglass lined and shall meet all the requirements of this specification.

XIII.7. WARRANTY:

The fiberglass manufacturer shall warrant the fiberglass wet well against defects for at least ten years after the date of acceptance by JEA. Defects are defined as cracking, delaminating, or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of JEA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

XIV. EXCAVATION

XIV.1. GENERAL:

The limit of excavation shall be such to allow for placing and removing forms, installing sheeting, shoring, bracing, etc. The Contractor shall pile excavated material in a manner that will not endanger the work and will avoid obstructing sidewalks, driveways, power poles, etc. Drainage shall be kept clear.

XIV.2. VERTICAL SIDES (SHEETING, SHORING AND BRACING):

When necessary to protect existing or proposed structures or other improvements, the Contractor shall maintain vertical sides of the excavation. The limit shall not exceed three feet outside the footing on a vertical plane parallel to the footing except where specifically approved otherwise by the Engineer. The Contractor shall provide and install any sheeting, shoring, and bracing as necessary to provide a safe work area as required protecting workers, structures, equipment, power design and adequacy of all sheeting, shoring, and bracing. For excavations deeper than 20 vertical feet, which utilize sheeting, shoring or bracing, the sheeting,

shoring and bracing plan shall be designed by a Florida Professional Engineer, (signed and sealed). This plan shall be submitted to JEA for review and approval, prior to construction. The construction of sheeting, shoring and bracing shall be in accordance with the approved plan. All major field modifications shall be approved by the professional engineer. The sheeting, shoring, and bracing shall be removed, as the excavation is backfilled in such manner as to prevent injurious caving. Excavation shall meet the Florida Trench Safety Act (an OSHA requirement) and OSHA Excavation Standards (29 CFR sub-part P 1926.650) at a minimum.

XIV.3. SLOPING SIDES:

Where sufficient space is available, the Contractor shall be allowed to back slope the sides of the excavation. The back slope shall be such that the excavation shall be safe from caving. The type of material being excavated shall govern the back slope used, but in any case, the back slope shall be no steeper than 1 foot horizontal to 1 foot vertical without sheeting or shoring.

XIV.4. DE-WATERING:

The Contractor shall keep excavation free from water by use of cofferdams, bailing, pumping, well pointing, or any combination as the particular situation may warrant. All de-watering devices shall be installed in such a manner as to provide clearance for construction, removal of forms, and inspection of exterior of formwork. It is the intent of these specifications that the foundation be placed on a firm dry bed. The foundation bed shall be kept in a de-watered condition a sufficient period of time to insure the safety of the structure. The excavation shall be protected from excessive rainfall, drainage and drying. The excavation shall be inspected and approved by JEA's representative before work on the structure is started. It is the intent of these specifications that the Contractor provides a relatively smooth, firm foundation bed for footing and slabs that bear directly on the undisturbed earth without additional cost, regardless of the soil conditions encountered. The Engineer will be the sole judge as to whether these conditions have been met.

XIV.5. UNAUTHORIZED EXCAVATION:

Excavation for slabs, footings, etc., that bear on earth shall not be carried below the elevation shown on the drawings. In the event the excavation is carried on below the indicated elevation, the Contractor shall bring the slab, footing etc., to the required grade by filling with concrete having a minimum compressive strength of at least 3,000 PSI at 28 days.

XV. BACKFILL

XV.1. BACKFILL MATERIAL:

Unless shown otherwise on the drawings, suitable soil (A-3 sand only, no clay or rocks larger than 3/4" size) shall be used for backfill around the wet well for a distance of two feet from the outside surface and extending from bottom of the excavation to the bottom of the top slab. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer. Backfill material shall be free of vegetation or other extraneous material. Excavation materials which are to be used for fill or backfill may be stockpiled on site. Top soil should be stockpiled separately and used for finish grading around the structure.

XV.2. SCHEDULE OF BACKFILLING:

The Contractor may begin backfilling of wet well as soon as the concrete has been allowed to cure and the forms removed.

XV.3. BACKFILL:

Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to at least 95% Standard Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

XVI. WASHDOWN STATION**XVI.1. WATER SERVICE PIPING:**

Water service piping shall be 1½-inch diameter (minimum). Water meter, shall be 1½-inch diameter (minimum). Materials and installation shall meet JEA's standards for typical water service construction.

XVI.2. BACKFLOW PREVENTOR:

The Contractor shall furnish and install a 1½ inch reduced pressure backflow preventer, which meets the requirements of JEA's Cross Connection Control Policy (see details on drawings).

XVI.3. WATER SERVICE & METER:

The contractor/developer shall secure the water for the pump station site by applying for either a commercial 1 ½-inch water only meter (if no irrigation water use is included with meter) or commercial 1 ½ inch irrigation meter (if irrigation water use is included with this meter). The contractor/developer is responsible for all JEA fees. The Contractor shall install the meter box and service in accordance with all applicable JEA Standard Details and Specifications and JEA will install the meter. The Contractor shall be responsible for the cost of all water used during construction and testing. The water service will then be transferred to JEA upon final acceptance of the pump station.

XVI.4. HOSE:

Wash-down hose to be white cover paper mill creamery wash-down hose with tapered nozzle, model number T260LL-150 as manufactured by Goodyear or JEA pre-approved equal. Hose length shall be sufficient to reach bottom of wet well from hose station.

XVII. SITE WORK**XVII.1. SITE PLAN:**

The site plans shall be designed site specific. The site plan shall indicate the actual site and orientation of all structures, panels and piping, at a minimum.

XVII.2. GENERAL:

All work shall be in accordance with the following specification sections, at a minimum: Chapter II. 1. - Section 406 - Site Preparation, Cleanup and Restoration, Chapter II. 2. - Section 407- Demolition and Abandonment, Section 408 - Excavation and Earthwork and Chapter II. 5. - Section 437 – Concrete Work. Slope concrete and site to drain towards street or other adjacent, JEA or City owned drainage facility.

XVII.3. DRIVEWAYS AND SITE:**XVII.3.1. Concrete:**

All work under this section shall be of 3,000 PSI concrete with reinforcing wire or fiber mesh. Thickness of concrete shall be 5 inches (minimum).

XVII.3.2. Expansion Joints:

Expansion joints shall be performed joint fillers meeting the requirements of AASHTO M153 or AASHTO 213 and cut to the true shape of the cross section, set to line and grade and held true while the concrete is being placed. The joint shall be edged and finished in a competent manner. These strips shall be left in place and shall be placed adjacent to the paving, curb driveway aprons, structures and pads, or as specified by the Engineer. Expansion Joints which are not adjacent to the structures listed above may be 1 inch by 4 inch pressure treated lumber or other approved materials and shall appear every 18 feet, at a minimum or be placed between truckloads of concrete that exceed the time limits specified in the JEA Water and Wastewater Standards Chapter II. 5. - Section 437 Concrete Work.

XVII.3.3. Contraction and Construction Joints:

XVII.3.3.1. Contraction and construction joints shall be placed and formed by means of an approved jointer template. The stem of the jointer shall be pressed into the freshly finished concrete forming a groove 1/2 inch deep.

XVII.3.3.2. The edges of the groove and adjacent surface shall be neatly finished. Unless otherwise shown on the plans or designated by the Engineer, these joints shall be placed at 6-foot intervals between expansion joints.

XVII.3.4. Surface Requirements:

The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten-foot straight edge, nor more than 1/8 inch on a five foot transverse section. The edge of the concrete shall be carefully finished with an edging tool having a radius of 1/2 inch.

XVII.4. ROCK COVER:

When indicated on the drawings, the Contractor shall furnish and install 6 inches of No. 57 (1" nominal diameter) crushed limestone placed over a 10 mill plastic membrane.

XVII.5. FENCING:

Fencing shall be furnished and installed in accordance with details on the drawings.

XVIII. PERMITS

The Engineer will supply the land-clearing permit. The Contractor shall secure and pay for all plumbing, electrical, right-of-way and other required permits. The Contractor shall make application and pay applicable fees for electric and water meters. The Contractor shall be responsible for all costs associated with utilities used during construction and testing of the pump station. Upon final acceptance or, if approved, following substantial completion of the project, the JEA Pump Station Manager shall, by letter to JEA, transfer services to JEA.

XIX. LANDSCAPING**XIX.1. PLANT MATERIALS:**

Plants shall be of the types and placed in the locations as indicated on JEA's Minimum Standards for Landscaping as included in the Sewage Pump Standard Details (Latest revision) and as approved by local landscape code enforcement.

XX. SPRINKLER SYSTEM**XX.1. GENERAL:**

Sprinkler system shall consist of a single main traveling around the perimeter of the pump station site. Sprinkler system shall form a complete loop and be connected to the hose station downstream of the backflow preventer, as indicated on the drawings. Sprinkler system shall be operated by a single stage timer located in the control panel. Sprinkler system shall be designed by the sprinkler supplier, which shall be a firm regularly engaged in the design and supply of sprinkler systems.

XX.2. COMPONENTS:

XX.2.1. Sprinkler system shall consist of mister heads on 2-foot tall, black, risers around perimeter of pump station paving at site. System shall provide 100% cover over the buffer zone (plant zone), while minimizing the over spray to less than 5% of the volume of water delivered. Provide irrigation to land between pump station and road paving.

XX.2.2. Commercial grade, 12 inch pop-up, gear driven sprinklers may be used if necessary for this area only. Mister heads on risers shall be required around pump station perimeter. Acceptable:

Nelson. Nelson spray nozzles, PRO-6300 Series pop-up nozzles, PRO-5500 and PRO-6000 Series gear drivers sprinklers and 9000 Series Control Valve.

XX.3. SUBMITTALS:

Shop drawing submittals will be required on sprinkler system design and components.

XX.4. DRAIN VALVE:

Sprinkler system shall include 1/2-inch solid brass automatic drain valves, Nelson #8819 or JEA pre-approved equal. Drain valve shall carry a 5-year warranty against failure and be installed in a plastic landscape valve box as depicted on drawings.

XX.5. WATER SERVICE:

If applicable, an irrigation water meter service shall be provided for the sprinkler system. In this case, the Contractor may be required to secure the irrigation meter by submittal of a JEA irrigation meter application and payment of applicable fees. If available, reclaimed water should be utilized for all irrigation.



PUMP TEST REPORT

PROJECT _____ DATE _____

STREET ADDRESS _____

LONGITUDE / LATITUDE _____

WATER METER NO: _____

ELECTRIC METER NO: _____

AUXILARTY GENERATOR _____ YES _____ NO _____ Size _____

PUMP DATA

Manufacturer _____ Model _____

Impeller Size _____ Motor HP _____ Pump Discharge size _____ RPM _____

Pump Full Load Amps _____ Run Amps _____ Volts _____ Phase _____

DESIGN DATA

Wetwell Diameter & Depth _____ Gals/V. Ft. _____

Pump Design Point _____ GPM @ _____ Feet

T.D.H.

Wet Well Top Elevation _____

TEST DATA

Pump No.: _____

Serial No.: _____

Water Elevation Start _____

(HWL) (ft.) _____

Water Elevation Stop _____

(MWL) (ft.) _____

Net Draw down (ft.) _____

(Subtract water El. Stop from water start El.)

Total Gallons _____

Gallons/Minute (divide total gallons by minutes) _____

Pressure Gauge Reading (ft.) _____

Total Head @ Pump (ft.) _____

Ammeter Reading (amps) _____

Pump Shut off TDH _____

Contractor Representative _____

JEA Inspection Representative _____

JEA Maintenance Representative _____

Pump Manufacturer's Representative _____

Engineering Representative _____

MECHANICAL

JEA Final Inspection Checklist

Project Name: _____		
Street/Intersection/Address Location: _____		
Checked		
1	All valves operate from the closed to the fully open position	<input type="checkbox"/>
2	All valves seal when closed	<input type="checkbox"/>
3	All valves open turning to the left, and an indicating arrow is cast into the metal	<input type="checkbox"/>
4	All valves are easy to operate and have no sharp protrusions on hand wheels	<input type="checkbox"/>
5	All fasteners are SS, and mountings are tightened correctly	<input type="checkbox"/>
6	Discharge piping is installed plumb with both horizontal and vertical alignment provided	<input type="checkbox"/>
7	Pressure gauge provided	<input type="checkbox"/>
8	All pipework within the pump well complete, suitably anchored and guide rails in place	<input type="checkbox"/>
9	Check that the pump cables are installed clear of guide rails and not such as to impede removal of the pumps	<input type="checkbox"/>
10	Turn the pump impellers by hand to ensure they are free to rotate	<input type="checkbox"/>
11	One piece flanged SS discharge piping provided in wetwell	<input type="checkbox"/>
12	Pumps are clear of the well bottom, and securely mounted at the base plate	<input type="checkbox"/>
13	Check valve has vertical support	<input type="checkbox"/>
14	No rubbish at the bottom of the well which is likely to damage the pump when it is started	<input type="checkbox"/>
15	Check for correct pump rotation as indicated by the arrow on the pump casings	<input type="checkbox"/>
16	Turn the circuit breaker for each pump and that the correct pump starts	<input type="checkbox"/>
17	Lower/raise the pumps to ensure they pass freely through the hatch opening with 4 inch clearance all sides; checking that pumps slide smoothly on each guiderail and sit properly onto the discharge stand	<input type="checkbox"/>
18	With one valve open, start the associated pump in manual mode and check for leaks, pump/motor vibrational noise, and well level drop	<input type="checkbox"/>
19	Shut valve and restart pump, checking for any leaks in piping/valves	<input type="checkbox"/>
20	Wetwell frame and cover constructed of aluminum with stainless steel assembly	<input type="checkbox"/>
21	Wetwell frame and cover constructed flush with top slab elevation	<input type="checkbox"/>
22	Drop bowl installed in wetwell and secured to wetwell wall	<input type="checkbox"/>
23	Site light installed in gravel pit	<input type="checkbox"/>
24	All above ground pipe/fittings/valves have approved coating applied(two coats)	<input type="checkbox"/>
25	Provide electronic photos of pump station showing overall site, valves, panels, etc.	<input type="checkbox"/>

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

GENERATOR

JEA Commissioning Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Check the following as applicable:

Verify diesel tank is sized per JEA W & S standards manual section 472 VII.2 and is fully fueled after manufacturer's representative has performed load run	<input type="checkbox"/>
Run generator in "manual" mode; check hertz, voltage, etc; verify operation of load bank	<input type="checkbox"/>
Verify certified affidavit of start-up and load testing from manufacturer's representative	<input type="checkbox"/>
Receipt of manufacturer's warranty (5-year)	<input type="checkbox"/>
Test "auto shut-down" on overspeed circuit	<input type="checkbox"/>
Test to see if genset meets decibel requirements of <i>Specifications</i>	<input type="checkbox"/>
Simulate power failure (disconnect main breaker); verify automatic start of genset	<input type="checkbox"/>
Verify automatic transfer of power to emergency source; check for proper time delay between sequences.	<input type="checkbox"/>
Verify fuel tank and generator anchor bolts and related hardware is stainless steel.	<input type="checkbox"/>
Let run for ten (10) minutes	<input type="checkbox"/>
Restore utility power source; verify automatic transfer, cool-down cycle time, and shut down	<input type="checkbox"/>
Test load bank for proper operation	<input type="checkbox"/>
Ensure that separate circuits are provided for battery charger and block heater	<input type="checkbox"/>
Test block heater and battery charger for proper operation	<input type="checkbox"/>
Check for leaks	<input type="checkbox"/>
Check fuel monitoring gauges and interstitial gauges are accurate and working properly.	<input type="checkbox"/>
Check for bent, kinked, or dented supply or return	<input type="checkbox"/>
Check to make sure fuel tank shipped with a level indicator probe and an inch per gallon laminated fuel level chart.	<input type="checkbox"/>
Verify a handle and step is installed on the control panel door.	<input type="checkbox"/>
Verify the radiator has been coated with a bronze-glow corrosion resistive coating.	<input type="checkbox"/>
Verify the ball valves are installed on the Jacket Water Heater hoses, supply and return.	<input type="checkbox"/>
Verify the Jacket Water Heater hose is a silicone type.	<input type="checkbox"/>
Ensure that there is an oil vapor recovery box installed.	<input type="checkbox"/>
Confirm there is a spill response plan (SPCC) filed and a spill response kit installed on site for tanks larger than 1320 gallons.	<input type="checkbox"/>
Check for any threaded connections on tank are touched up with the supplied touch up kit. Any and all exposed uncoated metal should be coated.	<input type="checkbox"/>
External Piping is welded stainless steel	<input type="checkbox"/>
Verify Greenleaf system interface with SCADA for generator run sequences and fuel level.	<input type="checkbox"/>
Digital copies of warranties and Manuals	<input type="checkbox"/>



Inspect fuel filters for dirt, water, or other foreign matter	<input type="checkbox"/>
Check for water in the fuel filter	<input type="checkbox"/>
Inspect the entire air-intake system for openings that could draw in unfiltered air	<input type="checkbox"/>
Inspect dry element type filters and replace if clogged. Inspect for damaged seams and pleats.	<input type="checkbox"/>

Comments: _____

Contractor Representative: _____

Signature

Print name

JEA Inspector: _____

Signature

Print name

JEA O&M representative: _____

Signature

Print name

Commissioned this date: _____

BUILDING OPS

JEA Commissioning Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Checked

_____	Fence installed with approved materials in the manner specified
_____	Fence installed free of any large gaps (those greater than 6 in.) at sides/corners
_____	Fence installed with maximum clearance of 6 in. above finished grade
_____	Fence installed with a minimum 12 in. mow strip, with galvanized anchors every 3-5 ft.
_____	Maximum fence post span 10 ft. or less
_____	Fence at least 6 ft. high, chainlink mesh (9 ga minimum) with 3 strands of barbed wire extended outwards from top of fence at a 45-degree angle with the smooth side of the fence on the outside wall. Materials approved by Security and Facilities
_____	Inspect fence posts and fabric for correct material (vinyl coated black or green)
_____	Gate installed with approved materials in the manner specified
_____	Gate installed free of any large gaps at sides
_____	Gate installed with maximum clearance of 6 in. above finished grade
_____	Gate has an adequate catch to ensure the gate cannot be pushed in or pulled out
_____	Gate installed with minimum height 72 in. for fence fabric (usually chain link), plus 3 strands of barbed wire, or using fabric/material with a minimum height of 96 in.
_____	Gate operates smooth and freely, without undo stress on gate operator
_____	Operator appears to be adequately anchored
_____	Operator is the unit specified
_____	Exit/Safety loops installed at required distances and function properly
_____	Limit switches appear to be set appropriately
_____	Inspect asphalt; check slope for proper drainage (no puddles)
_____	Card readers are appropriate models, installed appropriately, and function correctly
_____	Storm drain gates clean and open
_____	Ensure that all debris has been removed from the site
_____	Ensure that all required signage has been installed (incl. Pump Station I.D. sign)
_____	Fire hydrant as specified and operating (if applicable)
_____	All landscaping is to JEA standards
_____	Irrigation is installed and functions properly (Establishment Only)
_____	Copy of BackFlow Certification sent Building Ops

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____
Signature _____ Print name _____

JEA Inspector: _____
Signature _____ Print name _____

JEA O&M representative: _____
Signature _____ Print name _____

Commissioned this date: _____

ELECTRICAL

PRE-COMMISSIONING CHECKLIST

1	Check that all defects from switchboard inspection have been addressed	<input type="checkbox"/>
2	Electricity supply has been connected and energized. And confirm that a Certificate of Compliance for Electrical Work (CCEW) and associated paperwork has been supplied	<input type="checkbox"/>
3	Pump with the lowest serial number is installed as Pump 1 (i.e. nearest to switchboard)	<input type="checkbox"/>
4	Specified pump number labels are correctly installed adjacent to the pumps	<input type="checkbox"/>
5	"DANGER ELECTRIC" marker bricks installed at ground level and painted yellow	<input type="checkbox"/>
6	Earth electrode installed as specified	<input type="checkbox"/>
7	Earth pit, main earth electrode and water service bond installed	<input type="checkbox"/>
8	Meter panels are equipped and wired to requirements	<input type="checkbox"/>
9	Cable supports within the pump well are correctly located and properly fixed	<input type="checkbox"/>
10	No cable stocking has more than one cable installed in it	<input type="checkbox"/>
11	Motor cables are supported so as to avoid damage when removing other pump/pumps	<input type="checkbox"/>
12	Motor cables have minimal slack and do not present undue stress on motor cable glands	<input type="checkbox"/>
13	Check that the cable duct cover is held firmly under the edge of the concrete plinth by the well sliding cover. Also, check that it is held firmly under the edge at the switchboard end.	<input type="checkbox"/>
14	Appropriate lugs fitted to all field cables, and cables correctly identified at terminations	<input type="checkbox"/>
15	Confirm sufficient terminals installed to allow an individual terminal for every incoming field wire	<input type="checkbox"/>
16	Confirm all field wiring holes are mechanically protected (bushes, sleeves, etc.)	<input type="checkbox"/>
17	Motor terminations are in accordance with the connection diagram	<input type="checkbox"/>
18	All power cable terminations tested for tightness	<input type="checkbox"/>
19	Where parallel cables may be installed on site, provision has been made to ensure only one cable lug needs to be installed on each side of terminal lug	<input type="checkbox"/>
20	SCA rating plate complying with AS 3439 has been fixed	<input type="checkbox"/>
21	Confirm motor and pump details displayed on all labels are identical to the manufacturer's information. Take a copy of name plate information	<input type="checkbox"/>
22	Correct orientation and fixing of the switchboard as per design	<input type="checkbox"/>
23	Switchboard plinth and all gland plates sealed	<input type="checkbox"/>
24	<u>Check continuity of Earthing system:</u> Main Earth Water pipe bond Pump 1 connection box Pump 2 connection box Pump 1 Motor Pump2 Motor	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
25	With the motor circuit breakers open and the control isolators off, turn the main switch on, and check that the supply monitoring relay picks up	<input type="checkbox"/>
26	Check operation of phase failure/phase reversal function of the power meter by removing one phase of supply. Also check by reversing the supply rotation to	<input type="checkbox"/>
27	Measure the voltages both phase to phase and phase to neutral. Compare the actual voltages relative to typical no-load voltage of 400/230V, and the voltage variation between phases should be less than 2%	<input type="checkbox"/>

28	Check settings of Starters(VSD or Soft starter)	<input type="checkbox"/>
29	If fitted, check operation of by-pass contactor	<input type="checkbox"/>
30	Check the motor and pump nameplates for all details and for compliance with the data shown on the pump rating plate. Take a copy of name plate information	<input type="checkbox"/>
31	Check that the level switches have been adjusted to the required settings and are functional	<input type="checkbox"/>
32	Check that level transmitters give an analogue output for the full level range of the device. Simulate a pressure/water level of zero to full (or part of) span and check the reading on the level display	<input type="checkbox"/>
33	For the <u>following tests</u> , test for <u>pump 1</u> & pump 2:	
		P1 P2
	E-Stop	
	Overload	
	Motor Thermal Protection	
	Other: Check operation of all safety/protective devices for correct operation	
34	With the main switch, pump circuit breakers and control isolating switches off, conduct an insulation test with a megometer (megger test) on all motors at 500V. This must give greater than 10MΩ. Record Results:	<input type="checkbox"/>
	415 Bus	RW WB BW RE WE
	BE	
	Pump 1 cables	RW WB BW RE WE
	BE	
	Pump 2 cables	RW WB BW RE WE
	BE	
	GPO RE =	
35	For each pump turn the circuit breaker on and with personnel clear of all pumps, momentarily turn the control switch to ON and check for correct. Switch pump circuit breaker off.	<input type="checkbox"/>
36	Confirm that the Power Meter is configured for CT's and that the readings on the local display are appropriate.	<input type="checkbox"/>
37	Inspect telemetry and radio supply cable connections for correct polarity	<input type="checkbox"/>
38	Measure telemetry supply voltage and back-up battery voltage (should be 13.6V). Ensure appropriate voltages are detected as per electrical drawings	<input type="checkbox"/>
39	Check for mains voltage rated insulation on data cables where mixed with mains voltage cables	<input type="checkbox"/>
40	Check configuration of the PLC I/O against electrical drawings	<input type="checkbox"/>
41	Confirm that the telemetry unit has been configured	<input type="checkbox"/>
42	Confirm that the RTU calibration certificate has been supplied	<input type="checkbox"/>
43	Visual check of antenna installation, clearance from surroundings, mountings secure, and all cables connectors fitted and taped.	<input type="checkbox"/>
44	Check antenna mounted with weep hole to bottom	<input type="checkbox"/>
45	Check antenna bearing and polarization	<input type="checkbox"/>
46	Check for secure earth on radio coax surge protection (if applicable) and coax continuity	<input type="checkbox"/>
47	Check radio is marked with frequency in use as per electrical drawings	<input type="checkbox"/>
48	Check radio signal strength against fade margin figures	<input type="checkbox"/>
49	Check telemetry transmit-level to network device. Set as required by network device	<input type="checkbox"/>

50	Check telemetry receive level from network device, and set as required by the network device (or if not adjustable, ensure level is below telemetry threshold level)	<input type="checkbox"/>
	Monitor telemetry messages for errors	<input type="checkbox"/>
	Monitor radio audio clarity and set audio control off or to min volume	<input type="checkbox"/>
	Enable SCADA RTU and check telemetry unit is configured correctly	<input type="checkbox"/>
	Check that correct locks are fitted	<input type="checkbox"/>
	Monitor SCADA pull and error counters for satisfactory operation over a period of time until error rate is below 3%	

☐ OK

☐ Rectification Required

Comments: _____

Contractor Representative: _____
 Signature _____ Print name _____

JEA Inspector: _____
 Signature _____ Print name _____

JEA O&M representative: _____
 Signature _____ Print name _____

Commissioned this date: _____

INSTRUMENTATION

JEA Commissioning Checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Circle the following as applicable:

Checked

Probe in Oil	Yes / No
Normal Switch State	Open / Closed
Do latches on control panel work smoothly?	Yes / No
Are all connections tight?	Yes / No
Is the interior of the panel dry?	Yes / No
High water alarm light and horn activate with test button?	Yes / No
Horn silences with silence button?	Yes / No
High water alarm light and horn activate with float?	Yes / No
All electrical components are locally available	Yes / No

SCADA:

Auto control	<input type="checkbox"/>
Hand/Manual control	<input type="checkbox"/>
Pump 1 status	<input type="checkbox"/>
Pump 1 start	<input type="checkbox"/>
Pump 2 status	<input type="checkbox"/>
Pump 2 start	<input type="checkbox"/>
Pump 3 status	<input type="checkbox"/>
Pump 3 start	<input type="checkbox"/>
Generator run status	<input type="checkbox"/>
Power fail	<input type="checkbox"/>
Generator fail	<input type="checkbox"/>
Battery fail	<input type="checkbox"/>
Transducer fail	<input type="checkbox"/>
High wet well level alarm	<input type="checkbox"/>
Station Intrusion	<input type="checkbox"/>

SCADA:

Turn off main switch. On the overview page of the SCADA confirm that the *POWER* changes from *NORMAL* to *FAIL*. And back again when the power is restored

☐

For each pump:

Turn the pump from OFF to HAND. Check on the SCADA that *LOCAL HOA* changes from *OFF* to *HAND*.

☐

Turn pump from HAND to AUTO. Check on the SCADA that *LOCAL HOA* changes from *HAND* to *AUTO*.
NB: Pump may stop if not called by the controller.

☐

Turn pump from AUTO to OFF. Check that <i>LOCAL HOA</i> changes to <i>OFF</i> and <i>PUMP STATUS</i> changes (or already has changed) back to <i>STOP</i>	<input type="checkbox"/>
Bridge out terminals for the seal fail probe on the pump until the seal fail relay is activated (may be referred to as "Pump Warning Healthy"). Check on the SCADA that <i>PUMP WARNING</i> changes from <i>NORMAL</i> to <i>ALARM (FAIL)</i> & the "SEAL FAIL" label is ON. Reset the relay and check that <i>PUMP WARNING</i> returns to <i>NORMAL</i> & the "Pump Warning" lamp is OFF. NB: This will not trip the pump.	<input type="checkbox"/>
Test operation of overload relay by winding down trip point. Check on the SCADA that the pump becomes unavailable and the pump status is <i>FAILED</i> & the "Drive Fault" lamp is ON. Reset the relay. Reset the alarm condition by switching pump to OFF, then AUTO. Check Alarm clears	<input type="checkbox"/>
Using a manual trip on the pump temperature sensor relay (may be referred to as "Pump Protection"). Ensure that the drive trips and becomes unavailable on the SCADA, and check that the "OVER TEMP" label is ON. Remove the trip condition and reset by pump inhibit OR switch pump to Off, then Auto.	<input type="checkbox"/>
With pumps running, ensure that the correct current readings are recorded in SCADA.	<input type="checkbox"/>
Check on the SCADA that Pump Hours Run is calculated and displayed correctly. NB: Change clock on PLC to test as value resets at 8 am.	<input type="checkbox"/>
Check on the SCADA that Pump Starts for the previous hour is calculated and displayed correctly.	<input type="checkbox"/>
Ensure that an appropriate "Fail to Start" time has been entered. Remove the Pump Start feedback from PLC and call the pump to run in Auto. After the "Fail to Start" time, ensure that an Alarm is raised, and the pump is <i>FAILED</i> & the "Drive Fault" lamp is ON. Reset the relay. Reset the alarm condition reset by pump inhibit OR switch pump to OFF, then Auto. Check that the pump is no longer <i>FAILED</i> & the "Drive Fault" lamp is OFF.	<input type="checkbox"/>

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IN-LINE BOOSTER WASTEWATER PUMPING STATIONS – SECTION 435

I. SCOPE OF WORK

The Contractor shall furnish, install, test and place in operation the In-line Booster pumping station shown on the drawings and specified hereinafter. All applicable sections of the City of Jacksonville Standard Specifications and JEA Water and Wastewater Standards shall be considered part of this work. All references to Industry Standards (ASTM, ANSI, etc.) shall be to the latest revision unless otherwise stated. Only those materials included in the JEA Water and Wastewater Standards Manual, (including, but not limited to, dry pit pumps, VFD equipment and control panels), shall be installed. All materials shall be new unless specifically called for otherwise. All structures, pumps and panels shall require a complete shop drawing submittal, as detailed in this specification for JEA's review and approval prior to the start of construction.

II. WARRANTY

II.1. CONTRACTOR WARRANTY:

II.1.1. The Contractor shall supply to JEA a two (2) year unconditional warranty effective on the date of the JEA's Operation and Maintenance Pump Station acceptance letter. 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 to insure safe and correct operation of the station.

II.2. PUMP MANUFACTURER WARRANTY:

II.2.1. The Pump Manufacturer shall warrant to JEA all permanently installed municipal sewage service Submersible Pumps and Motors against all defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years: Mechanical Seals, Bearings, Shafts, Motor Electrical Cables and Motor Stators. See section IV.9 below entitled "Pump Warranty (Solids Handling)" for additional requirements.

III. GENERAL REQUIREMENTS

III.1. SHOP DRAWING SUBMITTALS:

Actual catalog data, brochures and descriptive literature will be required for dry pit pumps and electrical and controls at a minimum as specified here-in.

III.2. AS-BUILT DRAWINGS:

As-built drawings shall be required on all Wastewater, force main and pump station 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" and as defined here-in. 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. The Contractor shall submit "As Built" drawings before pump station start-up.

III.3. WORKMANSHIP:

All work shall be proved to be in first class condition and constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor with no additional cost to JEA.

III.4. MATERIALS:

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.

III.4.1. Unless indicated otherwise on the drawings, all metal components, with the exception of pumps and motors shall be anodized aluminum or 316 stainless steel as specified here in or on the plans.

III.4.2. The pumps and motors shall be supplied by the pump supplier to ensure unit compatibility.

III.4.3. Station piping shall conform to JEA Water and Wastewater Standards Chapter IV. 3. - Section 429, entitled Wastewater Force Mains and Chapter IV. 4. Section 430, entitled Wastewater Valves and Appurtenances. Specifically, station piping for Class I, Class II, Class III and Class IV stations shall be plumbed and aligned according the latest ASTM, AWWA standards, any piping ill-regularities shall be removed and replaced.:

III.4.3.1. Piping within the in-line booster station site shall be flanged 316 stainless steel, (schedule 10, one piece construction with no butt-welds with exception of pump-out pipe). Fittings shall be flanged 316 stainless steel. All nuts, bolts and accessories within shall be 316 stainless steel.

III.4.3.2. Pipe and fittings above ground shall be 316 stainless steel (flanged, schedule 10 with no butt-welds). All bolts, washers and nuts shall be 316 stainless steel, threaded and shall be coated with "Never Seize" type coating. All above ground pipe, fittings and valves not constructed of stainless steel shall receive two coats of an exterior coating of "moisture cured aluminized urethane" or epoxy paint as specified below. Moisture cured (aluminum and primers, grey or silver color), Sherwin Williams or "Wasser MC-Aluminum" JEA approved equal. Surface preparation shall be in accordance with paint manufacturer's recommendation.

III.4.3.3. Epoxy Paint System – A. Surface Preparation: 1. All piping and valves not constructed of stainless steel shall be coated and receive an SSPC-SP-1 Solvent Cleaning Standard or equal. This shall be received by mixing Devco Coatings Devprep 88 Heavy Duty Cleaner mixed 1 part Devprep 88 to 2 parts of potable water or equal, low pressure applied, then removed with a minimum of 3,000 psi washing unit. Repeat as necessary until all surfaces are clean and contaminant free, including all removal of Devprep 88 Cleaner. 2. Carbon steel shall receive an SSPC-SP-3 Hand Power Tool Cleaning standard until all surfaces are abraded thoroughly. 3. If directed to be coated, stainless steel shall receive the same method of preparation however a much more aggressive abrasive such as 30 grit must be used to create a minimum consistent one mil surface profile. 4. All surfaces shall be left clean and dry prior to the applications of all coatings, with the surface temperature being a minimum of 5 degrees above the dew point and not falling. B. Primer Coats: Stainless Steel: All stainless shall receive Devco Coatings Devran 201 Epoxy applied or equal @ 2.0-3.0 mils dry film thickness. Carbon Steel: All carbon steel surfaces shall receive Devco Coatings Bar-Rust 231K3501 Off-White Epoxy Primer or equal applied @ 4.0-8.0 mils dry film thickness. C. Finish Coats: Both stainless and carbon steel surfaces shall receive Devco Coatings Devthane 379 UVA Aliphatic Gloss Urethane

Enamel(grey color) or equal applied @ 2.0-3.0 mils dry film thickness or to full capacity. If brush and rolled, multiple coats may be required to achieve correct film thickness and/or hide. All products shall be applied in accordance with manufacturer's recommendations and their technical data pages.

- III.4.3.4. Force main piping below ground, shall be in accordance with Chapter IV. 3. - Section 429 and Chapter IV. 4. - Section 430 of this standards manual. No connections permitted into JEA force mains which are greater than 12" size unless the connection is from a master pump station (441 GPM/MIN) All connections shall be 4" size or larger (no 2" size connections).

III.4.4. Refer to Chapter IV. 7. - Section 472, "Emergency Generator", for technical specifications on automatic standby emergency generator with diesel engine drive and above ground fuel storage tank. All generators shall be sized to run all pumps. All in-line booster stations must be provided with an automatic standby generator. (See section 472, Emergency Generator)

III.4.5. All pumping stations, both rehabilitation and new construction, shall include a magnetic flow meter(indicating, totalizing, and recording capabilities) with bypass configuration located within the fenced area.

III.5. CRITERIA FOR AN IN-LINE BOOSTER WASTEWATER PUMPING STATION:

III.5.1. The use of an in-line booster wastewater pumping station is intended to serve areas within the sewer collection systems that have a large basin area and long force mains. Criteria for the selection of an in-line booster station includes a location where all flow is pumped to the site, no influent gravity flow, no system storage available, and a minimum pumping capacity of 500 gpm. JEA will have the final approval on the use of and in-line booster station.

III.5.2. The pump station maximum GPM excludes the flow from the stand-by pump.

III.5.3. For motors larger than 75 HP and/or have a full load amperage of greater than or equal to 400 amps, an electric power and control building shall be provided in accordance with the Submersible Wastewater Pumping Station – Section 433, VII, Prefabricated Concrete Enclosure standards.

IV. DRY PIT PUMPS

IV.1. OPERATING CONDITIONS AND UNIT SIZES:

Operating conditions and unit sizes shall be as shown on the drawings. The pump design operating conditions shall be within 10% +/- of the best efficiency point, unless otherwise approved by JEA. When possible, the pump selection shall be made in the center of the family of curves. JEA will provide collection system pressure information to aid in the design and selection of the pumps.

IV.2. SHOP DRAWINGS AND PUMP TAGS:

Prior to commencing the pumping station installation and/or the furnishing of replacement pumps, the pump distributor shall submit for approval, detailed and dimensioned shop drawings for pumps including factory curves of identical model pumps provided to JEA. The pump distributor shall furnish and deliver at the time of acceptance for use of the pumping station and/or of the replacement pump(s) by JEA, 3 computer diskettes (Microsoft Word) containing Operation & Maintenance data and motor and pump nameplate data (including serial numbers) for each pump supplied. The pump supplier shall provide a vinyl or aluminum placard or tag which indicates all operating conditions of the pumps, including name plate data, impeller size and part number, design flow, TDH, and other pump related data. The tag shall be placed (with adhesive) inside the front panel of the pump control panel or as directed by JEA.

IV.3. PUMP EQUIPMENT:

Pumping equipment shall be as listed in AS-603 and premium quality dry well non-clog pumps for sewage service. Pumps shall be as listed in the Approved Materials section. Dry-pit pumps shall be complete with a submersible electric motor, electric cable (min. cable length to be site specific, dependent upon junction box location(s)), maintenance free cooling system, pump support legs and all other appurtenances specified or otherwise required for proper operation.

IV.4. GENERAL:

Equipment furnished and installed shall be fabricated, assembled, erected and placed in proper operating condition in full accordance with drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by JEA.

IV.5. SERVICE CONDITIONS:

Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component.

IV.6. MATERIALS:

Major pump components shall be of gray cast iron. All exposed nuts, bolts, washers, anchor bolts and other fastening devices coming in contact with sewage shall be 316 stainless steel.

IV.7. SOLID HANDLING PUMP CONSTRUCTION (DRY-PIT PUMPS):**IV.7.1. Impeller:**

The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be a semi-open or enclosed one-piece casting with not more than two non-clog passages and must pass a minimum 3 inch solid. Screw impellers are not acceptable. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft by means of a key and self-locking bolt or nut.

IV.7.2. Mechanical Seals (Upper and Lower Seals):

Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be either carbon-ceramic, tungsten carbide or silicon carbide material. Adjustable wearing rings shall be provided for all pumps 25 HP and larger.

IV.7.3. Mating Surfaces:

All mating surfaces (pump assembly), of major components shall be machined and fitted with O-rings where watertight sealing is required.

IV.7.4. Motors:

The pump shall be driven by a totally submersible electric motor at 1800 RPM (max.). Pump motor shall be of sufficient horsepower as to be non-overloading over the entire length of the pump curve. The stator housing shall be a watertight casing. Motor insulation shall be moisture resistant, Class F, 180 degree C. at a minimum. All motors shall be VFD rated including class H winding insulation. Motor shall be

NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour. All motors over 3 HP shall be 3 phase. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be designed to operate in a totally, partially or non-submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assembly with grommet. An epoxy seal may be added to this cable entrance assembly to improve water tightness. The system used shall ensure a watertight submersible seal. Cable shall terminate in a junction chamber. Junction chamber shall be sealed from the motor by a compression seal. Cooling System and Supports (Dry-Pit Applications Only):

The pump should have a reliable, maintenance free cooling system that circulates a cooling liquid in a closed loop through a cooling jacket, and transfers the heat to the pumped liquid by heat exchange. A system that circulates the pumped liquid in a cooling system is not acceptable. The pump should be equipped with support base to secure the pump and facilitate the installation.

IV.7.5. Balance:

All rotating parts shall be accurately machined and shall be rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed.

IV.8. PAINTING:

Exterior of pump shall be coated with manufacturer's standard finish (powder coated epoxy finish is preferred, not required).

IV.9. INSTALLATION:

Pump discharge base shall be leveled, plumbed and aligned into position to fit connecting piping. The discharge base shall be solidly secured to the booster station concrete base using a 1" thick steel hold-down plate (see details) and appropriately sized 316 stainless steel anchors then grouted after initial fitting and alignment and before final bolting of the discharge piping. This work shall be inspected by JEA prior to any liquid being allowed to pump. After final alignment and bolting, pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

IV.10. PUMP WARRANTY (SOLIDS HANDLING):

The following warranty conditions shall also apply to existing pump station pump replacements.

IV.10.1. The manufacturer shall warrant to JEA for the permanent installation in municipal sewage service, the submersible/dry pit pump and motor against defects in materials and workmanship including normal wear and tear to the following parts for a period of 5 years, mechanical seals, bearings, shafts, motor electrical cables and motor stators. The warranty shall include no less than 100% coverage for original equipment (OEM) parts and in-shop labor for pump/motor repairs for the full 5 years at NO COST to JEA. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for use the pumping station and/or of the replacement pump by JEA.

IV.10.2. Verification of guarantees of performance and warranty certificate shall be indicated in the shop drawing submittal and in the Operation and Maintenance disc (Microsoft Word).

IV.10.2.1. The pump distributor shall employ and make available proficient manufacturer-authorized service technicians to perform service calls to pumps supplied to JEA on a 24 hour basis,

7 days a week. The pump distributor shall provide service technicians company-owned service vehicles equipped with lifts/booms capable of retrieving all sizes of dry pit pumps from the in-line booster site locations, all necessary tools, test and safety equipment, etc., that are required to make field repairs. Service personnel shall adhere to all JEA Safety Rules & Regulations and be trained and certified for confined space entries and carry liability and workers compensation insurance.

- IV.10.2.2. During the warranty period, the pump distributor shall at no cost to JEA repair and re-install the subject pump within 24 hours or provide a loaner pumps which can be transported, installed, and capable of maintaining operation of JEA's sites. The location address, contact names, phone numbers, (including emergency, mobile, etc.) and fax numbers of the manufacturer-authorized warehouse and service center shall be indicated in the shop drawing submittal and in the Operation & Maintenance diskettes (Microsoft Word).

V. PUMP STATION ELECTRICAL

V.1. STATION ELECTRICAL SERVICE

- V.1.1. The Contractor shall provide complete new electrical service for each lift station, including coordination of electrical service selection and approval by JEA and the serving electrical utility company. Each lift station electrical service shall include complete primary and secondary electrical service equipment, metering and installation in accordance with these standards and the serving electrical utility company requirements.
- V.1.1.1. Unless specifically unavailable from the serving electrical utility company, the electrical service to each lift station shall be three phase. The basis of design lift station electrical service to be requested from the serving electrical utility company shall be as follows:
- V.1.1.2. 20 HP and below: 240/120 volt, 3 phase, open delta, full voltage motor starting, and 15 starts per hour. However 480/277 volt, 3 phase, wye is always preferred.
- V.1.1.3. 21 HP thru 40 HP: 480/277 volt, 3 phase, wye, full voltage motor starting, 15 starts per hour
- V.1.1.4. 41 HP and above: 480/277 volt, 3 phase, wye, reduced voltage motor starting, 10 starts per hour
- V.1.1.5. The lift station design engineer shall contact the serving electrical utility company and obtain written documentation of the availability of the service requested. The electrical service documentation to be obtained from the serving electrical utility company shall identify each of the following basis of design issues:
- V.1.1.6. Electrical service voltage and phase
- V.1.1.7. Electrical service point of connection
- V.1.1.8. Type of motor starting required (full voltage or reduced voltage)
- V.1.1.9. Maximum number of starts per hour permitted
- V.1.1.10. Maximum available fault current
- V.1.2. The electrical service documentation obtained from the serving electrical utility company shall identify all applicable electrical utility company rules, regulations and fees. Additionally, the lift station electrical design engineer shall obtain a schedule that identifies when the requested electrical service would be available from the electrical utility company.
- V.1.3. If it is determined that the requested electrical service is not available from the electrical utility company, the design engineer shall submit an alternate basis of design recommendation for review and approval by JEA before proceeding with the lift station electrical design.

- V.1.4. The use of 208/120 volt, 3 phase, wye service shall not be permitted. For locations where the serving electrical utility company can only provide 3 phase wye services, the lift station electrical service shall be 480/277 volt, 3 phase, and wye. For locations where the serving electrical utility company can only provide 240/120 volt single phase service, the pump motors shall be limited to a maximum of 7.5 HP. Three phase pump motors shall be provided. Variable frequency drive motor starters shall be used to operate the three phase motors from the single phase electrical service.
- V.1.5. Electrical service size shall be based on these standards and N.E.C. requirements. The minimum electrical service size shall be 100 amps. Where the electrical service requirements exceed 100 amps, but are less than or equal to 200 amps, the electrical service size shall be 200 amps. Where the electrical service requirements exceed 200 amps, but are less than or equal to 400 amps, the electrical service size shall be 400 amps. Above 400 amps, the electrical service size shall be selected by the lift station electrical design engineer.
- V.2. CONTROL SELECTION GUIDE
- Below is a selection guide to determine the type of panel required for a Lift Station.
- Variable Frequency Drives (VFD)
- Across Line contactors (ACL)
- V.2.1.1. 1-75HP or FLA < 400A, VFD, 480VAC, Panel is to be sized for no AC and Heat sinks vented out the back.
- V.2.1.2. 76-200HP or FLA \geq 400A or > 3 Pumps, VFD, in a building. Please contact JEA for further details.
- Note that 208VAC shall not be permitted
- V.3. OVERALL SPECIFICATIONS FOR SCADA EQUIPMENT
- V.3.1. Qualified Panel Manufacturers:
- The electrical control panel shall only be manufactured by a JEA approved manufacturer as listed below. See section XI Wastewater Approved Materials, plate AS-604
- V.3.2. Drawings:
- Drawings are provided for the JEA web site. All panels shall be built based on the latest drawings. These drawings are a template of how the overall Control Panel is to be designed. Note the drawings will need to be changed based on the voltage, pump size and the number of pumps. Keep existing format of drawings and only change Title Block.
- V.3.2.1. Prior to building, all drawings shall be modified and submitted for approval in AutoCAD 2013 DWG format and PDF for review by JEA.
- V.3.2.2. Variables for the VFD design are wire size, enclosure size, circuit breaker, VFD, reactors and generator receptacle.
- V.3.2.3. A Control Panel Detail List shall be provided for quotation and design purposes. List will include items as the voltage and FLA. Included shall be detail additional Inputs if required for such items as Generator Monitoring, Odor Control, Potable Water Presser and other inputs.
- V.3.2.4. Key electrical drawings as power distribution and I/O shall be laminated, attached to the door and in color. Drawings shall be printed on 8.5 x 11 if 11 x 17 is too large to fit on the door.
- V.3.2.5. Full set of electrical drawings printed with a Laser Printer and in color shall be inserted in the door pocket. Ink jet is not accepted.
- V.3.3. Panel Enclosures:
- V.3.3.1. All enclosures and heat shields shall be powder coated white. Before powder coating enclosures they shall be degreased, cleaned and treated with phosphate process.

- V.3.3.2. All insides of the Enclosures shall be Rated NEMA 12/3R with no ventilation to the outside.
- V.3.3.3. All Enclosures shall be fitted with 3-Point Latch.
- V.3.3.4. All enclosures shall have Marine Grade Aluminum heat shields on the top, front, back and side, unless mounted inside a building. They shall be fabricated from .125 Marine Grade Aluminum.
- V.3.3.5. Enclosures shall have pockets mounted on the inside of the door.
- V.3.3.6. The enclosure shall have a twelve gauge steel, formed, removable sub panel. The sub panel shall be degreased, cleaned, treated with phosphate process, then primed and painted with white industrial grade baked enamel.
- V.3.3.7. The maximum size of an aluminum enclosure shall be no taller than 60" wide or 60" high with 12" floor stands for a total height of 60". Any enclosure that requires a larger size shall use 316 stainless steel. These enclosures shall be fabricated from .125 Marine Grade Aluminum.
- V.3.3.8. Aluminum enclosures with free standing bases shall have the bases manufactured out of 316 stainless steel.

V.3.4. 3P VFD Cabinet Requirements:

- V.3.4.1. Minimum enclosure size for a 40HP VFD cabinet shall be 60" high by 48" wide and 20" deep on 12" floor stands. The maximum enclosure height shall not exceed 72". The sides of the enclosure may be extended no more than three inches from the door. Refer to Heat Load Calculations section of this document to size panel.
- V.3.4.2. VFD's installed in an enclosure outside will be built in a NEMA 12/3R enclosure with the drives heat sinks vented. Refer to drawings for further details.
- V.3.4.3. VFD's shall be mounted on a removable plate connect to rear of panel with a gasket. The back of the panel will have studs sticking out to bolt the plate to. This plate is to be sized a minimum of 2.75" wider and 3.5" taller on each side of the drives cutout hole for a 40HP drive. The distance will increase proportionally to the size of the VFD. For example, an 80HP VFD would require 5.5" wider and 7.0" taller on each side of the drive cutout hole. This is to insure that a future replacement of the drive will allow for different dimensions.
- V.3.4.4. The rear sunshield shall have a removable cover with handles to allow access to the VFD heat sinks for cleaning and maintenance. The heat shield will have studs sticking out with wing nuts for the removable cover.

V.3.5. Components:

Components to build a control cabinet are classified as sole sourced or non-sole sourced as listed below.

- V.3.5.1. Sole Sourced items are items in the drawings bill of material that shall not be substituted. These items are the radio, PLC, Input/Output modules, SINAUT communication module, UPS and CITEL 4-20ma surge suppression.
- V.3.5.2. Non sole sourced items such as Power Supply, Transformer, Circuit Protection and others may be substituted for an equivalent device. The specifications of the devices shall meet or exceed the items listed in the bill of material. Any items found to not meet specification must be replaced at the panel builder's expense.

V.3.6. Wiring:

Type and Identification:

- V.3.6.1. All Wire Colors in the panel shall follow the UL508A standards.
- V.3.6.2. Wire type #12 AWG and smaller shall be Hook-Up/Lead tinned copper, # 18 AWG stranded is minimum: BELDEN – 35612 Hook-Up Lead-UL AWM Style 3173-XL-DUR or equal.
- V.3.6.3. Control:
 - V.3.6.3.1. All control cabinet wiring to the PLC and control devices shall be 18 AWG and terminated with ferrules.
 - V.3.6.3.2. Control Wiring shall be numbered / lettered at each end. Wire numbers / letters shall be Flattened Polyolefin Heat Shrink Markers for Permanent Wire and Cable Identification (Panduit) or JEA approved equal. Pass & Seymore “Legrande” will no longer be acceptable.
- V.3.6.4. Power:
 - V.3.6.4.1. The allowed ampacity or current rating on the surface of a conductor shall be a maximum of 75°C.
 - V.3.6.4.2. All wires going from Distribution Block to the Pump Breaker and Motor Contactor must be sized for 140% of Motors FLA.
- V.3.6.5. Field Wiring
 - V.3.6.6. All field wiring shall be ground burial rated.
 - V.3.6.7. All control wires shall be tin plated and #12 AWG.
 - V.3.6.8. All control wires shall be labeled at both ends for tracing.
 - V.3.6.9. Analog wires shall tin plated with a foil and braided shield.
 - V.3.6.10. VFD rated cable shall be used from the VFD to the demarcation box.
 - V.3.6.11. Field wiring colors:
 - V.3.6.11.1. Motor Wires:
 - 240V = Blue, Orange, Black
 - 480V = Brown, Orange, Yellow
 - V.3.6.11.2. Over Temp:
 - Hot = Black
 - Common = White
 - V.3.6.11.3. Seal Fail:
 - Hot = Red:
 - Common = Orange
 - Ground = Green

V.3.7. Terminals:

Terminals shall be based on the WAGO Top Job S series terminals. The minimum size shall be 4mm. The spring portion of the clamp shall be fabricated of a chrome nickel spring steel of high tensile strength and shall be solid, without perforation. The chrome nickel spring steel spring tension mechanism shall provide the installer the opportunity to directly insert solid or ferruled conductors without having to utilize tooling to open the clamping mechanism. The terminal block shall be designed to accept solid and/or stranded copper conductors without requiring special preparation, such as crimps, ferrules or tinning. Proportional clamping shall ensure mechanical and electrical connection integrity without damage to the conductors of various sizes throughout the rated range. The design of the terminal block shall not prevent or interfere with the use of wire preparation methods, such

as crimps, ferrules or tinning. The pullout force shall be a minimum of 6 times that specified in VDE 0611 (Resistance to Vibration Test for Terminal Block). The current bar and clamping yoke shall have traverse grooves to increase the force required for conductor pull out and "Gas tight" connection. The voltage drop also shall remain virtually unchanged. Gas tightness will be per DIN 41640, part 76.

V.3.8. Generator Disconnect Switch:

A NEMA 3R enclosed generator disconnect switch shall be supplied and sized as follows.

VI.3.10.1. Approved manufacturer: Eaton quick-connect double-throw (QCDT) safety switch or approved equal.

VI.3.10.2. The Generator Disconnect Switch shall be sized greater than or equal to the current rating of the Main Circuit Breaker but not larger than 400A.

VI.3.10.3. The generator disconnect switch shall not be required if a generator set is installed on site.

V.3.9. Thermal Magnetic Circuit Breakers:

Thermal Magnetic Circuit Breakers shall be used for the Main, Emergency and Pumps. As a minimum the breakers must comply with the standards as follows.

V.3.9.1.1. Circuit breakers shall be minimum "E" frame.

V.3.9.1.2. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device.

V.3.9.1.3. Protector operators shall be quick make, quick break and trip free.

V.3.9.1.4. Shall be rated a minimum of a 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18KAIC for 460/480 Volt systems.

V.3.9.1.5. The thermal and magnetic elements shall operate independently and multiple pole breakers shall be designed with common trip bar breaking all poles when a fault is received on any pole.

V.3.9.2. Main and Emergency Breakers

V.3.9.2.1. The electric utility company servicing the utility shall provide the maximum available fault current rating for each electrical service. Each panel shall be UL rated for the maximum available fault current.

V.3.9.2.2. The Trip Rating or Setting shall be calculated by taking the largest Pump Breaker's Amps + the Nameplate Amps of all the other Pumps + 10Amps (auxiliary loads) = Normal Main Breaker Trip Setting.

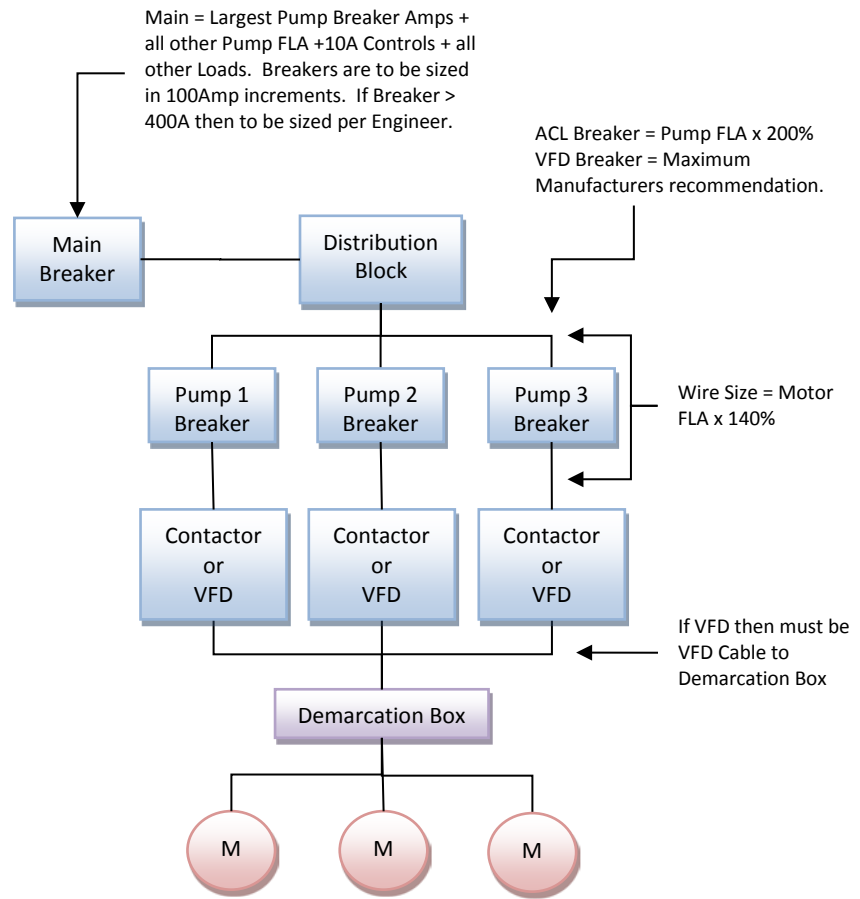
V.3.9.2.3. The minimum size breaker will be 100A. Where the breakers trip setting is greater than 100 amps and less than or equal to 200 amps the breakers shall be rated at 200 amps. Where the breakers trip setting is greater than 200 amps and less than or equal to 400 amps the breakers shall be rated at 400 amps. Where the breakers trip setting is greater than 400 amps the main breaker shall be rated as determined by the lift station electrical design engineer.

V.3.9.3. Across the Line Pump Breakers

V.3.9.3.1. The Trip Rating or Setting shall be calculated using the Pump Motor Nameplate Amps x 200% for Across the Line Starters.

V.3.10. Variable Frequency Drive Breakers

V.3.10.1.1. Breakers shall be selected and sized for maximum ratings per manufacturer's recommendation.



V.3.11. Variable Frequency Drive Specifications

V.3.11.1. All VFD's shall be on the approved manufacturer list.

V.3.11.1.1. Cutler Hammer – SVX9000

V.3.11.1.2. Yaskawa – P7

V.3.11.2. VFD's shall be sized for 110% continuous and 120% for 1 minute.

V.3.11.3. VFD's shall have a minimum 3% Input Line Reactor on each of the drives.

V.3.11.4. VFD's shall be rated for a minimum of 50 Celsius ambient temperature.

V.3.11.5. VFD's in buildings shall have a DV/DT Output Filter on each drive.

V.3.11.6. Each drive shall come with a Profibus DP module that supports "ProfiDrive" Communication not just Profibus DP. Each drive must support Profibus as a native protocol; a protocol translator between drives isn't acceptable. The drive shall be set up for PPO4 telegrams and data rates of 1.5 M.

V.3.11.7. Each drive shall come with a keypad that supports Local/Remote, Jog, FWD/Rev, Run and Stop.

V.3.11.8. Drives shall be rated a minimum of NEMA 12.

V.3.11.9. Drive control boards shall be conformal coated.

V.3.11.10. VFD's shall be flange mount capable.

V.3.11.11. All VFD's shall come pre-programmed to the description of the VFD Float Backup Functional as described below.

V.3.11.12. All drawings shall come with a parameter sheet, on the drawing, with instructions for drive set up on Profibus and have backup pressure control capability.

V.3.11.13. All drives shall come with a certified three year warranty with documentation showing proof.

V.3.11.14. VFD Pressure Backup Functional

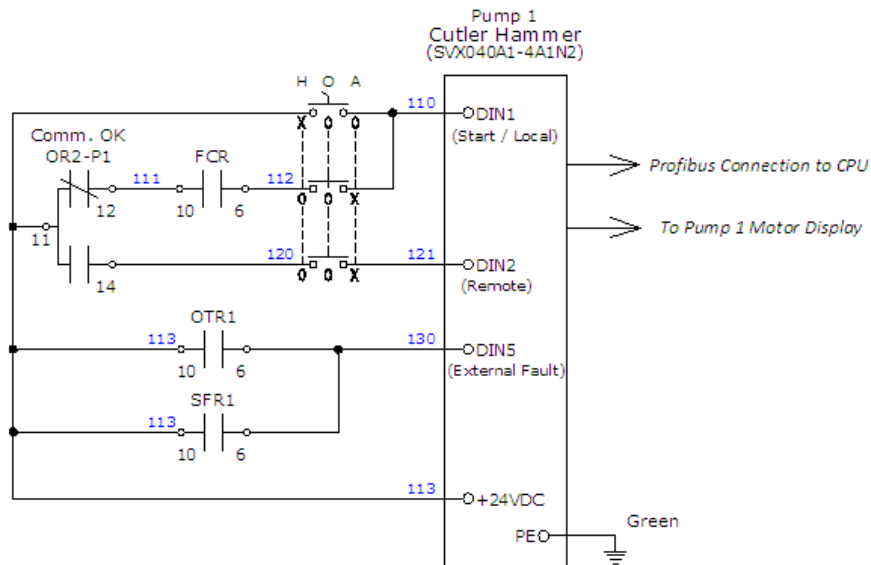
Each VFD shall be wired with a Hand, Off and Auto switch. The three modes of operation are described below.

V.3.11.14.1. Off – The drive is disabled.

V.3.11.14.2. Manual – The drive shall turn on and ramp up to maximum speed.

V.3.11.14.3. Auto – If the VFD selector switch is put into Auto and PLC Communication to the drive is ok then the drive will be controlled over the Profibus communication. If communication is ever lost to the VFD the Communication OK relay will drop out and control the VFD from the Float Control Relay. The Communication OK relay is controlled by the PLC and is to be energized as long as the VFD Communication is ok.

Below is the connection diagram for the hardwired interface to the VFD.



V.3.11.15. Heat Load Calculations for Gasketed / Unvented Enclosures

All heat calculations shall be provided showing surface area, internal heat load of components broken out, Watts per square foot and any other pertinent data. This data shall be submitted with the enclosure drawing for approval.

V.3.11.15.1. The evaluation of the heat load on an enclosure, include the following:

V.3.11.15.1.1. Total surface area of the enclosure

V.3.11.15.1.2. Internal heat load [load and duty cycle to be considered in calculation]

V.3.11.15.1.3. Maximum allowable internal temperature [113F]; with an assumed outside temperature[95F]

V.3.11.15.2. Enclosure surface area is the primary factor in determining its ability to dissipate heat.

V.3.11.15.2.1. $\text{Surface Area} = 2[(A \times B) + (A \times C) + (B \times C)] \div 144$

V.3.11.15.2.2. Where the enclosure size is A x B x C in inches.

V.3.11.15.2.3. This equation includes all six surfaces of the enclosure.

V.3.11.15.2.4. If any surface is not available for transferring heat (for example, an enclosure surface mounted against a wall), that surface's area should be subtracted.

V.3.11.15.3. For any temperature rise calculation, the heat generated within the enclosure or internal heat load shall be known.

This information can be obtained from the supplier of the components mounted in the enclosure.

Any internal heat calculation shall include but is not limited to the following components:

V.3.11.15.3.1. Transformer Power Supply UPS PLC Circuit Breakers Heat Load Main All Pump circuit breakers taking into consideration duty cycle.

V.3.11.15.3.2. VFD Heat Load

V.3.11.15.3.2.1.1. If VFD is inside the enclosure assume Heat Load = $(746W \times \text{HP} \times 3\%)$

V.3.11.15.3.2.1.2. If VFD heat sink is out back assume Heat Load = $(746W \times \text{HP} \times 3\%) \times 10\%$

V.3.11.15.3.2.1.3. Note: the 10% is from Cutler Hammers statement that with heat sinks out the back only 10% of the heat will be dissipated inside the enclosure. Other manufacturers may require a greater percentage and must adjust the formula accordingly.

V.3.11.15.3.3. VFD Duty Cycle

V.3.11.15.3.3.1.1. For two pumps VFD applications assume worst case of one pump running continuously.

V.3.11.15.3.3.1.2. For three pumps VFD applications assume worst case of two pumps running continuously.

V.3.11.15.4. Enclosure Temperature Rise (ΔT)

Example:

What is the temperature rise that can be expected from a 72 x 72 x 20 in. painted white enclosure designed to control 3 VFD's with external mounted heat sinks?

Solution:

$$\text{Surface Area} = 2[(72 \times 72) + (72 \times 20) + (20 \times 72)] \div 144 = 112 \text{ ft.}$$

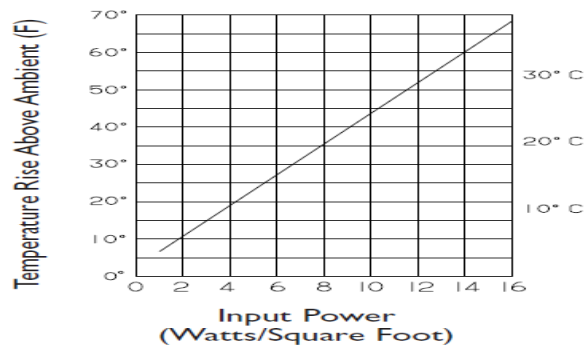
V.3.11.15.5. Internal heat load (min.) :

Component		PN	Load	Full Load Loss	Loss
Control Transformer	500VA	SiemensMT0500A	50%	21.5w	11w
24VDC Power Supply	5A	PULS CS5.241 89.4		15w	15w
CPU 313C-2DP	Siemens	6ES7 313-6CF03-0AB0		14w	14w
Analog Input Module	Siemens	6ES7 313-1KF01-0AB0		1w	1w
Communication Module	Siemens	SINAUT ST7, TIM 3V-IE		6w	6w
3 Pole 200 Amp [2]	Siemens	NFG3B200L	33% (65amps per drive)	80w per breaker at 200 amps	53w
[2] 50 HP VFD	Cutler-Hammer	SVX040A1-4A1N2	100%	112w per drive	224
Misc.					13w
Total					337w

*Full Load loss data from component specifications sheets.

$$\text{V.3.11.15.6. Watts per Square Foot} = \text{total internal watts} / \text{surface area} = 337/112 = 3 \text{ Watts/Square Foot}$$

$$\text{V.3.11.15.7. Temperature Rise } [\Delta T] = 15 \text{ degrees F}$$



V.3.11.16. Air Conditioning

Only buildings will require air conditioning and shall meet the specifications below.

- V.3.11.16.1. Air conditioners shall be rated NEMA 4X and Corrosion Resistant.
- V.3.11.16.2. Buildings shall require heating strips.
- V.3.11.16.3. AC Units shall carry a minimum of a 3 year warranty in a corrosive environment.

V.3.11.17. Surge Suppression:

Surge Protective Devices (SPD) for 120VAC and above shall be UL1449 Third edition.

- V.3.11.17.1. The Main Disconnect shall have a Type 1 SPD rated NEMA 4X. It will have a minimum surge capacity of 50kA at 8x20us
- V.3.11.17.2. The Control Panel shall have a minimum Type 2 SPD with a surge capacity of 40kA at 8x20us.or above.
- V.3.11.17.3. The 4-20ma surge suppression shall be CITEL part # DLAW-24D3. No other device will be accepted.

V.3.11.18. Additional Field Wiring Requirements:

Some sites require additional inputs based on external field requirements. Below is a list of inputs for different field requirements.

- V.3.11.18.1. Generator Input requirements as listed.
Discrete Inputs – Generator Fault, Transfer Switch Normal, Transfer Switch Emergency, Generator Running, Normal Power Available and Fuel Leak, Analog Input 4-20ma – Fuel Level.

V.3.11.19. UL Labels:

The entire control system shall bear a UL 508A serialized label "Enclosed Industrial Control Panel". The use of the label "Industrial Control Panel Enclosure" without the UL508A serialized label shall not be acceptable.

V.3.11.20. Warranty:

- V.3.11.20.1. The Panel Manufacturer shall supply to JEA a three (3) year (min.) unconditional warranty after completion or acceptance of MCC Panel on all parts supplied by the manufacturer, excluding parts supplied by JEA.
- V.3.11.20.2. 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 material or defective workmanship with new materials/workmanship conforming to the specifications.
- V.3.11.20.3. The Panel Manufacturer shall also be responsible to ensure that Component Manufacturer's Warranty which exceeds the Panel Manufacturer's warranty is honored.

V.4. COMPONENTS EXTERNAL TO THE PANEL**V.4.1. Potable Water Pressure Transducer:**

Not every Lift Station is required to have a Potable Water Pressure Transducer. Refer to design for site for requirements.

- V.4.1.1. Transducer shall be rated 0-100PSI.

V.4.1.2. Transducer shall be a United Electric Controls model number TX200B or equivalent.

V.4.1.3. Shall have a minimum 3 year warranty.

V.4.2. Power Distribution Panel:

Panel to distribute power to devices external to the control panel and shall be fabricated from 0.125 Marine Grade Brushed Aluminum or 316 stainless steel. Reference site drawings for details.

V.4.3. Radio Pole / Tower:

The radio pole or tower shall provide communication to the SCADA cabinet to the remote master. To determine if a Pole or Tower is required a Radio Path Study shall first be conducted. The Radio Path Study shall be done using the same type of radio used in the SCADA panel and shall be a minimum of -86DB RSSI. If the height of the minimum -86DB RSSI level is less than or equal to 20' then a 20' Pole shall be used. If the height requirements are over 20' then a Tower shall be used. Refer to drawings for specifications on Pole and Tower.

V.4.4. Inlet & Outlet Pressure Transducers:

Shall be manufactured by Red Valve and be Series 48. The specifications are to be Wafer style Stainless Steel Body & Flanges Buna-N Sensing Sleeve, Silicone Oil Fill with United Electric Controls model One Series (2WLP41P14) Gauge Range (0-100psi), with Stainless Steel Ball Valve Isolator.

V.4.5. Backup Pressure Control / High Pressure Indication

Shall be manufactured by United Electric Controls model One Series (2W3A00P14) Gauge Range (0-100psi).

V.4.6. Vibration Transmitter

Each pump shall be provided with a vertical and horizontal vibration transmitter. The transmitter shall be Wilcoxon model PCC421VR-10-R6 with 2 wire 4-20ma output, Velocity, RMS, 1.0 ips full scale, 2 pin MIL-C5015 connector. The sensor shall also be provided with a cable R6Q Mill 2 pin high temperature connector for waterproof applications with twisted pair, braided shield for a continuous run from the sensor to the panel.

V.4.7. Check Valve Limit Switches

Limit Switches shall be provided on all check valves. This will be used to indicate that the check valves are closed. The limit switch shall be manufactured by GO Switch Leverless limit switch and be Model # 81-10528-A3.

V.4.8. Flow Meter

V.4.8.1. Shall be of type Siemens Sitrans FUS1010 Clamp-on Ultrasonic Flowmeter or meet the same specifications as listed below. Approval is required for any other proposed meter.

V.4.8.2. The meter shall be Clamp-on type that uses externally mounted transducers with no pipe penetration.

V.4.8.3. The meter shall be NEMA 4X, C1D2 rated, capable of Transit-time and Doppler operation.

V.4.8.4. The flow meter shall employ the phase detection multiple pulse transmit principle in conjunction with multiple frequency axial beam transducer technology to insure operation on liquids with solids and/or bubbles.

V.4.8.5. The meter shall include a pipe configuration menu to correct for flow errors due to inadequate pipe diameters or convoluted piping.

V.4.8.6. The transducers shall be NEMA 4X, C1D1, matched to pipe wall thickness and material.

- V.4.8.7. The meter shall be microprocessor based with graphic display and advanced diagnostics including signal graph display. It shall include automatic Reynolds number compensation.
- V.4.8.8. Meter will provide totalization and flow rate in all standard units.
- V.4.8.9. Meter accuracy will be 0.5%-1% of rate at flows above 1 fps.
- V.4.8.10. Meter shall be bi-directional in the transit-time mode.
- V.4.8.11. Meter shall have auto-zero and not require flow stoppage to set zero flow.

V.5. SERVICE:

The manufacturer or representative shall provide two hour on site emergency service for the first 12 months after commissioning. The manufacturer shall stock replacement components locally for emergency replacement as needed.

V.6. START UP:

The manufacturer or representative shall be present for start-up at time designated by JEA.

VI. PREFABRICATED CONCRETE ENCLOSURE

VI.1. PREFABRICATED CONCRETE ENCLOSURE:

The prefabricated building system shall be factory assembled, pre-tested, shipped to the site, and suitably anchored to the respective concrete foundations. In the case of a conflict between this specification section and the current JEA Standards, the more stringent of the two requirements shall apply.

The enclosure shall be manufactured by Old Castle Precast, Inc. of Newnan, GA (770) 304-4648, or JEA approved equal. The enclosure design and construction shall conform to all applicable federal, state, and local building codes and standards including the current Florida Building Code, D1.1 Structural Welding Code, ACI-318-02 and ACI-318R-02.

The enclosure shall be guaranteed to be completely weather-tight under all weather conditions for a period of three (3) years (min). Leaks which occur during the period, whether through roofs, walls, doors, accessory equipment, or materials, shall be repaired to the satisfaction of JEA at no additional cost to JEA.

CONTRACTOR shall verify all openings and penetrations, and shall coordinate with the manufacturer prior to casting.

VI.2. DESIGN REQUIREMENTS:

The enclosure shall be constructed of solid, one-piece concrete panels. Minimum outside dimensions of the building shall be 11'-8" x 28'-0". The minimum interior clear height shall be 10'-0". Panels shall be bolted or welded together and joints caulked inside and out to make the building weatherproof. The wall panels shall be minimum 3-1/2" thick solid panels of concrete with primary structural reinforcement of steel bars and welded wire fabric. Wall panel assembly shall develop strength to resist the design wind loads. Wall panels shall be continuous from base to eave with no horizontal joints.

The roof shall have a gable profile with the ridge parallel to the long dimension and shall have a minimum 4" thick concrete panel extending over the walls to act as a drip edge. The roof shall contain primary reinforcement of steel bars and welded wire fabric as well as secondary reinforcement of polypropylene fibers.

The interior finish on the walls shall be 3/4" plywood panels with plastic laminate suitable for equipment mounting and insulated to R-14. The ceiling shall be 5/8" gypsum and insulated to R-21. All fasteners and nails shall be 316 stainless steel.

The exterior surfaces of the walls shall have a stucco texture finish. The exterior shall be finished with a cementitious base coating and a topcoat of textured 100% acrylic. The topcoat

shall be of the same manufacturer as the cementitious base coating. Coatings shall be Thoro System Products; "Thoroseal with Acryl 60" and "Thoroseal". Colors will be selected after the award of the contract Exterior flashing and fasteners shall be 316 stainless steel.

Caulking shall be provided at all bases, corners, eaves, doors, and other openings to provide a completely weather-tight installation. Sill angles and door frames shall be caulked in place and sealed.

All necessary erection hardware, fasteners, trim, flashing, closures and other accessories necessary for a complete building shall be furnished. The enclosure shall be assembled in accordance with the building manufacturer's instructions. All members shall be carefully leveled. All welding shall be in accordance with AWS D1.1 Structural Welding Code.

VI.3. DOORS AND HARDWARE

The building shall be provided with a pair of 2'-6" x 7'-0" fiberglass reinforced plastic (FRP) doors for equipment installation and a 3'-0" x 7'-0" FRP personnel door as indicated on the drawings. The color of the door shall be selected after award of the contract.

Hardware shall be furnished and installed by the door manufacturer. The hardware shall be 316 stainless steel provided for the building and shall include mortise locks on each door set Corbin Russwin interchangeable core cylinders. Interchangeable core shall have Contractor's core in cylinder. Contractor core shall be provided with control key and registered change keys. Contractor will coordinate door hardware lock mechanism with the JEA representative. Hinges shall be heavy duty stainless steel. The location of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware".

Hardware shall be stainless steel and furnished complete with machine screws, bolts, and other attachments as required. The CONTRACTOR shall furnish complete specifications and catalog cuts of each item offered.

VI.4. ELECTRICAL:

The manufacturer of the building shall provide to the CONTRACTOR any requirements necessary for the installation of the electrical equipment and conduits by the CONTRACTOR as indicated on the drawings. This shall include recommended conduit penetration and sealing methods to ensure the weather-tight integrity of the building.

VI.5. STRUCTURAL DESIGN:

The applicable building code shall be the latest Florida Building Code. The enclosure shall be designed to resist overturning and sliding forces resulting from wind loading. Embedments to be cast into the slab for anchorage shall be designed and provided by the building supplier. Structural design shall be performed by a Professional Engineer registered in the State of Florida and submittal of building components shall bear his/her seal.

The building shall be designed for the following criteria (at a minimum):

Roof live load, lb per sq ft of horizontal projection (no live load reduction is permitted)	20 psf
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Wind Load	120 mph, 3 second gust
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VI.6. PAINTING AND FINISHES:

All surfaces to receive paint shall be cleaned of any grease, dust, or dirt. Pre-finished surfaces shall be masked or otherwise protected to avoid damage from spilled paint, overspray, or spatter.

Factory finished surfaces which have become damaged during shipping, assembly, or erection shall be touchup painted with materials supplied by the building manufacturer. No other finish will be accepted. All touchup painting shall produce a final finish satisfactory to JEA.

VI.7. DRAWINGS AND DATA TO BE SUBMITTED:

Complete specifications and drawings covering the doors and a complete hardware schedule shall be submitted in accordance with the Submittals section. Drawings shall indicate an elevation of the door, details of construction, assembly and erection details, profiles and thickness of materials, anchors, reinforcements, hardware coordination, and finish. Drawings shall be accompanied by the manufacturer's installation manual, indicating standard recommendations and details of erection. The hardware schedule shall indicate each item of hardware required, manufacturer's name, manufacturer's number or symbol, and finish.

Complete drawings and data shall be furnished showing anchor bolt locations, sizes, and projections; details of sidewall, end wall, and roof framing; transverse cross-sections; locations of all openings; details of louver; flashing details; and erection instructions. Color samples of manufacturer's standard finishes shall be submitted. Drawings and data shall be in accordance with the Submittals section.

VI.8. CERTIFICATION:

A letter of certification signed and sealed by a Professional Engineer registered in the State of Florida shall be submitted for the structural framing, anchorage and covering panels of the building system.

VII. VALVES

VII.1. GENERAL:

The contractor shall furnish and install check valves, plug valves, and accessories as shown on the drawings and as specified in JEA Water and Wastewater Standards Manual.

VII.2. CHECK VALVES (LEVER & WEIGHT STYLE):

Check valves shall be as generally specified in JEA Water and Wastewater Standards Chapter IV. 4. - Section 430, and shall also meet the following additional requirements. Rubber disc facing shall operate on a 316 stainless steel shaft connected to a steel outside lever and cast iron adjustable weight. Check valve shall include renewable seat and disc. Valves shall meet AWWA Standard C508 and rated at 150 psi (min.) working pressure.

VIII. TESTING

VIII.1. ARC FLASH HAZARD ANALYSIS

Contractor shall commission an Arc Flash Hazard Analysis for each piece of electrical equipment in accordance with OSHA 29 CFR Part 1910, NEC, NFPA 70E, and IEEE 1584 and shall submit an Arc Flash Hazard Analysis report as specified herein.

VIII.1.1. The Arc Flash Hazard Analysis shall be performed in association with, or as a continuation of, the short circuit study and protective-device coordination study.

VIII.1.2. Arc Flash Hazard Analysis calculations shall lead to a selection of a level of Personal Protective Equipment (PPE) that is a balance between the calculated incident energy exposure and the work activity being performed, while meeting the following concerns:

VIII.1.3. Provide adequate protection.

VIII.1.4. Avoid the need for more protection than is warranted.

VIII.1.5. Results of the Arc Flash Hazard Analysis shall be used to identify the flash- protection boundary and the incident energy at assigned working distances throughout any position or level in the overall electrical generation, transmission, distribution, or utilization system.

VIII.2. THE ANALYSIS SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING :

VIII.2.1. A tabulation of the symmetrical RMS bolted fault current available and X/R ratio at each piece of electrical equipment.

VIII.2.2. A tabulation of the arc fault current available at each piece of electrical equipment

VIII.2.3. A list containing the incident energy and the flash-protection boundary for the electrical equipment being installed.

VIII.2.4. A list containing each piece of electrical equipment, its corresponding incident energy, hazard rating, and the required Personal Protective Equipment.

VIII.3. An Engineering and Testing Services firm acceptable to Owner shall conduct the Arc Flash Hazard Analysis.

VIII.4. Arc Flash Analysis Software. The Arc Flash Hazard Analysis shall be performed using the latest version of SKM Power*Tools for Windows software, without exception. After the final version of the study and analysis are completed and accepted, Contractor shall provide two (2) copies of the SKM electronic file to Owner.

VIII.5. Arc Flash Hazard Report:

VIII.5.1. Contractor shall be responsible for submitting complete and accurate arc flash analysis information in the Arc Flash Hazard Report. The report shall be submitted to Owner for review before the final report is prepared. Contractor shall ensure that calculated values for flash-protection boundary, working distance, incident energy, and required Personal Protective Equipment is submitted and provide substantiation that the information will be prominently displayed on electrical equipment.

VIII.5.2. The Arc Flash Hazard Analysis report shall be bound in a standard 8-1/2 by 11 inch three-ring binder and shall be submitted in accordance with the Submittals section. Final selection of required Personal Protective Equipment shall be subject to review and acceptance by Owner.

VIII.5.3. Arc Flash Labeling. After approval of the Arc Flash Hazard Report, Contractor shall furnish and install arc flash warning labels on the applicable electrical equipment. Electrical equipment shall be provided with the appropriate ANSI compliant arc flash labeling. Labels shall include the flash protection boundary distance, incident energy, and minimum required Personal Protective Equipment.

VIII.6. Coordination Study: Contractor shall commission a short circuit study and protective-device coordination study of relays, fuses, circuit breakers, and any other protective devices and shall submit a coordination report as specified herein. The study shall include the entire electrical distribution system from high side of distribution transformer and finishing with the smallest – 480 volt, 3 phase, 60 Hz – circuit protective device on the load end.

VIII.6.1. Contractor shall be responsible for and shall ensure that relays and circuit breakers are set according to the study results.

VIII.6.2. The study shall include, but shall not be limited to, the following:

VIII.6.3. Color-coded printouts of coordination curves prepared with calculation software .

VIII.6.4. A tabulation for any protective relay and circuit breaker trip settings and recommended sizes and types of medium-voltage fuses.

VIII.6.5. Motor starting profiles for 50 horsepower [37 kW] and larger motors.

VIII.6.6. Transformer damage curves and protection, evaluated in accordance with ANSI/IEEE C57.109.

VIII.6.7. Coordination curve(s) from the power company, if available.

VIII.6.8. Calculated short-circuit values at nodes in the distribution system included within the scope of the coordination study.

VIII.7. An Engineering and Testing Services firm acceptable to Owner shall conduct the coordination study.

VIII.7.1. Contractor shall be responsible for obtaining the following:

VIII.7.2. The coordination curves for relays, fuses, and circuit breakers. Transformer damage curves.

VIII.7.3. Motor data.

VIII.7.4. Other applicable information for any new and existing electrical equipment.

VIII.8. Contractor shall coordinate with the power company to obtain the required protective device curves and shall be responsible for any field work associated with obtaining the necessary data on existing relays, circuit breakers, fuses, and transformers to be included in the coordination study.

VIII.9. The available 3 phase, symmetrical fault current at the point of service shall be obtained from the Power Company.

VIII.10. The coordination report shall be bound in a standard 8-1/2 by 11 inch [210 by 275 mm] three-ring binder and shall be submitted in accordance with the Submittals section. Final selection of protective device settings or sizes shall be subject to review and acceptance by Owner.

VIII.11. PUMP FACTORY TESTS:

The pump manufacturer shall perform the following tests on each pump prior to shipment.

VIII.11.1. Meg the pump motor and cable for insulation breaks or moisture intrusion.

VIII.11.2. Prior to submergence, run pump dry and check for correct rotation.

VIII.11.3. Pump shall be run continuously for 30 minutes in a submerged condition, with a minimum submergence of 10 feet.

VIII.11.4. Pump shall be removed from test tank, megged immediately for moisture and all seals checked for water intrusion.

VIII.11.5. Pumps shall be operated at a minimum of 6 points to establish the hydraulic curve. KW input shall be monitored and recorded. One test point shall be performed with discharge valve closed. Pumps shall develop appropriate capacity and head within Hydraulic Institute Standards without excessive noise, vibration or cavitation. If specifically requested by JEA, a vibration test shall be performed on each pump to demonstrate compliance.

VIII.11.6. For pumps less than 100 HP, the pump supplier shall submit copies of certified Hydraulic Institute test reports including factory pump curves of identical model pump (s) provided to JEA (in lieu of written certified test reports for each pump supplied).

VIII.11.7. For pumps 100 HP and greater, the above certified pump performance test (at a minimum) must be completed on each actual pump supplied. A JEA representative(s) shall be present to witness the certified test (JEA's travel expenses by JEA).

VIII.12. FIELD ACCEPTANCE TESTING:

VIII.12.1. Pre-Final Inspection:

Prior to final inspection, the Contractor shall conduct a pre-final site inspection (including energizing each pump), in the presence of a JEA representative. Any deficiencies noted at this time shall be corrected prior to scheduling of the final inspection.

VIII.12.2. Final Inspection:

The Contractor shall be responsible for conducting the following field acceptance tests and start-up procedures in the presence of a JEA representative. The Contractor shall notify JEA, the Engineer and the pump manufacturer's representative 48 hours prior to start-up. The time and date of this final inspection shall be scheduled by JEA. The Contractor shall furnish all labor, piping, equipment, water and materials required to perform the acceptance testing. The Contractor shall ensure the force main is full of water prior to the pump test. The contractor shall submit proof of compliance with electric site grounding requirements. JEA will complete a final inspection checklist for acceptance.

VIII.12.2.1. Pump Performance:

Prior to acceptance, as part of the final inspection, and prior to placing the station in operation, the Contractor shall conduct a pump performance test. Pumps shall operate according to the operating conditions indicated on the drawings without excessive vibration or overheating. Testing shall be performed using clean water. The Contractor shall supply water at its own expense to perform the required testing. Pumping rates shall be determined by pumping a calculated volume of water in a specified time interval. Head and flow conditions shall be measured and recorded. Water levels during testing shall fall within the pump control levels shown on the drawings. Amperage draws shall be monitored to determine effectiveness and efficiency of equipment. The test shall be repeated until satisfactory results are obtained. The test results shall be recorded on the Pump Test Report sheet included in the appendix section herein. If the Contractor is unable to demonstrate to JEA that the pumping unit performs satisfactorily, the unit shall be rejected. The Contractor shall then remove and replace the defective unit at its own expense. Satisfactory performance includes, but is not limited to, the following:

VIII.12.2.1.1. Pumps:

Pumps shall deliver rated GPM at rated TDH.

VIII.12.2.1.2. Motors:

Running amperage shall be noted and recorded on each leg of power cord while pump is operating under full load.

VIII.12.2.1.3. All self-test trip relays shall demonstrate ability to simulate a fault condition. All test results shall be recorded on the pump test report and be submitted to the Engineer.

VIII.12.2.1.4. Pumps shall operate within 5 % of the approved, certified, head-capacity curve.

VIII.12.2.1.5. Following performance testing, pumps shall be megged for pump-moisture intrusion.

VIII.12.2.1.6. Pump spare parts are not required unless specifically noted otherwise.

VIII.12.2.1.7. For dry-pit submersible pumps, the closed loop cooling system shall provide adequate cooling, in accordance with pump manufacturer's recommendation, throughout the pumping range.

VIII.12.3. SCADA Inspections:

A JEA representative shall conduct the following field acceptance test and start up procedures in the presence of the contractor.

IX. REFERENCE POINTS AND LAYOUT

The Contractor shall be responsible for setting all grade stakes, 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.

X. EXCAVATION

X.1. GENERAL:

The Contractor shall make all excavations for piping and appurtenant structures in any material encountered to the depth and grades indicated on the plans, shall backfill such excavations to the depth and grades indicated on the plans, shall backfill such excavations and dispose of excess or unsuitable materials from such excavations, and shall provide and place necessary borrow material to properly backfill excavations, all as indicated on the drawings, specified herein or as directed by the Engineer. All work shall be in accordance with the Water and Wastewater Standards, Excavation and Earthwork – Section 408.

XI. WASHDOWN STATION

XI.1. WATER SERVICE PIPING:

Water service piping shall be 1½ inch diameter (minimum). Water meter, shall be 1½ inch diameter (minimum). Materials and installation shall meet JEA's standards for typical water service construction.

XI.2. BACKFLOW PREVENTOR:

The Contractor shall furnish and install a 1½ inch reduced pressure backflow preventer which meets the requirements of JEA's Cross Connection Control Policy (see details on drawings).

XI.3. WATER SERVICE & METER:

The contractor/developer shall secure the water for the pump station site by applying for either a commercial 1 ½ inch water only meter (if no irrigation water use is included with meter) or commercial 1 ½ inch irrigation meter (if irrigation water use is included with this meter). The contractor/developer is responsible for all JEA fees. The Contractor shall install the meter box and service in accordance with all applicable JEA Standard Details and Specifications and JEA will install the meter. The Contractor shall be responsible for the cost of all water used during construction and testing. The water service will then be transferred to JEA upon final acceptance of the pump station.

XI.4. HOSE:

Wash down hose to be white cover paper mill creamery wash-down hose with tapered nozzle, model number T260LL-150 as manufactured by Goodyear or JEA pre-approved equal. Hose length shall be sufficient to reach the entire site from hose station.

XII. SITE WORK

XII.1. SITE PLAN:

The site plans shall be designed site specific. The site plan shall indicate the actual site and orientation of all structures, panels and piping, at a minimum.

XII.2. GENERAL:

All work shall be in accordance with the following specification sections, at a minimum: Chapter II. 1. - Section 406 - Site Preparation, Cleanup and Restoration, Chapter II. 2. - Section 407- Demolition and Abandonment, Section 408 - Excavation and Earthwork and Chapter II. 5. - Section 437 – Concrete Work. Slope concrete and site to drain towards street or other adjacent, JEA or City owned drainage facility.

XII.3. DRIVEWAYS AND SITE:**XII.3.1. Concrete:**

All work under this section shall be of 3,000 PSI concrete with reinforcing wire or fiber mesh. Thickness of concrete shall be 5 inches (minimum).

XII.3.2. Expansion Joints:

Expansion joints shall be preformed joint fillers meeting the requirements of AASHTO M153 or AASHTO 213 and cut to the true shape of the cross section, set to line and grade and held true while the concrete is being placed. The joint shall be edged and finished in a workmanlike manner. These strips shall be left in place and shall be placed adjacent to the paving, curb driveway aprons, structures and pads, or as specified by the Engineer. Expansion Joints which are not adjacent to the structures listed above may be 1 inch by 4 inch pressure treated lumber or other approved materials and shall appear every 18 feet, at a minimum or be placed between truckloads of concrete that exceed the time limits specified in the JEA Water and Wastewater Standards Chapter II. 5. - Section 437 Concrete Work.

XII.3.3. Contraction and Construction Joints:

XII.3.3.1. Contraction and construction joints shall be placed and formed by means of an approved jointer template. The stem of the jointer shall be pressed into the freshly finished concrete forming a groove 1/2 inch deep.

XII.3.3.2. The edges of the groove and adjacent surface shall be neatly finished. Unless otherwise shown on the plans or designated by the Engineer, these joints shall be placed at 6 foot intervals between expansion joints.

XII.3.4. Surface Requirements:

The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten foot straight edge, nor more than 1/8 inch on a five foot transverse section. The edge of the concrete shall be carefully finished with an edging tool having a radius of 1/2 inch.

XII.4. ROCK COVER:

When indicated on the drawings, the Contractor shall furnish and install 6 inches of No. 57 (1" nominal diameter) crushed limestone placed over a 10 mill plastic membrane.

XII.5. FENCING:

Fencing shall be furnished and installed in accordance with details on the drawings.

XIII. PERMITS

The Engineer will supply the land clearing permit. The Contractor shall secure and pay for all plumbing, electrical, right-of-way and other required permits. The Contractor shall make application and pay applicable fees for electric and water meters. The Contractor shall be responsible for all costs associated with utilities used during construction and testing of the pump station. Upon final acceptance or, if approved, following substantial completion of the project, the JEA Pump Station Manager shall, by letter to JEA, transfer services to JEA.

XIV. LANDSCAPING**XIV.1. PLANT MATERIALS:**

Plants shall be of the types and placed in the locations as indicated on JEA's Minimum Standards for Landscaping as included in the Sewage Pump Standard Details (Latest revision) and as approved by local landscape code enforcement.

XV. SPRINKLER SYSTEM (AS REQUIRED)**XV.1. GENERAL:**

Sprinkler system shall consist of a single main traveling around the perimeter of the pump station site. Sprinkler system shall form a complete loop and be connected to the hose station downstream of the backflow preventer, as indicated on the drawings. Sprinkler system shall be operated by a single stage timer located in the control panel. Sprinkler system shall be designed by the sprinkler supplier, which shall be a firm regularly engaged in the design and supply of sprinkler systems.

XV.2. COMPONENTS:

XV.2.1. Sprinkler system shall consist of mister heads on 2 foot tall, black, risers around perimeter of pump station paving at site. System shall provide 100% cover over the buffer zone (plant zone), while minimizing the over spray to less than 5% of the volume of water delivered. Provide irrigation to land between pump station and road paving.

XV.2.2. Commercial grade, 12 inch pop-up, gear driven sprinklers may be used if necessary for this area only. Mister heads on risers shall be required around pump station perimeter. Acceptable: Nelson. Nelson spray nozzles, PRO-6300 Series pup-up nozzles, PRO-5500 and PRO-6000 Series gear driven sprinklers and 9000 Series Control Valve.

XV.3. SUBMITTALS:

Shop drawing submittals will be required on sprinkler system design and components.

XV.4. DRAIN VALVE:

Sprinkler system shall include ½ inch solid brass automatic drain valves, Nelson #8819 or JEA pre-approved equal. Drain valve shall carry a 5-year warranty against failure and be installed in a plastic landscape valve box as depicted on drawings.

XV.5. WATER SERVICE:

If applicable, an irrigation water meter service shall be provided for the sprinkler system. In this case, the Contractor may be required to secure the irrigation meter by submittal of a JEA irrigation meter application and payment of applicable fees. If available, reclaimed water should be utilized for all irrigation.



PUMP TEST REPORT

PROJECT _____ DATE _____

STREET ADDRESS _____

LONGITUDE / LATITUDE _____

WATER METER NO: _____

ELECTRIC METER NO: _____

AUXILIARY GENERATOR _____ YES _____ NO _____ Size _____

PUMP DATA

Manufacturer _____ Model _____

Impeller Size _____ Motor HP _____ RPM _____

Pump Full Load Amps _____ Run Amps _____ Volts _____ Phase _____

DESIGN DATA

Pump Design Point _____ GPM @ _____ Feet
T.D.H.

TEST DATA

Pump No.: _____

Serial No.: _____

Total Gallons _____

Gallons/Minute (divide total gallons by minutes) _____

Pressure Gauge Reading (ft.) _____

Total Head @ Pump (ft.) _____

Ammeter Reading (amps) _____

Pump Shut off TDH _____

Contractor Representative _____

JEA Inspection Representative _____

JEA Maintenance Representative _____

Pump Manufacturer's Representative _____

Engineering Representative _____

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PUMP STATION OPERATION AND MAINTENANCE DATA SUBMISSION REQUIREMENTS SECTION 445

I. SCOPE OF WORK

This Section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project (excluding Development projects that do not receive cost participation).

I.1. RELATED WORK

- I.1.1. Submittals are included in the Wastewater Specifications, Sections 400 Series.
- I.1.2. Contract closeout is included in Contract Documents.
- I.1.3. Warranties and Bonds are included in Contract Documents, and or in the Wastewater Specifications Section 400 Series, whichever is more stringent.

I.2. OPERATING MANUALS

- I.2.1. Provide operation and maintenance instructions for all electrical, mechanical, and instrumentation & controls equipment furnished under various technical specifications Sections.
- I.2.2. Six complete sets of operation and maintenance manuals approved by the JEA representative and JEA Operation Personnel covering all equipment furnished under the Wastewater Specifications, Section 400 Series shall be delivered at least 30 days prior to scheduled start-up directly to the JEA. One set of originals must be part of the six sets of operation and maintenance instructions required, including original manuals covering components manufactured by others.
- I.2.3. An electronic copy of the manual will be provided with each hard copy submittal.
- I.2.4. Separate manuals shall be provided for each type of equipment, or each Section number. Each manual shall contain the following specific requirements. Manuals that do not meet the requirements will be rejected and CONTRACTOR and/or Equipment Supplier /MANUFACTURER will bear all expenses to resubmit the manual to meet the following requirements.
 - I.2.4.1. Format and Materials
 - I.2.4.1.1. Binders
 - I.2.4.1.1.1. Commercial quality three ring binders with durable and cleanable plastic covers
 - I.2.4.1.1.2. Maximum ring width capacity: 3 inches
 - I.2.4.1.1.3. When multiple binders are used, correlate the data into related consistent groupings/volumes.

- I.2.4.1.2. Identification: Identify each volume on the cover and spine with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". Include the following:
 - I.2.4.1.2.1. Title of Project.
 - I.2.4.1.2.2. Identify the general subject matter covered in the manual
 - I.2.4.1.2.3. Identify structure(s) and/or location(s), as applicable
 - I.2.4.1.2.4. Specification Section number
- I.2.4.1.3. 20 lb loose leaf paper, with hole reinforcement
- I.2.4.1.4. Page size: 8-1/2 inch by 11 inch
- I.2.4.1.5. Provide heavy-duty fly leaves (section separators), matching the table of contents, for each separate product, each piece of operating equipment, and organizational sections of the manual.
- I.2.4.1.6. Provide reinforced punched binder tab; bind in with text.
- I.2.4.1.7. Reduce larger drawings and fold to the size of text pages - but not larger than 11 inches x 17 inches - or provide a suitable clear plastic pocket (with drawing identification) for such folded drawings/diagrams.
- I.2.4.2. Contents:
 - I.2.4.2.1. A table of contents/Index
 - I.2.4.2.2. Specific description of each system and components
 - I.2.4.2.3. Name, address, telephone number(s) and e-mail address(es) of vendor(s) and local service representative(s)
 - I.2.4.2.4. CONTRACTOR and/or Equipment Supplier/MANUFACTURER shall clearly strike out portions of manual that do not apply to the project. Manual will be rejected until inapplicable information is deleted and only applicable information is clearly indicated.
 - I.2.4.2.5. Specific on-site operating instructions (including starting and stopping procedures)
 - I.2.4.2.6. Safety considerations
 - I.2.4.2.7. Project specific operational procedures
 - I.2.4.2.8. Project specific maintenance procedures
 - I.2.4.2.9. MANUFACTURER's operating and maintenance instructions – specific to the project
 - I.2.4.2.10. Copy of each wiring diagram
 - I.2.4.2.11. Copy of CONTRACTOR's approved shop drawing
 - I.2.4.2.12. List of spare parts and recommended quantities
 - I.2.4.2.13. Product Data: Mark each sheet to clearly identify specific products and component parts and data

- applicable to installation. Delete inapplicable information.
- I.2.4.2.14. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams
 - I.2.4.2.15. Provide logical sequence of instructions for each procedure, incorporating MANUFACTURER's instructions specified.
 - I.2.4.2.16. Equipment attributes sheet for submittal of name plate data
 - I.2.4.2.17. Warranties and Bonds, as specified in the Contract Documents.
 - I.2.4.3. Transmittals
 - I.2.4.3.1. Prepare separate transmittal sheets for each manual. Each transmittal sheet shall include at least the following: the CONTRACTOR's name and address, JEA's name, project name, project number, submittal number, description of submittal and number of copies submitted.
 - I.2.4.3.2. Submittals shall be transmitted or delivered directly to the office of the JEA representative, as indicated in the Contact Documents or otherwise directed by the JEA.
 - I.2.5. Manuals for Equipment and Systems - In addition to the requirements listed above, for each System, provide the following:
 - I.2.5.1. Overview of system and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.
 - I.2.5.2. Panelboard circuit directories including electrical service characteristics, controls and communications and color coded wiring diagrams as installed.
 - I.2.5.3. Operating procedures: include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.
 - I.2.5.4. Maintenance Requirements
 - I.2.5.4.1. Procedures and guides for trouble-shooting; disassembly, repair, and reassembly instructions
 - I.2.5.4.2. Alignment, adjusting, balancing and checking instructions
 - I.2.5.4.3. Servicing and lubrication schedule and list of recommended lubricants
 - I.2.5.4.4. MANUFACTURER's printed operation and maintenance instructions

- I.2.5.4.5. Sequence of operation by instrumentation and controls manufacturer
- I.2.5.4.6. Original MANUFACTURER's parts list, illustrations, assembly drawings and diagrams required for maintenance
- I.2.5.5. Control diagrams by controls manufacturer as installed (as-built)
- I.2.5.6. CONTRACTOR's coordination drawings, with color coded piping diagrams, as installed (as-built)
- I.2.5.7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Include equipment and instrument tag numbers on diagrams.
- I.2.5.8. List of original MANUFACTURER's spare parts and recommended quantities to be maintained in storage
- I.2.5.9. Test and balancing reports, as required
- I.2.5.10. Additional Requirements as specified in individual product specification
- I.2.5.11. Design data for systems engineered by the CONTRACTOR or its Suppliers
- I.2.5.12. Equipment Attribute Information
- I.2.5.13. Equipment Attribute Worksheets as presented at the end of this Section shall be provided for all equipment meeting the asset definition as follows:
 - Asset Definition:
 - I.2.5.13.1. Maintenance is recommended
 - I.2.5.13.2. Assets have a value greater than \$1,000
 - I.2.5.13.3. Assets are complete and usable, and perform a distinct function independently (i.e. they pump waste, remove solids, etc.)
 - I.2.5.13.4. This asset definition is intended to give a general indication of which equipment must be included in the Equipment Attribute Worksheets. The JEA representative will provide the specific list of equipment that the CONTRACTOR must provide information for.
 - I.2.5.13.4.1. The information requirements are shown in detail in the table. The data requirements include nameplate data, manufacturer and supplier information, information specific to the type of equipment, and recommended preventive maintenance activities.
 - I.2.5.13.4.2. An electronic copy of the Equipment Attribute Worksheets must be delivered in Excel format and submitted to the JEA representative on CD-ROM and submitted with the O&M manuals. It is

not necessary to submit printed copies of the Equipment Attribute Worksheets.

- I.2.6. Manual for Materials and Finishes – In addition to the requirements listed above, for each material or finish, provide the following:
 - I.2.6.1. Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition and color and texture designations. Provide information for re-ordering custom manufactured products.
 - I.2.6.2. Instructions for Care and Maintenance: Include MANUFACTURER's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.
 - I.2.6.3. Moisture Protection and Weather Exposed Products: Include product data listing, applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance and repair.
 - I.2.6.4. Additional Requirements: As specified in individual product specifications.
- I.2.7. Electronic Transmission of O&M Manuals
 - I.2.7.1. Unless otherwise approved by the JEA Representative and Operation Personnel, O&M manuals may not be transmitted by electronic means other than by CD-ROM. Electronic O&M manuals shall meet the following conditions:
 - I.2.7.1.1. The above-specified transmittal form is included.
 - I.2.7.1.2. All other requirements specified above have been met, including, but not limited to, coordination by the CONTRACTOR, review and approval by the Contactor.
 - I.2.7.1.3. The submittal contains no pages or sheets large than 11 x 17 inches.
 - I.2.7.1.4. With the exception of the transmittal sheet, the entire submittal is included in a single file.
 - I.2.7.1.5. Files are Portable Document Format (PDF) – with the printing function enabled.
 - I.2.7.1.6. The Vendor provided equipment, sub-system, or system manuals shall be in PDF format, compliant with the Adobe PDF Specification Version 1.7. The manual shall be Searchable Image. The Optical Character Recognition of the image shall be at a 95% confidence level. The manuals shall be linked and bookmarked as follows:
 - I.2.7.1.6.1. Provide links from all Table of Contents, List of Tables, List of Figures, etc., entries to the actual occurrence in the body of the manual.
 - I.2.7.1.6.2. Create bookmarks for all linked Table of Content entries.

- I.2.7.1.7. All drawings shall be in PDF format, compliant with the Adobe PDF Specification Version 1.7. The manual shall be PDF Searchable Image. The Optical Character Recognition of the image shall be at a 95% confidence level. The drawings shall be linked as follows:
 - I.2.7.1.7.1. External links from the Drawing Index (if it exists) to each drawing.
 - I.2.7.1.7.2. External links from references within drawings to other drawings.
- I.2.7.1.8. When electronic copies are provided, transmit two hard-copy (paper) originals to the JEA Representative with an electronic copy on CD-ROM.
- I.2.7.1.9. The electronic copy of the O&M manual must be identical in organization, format and content to the hard copies of the manual.
- I.2.8. Quick Reference Sheets for Equipment
 - I.2.8.1. For each item of equipment furnished under Wastewater Specification, Section 400 Series provide the following:
 - I.2.8.1.1. A minimum of one 8 ½ x 11-inch laminated quick reference sheet. Sheets shall be three hole punched and may be double sided.
 - I.2.8.1.2. Each quick reference sheet shall include the following minimum information:
 - Safety Procedures:
 - I.2.8.1.2.1. Brief descriptions of each piece of equipment and components
 - I.2.8.1.2.2. Starting and stopping procedures
 - I.2.8.1.2.3. Special operating instruction
 - I.2.8.1.2.4. Routine maintenance procedures
 - I.2.8.1.2.5. Calibration procedures
 - I.2.8.1.2.6. Pump curves
 - I.2.8.1.2.7. Trouble shooting procedures
 - I.2.8.1.2.8. Name, address, and telephone numbers of local service representative
 - I.2.8.1.3. Provide three copies of quick reference sheets for review by the JEA representative.
 - I.2.8.1.4. After quick reference sheets have been approved, provide four copies of laminated quick reference sheets to the JEA representative in one commercial coiled three-ring binder with durable and cleanable plastic cover.

I.3. SERVICES OF MANUFACTURERS' REPRESENTATIVE

- I.3.1. All electrical, mechanical, and instrumentation & controls equipment furnished under various technical specifications Sections shall include the cost of a

competent representative of the manufacturers of all equipment to supervise the installation, adjustment and testing of the equipment; and, to instruct the JEA Operation personnel on operation and maintenance. This supervision may be divided into two or more time periods to suit the CONTRACTOR's schedule and/or the JEA Operation personnel availability.

- I.3.2. See the detailed specifications for additional requirements for furnishing the services of MANUFACTURER's representatives.
- I.3.3. The MANUFACTURER's representative shall certify that the installation of the equipment is satisfactory; that the unit has been satisfactorily tested; that the equipment is ready for operation; and, that the operating personnel have been suitably instructed in the operation, maintenance, care, and safe operation of the equipment. The Equipment Manufacturer's Certificate of Installation, Testing, and Instruction attached to this Section shall be used for this certification.
- I.3.4. For other materials furnished under other specification Sections, furnish the services of approved representative(s) of the MANUFACTURER when, in the opinion of the JEA Operation Personnel, some evident product failure or malfunction makes such services necessary.

II. PRODUCTS (NOT USED)

III. EXECUTION

III.1. SUBMITTAL SCHEDULE

- III.1.1. Operation and maintenance manuals shall be delivered directly to the office of the JEA representative, as follows:
 - III.1.1.1. Provide six final copies of complete manuals prior to testing and start-up.
- III.1.2. The JEA representative will review Operation and Maintenance manuals submittals on operating equipment for conformance with the requirements of the applicable specification Section. The review will generally be based on the *O&M Manual Review Checklist* appended to this Section. Conformance must be confirmed to the JEA Representative by JEA Operation Personnel.
- III.1.3. If during test and start-up of equipment, any changes were made to the equipment, provide copies (the number specified in paragraph 3.01.A.2) of as-built drawings or any other amendments for insertion in the final manuals. Submit the required number within 30 days of start-up and testing of the facility.

END OF SECTION

O&M MANUAL REVIEW CHECKLIST

Submittal No.: _____

Project No.: _____

Manufacturer: _____

Equipment Submitted: _____

Specification Section: _____

Date of Submittal: _____

General Data

- _____ 1. Are the Vendor's/Manufacturer's area representative's name, address, e-mail address and telephone number included?
- _____ 2. Is the nameplate data for each component included?
- _____ 3. Are all associated components related to the specific equipment included?
- _____ 4. Is non-pertinent data crossed out or deleted?
- _____ 5. Are drawings neatly folded and/or inserted into packets?

Operations and Maintenance Data

- _____ 6. Is an overview description of the equipment and/or process included?
- _____ 7. Does the description include the practical theory of operation?
- _____ 8. Does each equipment component include specific details (design characteristics, operating parameters, control descriptions, and selector switch positions and functions)?
- _____ 9. Are alarm and shutdown conditions clearly identified? Does it describe possible causes and recommended remedies?
- _____ 10. Are step procedures for starting, stopping, and troubleshooting the equipment included?
- _____ 11. Is a list of operational parameters to monitor and record for specific equipment included?
- _____ 12. Is a proposed operating log sheet included?
- _____ 13. Is a spare parts inventory list included for each component?
- _____ 14. Is a lubrication schedule for each component included - or does it clearly state "No Lubrication Required"?
- _____ 15. Is a maintenance schedule for each component included?
- _____ 16. Is a copy of the warranty information included?
- _____ 17. Are Equipment Attributes Sheets provided as specified?

Review Comments

Is the submittal fully approved (yes/no)?

If not, see the following are the points of rejection that must be addressed and require resubmittal by the Contractor:

Item No.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

Reviewed By: _____ Date: _____

Legend

1 = OK

2 = Not Adequate

3 = Not Included

Note: This submittal has been reviewed for compliance with the Contract Document



**EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION, TESTING
AND INSTRUCTION**

OWNER: JEA

Project Name: _____

Contract No. _____

CDM Project No. _____

EQUIPMENT SPECIFICATION SECTION _____

EQUIPMENT DESCRIPTION _____

I _____, Authorized representative of
(Print Name)

(Print Manufacturer's Name)

hereby CERTIFY that _____
(Print equipment name and model with serial No.)

installed for the subject project [has] [have] been installed in a satisfactory manner, [has] [have] been satisfactorily tested, [is] [are] ready for operation, and that JEA assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the unit[s] on Date: _____ Time: _____.

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacturer's Representative)

JEA ACKNOWLEDGMENT OF MANUFACTURER'S INSTRUCTION

[I] [We] the undersigned, authorized representatives of the _____
and/or Operating Personnel have received classroom and hands on instruction on the operation,
lubrication, and maintenance of the subject equipment and [am] [are] prepared to assume normal
operational responsibility for the equipment:

_____ DATE: _____

_____ DATE: _____

_____ DATE: _____

EQUIPMENT ATTRIBUTE SHEETS

In order to facilitate the creation of asset records and their corresponding preventive maintenance schedules and activities in the Computerized Maintenance Management System (CMMS), information should be completed using the Excel template provided. Examples are provided in the Equipment Attribute Sheets template to help convey how the information should be completed. In addition, each worksheet in the Excel template is described below. The JEA REPRESENTATIVE will provide the CONTRACTOR a copy of the Excel spreadsheet for use in distributing to vendors/manufacturers for completion. The spreadsheet will be pre-populated with the list of assets for which information is required and the specific attributes that need to be completed.

Vendor-Manufacturer Worksheet

Information for the equipment Vendors and Manufacturers should be provided on the Vendor-Manufacturer worksheet. The information that is required is listed below.

Vendor ID / Manufacturer ID	A unique identifier for the Vendor or Manufacturer. If this is unknown enter an abbreviation for the Vendor / Manufacturer name.
Vendor/Manufacturer Name	The name of the Vendor or Manufacturer
Address	Company address
City	
State or Country	
ZIP Code	
Phone	Company phone number
Fax	Company fax number
Contact Name	Best contact person
Contact Phone	Contact information associated with the person identified in the Contact Name field
Contact Fax	
Contact email	

Local Representative Worksheet

Information for the local representative should be provided on the Local Representative worksheet. The information that is required is listed below.

Company Name	The company name of the Local Representative
Address	Company address
City	
State	
ZIP Code	
Contact Name	Best contact person
Contact Phone	Contact information associated with the person identified in the Contact Name field
Contact Fax	
Contact email	

Assets Worksheet

The following Asset information should be provided for all equipment. The equipment that should be included will be pre-populated.

Asset ID	Will be pre-populated
Asset Description	Will be pre-populated
Tag Number	Identifier from the P&ID
Model Number	Equipment Model Number
Serial Number	Serial Number that is specific to the piece of equipment
Vendor ID	Identifier for the Vendor associated with the piece of equipment. The Vendor ID should be defined on the Vendor-Manufacturer worksheet.
Manufacturer ID	Identifier for the Manufacturer associated with the piece of equipment. The Manufacturer ID should be defined on the Vendor-Manufacturer worksheet.
Cost	The installed cost of the equipment.
Warranty Duration	The length of the warranty on the equipment
Anticipated Warranty Start Date	The estimated date of substantial completion. Will help define when the warranty will expire.

In addition to the information above, additional asset-specific attributes must be completed. The additional fields that need to be completed will be defined for you on the Assets Worksheet for each different type of asset. See the Equipment Attribute Sheets template for examples.

Spare Parts Worksheet

Spare parts or kits that are to be used in the performance of recommended preventive maintenance activities should be listed on the Spare Parts worksheet. This will enable JEA to keep an inventory of the items and enable preventive maintenance work orders to reference the spare part requirements.

Spare Part or Kit ID	A unique identifier for the Spare Part of Kit
Spare Part / Kit Description	A useful description to help users of the CMMS and/or maintenance crews identify what is needed to perform the preventive maintenance task.
Vendor/Manufacturer ID	The unique identifier for Vendor or Manufacturer of the item. The identifier should reference the Vendor-Manufacturer worksheet.
Kit Contents	If the item is actually a kit that contains multiple items, the quantity and a brief description of each item in the kit should be listed individually.
Asset ID(s)	The list of Assets that the spare parts are applicable to. The Asset IDs are defined in the Assets worksheet.

Preventive Maintenance Worksheet

All recommended preventive maintenance (PM) activities for the equipment provided must be compiled on the Preventive Maintenance worksheet. This will facilitate the creation of the necessary preventive maintenance schedules for the equipment in the CMMS. It will also help JEA identify the specific tasks and materials that are involved in completing future PM work orders. The Preventive Maintenance worksheet contains two sections. The general list of preventive maintenance activities and their frequencies should be entered in the Preventive Maintenance Header. The tasks that a maintenance worker would execute as part of each PM should be entered into the Preventive Maintenance Tasks.

Preventive Maintenance Header

PM ID	Please specify a unique number for each recommended preventive maintenance (PM) activity. The first PM should have an ID of 1, and you should increment from there. The individual tasks that comprise the activity will be listed separately below and will reference this identifier.
PM Description	A useful description of the PM activity. It should also contain the frequency that the activity should be performed.
Frequency - Calendar	If the frequency is calendar based (every week, 2 weeks, month, etc) please enter the frequency.
Frequency - Runtime	If the PM should be scheduled based on equipment run-time, please enter the runtime interval at which the PM should be performed.
Applicable Asset ID(s)	In order to create the PM schedules in the CMMS, a list of the applicable Asset IDs are needed. If a PM is applicable to several assets that you are supplying, please list all those Asset IDs and create rows as necessary in Excel.

Preventive Maintenance Tasks

PM ID	This is the identifier from the Preventive Maintenance Header (above).
Task Number	A numeric identifier for each task listed under a scheduled PM. The first task should be "10" and each successive task should be incremented by 10.
Task Description	A useful description of the task. It is not necessary or desirable for this to be overly detailed. It is meant to be a checklist that a person could use in performing the recommended PM activities. The examples provided are an indicator of the desired level of detail.
Spare Part / Kit ID	If the task likely will require spare parts, the spare parts should be listed here. The ID that should be entered here should come from the Spare Parts worksheet.
Spare Part / Kit Quantify	The quantity of the specified parts that are likely to be necessary to complete the PM task
Special Tools / Equipment Description	If any special or unusual tools or equipment are necessary to perform the maintenance task, a description should be entered here.



JEA Standard Pump Station Asset Data

Station Address: _____

Asset	Attributes required for all equipment					
Description	Vendor	Serial Number	Model	Purchase Price	Install Date	Warranty Duration (Years)
ANTENNA						3
PONY PUMP ASSEMBLY						1
ODOR CONTROL MEDIA						1
MAIN BREAKER						3
MOTOR CONTROLLER 1						3
MOTOR CONTROLLER 2						3
MOTOR CONTROLLER 3						3
MOTOR CONTROLLER 4						3
CONTROL PANEL						3
EYEWASH STATION						1
GENERATOR						5
COMMUNICATION MODULE						3
MOTOR/PUMP ASSEMBLY 1						5
MOTOR/PUMP ASSEMBLY 2						5
MOTOR/PUMP ASSEMBLY 3						5
MOTOR/PUMP ASSEMBLY 4						5
ELECTRICAL DISTRIBUTION PANEL						3



Description	Vendor	Serial Number	Model	Purchase Price	Install Date	Warranty Duration (Years)
PIPING PUMP #1						1
PIPING PUMP #2						1
PIPING PUMP #3						1
PIPING PUMP #4						1
POTABLE WATER PIPING						1
SIPPY SUCTION PIPE						1
PUMP OUT DISCHARGE PIPE						1
ODOR CONTROL PIPING						1
PROGRAMMABLE LOGIC CONTROLLER						3
RADIO						3
STARTER / SOFT START 1						3
STARTER / SOFT START 2						3
STARTER / SOFT START 3						3
STARTER / SOFT START 4						3
ELECTRICAL DISCONNECT SWITCH						1
AUTO TRANSFER SWITCH						1
ODOR CONTROL TANK						30
GENERATOR FUEL TANK						30
DISCHARGE VALVE PUMP #1						1
CHECK VALVE PUMP #1						1



Description	Vendor	Serial Number	Model	Purchase Price	Install Date	Warranty Duration (Years)
DISCHARGE VALVE PUMP #2						1
CHECK VALVE PUMP #2						1
DISCHARGE VALVE PUMP #3						1
CHECK VALVE PUMP #3						1
DISCHARGE VALVE PUMP #4						1
CHECK VALVE PUMP #4						1
PUMP OUT CHECK VALVE						1
PUMP OUT PLUG VALVE						1
ODOR CONTROL SOLENOID VALVE						1
VARIABLE FREQUENCY DRIVE 1						3
VARIABLE FREQUENCY DRIVE 2						3
VARIABLE FREQUENCY DRIVE 3						3
VARIABLE FREQUENCY DRIVE 4						3
WETWELL						5
LEVEL TRANSDUCER						3
FORCE MAIN TRANSDUCER						3
POTABLE WATER TRANSDUCER						3



Asset	Additional Attributes based on Classification		
Description	Antenna	Master Radio? Y/N	Master Site Bearings
ANTENNA			

Description	Discharge Size	Tank Capacity	Fuel Type	Engine Manufacturer	Engine Model #	Engine Serial #	GPM
PONY PUMP ASSEMBLY							
	HP	Impeller	Pump Manufacturer	Pump Model #	Pump Serial #	Suction Size	

Description	Manufacturer	Material	Type
ODOR CONTROL MEDIA			

Description	AMP Rating	Phase	Voltage
MAIN BREAKER			

Description	Manufacturer	Model #
MOTOR CONTROLLER 1		
MOTOR CONTROLLER 2		
MOTOR CONTROLLER 3		
MOTOR CONTROLLER 4		



Description	ACL, VFD, SST	Motor Breaker Size	Main Breaker Size	Main Conductor Size	Phase	Voltage
CONTROL PANEL						

Description	Continuous AMP Rating	Nominal Voltage	Mechanism Type	Type	Model #
GENERATOR					
	Switch Mounting	Item Number	Style	Manufacturer	Max Voltage

Description	Manufacturer	Part Number	Type	MODULE USE (COMM, CONTROL, ETC.)
COMMUNICATION MODULE				

Description	Design Capacity	Discharge Size	Full Load AMPS	HP	Impeller	Manufacturer	Motor Model #
MOTOR/PUMP ASSEMBLY 1							
MOTOR/PUMP ASSEMBLY 2							
MOTOR/PUMP ASSEMBLY 3							
MOTOR/PUMP ASSEMBLY 4							

	Phase	Pump Model #	Pump Type	RPM	Serial Number	Voltage
MOTOR/PUMP ASSEMBLY 1						
MOTOR/PUMP ASSEMBLY 2						
MOTOR/PUMP ASSEMBLY 3						
MOTOR/PUMP ASSEMBLY 4						

Description	Manufacturer	Part Number	Size
ELECTRICAL DISTRIBUTION PANEL			

Description	Length	Material pipe is made of	Size
PIPING PUMP #1			
PIPING PUMP #2			
PIPING PUMP #3			
PIPING PUMP #4			
POTABLE WATER PIPING			
SIPPY SUCTION PIPE			
PUMP OUT DISCHARGE PIPE			
ODOR CONTROL PIPING			

Description	Manufacturer	Model #	Part #
PROGRAMMABLE LOGIC CONTROLLER			

Description	Manufacturer	Model #
RADIO		

Description	AMP Rating	Manufacturer	Model #	Serial #	Starter Size	Voltage Rating
STARTER OR SOFT START 1						
STARTER OR SOFT START 2						
STARTER OR SOFT START 3						
STARTER OR SOFT START 4						

Description	Service Amps Rating	Manufacturer	Manufacture Date	Type	Model #	Serial #	Manufacturer
ELECTRICAL DISCONNECT SWITCH							

Description	Continuous Amp Rating	Nominal Voltage	Mechanism Type	Type	Model #
AUTO TRANSFER SWITCH					
	Switch Mounting Gear	Item #	Style	Manufacturer	Max Voltage

Description	Manufacturer	Tank Capacity
ODOR CONTROL TANK		
GENERATOR FUEL TANK		

Description	Manufacturer	Model #	Operator Description	Size	Type
DISCHARGE VALVE PUMP #1					
CHECK VALVE PUMP #1					
DISCHARGE VALVE PUMP #2					
CHECK VALVE PUMP #2					
DISCHARGE VALVE PUMP #3					
CHECK VALVE PUMP #3					
DISCHARGE VALVE PUMP #4					
CHECK VALVE PUMP #4					
PUMP OUT CHECK VALVE					
PUMP OUT PLUG VALVE					
ODOR CONTROL SOLENOID VALVE					

Description	Amp Rating	HP (of Motor)	Manufacturer	Model #	Size	Voltage Rating
VARIABLE FREQUENCY DRIVE 1						
VARIABLE FREQUENCY DRIVE 2						
VARIABLE FREQUENCY DRIVE 3						
VARIABLE FREQUENCY DRIVE 4						

Description	Diameter	Invert Elevation	Main Invert Height From Bottom of Well	Invert Size in Well	Well Lined	Material	Pump Out Size for Well
WETWELL							
	Well Shape	Top Elevation of Wetwell	Well Depth	Wetwell Base Elevation	Wetwell Width	Wetwell Size	

Description	Manufacturer	Model #
LEVEL TRANSDUCER		
FORCE MAIN TRANSDUCER		
POTABLE WATER TRANSDUCER		



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SPECIALTY COATINGS AND LININGS – SECTION 446

I. GENERAL

I.1. SCOPE OF WORK:

A specialty coating or lining is required on the interior surfaces of all junction manholes (first manhole located adjacent to wet well), manholes which include a direct discharge from a force main or low pressure system, manholes which include a 24 inch or larger pipe and pump station wet wells, at a minimum. The Contractor shall furnish, install, and test the structures coatings as shown on the drawings and specified herein. All applicable sections of the City of Jacksonville Standard Specifications and JEA Water and Wastewater Standards shall be considered part of this work. All references to Industry Standards (ASTM, ANSI, 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.

I.2. WORKMANSHIP:

All work shall be proved to be in first class condition and constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor at no expense to JEA.

I.3. COVERAGE:

The lining/coating shall cover all concrete surfaces within the wet well or manhole including the adjustment ring area.

I.4. 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, liner installation, 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.5. 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.6. WARRANTY:

The liner manufacturer shall warrant the liner against defects for at least ten (10) years after the date of acceptance by JEA. Defects are defined as cracking, delamination or leaking. The warranty shall require the manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of JEA. The Contractor and/or manufacturer shall not make any exemption or exception to the above stated conditions or warranty.

I.7. APPLICATION:

A list of approved liner materials is provided in the attached "Approved Materials Manual" (see page AS-602). Those liner materials not described below shall be manufacturers' standard and installed in accordance with the manufacturer's recommendations, at a minimum. Each liner listed (see Approved Materials Manual AS-602) is defined as either a hard shell liner, a polyurethane/fiberglass liner or a cementitious liner. Hard shell liners and polyurethane liners may be used on wet wells and all manholes, regardless of pipe sizes, and may be used on manholes which include a discharge from a wastewater force main or low pressure system. Hard shell liners or structural polyurethane is acceptable for structural liner applications where specified on the construction documents. If, in the opinion of the JEA representative, the manhole contains or will contain a very high concentration level of wastewater gas, then only a hard shell liner or polyurethane liner shall be utilized, regardless of the pipe sizes.

II. FIBERGLASS REINFORCED POLYESTER (FRP) INTERIOR LINING**II.1. GENERAL:**

FRP linings shall be manufactured by L.F. Mfg., Inc., Containment Solutions Inc. (Flowtite Fiberglass manhole) or JEA pre-approved equal. The work shall include the furnishing of an interior protective lining system including all necessary materials, equipment and tools as required for a complete installation. The completed system shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, one supplier/manufacturer. The lining shall be provided in wet wells and manholes as designated on the drawings. The wet well shall have a flat slab concrete top lined with the fiberglass liner. FRP liner shall be one piece with no vertical or horizontal seams allowed. The liner shall be plain end. The FRP shall be fabricated in accordance with NBS PS 15-69, and shall consist of commercial grade poly ester resin, UV inhibitor, chopped strand, woven roving, and continuous reinforcement. Minimum liner thickness shall be half-inch for all diameter wells, and shall not have external ribs. Liner size shall be field verified by liner manufacturer's representative.

II.2. MATERIALS:**II.2.1. Resin:**

The resins used shall be commercial grade polyester resins.

II.2.2. Reinforced Materials:

The reinforcing materials shall be commercial Grade "E" type glass in the form of continuous roving, and chop roving, having a coupling agent that provides a suitable bond between the glass reinforcement and the resin.

II.2.3. Interior Surfacing Material:

The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010 to 0.020 inch thick. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5 inch to a maximum length of 2.0 inches, and shall be applied uniformly to an equivalent weight of 3 oz. per square foot. Each pass of chopped roving shall be well rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inch.

II.2.4. Wall Construction:

After the inner layer has been applied, the liner wall shall be constructed with chop and continuous strand filament wound manufacturing process which ensures continuous reinforcement and uniform strength and composition.

II.2.5. Exterior Surface:

For a UV inhibitor, the resin on the exterior surface of the liner shall have a gray pigment added for a minimum thickness of .125 in.

II.2.6. Fillers and Additives:

Fillers, when used, shall be inert to the environment and liner construction. Sand shall not be acceptable as an approved filler. Additives, such as thixotropic agents, catalyst, promoters, etc., may be added as required by the specific manufacturing process to be used to meet the requirements of this standard. The resulting reinforced-plastic material must meet the requirements of this specification.

II.3. MANUFACTURING REQUIREMENTS:

II.3.1. General:

Liner cylinders shall be produced from glass fiber reinforced vinyl ester resin using a combination of chop and continuous filament wound process. Flat sheets for the underside of top slabs shall have the same

II.3.2. Exterior Surface:

The exterior surface shall be relatively smooth with no sharp projections. Hand work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 0.5 in. in diameter, delamination, or fiber show.

II.3.3. Interior Surface:

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 0.5 inch in diameter, and wrinkles of 0.125 inch or greater in depth. Surface pits shall be permitted if they are less than 0.75 inch in diameter and less than 0.0625 inch deep. Voids that cannot be broken with finger pressure and that are entirely below the resin surface shall be permitted if they are less than 0.5 inch in diameter and less than 0.0625 inch thick.

II.3.4. Diameter Tolerance:

Tolerance of the inside diameter shall be +/- 1% of the required liner diameter.

II.3.5. Stiffness:

The liner cylinder shall have the minimum pipe stiffness values shown in the table below when tested in accordance with ASTM D3753 8.5 (Note 1).

LINER LENGTH in FT.	PSI
3 – 6.5	0.75
7 – 12.5	1.26
13 – 20.5	2.01
21 – 25.5	3.02
26 – 35	5.24

II.3.6. Soundness:

In order to determine soundness, apply an air or water pressure test to the liner test sample. Test pressure shall not be less than 3 psig or greater than 5 psig. While holding at the established pressure, inspect the entire liner for leaks. Any leakage through the laminate is cause for failure of the test. Refer to ASTM D3753 8.6.

II.3.7. Chemical Resistance:

When tested in accordance with ASTM D3753 8.7, the log of percent retention of each property after immersion testing when plotted against the log of immersion time, and extrapolated to 100,000 hours, shall assure retention of at least 50% of initial properties.

II.3.8. Physical Properties:

Item	Hoop Direction	Axial Direction
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modules (psi)	0.6 x 10e	0.7 x 10e
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modules (psi)	1.4 x 10e	0.7 x 10e
e. Compressive Strength (psi)	18,000	12,000

II.4. TESTING:

All tests shall be performed as specified in ASTM D3753 latest edition, Section 8. Test method D-790 (note 5) and test method D695. Each completed liner shall be examined for dimensional requirements, hardness and workmanship. All required ASTM D3753 testing shall be completed and records of all testing kept. Copies of test records shall be presented with shop drawings. As a basis of acceptance, the manufacturer shall provide an independent certification which shall consist of a copy of the manufacturer's test report, and be accompanied by a copy of the test results that the liner has been sampled, tested and inspected in accordance with the provisions of this specification and meets all its requirements.

II.5. SHIPPING AND HANDLING:

Do not drop or impact. Fiberglass liners may be lifted by a sling or "choker" connection around the center of the liner, and lifted as required. Use of chains or cables in contact with the liner surface is prohibited.

II.6. INSTALLATION:

The FRP liner shall be designed and fabricated as a non-load bearing liner to be installed inside a new manhole or wet well after installation of the manhole or wet well. The flat sheet liner placed on the underside of the manhole or wet well top slab shall be suitably anchored over the total contact surface area. The liner shall be designed to withstand normal shipping

and installation loads. When properly installed inside a concrete manhole or wet well with properly designed and reinforced top slab, the manhole or wet well shall withstand an ASSHTO H-20 loading and all other applicable soil and hydrostatic loads. The annular space between the existing concrete and the new liner shall be filled with a high strength, non-shrink, cementitious grout for non-structural units or cementitious grout for structural liners, which shall leave no void between the liner and the existing structure. The annular space shall be no wider than 3-inches.

II.6.1. Joints:

Following field installation, the manhole or wet well FRP joints between top slab and walls shall be sealed in the field by persons certified by the liner manufacturer and shall be done in accordance with the recommendations of the liner manufacturer. Joints shall be sealed using the following method:

II.6.1.1. Grind sand and clean thoroughly the surface to be joined or repaired.

II.6.1.2. To prepare resin, mix one pint of resin with 1/3 ounce of catalyst. (Note: To decrease set up time, increase amount of catalyst. To increase set up time, decrease amount of catalyst.)

II.6.1.3. Coat the joint or the repair area with the prepared resin. Thoroughly wet a section of coarse mat with the prepared resin. Apply the wet mat to the repair area. It is very important to roll out all air pockets from the wet mat. Wet a section of fine mat and apply in the same fashion, being sure to roll out all air pockets. Repeat again until the area has been completely covered. Stagger your wet mat applications by at least one inch each time.

II.6.2. Connections:

Openings for pipe connections will be core drilled in the field. Pipes shall be placed through concrete wet well and fiberglass liner in the locations indicated on the drawings. Pipes shall then be grouted in place with the grout filling the entire void and being as thick as the concrete wet well. The pipe on the interior of the wet well shall be fiberglassed to the fiberglass liner. To fiberglass the PVC or Ductile Iron pipe to the fiberglass liner, the surface to be fiberglassed must first be sanded. In the case of Ductile Iron pipe, the protective coating on the exterior of the pipe must be removed and then the pipe sanded. After sanding and cleaning the area to be fiberglassed, apply a coat of primer equal to Derakane 8084 resin. When the Derakane becomes tacky, begin normal installation of the fiberglass, taking care to roll out all of the air pockets. All field fiberglassing must be accomplished by a lining manufacturer certified installer. Submit certification with shop drawings.

II.7. REPAIRS:

Any liner repair must meet all requirements of this specification.

II.8. EXISTING MANHOLES AND WET WELLS:

Where an existing manhole or wet well is to be lined with an FRP liner, all of the requirements in Section 3, of these specifications, remain applicable except that where the vertical liner riser sections are to be cast with the concrete, a single monolithic liner shall be installed. The annular space between the existing concrete and the new liner shall be filled with a high strength, non-shrink, cementitious grout which shall leave no void between the liner and the existing structure. All existing liners must be removed from the existing

structure and the structure must be thoroughly cleaned in accordance with ASTM D4258 and abrasive blasting in accordance with ASTM D4259 prior to installation of the fiberglass liner.

II.8.1. Manholes:

Manholes shall have cone section removed to install liner in accordance with Section 3.8. Install new fiberglass lined concrete cone section and replace existing concrete or brick cone section as indicated on the drawings. Brick top of manhole with acid-resistant, non shrink mortar or use concrete grade rings mortared in place with acid resistant, non-shrink mortar.

II.8.2. Wet Wells:

Wet wells shall have top slab and piping removed to install liner in accordance with Section 3.8. Install new top slab with fiberglass liner cast with concrete. Seal joint between top slab liner and wall liner in accordance with Section 3.6.1. Install pipe connections in accordance with Section 3.6.2.

III. SPECTRASHIELD

III.1. GENERAL:

The work shall include the furnishing and installation of an interior protective coating system including all necessary materials, equipment and tools as required for a complete installation. Coating shall be manufactured by CCI Spectrum, Inc., or JEA pre-approved equal. The completed system shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, one supplier/manufacturer.

III.2. MATERIALS AND EQUIPMENT:

III.2.1. The materials to be utilized in the lining of concrete structures shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment.

III.2.2. Abrasive blasting equipment shall be suited to completely remove deteriorated concrete and hard contaminants from the existing concrete surfaces. Contaminant unit to capture spent abrasive material shall be provided unless otherwise approved by the Engineer.

III.2.3. Equipment for installation of lining materials shall be high quality grade as recommended by the manufacturer.

III.2.4. The lining system to be utilized shall be a multi-component stress panel liner system as described below:

III.2.4.1. Liner:

Installation	Liner
a. Moisture Displacement Barrier	Primer
b. Moisture Barrier	Modified Polymer
c. Surfacers	Polyurethane/Polymeric Blend Foam
d. Final Corrosion Barrier	Modified Polymer

III.2.4.2. Primer shall be 100% solids.

III.2.4.3. Modified polymer shall be sprayed, solvent-free, two-component polymeric, moisture/chemical barrier specifically developed for the corrosive environment of wastewater.

TYPICAL CHEMICAL ANALYSIS	
"A" Component	
Viscosity, 77°F, cps, ASTM D-11638	400
Physical State	Liquid
Color	Clear
Hygroscopicity	Reacts with Water
"B" Component	
Viscosity, 160°F, cps, ASTM D-1638	400
Physical State	Liquid
Color	Flamingo Pink
Non-Volatile	100%
Reaction Profile (100 grams, 175°F Sample)	
Gel Time, seconds	1-2
Tack Free Time, seconds	15
Cure Time, seconds	30
Processing	
A System / B System, volume ratio	1.00/1.00
Typical Physical Properties	
Tensile Strength, PSI	>1500
Elongation, %	125
Tear Strength, PSI	350
Shore D Hardness	55
100% Modulus, PSI	>1500

III.2.4.4. Polyurethane/polymeric blend foam shall be 100% CFC/HCFC free, low viscosity, two component, fire resistant, rigid structural filler.

TYPICAL CHEMICAL ANALYSIS	
"A" Component	
Viscosity, 77°F, cps, ASTM D-11638	200
Physical State	Liquid
Color	Dark Brown
Hygroscopicity	Reacts with Water and evolves CO ₂ gas
"B" Component	
Viscosity, 77°F, cps, ASTM D-1638	1800
Physical State	Liquid
Color	Tan
Hygroscopicity	Absorbs water rapidly thus changing ratio
Reaction Profile (100 grams, 77°F Sample)	
Cream Time, seconds	1-4
Tack Free Time, seconds	5-8
Rise Time, seconds	6-10
Processing	
A System / B System, volume ratio	1.00/1.00
Typical Physical Properties	
Density, nominal core, lb./ft ³ ASTM D-1622 @ 74°F	4 1/2 – 5 1/2
Compression Strength, ASTM D-1621 @ 74°F parallel to rise, PSI	105 – 110
Closed Cell Content, % ASTM D-1940 @ 74°F	Over 90
Shear Strength, PSI ASTM C-273 @ 74°F	225 – 250

- III.2.4.5. Total thickness of multi-component stress panel liner shall be a minimum of 500 mils and shall sustain a 300 PSI pull test. Product shall be SPECTRASHIELD by CCI Spectrum, Inc. or JEA pre-approved equal.

III.3. SURFACE PREPARATION:

- III.3.1. Abrasive blasting equipment shall remove all deteriorated concrete, hard contaminants, localized micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and other concrete structures. Final product shall be a cleaned, exposed and virgin concrete aggregate ready for rehabilitation material. Abrasive blasting equipment shall be suited to completely remove deteriorated concrete and hard contaminants from the existing concrete surfaces. Containment unit to capture spent abrasive material shall be provided unless otherwise approved by the Engineer.

- III.3.2. After completion of surface preparation, blasting phase, perform the seven point checklist, which is the inspection for:
 - III.3.2.1. Leaks
 - III.3.2.2. Cracks
 - III.3.2.3. Holes
 - III.3.2.4. Exposed Rebar
 - III.3.2.5. Ring and Cover Condition
 - III.3.2.6. Invert Condition
 - III.3.2.7. Inlet and Outlet Pipe Condition
- III.3.3. After the defects in the structure have been identified, repair all leaks with grout designed for use in field sealing of ground water. Severe cracks shall be repaired using a urethane based chemical sealant. Product to be utilized shall be as approved by the Engineer prior to installation. Repairs to exposed rebar, defective pipe penetrations or inverts, etc. shall be repaired utilizing non-shrink grout or Engineer approved alternate method.
- III.3.4. Prior to installation of final liner material, if required, re-blast the entire structure and remove all abrasive materials.
- III.4. MATERIAL INSTALLATION:
 - III.4.1. The limits of the corrosion protection system shall be all exposed concrete surfaces including walls, tap sections, risers, etc., unless otherwise approved by the Engineer.
 - III.4.2. Application of multi-component system shall be in strict accordance with the manufacturer's recommendations. Final installation shall be a minimum thickness of 500 mils. A permanent identification number and date of work performed shall be affixed to the structure in a readily visible location.
 - III.4.3. Provide final written report to Engineer detailing the location, date of report, and description of repair or original installation.
- III.5. INSPECTION AND REPAIRS:

Final concrete structure corrosion protection system shall be completely free of pinholes or voids. Entire exposed concrete surface shall be protected with corrosion protection system. Liner thickness shall be the minimum thickness described above. All defects identified during inspection such as pinholes, low film millage, etc. shall be repaired with same material and to same thickness as required of original installation.

IV. GREEN MONSTER™

IV.1. GENERAL:

The work shall include the furnishing and installation of an interior protective coating system including all necessary materials, equipment and tools as required for a complete installation. Coating shall be manufactured by GML Coatings, LLC., or JEA pre-approved equal. The completed system shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be approved and furnished by, and coordinated with, GML Coatings LLC.

IV.2. MATERIALS AND EQUIPMENT:

- IV.2.1. All materials used within the Green Monster™ system shall be highly resistant to hydrogen sulfide in the wastewater environment.
- IV.2.2. Waterblasting equipment shall be no less than 4000 psi and sandblasting equipment shall deliver enough pressure to remove all deteriorated concrete in the structure providing a substrate free of loose material.
- IV.2.3. High early strength calcium aluminate cementitious concrete shall be used to structurally rebuild structure also providing an esthetically smooth brush finished surface.
- IV.2.4. All spray equipment shall be plural component and be capable of monitoring pressures and temperatures of the coating ensuring a quality
- IV.2.5. All products used in the Green Monster™ system shall be approved and installed by only GML Coatings trained personnel. View product specifications below:
- IV.2.6. Primer Specifications:

TYPICAL PROPERTIES (1:1 BY VOL.):

TENSIL STRENGTH, PSI ASTM D638	4500
ELONGATION, % ASTM D638	6
COMPRESSIVE STRENGTH, NEAT ASTM D695	3800
COMPRESSIVE STRENGTH, SAND ASTM D695	4450
SHRINKAGE	None
EXUDATION	None
BOND STRENGTH, psi ASTM D4541	1200
HARDNESS, SHORE D ASTM D2240	71
COLOR	Amber
VISCOSITY, cps, neat	25
TACK FREE @ 72° F	10 min
FINAL CURE @ 72° F	20 min

- IV.2.7. Primer shall have an extremely low viscosity allowing it to penetrate deep into the pours of the brushed concrete for permanent bonding.
- IV.2.8. Shall only be spray-applied and fully cure in 20 minutes or less without experiencing any shrinkage.
- IV.2.9. Concrete substrate shall be heated and surface temperature decreasing during the application of Green Monster™ Primer.

- IV.2.10. Green Monster™ Liner shall display excellent chemical resistance, thermal stability, and maintain flexible characteristics preventing cracking which may allow wastewater gases to attack the substrate.

TYPICAL PHYSICAL PROPERTIES:

TENSIL STRENGTH, PSI ASTM D412	4500
ELONGATION, % ASTM D412	460
100% MODULUS ASTM D412	1460
200% MODULUS ASTM D412	1960
300% MODULUS ASTM D412	2650
TEAR STRENGTH, PLI ASTM D624	570
HARDNESS, SHORE A ASTM D2240	98
HARDNESS, SHORE D ASTM D2240	71
FLEXIBILITY, 1/8" MANDREL ASTM D1737	Pass
FLASH POINT, °F PENSKY-MARTIN	>200
TABER ABRASION, MG LOSS ASTM D4060	17.0
CS 17 WHEELS	1KG, 1000 REVS
VISCOSITY B-SIDE (75°F) CPS	650
VISCOSITY A-SIDE (75°F) CPS	350
A-SIDE HOSE TEMPERATURE °F	140-160
B-SIDE HOSE TEMPERATURE °F	140-160
BLOCK TEMPERATURE °F	160

- IV.2.11. ADHESION RESULTS:

ASTM D-4541 Patti Tester	PSI
Concrete (direct to concrete) (NO PRIMER)	>350PSI Glue Failure
Concrete Green Monster Primer	600 PSI EPOXY Glue Failure
Carbon Steel (direct)	900 PSI

IV.2.12. TYPICAL PROCESSING PROPERTIES:

GEL TIME, SECONDS	20
TACK FREE TIME SECONDS	45
VOLUME RATIO V:V	1:1

IV.2.13. Concrete restoration shall be between .25 and 3 inches whichever is required to return the surface to the original thickness. In the case of minor deterioration and spalling, a Green Monster™ system approved cementitious concrete shall be used as a resurfacer. Once the proper concrete restoration has been achieved, Green Monster™ will be applied at 100 mils. Product shall be Green Monster™ Liner by GML Coatings, LLC. or JEA pre-approved equal.

IV.3. SURFACE PREPARATION:

- IV.3.1. The structure will be solid plugged or flow-through plugs will be used to control flow coming into the work area.
- IV.3.2. Preparation will begin by sandblasting the entire substrate preparing the surface so that it is structurally intact, clean of all corrosion, and provided with a good profile.
- IV.3.3. After sandblasting is completed, the surface area will be power washed at 4000 psi ridding the substrate of all dust, sand, and loose debris.
- IV.3.4. All solids and water will be removed from the work site along with other debris.
- IV.3.5. Active infiltration will be injection grouted.
- IV.3.6. A cementitious calcium aluminate concrete will be applied to the entire substrate to be coated, in most cases the entire surface will be structurally built up .25 to 3 inches thick providing a smooth brushed finish. Thicker applications may apply where there is more deterioration of the existing structure.
- IV.3.7. The work area will be completely dried using in-direct heat lowering the moisture content of the substrate.
- IV.3.8. Green Monster™ Primer will be applied to the dry and cooling substrate providing maximum adhesion and sealing the porous concrete.
- IV.3.9. Green Monster™ Liner shall be spray applied at a 100 mil thickness. This will be sprayed onto the ring of the structure down to the coating of the bench in manholes and the entire bottom of other structures.

IV.4. MATERIAL INSTALLATION:

- IV.4.1. The limits of the corrosion protection system shall be all exposed concrete surfaces including walls, pipe penetrations, risers, etc., unless otherwise approved by Engineer.
- IV.4.2. Application of the Green Monster™ Liner System shall be in strict accordance with the manufacturer's recommendations.

IV.4.3. All material installed must be holiday tested for pinholes. Either a GML Coatings representative can approve the test or it is preferred to have an inspector from the utility on location to sign off on the test procedure.

IV.5. INSPECTION AND REPAIRS:

IV.5.1. Final concrete structure corrosion protection system shall be completely free of pinholes or voids. Entire exposed concrete surface shall be protected with corrosion protection system. Liner preparation and thickness shall meet what is stated above. All defects identified during inspection such as pinholes, thin film millage, etc. shall be repaired with same material and to same thickness as required of original installation.

V. SEWPERCOAT

V.1. GENERAL:

The work shall include the furnishing and installation of an interior protective coating system including all necessary labor, materials, equipment and tools as required for a complete installation. Coating shall be 100% calcium aluminate mortar as manufactured by SewperCoat, or JEA pre-approved equal. This liner material shall provide a corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, one supplier/manufacturer

V.2. PROPERTIES:

The lining system to be utilized shall be 100% calcium aluminate cement with 100% calcium aluminate aggregate and with the following minimum performance parameters:

PARAMETER	12 HRS	24 HRS	7 DAYS	28 DAYS
Compressive Strength, psi (ASTM C945)	>6000	>7000	>9000	>9000
Flexural Strength, psi (ASTM C293)	>1000	>1300	>1400	>1400
Shrinkage at 90% Humidity (ASTM C596)		>0.02	>0.04	>0.06
Freeze/Thaw after 300 Cycles (ASTM C666)	No damage	No damage	No damage	No damage
Tensile Strength (ASTM C900 modified)	200 – 230 psi Tensile Strength			
Air Void Content 7 Days (ASST. C457)	3%			
Specific Gravity/Absorption Test 7 Days (ASTM C642)	4-5%			

V.3. MATERIALS:

Mortar furnished under this specification shall be a pre-packaged mortar, including all cement, aggregate, and any required admixtures or fibers. It is the intent of this specification that the Contractor only be required to add the proper amount of potable water so as to

produce a mortar suitable for pneumatic application. Typical package weights shall not be less than 50 pounds.

V.4. INSTALLATION:

- V.4.1. High pressure water or sand spray blasting equipment shall remove all deteriorated concrete, (minimum of 3500 psi), hard contaminants, localized micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and other concrete structures. Final product shall be a cleaned, exposed and virgin concrete aggregate ready for rehabilitation material. The blasting equipment shall be suited to completely remove deteriorated concrete and hard contaminants from the existing concrete surfaces. Containment unit to capture spent abrasive material shall be provided unless otherwise approved by the Engineer.
- V.4.2. After completion of surface preparation, blasting phase, perform the following seven point checklist, which is the inspection for:
 - V.4.2.1. Leaks
 - V.4.2.2. Cracks
 - V.4.2.3. Holes
 - V.4.2.4. Exposed Rebar
 - V.4.2.5. Ring and Cover Condition
 - V.4.2.6. Invert Condition
 - V.4.2.7. Inlet and Outlet Pipe Condition
- V.4.3. After the defects in the structure have been identified, repair all leaks with a chemical or hydraulic sealant designed for use in field sealing of ground water. Severe cracks shall be repaired using a urethane based chemical sealant. Product to be utilized shall be as approved by the Engineer prior to installation. Repairs to exposed rebar, defective pipe penetrations or inverts, etc. shall be repaired utilizing non-shrink grout or Engineer approved alternate method.
- V.4.4. Materials shall be sprayed applied by either a wet gunning (low pressure spray) or dry gunning (shotcrete) method and shall conform to the "Suggested Manufacturer Procedures" document as supplied by the manufacturer. The equipment shall be clean and free of any hydrated or unhydrated Portland Cement to prevent acceleration of SewperCoat. To ensure a good bond, the newly blasted surface shall be thoroughly moistened with water prior to application. The material shall be applied in one or more layers to such total thickness as required. A minimum of one-half inch shall be applied. After spraying, the material shall be brushed or trowel finished. A moist curing environment is typically activated by replacing the manhole lid cover. If not, a heavy application of curing compound shall be applied.

WATER WASTEWATER PROTECTIVE COATINGS – SECTION 447

I. GENERAL

I.1. OPERATION AND MAINTENANCE PROJECTS

I.2. APPROVED MANUFACTURER AND INSTALLATION CONTRACTOR

A JEA approved Coating Manufacturer shall include an accompanying contractor of the manufacturer's choice for specialty coatings on interior/exterior structures.

I.3. APPROVED COATING MANUFACTURERS OPERATION AND MAINTENANCE PROJECTS : (SEE SECTION XI.PLATE AS-502)

I.3.1. Corrocoat

I.3.2. Sherwin Williams

I.3.3. PPG

I.3.4. Carboline

I.3.5. Tnemec (Capital only)

I.4. SCOPE OF WORK:

A JEA approved Coating Manufacturer shall be permitted to place one bid per project. The Coating Manufacturer shall provide coating specifications for the project as the manufacturer deems appropriate. The Coating Manufacturer/Contractor shall furnish, install, and test the structures' coatings as specified herein. All references to Industry Standards (ASTM, ANSI, AWWA, NACE 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.

I.5. WORK PLAN:

Prior to beginning work, the Coating Manufacturer/Contractor must submit to the JEA Representative a work plan detailing the coating materials, the procedure and schedule to be used to execute the project. The coating project shall not commence until the Coating Manufacturer/Contractor has received written approval of all work plan submittals from JEA.

I.6. WORKMANSHIP:

All work shall be proved to be in first class condition and application in accordance with the submitted and approved specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Coating Manufacturer at no expense to JEA.

I.7. 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 testing and final inspections shall be scheduled during the normal work schedule. Due to operational and manpower limitations on the JEA systems, JEA will may require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations, including but not limited to, other phases of the work which may impact the continued (non-interruptible) service to existing JEA customers. The Coating Manufacturer/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.8. PERMITS:

The Contractor shall verify the existence of all permits before commencing any work on the project.

I.9. WARRANTY OPERATION AND MAINTENANCE PROJECTS:

The Coating Manufacturer shall warrant the coating against defects for at least two (2) years after the date of acceptance by JEA. Defects are defined as cracking, delamination or excessive fading. The warranty shall require the Coating Manufacturer to supply all necessary labor, materials, and equipment to repair defects to the satisfaction of JEA. The Coating Manufacturer shall not make any exemption or exception to the above stated conditions or warranty. Non-compliance of the warranty by the Coating Manufacturer shall result in removal from JEA Water and Wastewater Standards approved materials list for no less than 24 months.

I.10. CAPITAL PROJECTS

Capital improvements work will require that the Engineer of Record originate a industrial coating specification that includes but is not limited to a 5 year warranty period.

I.11. APPROVED COATING MANUFACTURERS FOR CAPITAL PROJECTS

- I.11.1. Corrocoat
- I.11.2. Sherwin Williams
- I.11.3. PPG
- I.11.4. Carboline
- I.11.5. Tnemec

GENERAL SPECIFICATIONS EXISTING CONCRETE PREPARATION AND REPAIR – SECTION 448

I. SCOPE OF WORK

- I.1. The scope of work shall consist of removing all the coating and deteriorated concrete as shown and described in the Drawings, including saw cutting the perimeter of the repair area.
- I.2. Preparing the surface of the concrete for the repair, including abrasive cleaning, cleaning of existing reinforcement, and applying bonding agent to the surface.
- I.3. Supplying materials and the mixing and placing of concrete repair mortar or concrete as shown and described on the Drawings and in this Specification including vibrating, finishing and curing
- I.4. Supplying, fabricating, constructing, maintaining and removing temporary works, including falsework and formwork.
- I.5. The quality control (QC) testing of all materials.

II. REFERENCES AND RELATED SPECIFICATIONS

All reference standards and related specifications shall be current issue unless otherwise stated.

References:

- II.1.1. ACI 546R Concrete Repair Guide
- II.1.2. ACI 210R, Erosion of Concrete in Hydraulic Structures
- II.1.3. ACI 318, Building Code Requirements For Structural Concrete
- II.1.4. ACI 117, Standard Tolerances for Concrete Construction and Materials
- II.1.5. ACI 305, Hot Weather Concreting
- II.1.6. ACI 301, Cold Weather Concreting
- II.1.7. ACI 350 Environmental Concrete Structures
- II.1.8. ASTM: The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
- II.1.9. ASTM D638 - Tensile Properties of Plastics.
- II.1.10. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics.
- II.1.11. ASTM D695 - Compressive Properties of Rigid Plastics.
- II.1.12. ASTM D4541 - Pull-off Strength of Coatings Using a Portable Adhesion Tester.
- II.1.13. ASTM D7234 - Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
- II.1.14. ASTM D4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
- II.1.15. ASTM D2584 - Volatile Matter Content.
- II.1.16. ASTM D543 - Resistance of Plastics to Chemical Reagents.

- II.1.17. ASTM D4258 - Standard Practice for Surface Cleaning Concrete.
- II.1.18. ASTM D4259 - Standard Practice for Abrading Concrete.
- II.1.19. ASTM C109 - Compressive Strength Hydraulic Cement Mortars.
- II.1.20. ASTM C579 - Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.
- II.1.21. ICRI: The published standards of the International Concrete Repair Institute, Des Plaines, IL.
- II.1.22. CRI Technical Guideline No. 03732 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- II.1.23. NACE: The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.
- II.1.24. NACE RPO 188-99 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- II.1.25. SSPC: The published standards of the Society of Protective Coatings, Pittsburgh, PA.
- II.1.26. SSPC-SP 1 - Solvent Cleaning
- II.1.27. SSPC-SP 5 - White Metal Blast Cleaning
- II.1.28. SSPC-SP 10 - Near White Metal Blast Cleaning
- II.1.29. SSPC-SP 12 Surface Preparation and Cleaning of Metals by Water jetting prior to Recoating.
- II.1.30. SSPC SP-13/NACE No. 6 - Surface Preparation of Concrete.
- II.1.31. SSPC-PA 9 - Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages.

III. SUBMITTALS

The Contractor shall submit the following to the Engineer, for approval, prior to the Contractor proceeding with the work.

- III.1. Shop Drawings and proposed procedures.
- III.2. Product data sheets and installation procedures for proposed concrete repair mortar(s), reinforcing materials, fasteners and bonding agents
- III.3. Detailed design notes, calculations and Shop Drawings for any temporary shoring, including formwork.

IV. PRODUCTS

- IV.1. Reinforcing Materials:
 - IV.1.1. Reinforcing Bars: ASTM A615, Grade 60
 - IV.1.2. Stainless Steel Mesh: T-316 stainless steel, 0.105" wire diameter, 1" mesh with plain weave.
- IV.2. Concrete Materials:
 - IV.2.1. High Strength Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

Minimum Compressive Strength @ 24 hours: 2,000 psi

Minimum Compressive Strength @ 28 days: 6,000 psi

- IV.2.2. Vertical and Overhead Repair Mortars: Trowel applied, high strength, shrinkage compensated cement base mortar.

Approved products:

IV.2.2.1. SikaQuick VOH

IV.2.2.2. Approved equal

- IV.2.3. Horizontal Repair Mortars: Trowel applied, high strength, cement base mortar.

Approved products:

IV.2.3.1. SikaQuick 1000 or Approved equal per JEA approval letter from the project Engineer.

- IV.2.4. Extending Aggregate: 3/8" diameter, non-reactive, pea gravel and as specified by mortar/grout manufacturer.

IV.3. FASTENERS

- IV.3.1. Powder actuated, 0.145" shank diameter, 316 stainless steel pins with 1" metal washer. 1.5" minimum length, 1" embedment. Use low velocity shot.

IV.4. BONDING AGENT

- IV.4.1. Sika Armatec 110 EpoCem or as required/recommended by grout and mortar manufacturer. This product may also be used to prime reinforcing steel in accordance with mortar repair manufacturer requirements.

V. SURFACE PREPARATION

- V.1. The Contractor shall supply and erect appropriate protection barriers/shrouding or other approved means as required to protect all personnel, equipment, and existing improvements, and provide the appropriate PPE for personnel to perform their required tasks.
- V.2. Contractor shall pump out all liquids and remove all solids from the designated areas. All liquids and solids shall be disposed of by the Contractor according to Federal, State, and Local laws.
- V.3. The designated areas shall be cleaned using a high-pressure water spray (minimum 1200 psi). A solution of 10% hypochlorite/water or equivalent disinfecting solution shall be sprayed on all walls, floors, and overheads and left wet for 15 minutes minimum for disinfection. All walls, floors, and overheads shall be rinsed with clear, clean water while the disinfection solution is still wet. All liquids and solids shall be pumped out and disposed of by the Contractor according to Federal, State, and Local laws. Care must be taken not to allow the disinfection solution and washwater to enter the plant waste stream.
- V.4. Prior to blasting, a meeting with the coating manufactures representative, the Contractor, and the Owner shall be conducted to agree upon the surface preparation required for installation of the coating.
- V.5. All coatings, hard contaminants, localized micro-organisms, gas contaminants, and deteriorated concrete shall be removed from the walls, floor, overhead and other concrete structures as designated by high pressure hydro blasting (40,000 psi), mechanical methods, or abrasive blasting. The Contractor shall adhere to the requirements of SSPC-SP 13/NACE 6. Final product shall be cleaned, exposed and virgin concrete aggregate ready for

rehabilitation material. At the 50% completion of blasting, a meeting with the coating manufactures representative, the Contractor, and the Owner shall be conducted to inspect the surface preparation.

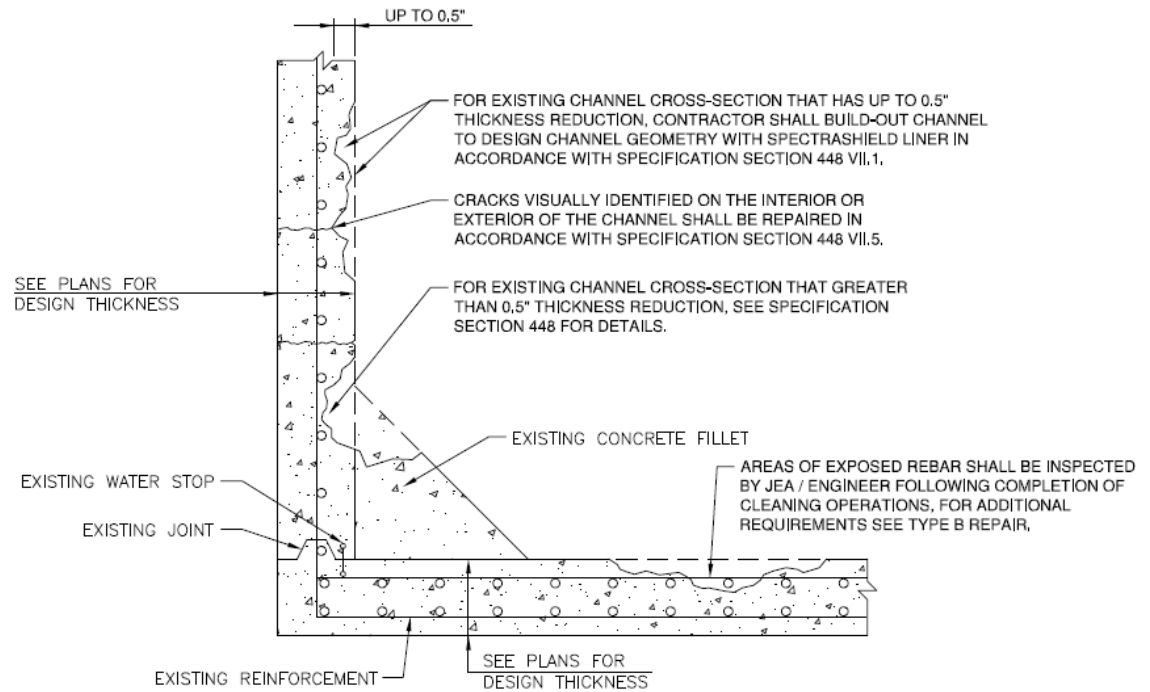
- V.6. Prior to any concrete repairs, the Contractor shall remove all dust, dirt, water and debris from the surface of the concrete in accordance with repair product manufacturers recommendations and requirements.
- V.7. After defects in the structure have been identified, repair all areas in accordance with this section.
- V.8. Prior to the installation of coatings, if required by the coating manufacturer, re-blast the entire structure to provide the proper surface profile, and remove all blasting residue. A meeting with the coating manufactures representative, the Contractor, and the Owner shall be conducted to inspect the surface preparation prior to installation of the coating.
- V.9. Coatings shall be applied in accordance with Section 446 and Section 447 as required.

VI. CONCRETE REMOVAL

- VI.1. All areas of unsound concrete to be repaired will be marked by the Contractor once he has cleaned the existing surface for the Owner/Engineer's review prior to proceeding.
- VI.2. The Contractor shall saw cut the outer perimeter of the repair areas. Feathered edges will not be acceptable.
- VI.3. The Contractor shall take care to ensure that the existing reinforcing steel is not damaged during saw cutting.
- VI.4. Any damage caused by the Contractor to any portion of the structure not intended for repair shall be repaired by the Contractor, at the Contractor's expense, to the satisfaction of the Engineer and Owner.
- VI.5. The Contractor shall remove all areas of unsound concrete by chipping, hydrodemolition, mechanical removal, or other approved methods. The Contractor shall exercise caution and take care not to damage any existing reinforcing steel intended to remain in place.

VII. TYPES OF REPAIR

- VII.1. Type A Repair: Partial Depth Repair - up to 0.5"
Repairs up to 0.5" in depth shall be cleaned and unsound concrete removed. No cementitious repair shall occur. However, coating material thickness shall be increased to create a uniform wall surface and maintain channel flowline.



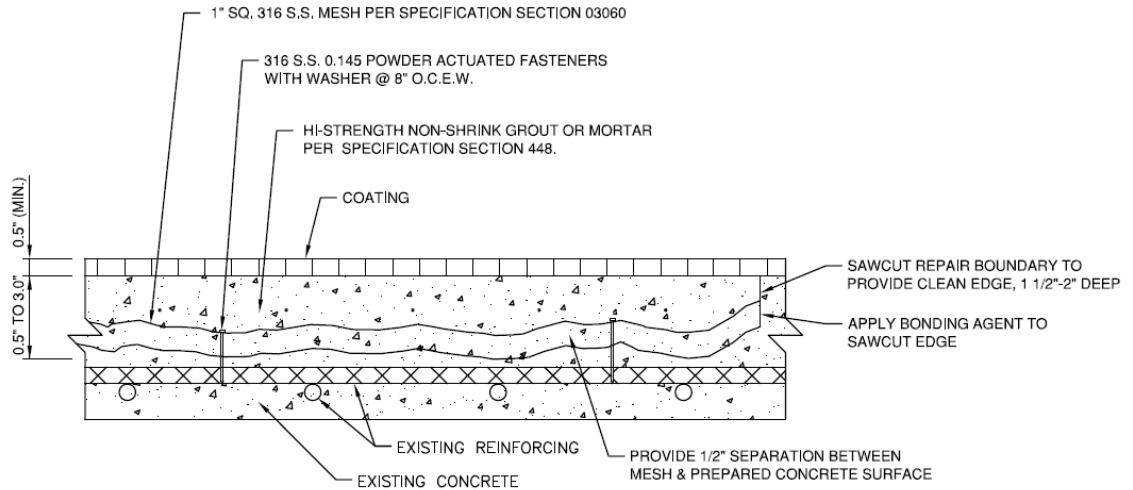
NOTES:

1. MAINTAIN WORK AREA VENTILATION THROUGHOUT THE DURATION OF THE CHANNEL REHABILITATION WORK. ALL WORK & INSPECTIONS SHALL BE COMPLETED BY PERSONNEL WITH CONFINED SPACE CERTIFICATIONS.
2. ALL VISIBLE CRACKS AND ACTIVE SEEPS SHALL BE REPAIRED AND SEALED PRIOR TO FINISHING THE SURFACE PREPARATION AND SUBSEQUENT SPOT REPAIR PER DETAILS
3. THE FINAL STEP IN SURFACE PREPARATION SHALL BE A WATER FLUSHING AND SURFACE DRYING OF THE ENTIRE AREA TO BE REHABILITATED INCLUDING THE AREA OF THE CRACK AND SEEP REPAIRS, AND REINFORCEMENT REPAIR PER SPECIFICATIONS ANY CONCRETE REPAIR AREAS SHALL HAVE A 28-DAY CURE TIME BEFORE FINAL COATING CAN BE APPLIED.
4. THE PREPARED SURFACE SHALL BE INSPECTED AND ACCEPTED IN ACCORDANCE WITH SPECIFICATION SECTION I.5. PRIOR TO INSTALLATION OF THE COATING SYSTEM.
5. OVERHEAD AND VERTICAL REPAIRS SHALL EMPLOY A CEMENTITIOUS MORTAR SUITABLE FOR THE REPAIR.

TYPE A REPAIR

VII.2. Type B Repair: Partial Depth Repair - 0.5" to 3.0"

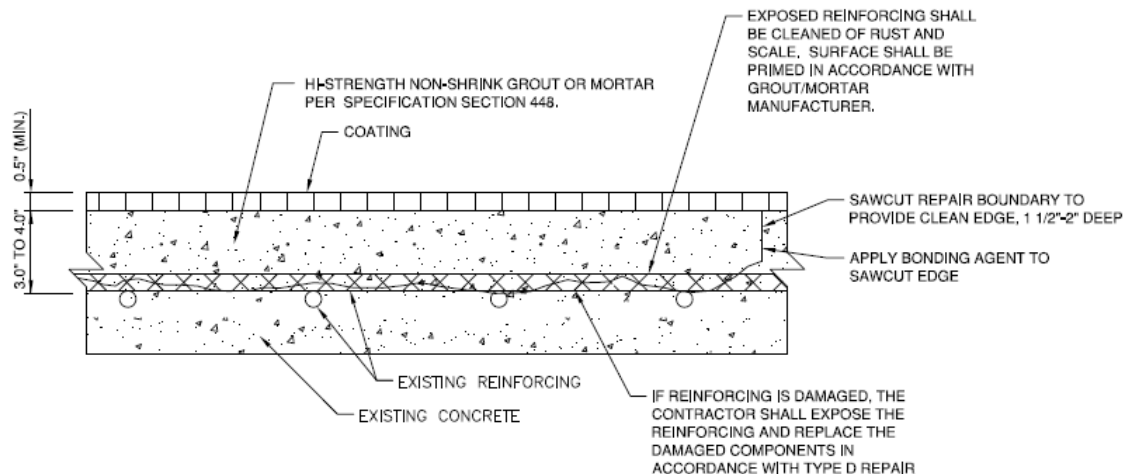
Repairs shall be defined as removal of unsound concrete to a depth of 3.0" or the top/face of the reinforcing steel, whichever is shallower. A cementitious repair shall be installed as described on the Drawings.



TYPE B REPAIR

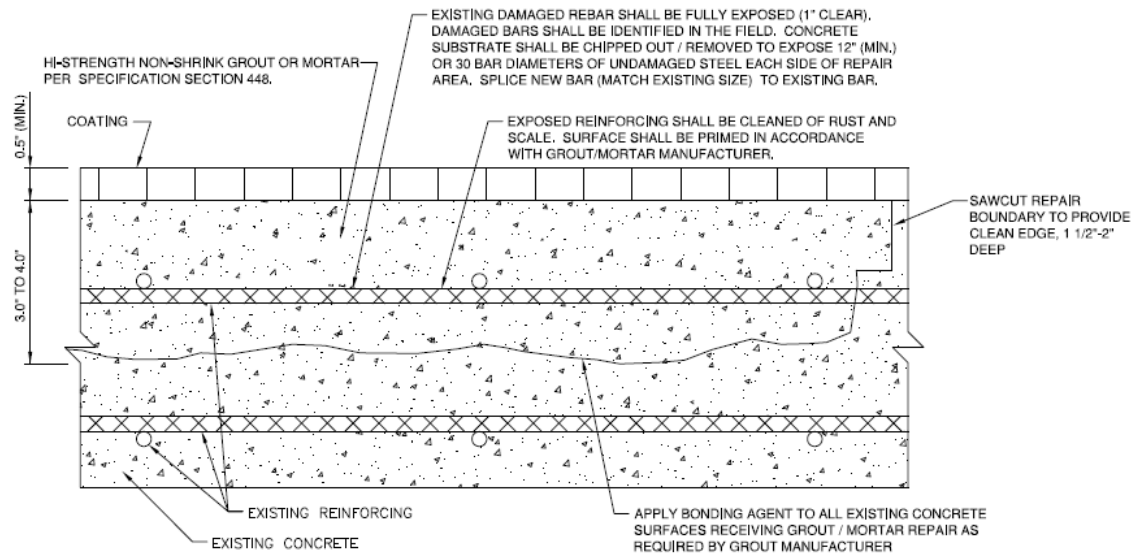
VII.3. Type C Repair: Full Depth Repair - Greater than 3.0" without Reinforcement Rehabilitation

Where unsound concrete extends beyond the reinforcing steel, the Contractor shall continue to remove all further concrete within the repair area until sound material is encountered. All existing reinforcing steel shall be cleaned back to near white metal to remove any scale or corrosion prior to being assessed for deterioration. Where the steel is sound, a cementitious repair shall be applied in accordance with the Drawings.



TYPE C REPAIR

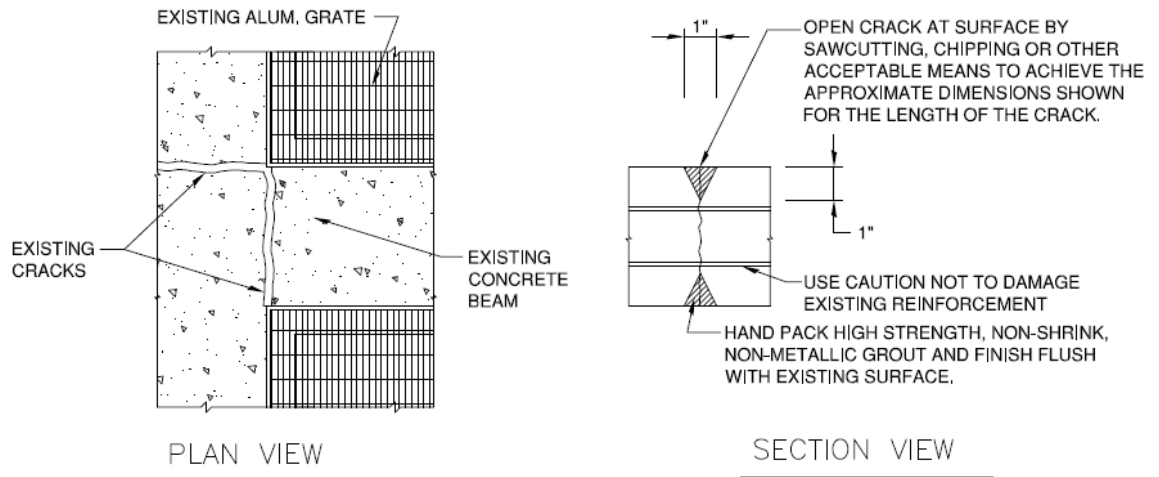
- VII.4. Type D Repair: Full Depth Repair - Greater than 3.0" with Reinforcement Rehabilitation
Where unsound concrete extends beyond the reinforcing steel, the Contractor shall continue to remove all further concrete within the repair area until sound material is encountered. All existing reinforcing steel shall be cleaned back to near white metal to remove any scale or corrosion prior to being assessed for deterioration. Reinforcing steel shall be replaced in accordance with Section I.8., and a cementitious repair shall be applied in accordance with the Drawings.



TYPE D REPAIR

VII.5. Type E Repair: Crack Repairs

Contractor shall identify all existing cracks within the top slabs, walkways, etc. of the rehabilitation areas defined in the Contract Drawings. The cracked areas shall be repaired in accordance with the Drawings.



TYPE E REPAIR

VII.6. All repair areas shall be neatly formed to restore the original geometry of the concrete structure (channel, slab, wall, slab, etc.).

VIII. REINFORCING STEEL

VIII.1. The Contractor shall supply and place additional reinforcing steel as shown when the existing reinforcing steel has a section loss of 25% or greater.

VIII.2. The reinforcing steel shall be of the same type and size as the existing, and spliced with a minimum lap length of 30 bar diameters, but not less than 12".

VIII.3. Exposed reinforcing steel shall be blasted clean and maintained to a near white condition.

VIII.4. Exposed reinforcing steel shall be primed in accordance with cementitious repair product manufacturer requirements.

IX. MATERIAL & BY-PRODUCTS

IX.1. All resulting material and by-products from demolition operations shall be collected, loaded, hauled, and disposed of by the Contractor as an approved waste disposal facility.

X. SURFACE PREPARATION

X.1. Immediately prior to placing the repair mortar or concrete, the Contractor shall thoroughly clean the existing concrete surfaces and formed repair areas, and apply a low resistivity bonding agent or cement slurry as recommended by the repair mortar manufacturer or as directed by the Engineer.

XI. REPAIR MORTAR/GROUT PLACEMENT AND FINISHING

- XI.1. The concrete repair mortar/grout shall be handled, stored, mixed and applied in accordance with the manufacturer's instruction.
- XI.2. Immediately prior to placing the repair mortar, the Contractor shall thoroughly clean the existing concrete surfaces and formed repair areas, and apply bonding agent or cement slurry as recommended by the repair mortar manufacturer or as directed by the Engineer.
- XI.3. The Contractor shall place the repair mortar such that the existing profile and cross section are restored to their original dimensions.
- XI.4. If the existing or repair concrete surface is damaged in any way by construction operations, or if the concrete repair shows signs of distress or scaling prior to final acceptance, it shall be repaired or replaced by the Contractor at his own expense.
- XI.5. All repair areas shall be trowel finished to a level similar to the adjacent existing concrete surfaces.

XII. CURING

- XII.1. Curing shall be in accordance with the manufacturer's instructions.

XIII. QUALITY CONTROL

- XIII.1. Concrete repair mortar that is not stored, handled, prepared, placed, or cured in accordance with the manufacturer's instructions will be rejected by the Engineer and his/her decision shall be considered final.
- XIII.2. The Engineer reserves the right to require immediate removal of any concrete from rejected batches that may have already been placed in the structure.
- XIII.3. Quality assurance testing will be carried out by the Contractor's testing agency and all associated costs will be paid for by the Contractor.
- XIII.4. Refer to Chapter XVI - Section 437 for testing requirements.

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EMERGENCY PUMP ENGINES – SECTION 470

I. GENERAL

I.1. SCOPE OF WORK

The Contractor shall furnish, install and test a complete, self contained, automatic standby emergency pump engine system as specified herein. The self-contained emergency pump engine system shall consist of a pump and engine unit, which upon interruption of normal power from MCC, will start automatically and start pumping immediately. Diesel engine driven pump sets shall be of the latest commercial type and design with all necessary controls. Contractor shall furnish and install fuel tank, marine grade aluminum enclosure, engine foundation and fuel tank foundation and all accessories necessary for a complete and operable installation. The enclosure shall be weatherproof, constructed with either 304 stainless steel or 5000 marine grade aluminum. All materials shall be new unless specifically called for otherwise. Under this purchase order number, JEA and the contractor shall be entitled to the special rates and purchase price of equipment and services. The contractor (not JEA) shall pay all cost associated with the installation of the emergency backup system.

I.2. SHOP DRAWING SUBMITTALS AND ADDITIONAL SUBMITTALS

The Contractor shall be required to submit a complete shop drawing submittal. Signed and sealed by a Florida Registered Professional Engineer, shall be submitted with the shop drawings.

- I.2.1. Five copies, plus the number of copies the Contractor wishes returned, shall be submitted to the Engineer for approval.
- I.2.2. List of 5 or more operating installations using major components of the same or similar type equipment furnished for this project.
- I.2.3. Name of nearest location of permanent parts supply from which parts may be obtained in sufficient quantity on a 24 hour basis.
- I.2.4. Shop drawings of the pump engine set, complete power and control wiring diagrams, foundation requirements, auxiliary equipment required including tanks, switches, controls, weatherproof enclosure, breaker, wiring and accessories shall be submitted.
- I.2.5. Manufacturer's product data describing unit, auxiliary equipment required, including switches, engine, and pump. Include the following:
 - I.2.5.1. Specifications for fuel
 - I.2.5.2. Make of engine
 - I.2.5.3. Number of cylinders
 - I.2.5.4. Compression ratio
 - I.2.5.5. Bore, inches
 - I.2.5.6. Stroke, inches
 - I.2.5.7. Piston displacement, cubic inches
 - I.2.5.8. Piston speed at rated RPM, feet per minute
 - I.2.5.9. Make and type of pump
 - I.2.5.10. Pump rating
- I.2.6. Two complete sets of operating and maintenance manuals shall be supplied for the electric set and for auxiliary equipment.

- I.2.7. Manufacturer's warranty.
- I.3. RATING

Pump Engine set shall be capable of producing rated output for continuous duty at rated engine pump RPM when equipped with necessary operating accessories such as air cleaners, lubricating oil pump, fuel transfer pump, radiator fan, and jacket water pump. Unit shall be sized to pump _____. Responsibility for sizing pump engine shall lie with the pump engine supplier and JEA Engineering.
- I.4. QUALITY ASSURANCE
 - I.4.1. Unit shall be the product of a firm regularly engaged in the manufacture of engines and pumps, and a standard model in regular production at the manufacturer's place of business. Both engine and pumps shall be warranted by the same manufacturer to establish single source responsibility.
 - I.4.2. Only current units which can be properly maintained and serviced without the necessity of JEA carrying extensive parts stocks, or being subject to long periods of interrupted service due to unavailable parts will be considered. Pump-Engine supplier shall maintain a local parts and service facility. Service facility shall have no less than 60 percent of all engine replacement parts in its stock at all times.
- I.5. WARRANTY AND SERVICE CONTRACT
 - I.5.1. Pump – Engine Manufacturer Warranty:

Equipment furnished under this section shall be guaranteed against defective parts and workmanship under terms of the manufacturer's and dealer's standard warranty for 5 year from date of acceptance of the system and shall include labor and travel time for necessary repairs at the job site. Running hours shall not be a limiting factor for the system warranty.
 - I.5.2. Contractor Warranty:

The Contractor shall supply to JEA a two (2) year unconditional warranty after substantial project completion or acceptance or any other design portion thereof. 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.5.3. The manufacturer shall provide the services of a factory-trained service representative to verify the correctness of the Contractor completed installation; to check all electronic circuitry and mechanical components to assure their proper function; to make all necessary measurements in and around the engine and pump. A minimum of 2 days startup services shall be provided. The manufacturer shall provide through the Contractor to JEA a written certification that the installation is complete, correct and properly calibrated; by written notation on the certification the Contractor shall endorse its accuracy.
- I.6. PERMITTING OF ABOVEGROUND FUEL STORAGE TANK (LARGER THAN 550 GALLONS)
 - I.6.1. Prior to construction of an aboveground fuel storage tank, the contractor shall obtain a copy of the approved construction permit by local regulatory agencies for the installation of the fuel tank. The contractor shall coordinate with David

Norse (904) 665-5501 of JEA to assist with this effort and DEP notifications in accordance with state of Florida Guidelines.

II. DIESEL ENGINE

- II.1. The Engine set shall be as manufacturer by _____, and provide under the JEA/_____ contract specifications.
- II.2. Diesel engine shall be vertical or "V" multi-cylinder, full diesel, mechanical injection, heavy duty type non Electronic Control Module (ECM), arranged for direct connection to a pump engine, and shall be the product of a manufacturer regularly engaged in the building of full diesel engines. Engine shall be a current model which has been in regular production for at least three years. Engine shall develop sufficient brake horsepower, net at rated RPM, corrected to sea level barometric pressure (29.92 in. HG) and 110 degrees F, to operate pump continuously at its rated output with all losses included without undue heating, vibration or wear. Diesel engine shall be water cooled four cycle compression ignition diesel. The engine exhaust manifold shall have an expanded metal guard spread sufficiently away from hot parts. Engine shall meet specifications when operating on No. 2 domestic burner oil.
- II.3. Engine shall be designed for automatic-electric starting and shall have battery charger 120 V, single phase, 10 AMP. It shall be furnished and installed in the pump-engine enclosure. A wet cell storage battery of not less than 24 volts and of 135 AH capacity to operate engine starting equipment. Batteries shall be lead acid type complete with cables and rack. Battery shall be rated in accordance with requirements of engine manufacturer. Batteries shall be located for easy removal and servicing. The service powered battery charger shall float charge the battery pack. The charger shall be mounted inside the enclosure. The service powered battery charger shall float charge the battery pack. The charger shall be mounted inside the enclosure.
- II.4. Engine shall be equipped with a pressure lubrication system supplying oil to all surfaces requiring lubrication. Circulation shall be by a positive displacement pump. Lubrication system shall include a full flow strainer, oil filter, and an oil cooler of sufficient capacity to properly cool all lubrication oil circulated.
- II.5. Engine shall have an individual mechanical injection pump and injection valve for each cylinder. Injection pumps and injection valves shall not require adjustment in service. Fuel injection pumps shall be positive action, constant-stroke pumps, actuated by a cam driven by gears from the engine crankshaft. All injection pumps and valves shall be serviced by Engine Manufacturer certified personnel.
 - II.5.1. Fuel lines between injection pump and valves shall be heavy seamless tubing; and, to eliminate irregularity of fuel injections, shall be of the same length for all cylinders.
 - II.5.2. Fuel system shall be equipped with replaceable fuel filter elements which may be easily removed without breaking any fuel line connections or disturbing the fuel pumps or another part of the engine. Provide easily serviceable fuel/water separator/filter ahead of other fuel filters.
 - II.5.3. All fuel filters shall be conveniently located in one accessible housing, ahead of injection pumps so that fuel will have been thoroughly filtered before it reaches the pumps. No screens or filters requiring cleaning or replacement shall be used in injection pump or injection valve assemblies.

- II.5.4. Engine shall be equipped with a built-in gear-type engine-driven fuel transfer pump, capable of lifting fuel against a head of twelve feet, for supplying fuel through filters to injection pump at constant pressure.
- II.6. Engine shall be provided with suitable safety controls to automatically stop the unit when low oil pressure, water temperature or engine speed exceeds safe limits. Pilot lights shall be provided to visually indicate the cause of engine shut down. Pilot lights shall operate off battery circuit and shall be on pump-engine control panel. Provide contacts for remote engine failure annunciation.
- II.7. Engine shall be equipped with a bronze glow(dipped) coated aluminum radiator and blower fan of sufficient capacity for cooling engine when diesel set is delivering full rated speed an ambient temperature of 125 degrees F. Air flow restriction from radiator shall not exceed 0.5 inches H₂O. Engine shall have a thermostat integral with jacket water circuit to maintain water at proper operating temperature. The radiator tank can be plastic. Engine shall have a belt driven centrifugal type water circulating pump for circulating water through cooling system.
- II.8. Provide a critical grade type exhaust silencer, manufactured of 316 stainless steel as specified in this specification.
- II.9. Engine shall be provided with an antifreeze solution of 50 percent ethylene glycol, and suitable unit mounted, thermal circulation type water heater incorporating a thermostatic switch to maintain engine jacket water at 90 degrees F. in an ambient temperature of 30 degrees F. Heater shall be 1000 watts minimum, single phase, 60 Hertz, and applicable voltage. Jacket Water Heater Hoses shall be reinforced rubber heater hose type or better with ball valves to isolate hose in the event that the hoses or JWH needs replacing.
- II.10. Furnish a set of spare parts and tools regularly supplied with engine. Include all tools of a special nature required to properly service engine.
- II.11. Provide one or more engine mounted dry type air cleaners of sufficient capacity to protect working parts of the engine from dust and grit.

III. PUMP

- III.1. Pump shall be engine-driven..... Pump shall be designed so all components are accessible with a minimum amount of labor. Both engine and pump shall be warranted and serviced by same manufacturer.
- III.2. Close Coupled centrifugal pump with vacuum priming compressor mounted to a diesel engine.
- III.3. Continuously operated air injector priming device requiring no periodic adjustment or control.
- III.4. Centrifugal pump shall be capable of handling up to 3" diameter non-compressible solids.
- III.5. Centrifugal pump shall be capable of fully self-priming on its own with a 25' static suction lift without the need of a foot valve or add-on priming device.
- III.6. Liquid-filled vacuum gauge for system diagnostics shall be viewable from outside enclosure.
- III.7. GR – Ready Prime Series type pump or equal.

IV. ENGINE STARTING AND CONTROL PANEL

- IV.1. Furnish and install an automatic starting mechanically controlled engine panel in a metal enclosure. Starting section shall automatically start engine upon high level sensor through starting contacts in control panel. Unit shall serve to operate as follows: High level sensor contact initiates starting cycle of diesel engine. Lack of oil pressure or over-temperature of cooling system will cause second relay in cranking panel to be energized, as normal alternator voltage is approached, causing starting cycle to be terminated immediately. Should engine fail to start for any reason, a time delay relay in cranking panel limits its cranking period to 30 seconds. A push-button switch mounted on cranking panel shall allow engine to be further cranked at the operator's discretion. Resumption of high level shall open engine contacts in control panel and shall cause engine to shut down after 5 minute delay.
- IV.2. Pump-engine controls will include an auto start feature controlled by one or more float balls or submersible transducer. It shall be a mechanical non mercury type float switch housed in a hermetically sealed polypropylene enclosure designed to extend into a wet well. The transducers polyurethane jacket shielded cable shall be of suitable length for proper installation into a wet well without splicing. The level control system shall continuously monitor the wet well level. Upon operator selection of automatic operation, the level controller shall start the pump- engine unit when the liquid level in the wet well rises to the pump start level. When the liquid is lowered to the pump stop level the level controller shall stop this pump – engine.
- IV.3. ENGINE CONTROLS
- IV.3.1. Mechanically controlled engine control panel shall provide the following functions:
- IV.3.1.1. Battery DC volts
 - IV.3.1.2. Coolant temperature
 - IV.3.1.3. Lube oil pressure
 - IV.3.1.4. Pump-Engine set operating hours
 - IV.3.1.5. With exception to mechanical control is fuel solenoid, starter and shutdown sensors.
- IV.3.2. Automatic/Manual Start-Stop with the following safety shutdowns:
- IV.3.2.1. Over-speed protection and indicator
 - IV.3.2.2. Low lube oil pressure protection and indicator
 - IV.3.2.3. High coolant temperature protection and indicator
 - IV.3.2.4. Over-crank protection and indicator
 - IV.3.2.5. Low coolant level protection
- IV.3.3. Engine Control Switch (Three-Position: Stop – Manual – Auto)
- IV.3.4. Indicator/Display, Test Switch
- IV.3.5. Control device shall be non-alternator driven speed control reframe. Control device shall be read off the magnetic pick-up.

V. WEATHERPROOF ENCLOSURE, NON-WALK-IN TYPE

- V.1. The complete pump-engine set shall be enclosed in a modular, non-walk-in type, marine grade aluminum weatherproof enclosure, constructed with either 5000 marine grade aluminum or 304 stainless steel. The enclosure shall be constructed of removable side panels and end panels. All fasteners and hardware used in construction of the enclosure

shall be type 316 stainless steel. The unit shall have hinged side doors each side and hinged doors at control end, equipped with key locks for ease of engine maintenance, hold open devices and a three point latch system. Doors shall be pad lockable and a minimum of 36 inches. There shall be a stainless steel expanded metal grating or a punched louvered radiator core guard installed - flush with the enclosure panels in front for the radiator grill, and fixed, punched louvered air intake ports on the enclosure sides and rear for proper air circulation within the housing. Provide lifting eyes and spreader bar reinforcement for crane unloading. Provide ¼ inch thick "non skid" deck underneath housing. The enclosure shall be constructed as a sound attenuated style with a maximum dba rating of 85 dba at 15 feet.

- V.2. Battery charger shall be mounted at rear of engine set. Control shall incorporate equipment as previously specified. Control wire connection between starting and safety circuits shall be pre-connected before arriving at job site. Provisions shall be made for mounting batteries and rack inside the enclosure. The engine control panel, distribution (lights, battery charger jacket water heater, etc.) breaker panel, batteries and accessories shall be enclosed in the enclosure.
- V.3. The engine oil and radiator drain lines shall be brought to the outside of the enclosure. A globe type shut off valve shall be installed in each drain line inside the enclosure for security.
- V.4. Enclosure shall be pre-approved by JEA prior to fabrication and shipment.

VI. EXHAUST AND MUFFLER

A critical grade type-304 stainless, exhaust silencer, or JEA pre-approved/equal, shall be provided. The intake of the silencer shall connect to the flexible exhaust connection by stainless steel pipe. Size as required by engine manufacturer.

VII. FUEL STORAGE TANK

VII.1. DOUBLE WALL SUB-BASE TYPE FUEL STORAGE TANK

The tank shall be UL listed, vented, and shall normally be used to store the specific petroleum product at atmospheric pressure. The sub-base fuel storage tank shall have a minimum capacity to provide 72 hours uninterrupted operation of the pump –engine at 100 percent capacity. The sub-base tank shall be of welded steel construction throughout and shall be constructed to permit access to the electrical stub up area. The tank shall have an over fill containment box that will hold 3-5 gallons and have a normally closed, hand operated valve to drain over spill content back into tank. The coating of the tank shall meet the coating specifications in section 9. The tank shall be electrically grounded and secured to slab with 4-6 stainless steel w/ stainless steel washers and fasteners anchor bolts.

VII.2. ABOVEGROUND FUEL STORAGE TANK

An aboveground stand alone fuel storage tank shall be installed when applicable per the JEA representative. The insulated secondary containment aboveground storage tank system for flammable and combustible liquids shall be vehicle impact protected and projectile resistant. Storage capacity shall be 72 hours rated at maximum fuel consumption. Tank shall be a steel tank housed in a double containment concrete vault/tank. The tank shall be manufactured by "ConVault, Inc.", Phoenix Products "Envirovault", or JEA pre-approved equal.

VII.3. UL/ULC LISTING

The tank shall be tested to and listed (and carry UL/ULC labels) for the following:

- VII.3.1. UL - 142, aboveground tanks for flammable and combustible liquids.
- VII.3.2. UL - 2085, two hour furnace fire test and two hour simulated pool fire test for insulated tank.
- VII.3.3. UL - 2085, insulated and protected secondary containment aboveground tanks for flammable and combustible liquids.
- VII.3.4. UL - 2085 and UFC SECTION (79-7) APPENDIX #A-II-F-1, ballistic and vehicle impact test for protected tank.
- VII.3.5. UL - 2085 Non-Metallic Secondary Containment and Venting by Form of Construction.
- VII.3.6. UL CAN/ORD - C 142.16, protected aboveground tank assemblies for flammable and combustible liquids.
- VII.3.7. UL CAN/ORD - C 142.5, concrete encased aboveground tank assemblies for flammable and combustible liquids.
- VII.3.8. UL CAN/ORD - 142.16, the furnace burn requirements for two hour fire rating.
- VII.3.9. UL CAN/ORD - 142.5, the open (pool) fire testing for two hour flammable liquid fire test.
- VII.3.10. UL CAN/ORD - 142.23, aboveground tanks for waste oil.

VII.4. REQUIREMENTS

VII.4.1. Steel Tank Construction

- VII.4.1.1. Steel tank shall be made of 3/16 inch thick steel. The steel tank shall hold the liquid fuel. The tank shall be made in accordance with UL Standard 142 and ULC Standard S601 covering all aspects of tank fabrication including material specification, fabrication, welding and testing. The steel tank's exterior shall be coated with primer paint for protection against corrosion.
- VII.4.1.2. At the fabrication shop, the tank shall undergo a 24 hour pressure test at 5 psig.

VII.4.2. Secondary Containment

- VII.4.2.1. The steel tank shall be wrapped with a minimum of ¼ inch thick Styrofoam (foam) insulation and an impervious barrier of 30 MIL high density polyethylene membrane (poly). The 30 MIL poly shall provide containment for a fuel leak through the steel tank. A leak detector pipe terminating in the secondary containment shall provide positive-proof that the tank is not leaking.
- VII.4.2.2. The 30 MIL poly, shall shield and protect the steel tank exterior from coming in direct contact with the concrete and thus minimize the potential of tank external corrosion.

VII.4.3. Concrete Vault

The tank and secondary containment shall then be encased in a 6 inch thick reinforced concrete vault. The 6 inches of concrete shall be poured on all sides, bottom and top of the tank in one step and be monolithic. This process assures that there are no joints and no heat sinks in the concrete to carry heat from a fire into the primary containment.

VII.4.4. Coating and Finishing

The concrete exterior of the tank shall be vacuum coated using a two-part water based epoxy paint to protect the tank from inclement weather conditions. The entire pipe fittings and nipples on the tank shall be Fast Clad DTM Urethane Mastic paint to protect them from corrosion, there shall be an intermediate and finish coat.

VII.4.5. Overfill Protection

The tank shall be provided with the following methods to protect against overfill: (a) direct reading level gauge at the tank which is visible from fill pipe location, Greenleaf EFG 8000-I solar gauge with AC back up mounted on exterior of enclosure and 4-20mA.1 data converter mounted in engine control panel; (b) valve located within fill pipe access to close automatically at a specified fill level.

VII.4.6. Venting

The tank system shall be furnished with a 2 inch normal vent and an emergency pressure relief system. The standard emergency relief system furnished with the tank shall open if the tank pressure exceeds ½ psi. The tank system shall conform to code requirements and UL/ULC Standards for venting. All vents and fittings utilized on the fuel tank shall be constructed of stainless steel.

VII.4.7. Support Legs

Vault shall have support legs that provide visual inspection capability.

VII.4.8. Thermal and Corrosion Protection

The tank construction shall provide thermal insulation to protect against temperature extremes and corrosion by separating the steel tank from the concrete. No part of the steel tank shall come in direct contact with concrete or any other corrosive material.

VII.4.9. Spill Containment

The tank system shall include a 5 to 15 gallon, 316 stainless steel spill containment surrounding the fill pipe. The spill container shall be equipped with a normally closed, hand-operated valve that can be actuated to drain the spilled fuel liquids into the steel tank.

VII.4.10. Bullet Resistance

The tank shall withstand bullet resistance tests in compliance with UFC Section (79-7), Appendix #A-II-F-1.

VII.4.11. Uplift Restraints

The tank shall be supplied with flood resistant tie-down brackets/hurricane hold-down restraints or bolted down to foundation.

VII.4.12. Fire Extinguisher and Clean-up Kit

Portable fire extinguishers must be provided for the suppression of fires in accordance with NFPA 10 and UFC for high hazard area. Fire extinguisher and clean-up kit shall be sized and provided by the tank manufacturer. Fire extinguisher shall be of the ABC type and mounted on the interior of the enclosure at the control panel with 316 stainless steel bracket and fasteners. Clean-up kit shall be similarly mounted inside the pump-engine enclosure.

VII.4.13. Fuel Piping

All fuel piping shall be schedule 40, 316 stainless steel welded socket joints and brass union seats at each end connecting the fuel tank to the Pump Engine. . A

316 stainless steel ball valve shall be installed on supply line at the tank. 550 gallon tanks and larger shall have installed downstream from the ball valve at the tank an adjustable anti-siphon valve.

VII.5. INSTALLATION

VII.5.1. Tank shall be installed as per manufacturer's requirements and as per the drawings. Tank shall be installed by qualified personnel who have been approved by the manufacturer and who have knowledge of, and possess the skills and equipment necessary, to install this type of aboveground storage tank properly and safely. Do not handle or move the tank unless it is empty. Under no circumstances should a tank containing petroleum product be moved. Do not drop or drag the tank. After install of tank a two part epoxy touch up paint shall be applied to the exposed metal. All mounting hardware shall be 316 stainless steel.

VII.5.2. Installation, operation and maintenance of the tank must be carried out in accordance with the applicable codes and regulations. These aboveground storage tanks are intended for installation in accordance with NFPA 30, 30A, 31 and UFC Appendix II-F.

VII.6. FOUNDATION

VII.6.1. The foundation for the tank/pump-engine must be designed (and approved by tank manufacturer) to support the tank, pump-engine, and enclosure plus the weight of the maximum amount of product the tank will be storing. The foundation design must also include provision for draining surface water away from the tank to minimize the risk of fuel accumulation under the tank from the overfill or spills.

VII.6.2. The tank foundation's sub-grade shall be over undisturbed earth or compacted fill, free of organic material. Provide a minimum 6 inch thick granular sub-grade, compacted and graded to a level uniform sub-surface prior to the cast slab placement or pouring of the cast-in-place slab. Surface under the foundation shall be flat within 1/16 inch per foot. An alternative to pouring the slab in the field is to purchase a pre-cast slab from the manufacturer.

VII.6.3. The legs of all tanks shall be grouted to provide a uniform load distribution on legs and foundations.

VII.7. ELECTRICAL

VII.7.1. Electrical service and fuel piping to the pumps unit shall be installed in accordance with the requirements of NEC and NFPA and local code requirements.

VII.7.2. All electrical devices used with or located within 20 feet of the fuel tank shall conform to NFPA 70 Hazardous Locations. All electric conduits and wiring connected to the tank shall be explosion proof and in strict accordance with NEC Class-1, Division 1 or local standards, whichever is stricter.

VII.7.3. Electrical grounding is required for flammable liquid fuel tanks. Tanks shall be provided with two grounding lugs welded to the nipples on tank top.

VII.8. TESTING

VII.8.1. The tank shall be shipped pre-assembled and shop tested. Upon completion of installation, contractor shall pressure test the primary steel tank to 3 psig. This

test shall be performed under the supervision and guidance of the manufacturer's representative and in the presence of the JEA's representative.

VII.9. WARRANTY

- VII.9.1. Tank manufacturer shall provide its standard 30 year warranty.

VII.10. TESTS

- VII.10.1. Prior to acceptance of the installation, the emergency pump-engine shall be tested at the job site to show it is free of any defects and will start automatically and be subjected to pump down the well per the JEA representative discretion.
- VII.10.2. Prior to acceptance, any defects which become evident during this test shall be corrected at no additional expense to JEA.

VII.11. COATINGS

- VII.11.1. Engine, pump, skid/ frame, and any ferrous metal surface not to exceed 150 degree Fahrenheit shall be coated per the following specification or JEA approved equal. Surface preparation: Protect all surfaces from preparation procedures. Solvent clean all surfaces to be coated utilizing Devoe Coatings Devprep 88 Heavy Duty Cleaner per SSPC-SP-1 Cleaning Standard. Abrasive blast per SSPC-SP-6 Commercial Blast as a minimum to all surfaces to be coated. All surfaces shall be clean and dry prior to the applications of all coatings. Any surfaces that are not to be coated shall be protected. Primer Coat: Apply Devoe Coatings Catha-Coat 303H Reinforced Inorganic Zinc Primer applied at 2.0-4.0 mils dry film thickness. Intermediate Coat: Apply Devoe Coatings Bar-Rust 236 Multi-Purpose Epoxy Coating applied at 2.0-4.0 mils dry film thickness. Finish Coat: Apply Devoe coatings Devthane 379UVA Aliphatic Urethane Glass Enamel applied at 2.0-4.0 mils dry film thickness. All ferrous metal that exceed 150 degree Fahrenheit (exhaust manifold and or muffler pipe) must be coated with hi-heat aluminum. Hi-heat aluminum shall be applied to surface prior to any other coating. Once applied cover and don't allow for overspray of other coatings.

VII.12. START-UP

- VII.12.1. On completion of the installation, the initial start-up shall be performed by a factory trained representative of the engine supplier. At the time of start-up, operating instructions and maintenance procedures shall be thoroughly explained to the operating personnel. On turnkey projects the contractor shall be responsible for providing a fuel tank of fuel for start up and maintain a fuel tank till unit/ facility is accepted.

EMERGENCY GENERATOR (LESS THAN 600 KW) – SECTION 472

- I. CHAPTER REVISED: SHARED SERVICES STANDARDS IS TAKING OVER THE GENERATOR SPECIFICATIONS. CONTACT INFORMATION FOR THE PROJECT ADMINISTRATOR:

Breadon, William A. breawa@jea.com
Office: 665-4285

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RECLAIMED WATER PIPING – SECTION 701

I. GENERAL

I.1. SCOPE OF WORK:

The Contractor shall furnish and install a reclaimed 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 Sewer 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 leakage and pressure testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational and manpower limitation 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 (TS&V, 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 Section 701 of the JEA Water and Sewer 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. WARRANTY:

The Contractor shall provide to JEA a two (2) year unconditional warranty after substantial project completion or acceptance or any designated portion thereof. 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.5. AS-BUILT DRAWING:

As-built drawings are required on all water, wastewater 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 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.

I.6. INSPECTION CHECKLIST:

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/operation of each new and rehabilitated fire hydrant, meter box and valve. The Contractor's representative shall complete the associated JEA Final Inspection Checklist for each new or rehabilitated fire hydrant, meter box and valve, and have the JEA attendees provide original signatures/names on the signature block. The JEA representative shall scan applicable checklists and ensure the documents are filed in the electronic file folder for the project.

I.7. LOCATE WIRE INSPECTION CHECKLIST:

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. The Contractor's representative shall complete the associated JEA Final Inspection Checklist for each 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.

II. MATERIALS

Pipe materials and appurtenances, installation and construction details, (plates), shall comply with the requirements of Section 350, entitled "Potable Water Piping", except as noted below.

II.1. COLOR CODE REQUIREMENTS:

Pantone purple (522C) color shall be utilized, in lieu of the blue color, for color coding the materials.

II.2. 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 purple. Copperhead and Protrace tracer wire or JEA approved equal. Refer to section-350, paragraph III.6.4. for additional information.

II.3. MARKING FOR DUCTILE IRON PIPE:

All ductile iron pipe above ground (including bridge crossings) shall be color labeled "RECLAIMED WATER" stenciled in the center of each joint of pipe utilizing an oil based paint. Stenciled lettering shall be 4 inch (minimum), high lettering and be pantone purple.

II.4. RECLAIMED WATER MAIN AND POTABLE WATER MAIN SEPARATION REQUIREMENTS:

The minimum separation requirements between reclaimed water piping and potable water mains shall be as outlined in specification Section 350 and Detail Nos. W-10 and W-11. A minimum horizontal separation of 3 feet (outside to outside) shall be maintained between reclaimed water mains and sewers or force mains.

II.5. DISINFECTION REQUIREMENTS:

Disinfection of materials and bacteriological clearance is not required for the reclaimed water system.

II.6. FLUSHING REQUIREMENTS:

Flushing of the reclaimed water system is required utilizing either potable water or reclaimed water, (when available).

II.7. 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.

- 1.1.1.1. New water, sewer 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.
- 1.1.1.2. 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.
- 1.1.1.3. 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.
- 1.1.1.4. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.
- 1.1.1.5. 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.
- 1.1.1.6. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
- 1.1.1.7. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.
- 1.1.1.8. 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.
- 1.1.1.9. 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.
 - 1.1.1.9.1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.

- 1.1.1.9.2. Swabbing speed shall range between two and five feet per second.
- 1.1.1.10. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

RECLAIMED WATER METER, VALVES, HYDRANTS AND APPURTENANCES – SECTION 702

I. GENERAL

I.1. SCOPE OF WORK:

The Contractor shall furnish, install and test all gate valves, check valves and other special valves and appurtenances as shown on the drawings and herein specified. 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 Sewer Standards Manual shall be installed. All materials shall be new unless specifically called for otherwise. The reclaimed water customer shall be responsible for the installation, maintenance and periodic testing of a backflow prevention device (BPD) on the potable water service line as specified in JEA's cross connection control rules and regulations.

I.2. 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 SI. of the JEA Water and Sewer 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 Sewer Standards.

I.3. ROTATION OF OPENING:

All valves larger than two inches installed within a reclaim water system to be JEA owned shall open by turning to the left or counter clockwise, when viewed from the stem.

I.4. EXTENSION STEMS:

Where extension stems are required, substantial, adjustable wall brackets and extension stems shall be furnished and located as directed. Extension stems shall be provided on all buried valves when the operating nut is deeper than 30 inches below the final grade. Sufficient stem extension shall be provided so that the nut will be no more than 30 inches below finished grade.

I.5. PAINTING OF VALVES AND VALVE BOX LIDS:

The top side of all reclaimed water valve box covers and the inside of the top section of the valve box shall be painted pantone purple. Oil based, traffic-rated paint shall be used.

I.6. HYDROSTATIC AND LEAKAGE TEST:

The Contractor shall be required to perform a separate hydrostatic/leakage field test on each valve installed to insure valves are bubble tight. The duration of this test shall be 15 minutes at 150 psi and conform to AWWA C504. The method of performing this test shall be left up to Contractor with the Engineer's approval. The failure of the valve to perform will result in its removal from the job site and replacement by the Contractor at the contractor's expense.

I.7. LOCATING MARKERS FOR VALVES:

A 'V' cut shall be carved in the curb closest/adjacent to a below grade valve. This 'V' cut shall be painted pantone purple. Reclaimed water services serving vacant lots (service not in use), shall include a "C" cut in the curb (closest to the meter box), and painted pantone purple.

I.8. WARRANTY:

The Contractor shall supply to JEA a two (2) year unconditional warranty after substantial project completion or acceptance or any designated portion thereof. 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.9. RECLAIM METERS AND HYDRANTS:

See SECTION 351 WATER METERS, VALVES, HYDRANTS AND APPURTENANCES

II. MATERIALS

All valves and appurtenances, installation and construction details (plates), shall comply with the requirements of Chapter III.2. Section 351, entitled "Water Valves and Appurtenances", except as noted below:

II.1. LABELLING VALVE COVERS:

The top of the valve covers shall say "RECLAIMED" and be painted pantone purple.

II.2. DISINFECTION REQUIREMENTS:

Disinfection of materials and bacteriological clearance is not required for the reclaimed water system.

II.3. VALVE TAGS:

Provide brass identification tag with "RECLAIMED", valves size, valve type and direction and number of turns to open. Provide a ¼ inch hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2 inch diameter and ⅛ inch thick brass with a ¼ inch hole.

II.4. WATER METER LOCATIONS:

Reclaimed water meter boxes or services shall be constructed similar to domestic water services and shall be located on opposite side of the customer's property, unless approved otherwise by JEA.

II.5. CORP STOPS:

The body of the valve shall be marked as reclaimed water.

II.6. CURB STOPS:

The Tee Head shall include "RW" or JEA approved equal which designates it as reclaimed water valve.

AS-BUILT DRAWINGS – SECTION 501

I. GENERAL

- I.1. Upon completion of the Work and prior to dedication of utilities to JEA or final payment under the Contract with JEA, Contractor shall furnish to JEA an electronic file and certified paper copies of the as-built drawings which have been re-drawn/revised to indicate final as-built data (true to scale) and in accordance with all addenda, change orders, Supplemental Work Account (SWA)s, and all requirements with respect to the drawings specified herein. Simply changing the coordinates note or just adding notes is not acceptable. An electronic file of the original Project drawings will be furnished to Contractor for this purpose. As-built information shall be recorded daily and kept current during the progress of the work verified by JEA personnel. All measurements are to be made by the certifying surveyor engineer or their employee. The Contractor shall provide access to buried facilities in order to allow for accurate horizontal and vertical measurements to be acquired by the surveyor or engineer as needed. Should discrepancies exist, at the discretion of JEA and at no cost to JEA the contractor shall verify buried facilities.
- I.2. Each page of the as-built drawings shall bear the name, of the signed as-built certification of the general contractor, and the signed and sealed as-built certification of the professional surveyor and mapper (PSM) or registered professional engineer (PE) who provided the horizontal and vertical dimensions and elevations on the as-built drawing. The signatures shall certify that the as-built drawings do, in fact, reflect the true as-built conditions as located under the direct supervision of the registered surveyor and/or professional engineer. The drawings shall be certified using the forms provided by JEA (See the end of this section).
- I.3. Upon completion of the work, Contractor shall deliver the as-built drawings including electronic file as-builts, two certified and embossed prints made from the as-built drawings and a electronic file in Ascii format (with Auto CAD, PDF) containing the State Plane Coordinate System using the Florida East Zone and the North American Datum of 1983 is preferred for horizontal data; North American Vertical Datum (NAVD) 1988 Datum is preferred for elevation data, state plane and geographic coordinates, elevation and description of the as-built facilities. All As-Builts shall be submitted with As-Builts submittal check list and the As-Builts submittal transmittal form complete. All capital projects that include Water plants, Wastewater plants, potable water wells, and pumping stations shall be submitted with JEA Record Drawing Submittal checklist and the transmittal form complete.
- I.4. The final as-built drawings shall include all changes in the work including verbal field changes, addenda, change orders, SWAs and other JEA directives.
- I.5. In making changes to the drawings, utility lines to be changed shall be deleted before new lines are drawn, notations to be changed shall be reworded as required. Lines, notations or required information not affected by addenda or SWAs shall not be disturbed. The legend used on the original Project drawings shall also be used to make all necessary corrections.
- I.6. Legibly mark the drawings to record the following:
 - I.6.1. Each document shall be labeled as-built in 1" high printed letters and shall be on 24" X 36" sheets and shall be accompanied by the electronic (Auto CAD and PDF) files on CD/DVD.
 - I.6.2. All changes in the Work made by addenda and SWAs.

- 1.6.3. All potable water, wastewater and reclaimed water facilities located in either public right-of-way or in a dedicated JEA easement shall be prepared in conformance with Section 501. JEA will also require all on-site private (excluding residential) water, wastewater and reclaimed water facilities to be as-built; however, the as-builts of the private facilities do not have to meet the same requirements outlined in Section 501.

Provide a coordinate referenced to the State Plane Coordinate System, Florida East Zone, NAD (83) (current epoch) and elevation referenced to NAVD 88 for all construction facilities. Deflections that result in a change of more than two feet from the "typical" alignment should be acquired regardless of the presence of a fitting. See below for additional as-built requirements. Additionally, measurements of horizontal dimensions of constructed improvements will be shown so that the constructed facility can be delineated in such a way that the location of the construction may be compared with the engineering plans.

- 1.6.3.1. In order to enable the efficient future location of the referenced facilities, the PSM or PE performing the as-built will independently verify the positional accuracy relative to the referenced horizontal and vertical datum. This will be accomplished through checks to published horizontal and vertical control points from local, state or federal agencies. These checks are to be independent of checks to local project control.
- 1.6.3.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
- 1.6.4. As-builts shall show physical dimensioning of the separation of water mains at crossings with all sanitary wastewaters, reclaimed water mains, storm drains and sanitary force mains. This can be shown by providing elevations of each pipe, or a noting measurement taken at the conflict crossing between the pipes on the plan view. As-builts shall also show measurement of vertical and horizontal separation in areas where water mains are parallel to sanitary wastewaters, reclaimed water mains, storm drains, or sanitary force mains. The vertical separation shall also be shown for the full length of the parallel run. The horizontal separation between utilities lines and structures shall also be provided.
- 1.6.5. Special detail drawings will be required where installations were not as shown on the Project drawings due to the field conditions or where required for clarity.
- 1.6.6. As-built drawings shall contain a vicinity map and street names shall be shown for all streets and right-of-ways. Each sheet of the As-built shall include in the bottom right hand corner the JEA availability number if applicable. All easements shall be shown with Official Record (OR) Deed book and page. Contractor shall coordinate with JEA real estate for JEA acquired easements.
- 1.6.7. Unless approved otherwise by JEA, the minimum scale requirements on the drawings are as follows:

- I.6.7.1. Pump Station Site: 1" = 5' (horizontal scale)
- I.6.7.2. Plan & Profile: 1" = 40' (20' preferred, horizontal scale)
1" = 4' (2' preferred, vertical scale)
- I.6.7.3. Plan (only): 1" = 60' (40' preferred, horizontal scale)
- I.6.8. The below table is to be inserted in a conspicuous location within the As-built specifying the following information for all constructed facilities, as well as leader lines in the drawing.

Example Table

LABEL	TYPE	NORTHING (feet) Latitude	EASTING (feet) Longitude	PIPE ELEVATION (feet)	FINAL GRADE (feet)	COVER (feet)	UTILITY TOP ELEVATION (feet)	UTILITY SIZE (inches)	SEPARATION (feet)
Force Main									
C-3-14	45° Vertical Bend	2193930.60 30°22'00.901"	455667.55 81°38'08.737"	8.46	13.9	5.4			
Water Main									
C-3-28	Sleeve Fitting	2194005.29 30°22'01.634"	455548.76 81°38'10.098"	8.93	12.8	4.0			
C-3-25	12" Gate Valve	2194009.45 30°22'01.674"	455537.28 81°38'10.229"	8.31	13.2	4.9	Nut=12.07		

- I.6.9. Separate As-built drawings are required for water, wastewater, and reclaimed water. No As-built drawings will be accepted which contain a combination of the above construction types, unless otherwise approved by JEA Manager.
- I.6.10. The below table is to be inserted in a conspicuous location within the As-built specifying the following information for all valves including those on the forcemain, reclaim, chilled and potable water as-builts:
- Valve size
 - Valve type
 - Valve manufacturer
 - Valve number of turns required to open the valve
 - Valve Open Direction (left/right)

Example valve information table

Valve Number	Size	Type	Manufacturer	#Turns to Open	Direction to Open	Northing (feet) Latitude	Easting (feet) Longitude
1	24"	Butterfly	ABC	72	Left	2193930.60 30°22'00.901"	455667.55 81°38'08.737"
2	6"	Gate	DEF	19.5	Right		
3	2"	ARV	GHI	N/A	N/A		

Every valve on all As-builts is to be referenced in the above table. This information is to be supplied by the contractor to the surveyor or engineer. If all valves are the same, then no table is required; provide all data in the form of a note.

- I.6.11. All features depicted in the as-built drawings must be surveyed, JEA will spot check all coordinates to ensure accuracy.
- I.6.12. Failure to comply with the JEA Standards herein or failure to verify "As Builts" as required shall result in the Contractor, Engineer, and Surveyor unable to bid future JEA projects and removed from the JEA approved contractor's list for a minimum of twelve months.
- I.6.13. Updated As-Builts
- I.6.14. All as-built information shall be recorded and kept current during the progress of the Work. On a monthly basis, the Contractor or Developer's authorized agent shall furnish to the JEA Representative a photocopy "redline" set of drawings identifying those field changes made to the Work to date, along with a photocopy set of the associated field notes. Revisions and recording of information on the photocopy set of drawings shall be done to scale in red ink clearly and accurately identifying those changes to the Work by a competent drafter. The JEA Representative may review and comment on the drawings which shall be incorporated into the next month's as-built submittal. Failure to incorporate changes the following month may result in rejection of any invoice submittal to JEA, denial of certification of completion or denial of acceptance by JEA.
- I.6.15. When the work includes associated items of final restoration for a project, or a portion of the project thereof, then the associated final as-builts shall be submitted as a "redline" marked photocopy set of drawings. The JEA Representative may review and comment on the drawings with the view toward final as-built submittal. The subsequent submittal shall incorporate a photocopy set of CADD drawing final as-builts. The JEA Representative shall review and comment on the photocopy set of CADD drawings which shall be incorporated into the final as-built submittal.
- I.6.16. Each drawing shall show a call out designating each size, material and class pipe installed with leader pointing to the installed pipe. Cover sheet shall include the Oracle Work Order/Project Numbers for each commodity—Water/Wastewater/Reclaimed. Only exception to this are Development projects (with no cost participation), but Availability # shall be shown on each sheet. JEA representative will provide the Work Order/Project Numbers at preconstruction meeting, and be responsible for checking this information at the end of the project when preliminary as-builts are submitted to ensure that the Oracle Work Order/Project Numbers have not been modified/added throughout the project.

II. SPECIFIC REQUIREMENTS

II.1. POTABLE WATER AND FIRE MAINS:

- II.1.1. The location of all valves, fittings, fire hydrants, water meter boxes, casings and points of connection to the existing system shall be referenced by coordinates.
- II.1.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
- II.1.3. Coordinates or elevations on the main and finished grade will also be required at all pipe deadends, intersections, size changes, points of connection to existing system, fittings (bends, valves, tees, plugs, etc.), at intersections of pipe, at 100' intervals, or to the nearest fitting/structure whichever is less and where the standard depth of cover is not provided.
- II.1.4. The below table is to be inserted in a conspicuous location within the potable water as-built specifying the following information for all fire hydrants

Hydrant manufacturer

Hydrant year of manufacture

Example hydrant information table

Hydrant Number	Manufacturer	Date of Manufacture and Acceptance Date
1	ABC	2008
2	DEF	2009

- II.1.5. Every hydrant on the potable as-built is to be numbered at the hydrant, and referenced in the above table. If all hydrants are the same, then no table is required, provide data in the form of a note.
- II.1.6. Backflow Preventers as required.

II.2. GRAVITY WASTEWATER:

- II.2.1. The location of all piping, wyes, tees, manholes, cleanouts and points of connection to the existing system shall be referenced by coordinates.
- II.2.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
- II.2.3. Runs of gravity wastewaters shall be identified (i.e., 300' of 8" PVC SDR26 at S=.004.)
- II.2.4. Elevations shall be given for the north rim of the top of all manhole covers and all manhole inverts.
- II.2.5. Elevations on the service piping and finished grade will be required at the property line for only those wastewater service laterals which result in more than 60 inches of cover or less than 30 inches of cover (these exceptions must be JEA approved).
- II.2.6. For wastewater service laterals which are totally perpendicular to the main, the location of the end of wastewater services shall be given to the plug and be located from the side property line or by station and offset. For wastewater service laterals, which include bends and off-sets which result in a service which is not totally perpendicular to the main, for these cases, the

location of all fittings between the sanitary tee and the plug (at the property line) shall be provided.

- II.2.7. Manhole types shall be identified (i.e., Type "A", "B", etc.).
 - II.2.7.1. Identify Exterior joint tape type used at the manhole joints
 - II.2.7.2. List manhole manufacturer name

- II.2.8. The below table is to be inserted in a conspicuous location within the as-built specifying the following information for all lined manholes:

Example manhole lining material table

Manhole Number	Lining material	Manufacture and Acceptance Date
1	Modified Polymer	ABC liner Inc 01.11.11
2	Fiberglass	DEF line Inc 01.11.11

- II.2.9. All manholes on the as-built are to be numbered at the manhole, and referenced in the above table. If all manholes are the same, then no table is required, provide data in the form of a note.

II.3. FORCE MAINS:

- II.3.1. The location of valves, fittings, casings and points of connection to the existing system shall be referenced in referenced by coordinates.
- II.3.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.01' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
- II.3.3. Coordinates or elevations on the main and finished grade will be required at points of connection to the existing system, fittings (bends, valves, tees, plugs, etc.), 100' intervals, at high points, and where the standard depth of cover is not provided.

II.4. PUMPING STATIONS:

- II.4.1. Wet well size and location shall be indicated and located relative to property lines and/or right-of-way lines.
- II.4.2. All utilities within the pump station site shall be located relative to property lines and/or right-of-way lines.
- II.4.3. Elevations shall be indicated at inverts, wet well top (rim elevation) and invert, and at ground adjacent to wet well. All utilities materials and sizes of lines and fittings shall be indicated.
- II.4.4. All schedules that show pump, motor and electrical data shall be corrected to show the as-built condition and submitted with the pump station drawings.
- II.4.5. As-built information should be provided for the pump station site plan. Within the pump station boundaries the following shall be located horizontally: pump-out, water spigot and cross-connection control device, wet well, control panel, bends, fittings, manholes, generator and fuel tank (if applicable), transformer, irrigation system, fence, and auxiliary electrical enclosures, as applicable.

- II.4.6. If required by JEA, the Contractor shall provide a boundary survey of the pump station site showing above and below ground improvements. This survey and sketch shall be prepared by a registered land surveyor in accordance with Chapter 472 of the Florida Statutes. The sketch shall be submitted with as-built drawings prior to final payment.
- II.4.7. All buried electrical conduit shall be labeled and located including electrical service from utility transformer to station meter and to control panel.
- II.4.8. See Chapter IV. 2. - Section 433 for additional requirements.
- II.4.9. The Contractor shall submit "AS built" drawing prior to pump station start-up.
- II.4.10. If the pump station is privately owned, provide a note on the drawing identifying the owner's name, address and phone number for future coordination tasks and emergency events.
- II.5. RECLAIMED WATER:
 - II.5.1. The location of valves, fittings, water meter boxes, casings and points of connection to the existing system shall be referenced by coordinates.
 - II.5.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
 - II.5.3. Coordinates or elevations on the main and finished grade will be required at points of connection to the existing system, fittings (bends, valves, tees, plugs, etc.), 100' intervals, at high points, and where the standard depth of cover is not provided.
 - II.5.4. Backflow Preventers as required.
- II.6. STORM DRAIN:
 - II.6.1. The location of all piping, wyes, tees, manholes, inlets, cleanouts and points of connection to the existing system shall be referenced in by coordinates.
 - II.6.2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically. Elevations relative to the site facilities must be within 0.1' of each other.
 - II.6.3. Runs of storm wastewaters shall be identified (i.e., 300' of 15" RCP at S=.004.)
 - II.6.4. Elevations shall be given for the north rim of the top of all manhole covers and inlets and catch basins and all manhole, inlet and catch basin inverts.
 - II.6.5. Storm Drain, manhole, inlet and catch basin types shall be identified.
- II.7. BUILDINGS:
 - II.7.1. As-built drawings for buildings shall be marked to indicate any and all changes made. As-built drawings shall also include the installed size, elevation and location of all interior equipment, structures and concealed materials, including plumbing, electrical conduits, ducts, air and piping. The piping shall be identified as to its use. Internal backflow devices shall be clearly noted in drawings.
- II.8. HORIZONTAL DIRECTIONAL DRILL (HDD):
 - II.8.1. The beginning and ending points of the HDD main shall be provided by a registered Professional Surveyor and Mapper. The HDD contractor shall



provide a JEA approved certified as-built drawing, directional bore log plan and profile on a 24 x 36 sheet and Auto CAD file (certified by the HDD contractor) of the HDD work indicating horizontal and vertical location data (continuous or data every 25 LF of main). A copy of the bore log shall be placed on the correct "As Built" sheet where drills are performed. An electronic PDF file containing this same information shall also be provided. See Chapter VI. 2. - Section 750 for additional requirements.

- II.8.2. Failure to comply with the JEA Standards herein or failure to verify "As Builts" as required shall result in; the HDD Contractor shall be unable to bid future JEA projects and removed from the JEA approved contractor's list for a minimum of twelve months.

AS-BUILT	
INFORMATION PROVIDED BY: _____	
Date:	_____
Name:	_____
Address	_____
Phone#:	_____
<u>I HEREBY CERTIFY THAT THE</u>	
_____ Pavement	_____ Chilled Water
_____ Curb & Gutter	_____ Water Main
_____ Storm & Drainage System	_____ Reclaimed Water Main
_____ Lake or Pond	_____ Force Main
_____ Underdrain Connections	_____ Sanitary Gravity System
	_____ Lift Station
ARE AT THE HORIZONTAL AND VERTICAL LOCATIONS AS SHOWN ON THESE "AS-BUILT" DRAWINGS <u>AND THE ACCOMPANYING ELECTRONIC FILE</u> HAVE BEEN LOCATED AND MAPPED IN ACCORDANCE WITH CHAPTER 471 OF FLORIDA STATUTES, CHAPTER 61G15-23 OF THE FLORIDA BOARD OF PROFESSIONAL ENGINEERS AND THE JEA STANDARDS FOR AS-BUILT DRAWINGS.	
ELECTRONIC DRAWING FILE NAME: _____ FILE DATE: _____	
DATE OF FIELD SURVEY _____	
SIGNATURE: _____	
NAME: _____	
FLORIDA PROFESSIONAL ENGINEER NO.: _____	

AS-BUILT

INFORMATION PROVIDED BY: _____

Name: _____

Address: _____

Phone#: _____

I HEREBY CERTIFY THAT THE

_____ Pavement	_____ Chilled Water
_____ Curb & Gutter	_____ Water Main
_____ Storm & Drainage System	_____ Reclaimed Water Main
_____ Lake or Pond	_____ Force Main
_____ Underdrain Connections	_____ Sanitary Gravity System
	_____ Lift Station

ARE AT THE HORIZONTAL AND VERTICAL LOCATIONS AS SHOWN ON THESE "AS-BUILT" DRAWINGS AND MEET THE MINIMUM TECHNICAL STANDARDS FOR SURVEYING AND MAPPING IN THE STATE OF FLORIDA AS PER CHAPTER 5J-17.051 AND 5J-17.052, F.A.C.

ELECTRONIC DRAWING FILE NAME: _____ FILE DATE: _____

DATE OF FIELD SURVEY _____

SIGNATURE _____

NAME: _____

PSM# _____

THIS REPORT AND DIGITAL FILE ARE NOT FULL AND COMPLETE WITHOUT THE OTHER AND ARE NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF THE FLORIDA LICENSED SURVEYOR AND MAPPER.



AS-BUILT

INFORMATION PROVIDED BY:

Date: _____
Name: _____
Address _____
Phone#: _____

I HEREBY CERTIFY THAT THE MATERIALS AND QUANTITIES USED IN THE CONSTRUCTION OF:

_____ Pavement	_____ Chilled Water
_____ Curb & Gutter	_____ Water Main
_____ Storm & Drainage System	_____ Reclaimed Water Main
_____ Lake or Pond	_____ Force Main
_____ Underdrain Connections	_____ Sanitary Gravity System
	_____ Lift Station

ARE IN ACCORDANCE WITH THE APPROVED PLANS AND JEA STANDARDS AND COUNTY SPECIFICATIONS, UNLESS OTHERWISE APPROVED BY THE REGULATORY AGENCY.

Contractor's Signature

Contractor's State Utilities License Number



Water & Wastewater Standards

To: **JEA AS-BUILT SUBMITTAL TRANSMITTAL**

From: _____

Phone: _____

E-mail: _____

Company Name: _____

Date of Submittal: _____

Signature of Submitter _____

Verifying Compliance: _____

Project Name: _____

Project Numbers: _____

JEA Project Manager: _____

JEA PM E-mail: _____

Engineering Firm: _____

Engineering Contact: _____

Engineers Phone: _____

Engineers E-mail: _____

Contracting Co.: _____

Contractor Contact: _____

Contractor Phone: _____

Contractor E-Mail: _____

Surveying Co.: _____

Surveyor Contact: _____

Surveyors Phone: _____

Surveyors E-mail: _____

JEA O&M representative: _____

Attached: _____ Water As-Builts - Paper Copy & Electronic
_____ Wastewater As-Builts - Paper Copy & Electronic
_____ Reclaimed Water As-Builts - Paper Copy & Electronic
_____ Chilled Water As-Builts - Paper Copy & Electronic
_____ As-Built Submittal Checklist filled out by Engineer, Contractor or Surveyor
_____ As-Built Submittal Checklist filled out by JEA Project Manager

JEA AS-BUILT SUBMITTAL REQUIREMENTS CHECK LIST

Per JEA Water and Wastewater Standards Manual Section 501

Initial next to each requirement verifying compliance

GENERAL

- _____ Separate As-Builts for water, wastewater, reclaimed water and chilled water
- _____ On each page of as-built, certification filled out, signed, sealed and dated by surveyor/mapper
- _____ On each page of as-built, certification filled out, signed and dated by contractor
- _____ Old lines not built as per design deleted and redrawn as constructed
- _____ "AS-BUILT" labeled in 1" letters on each sheet
- _____ Sheets are 24" x 36" in size
- _____ Includes all changes by Addendum or Change Order (SWA: Supplemental Work Allowance)
- _____ Includes datum & reference to state plane coordinates (Florida East Zone NAD 83, NAVD 88)
- _____ Vicinity map on cover page
- _____ Street names on all streets
- _____ JEA easements labeled as such, including RE number and Official Records Book and Page (OR #).
- _____ Title page and each page includes JEA Availability Number and/or JEA Oracle Project Numbers
- _____ Date of utility acceptance on each page
- _____ Ownership transition point between JEA and Private system shall be clearly designated on the as-built drawing.

POTABLE WATER SYSTEMS

WATER MAINS

_____ Elevations on the main and finished grade shown at:

- Points of connection to the existing system
- Points of crossing over or under wastewater mains or storm drains
- At maximum of 100 ft. intervals
- Where less than 30 inches or greater than 48 inches of cover is provided

_____ Table with the following data for each fitting:

- Fitting number
- Fitting type
- Fitting Size
- Northing Latitude
- Easting Longitude
- Pipe Elevation at Fitting
- Final Grade at Fitting
- Cover at fitting

_____ Each water main section between fittings/valves is shown with pipe size, pipe material and pipe pressure class called out with a leader line pointing to the applicable main (exceptions noted for extended pipe run)

_____ Pipe size and type indicated on service lateral piping

_____ Location of meter boxes and lateral end points indicated and referenced to property lines

_____ Beginning and end points of HDD (horizontal directional drills) located by professional surveyor

_____ HDD bore log included showing:

- Bore in plan and profile view or Bore log on 24" x 36" sheets with Cadd & PDF file attached
- Certified by HDD contractor
- Horizontal and vertical location data at 25 ft. intervals (max)

WATER VALVES

Table included with data for each valve:

- Valve number
- Valve Size
- Valve Type
- Valve Manufacturer
- Valve number of turns required to open the valve
- Valve Open Direction (left/right)
- Latitude/Longitude

WATER HYDRANTS

Table included with data for each hydrant:

- Hydrant number
- Hydrant manufacturer
- Hydrant year of manufacture
- Hydrant year of acceptance

LOCATE WIRE BOX

Table included with data for each locate wire box:

- Box number
- Latitude/Longitude

WASTEWATER SYSTEMS

GRAVITY WASTEWATER MAINS

Elevations on the main and finished grade shown at:

- Points of connection to the existing system
- Points of crossing over or under water mains

Vertical separation called out at crossings of water mains

Plan and profile drawings provided showing pipe and manholes

Table with the following data for each fitting:

- Fitting number
- Fitting type
- Fitting Size
- Northing Latitude
- Easting Longitude
- Pipe Elevation at Fitting
- Final Grade at Fitting
- Cover at fitting

Each gravity wastewater main section between manholes is shown with pipe size, pipe material, pipe pressure class and slope called out with a leader line pointing to the applicable main.

Pipe type and size and finished grade elevations on service lateral piping shown at the property line if those cover more than 60 inches or less than 30 inches of cover

The location of the plug end of the lateral located from the side property line or by station and offset.

MANHOLES & CLEANOUTS

- _____ Elevations of Manholes Inverts shown for all manholes
- _____ Manholes and cleanouts labeled with number at manhole/cleanout
- _____ Elevations of North Rim of top of manhole covers shown
- _____ Table with the following data for each manhole:
 - Manhole number
 - Manhole type (i.e. Type "A", "B", Etc.)
 - Manhole Lining Material
 - Northing Latitude
 - Easting Longitude
 - Manhole exterior joint sealing material
 - Manhole manufacturer

FORCE MAINS

_____ Elevations on the main and finished grade shown at:

- Points of connection to the existing system
- Points of crossing over or under water mains
- At maximum of 100 ft. intervals
- Where less than 30 inches or greater than 48 inches of cover is provided.

_____ Table with the following data shown for each fitting:

- Fitting number
- Fitting type
- Fitting Size
- Northing Latitude
- Easting Longitude
- Pipe Elevation at Fitting
- Final Grade at Fitting
- Cover at fitting

_____ Each force main section between fittings/valves is shown with pipe size, pipe material and pipe pressure class called out with a leader line pointing to the applicable main (exceptions noted for extended pipe run)

_____ Beginning and end points of HDD (horizontal directional drills) located by professional surveyor

_____ HDD bore log included showing:

- Bore in plan and profile view or Bore log on 24" x 36" sheets with Cadd & PDF file attached
- Certified by HDD contractor
- Horizontal and vertical location data at 25 ft. intervals (max)

LOCATE WIRE BOX

_____ Table included with data for each locate wire box:

- Box number
- Latitude/Longitude

PUMPING STATIONS

_____ Wet well size and location indicated & located relative to property lines and R/W lines

_____ All utilities within the pump station site located relative to property lines

_____ Elevations indicated at:

- Inverts
- Wetwell Top (rim elevation)
- Ground adjacent to wetwell

_____ All materials and sizes of lines and fittings indicated on drawing tables

_____ All buried electrical conduit labeled and located including electrical service from utility transformer to station meter and to control panel

_____ If pump station is privately owned, a note included on the drawing identifying the owner's name, address and phone number for future coordination tasks and emergency events

_____ MCC Panel chart filled out

_____ Schedule of elevation chart filled out entirely

_____ Station physical address indicated

RECLAIMED WATER SYSTEMS**RECLAIMED WATER MAINS**

_____ Elevations on the main and finished grade shown at:

- Points of connection to the existing system
- Points of crossing over or under water mains
- At maximum of 100 ft. intervals
- Where less than 30 inches or greater than 48 inches of cover is provided

_____ Table with the following data for each fitting:

- Fitting number
- Fitting type
- Fitting Size
- Northing Latitude
- Easting Longitude
- Pipe Elevation at Fitting
- Final Grade at Fitting
- Cover at fitting

_____ Each reclaimed water main section between fittings/valves is shown with pipe size, pipe material and pipe pressure class called out with a leader line pointing to the applicable main (exceptions noted for extended pipe run)

_____ Pipe size and type indicated on service lateral piping

_____ Location of meter boxes and lateral end points indicated and referenced to property lines

_____ Beginning and end points of HDD (horizontal directional drills) located by professional surveyor

_____ HDD bore log included showing:

- Bore in plan and profile view or Bore log on 24" x 36" sheets with Cadd & PDF file attached
- Certified by HDD contractor
- Horizontal and vertical location data at 25 ft. intervals (max)

RECLAIMED WATER VALVES

_____ Table included with data for each valve:

- Valve number
- Valve Size
- Valve Type
- Valve Manufacturer
- Valve number of turns required to open the valve
- Valve Open Direction (left/right)

RECLAIMED WATER HYDRANTS

Table included with data for each hydrant:

- Hydrant number
- Hydrant manufacturer
- Hydrant year of manufacture
- Hydrant year of acceptance

LOCATE WIRE BOX

Table included with data for each locate wire box:

- Box number
- Latitude/Longitude

CHILLED WATER SYSTEMS

CHILLED WATER

_____ Elevations on the main and finished grade shown at:

- Points of connection to the existing system
- Points of crossing over or under water mains
- At maximum of 100 ft. intervals
- Where less than 30 inches or greater than 48 inches of cover is provided

_____ Vertical separation called out at crossings of water mains

_____ Table with the following data for each fitting:

- Fitting number
- Fitting type
- Fitting Size
- Northing Latitude
- Easting Longitude
- Pipe Elevation at Fitting
- Final Grade at Fitting
- Cover at fitting

_____ Each chilled water main section between fittings/valves is shown with pipe size, pipe material and pipe pressure class called out with a leader line pointing to the applicable main

_____ Each pipe labeled as to supply water or return water

_____ Pipe size and type indicated on service lateral piping

_____ Location of lateral end points indicated and referenced to property lines

_____ Beginning and end points of HDD (horizontal directional drills) located by professional surveyor

_____ HDD bore log included showing:

- Bore in plan and profile view or Bore log on 24" x 36" sheets with Cadd & PDF file attached
- Certified by HDD contractor
- Horizontal and vertical location data at 25 ft. intervals (max)

CHILLED WATER VALVES

_____ Table included with data for each valve:

- Valve number
- Valve Size
- Valve Type
- Valve Manufacturer
- Valve number of turns required to open the valve
- Valve Open Direction (left/right)

LOCATE WIRE BOX

_____ Table included with data for each locate wire box:

- Box number
- Latitude/Longitude

STORM DRAIN SYSTEMS

STORM DRAIN

_____ Runs of storm wastewaters identified with size, material and slope (i.e., 300' of 15" RCP at S=.004)

_____ Elevations given for the north rim of the top of all manhole covers and inlets and catch basins and all manhole, inlet and catch basin inverts

_____ All storm drain manholes, inlets and catch basin types identified



LOCATE WIRE BOX (UTILIZING CO-POLYMER METER BOX)

JEA Final Inspection checklist

Project Name: _____

Street/Intersection/Address Location: _____

Station: _____ Offset: _____

Check the following as applicable

Water ☐

Wastewater ☐

Reclaimed ☐

Location: ☐ Paved Area
☐ Grassed Area

Cover at Finish Grade: ☐ Cover at finish grade
☐ Cover above/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

Comments:

Contractor Representative:

Signature Print name

JEA Inspector:

Signature Print name

JEA O&M representative:

Signature Print name

Commissioned this date: _____



JEA Tracer Wire Certification Form

Project Name/Number:

Date(s) Tested:

Installed by: (Contractor Name)

Name of Tester:

Tester Company Name:

Name of JEA Inspector:

Pass:

:

Y

N

Fail:

Continuity/Signal strength between access points:

Marker Balls Installed / Located

Access pt #1 to access pt #2:

--	--

Color is for the utility type of Marker ball

Access pt #3 to access pt #4:

--	--

Installed

--

Located

--

Access pt #5 to access pt #6:

--	--

Installed

--

Located

--

Access pt #7 to access pt #8:

--	--

Installed

--

Located

--

Access pt #9 to access pt #10:

--	--

Installed

--

Located

--

Total footage tested	Water	Sewer / FM	Reclaimed Water	Fiber Optic

If any faults found List below (please indicate utility type and location)

Fault # 1:	
Fault # 2:	
Fault # 3:	
Fault # 4:	
Fault # 5:	



JEA RECORD DRAWING SUBMITTAL TRANSMITTAL
Water/ Wastewater Plants, Wells and Pumping stations

To: *W&S As-Built Submittal Mailbox*

From: _____

Phone: _____

E-mail: _____

Company Name: _____

Date of Submittal: _____

**Signature of
Submitter Verifying
Compliance:** _____

Project Name: _____

Project Numbers: _____

JEA Project Manager: _____

JEA PM E-mail: _____

Engineering Firm: _____

Engineering Contact: _____

Engineers Phone: _____

Engineers E-mail: _____

Contracting Co.: _____

Contractor Contact: _____

Contractor Phone: _____

Contractor E-Mail: _____

Surveying Co.: _____

Surveyor Contact: _____

Surveyors Phone: _____

Surveyors E-mail: _____

Attached:

_____ *Record Drawing Submittal Checklist filled out by Engineer, Contractor or Surveyor*

_____ *Record Drawing Submittal Checklist filled out by JEA Project Manager*

JEA RECORD DRAWING SUBMITTAL REQUIREMENTS CHECK LIST

Per JEA Water and Sewer Standards Manual Section 501

Initial next to each requirement verifying compliance

GENERAL—Record Drawing

- _____ On each page of record drawing, certification filled out, signed and dated by contractor or Engineer
- _____ Improvements not built as per design are redrawn as constructed
- _____ "conformed to construction records" labeled in 1" letters on each sheet
- _____ Sheets are 24" x 36" in size
- _____ Includes all changes by Addendum or SWA (Supplemental Work Allowance), or Change Order
- _____ Includes datum & reference to state plane coordinates (Florida East Zone NAD 83, NAVD 88)
- _____ Vicinity map on cover page
- _____ Title page and each page includes JEA Oracle Project Number(s)
- _____ Provide Electronic copies of Record Drawing on a CD (dwg and pdf formats)

PUMPING STATIONS

- _____ Wet well size and location indicated & located relative to Northing Latitude,
_____ Easting Longitude
- _____ All utilities within the pump station site located relative to property lines
- _____ All materials and sizes of lines and fittings indicated on drawings
- _____ All buried electrical conduit labeled and located including electrical service from utility transformer to station meter
and to control panel
- _____ If pump station is privately owned, a note included on the drawing identifying the owner's name, address and
phone number for future coordination tasks and emergency events
- _____ MCC Panel chart filled out
- _____ Schedule of elevation chart filled out entirely

PLANT INFRASTRUCTURE

Provide and incorporate into record drawings the horizontal and vertical record locations of improvements, including the following:

- _____ Corner coordinates of rectangular or square buildings, structures, and tanks.
- _____ Center coordinates of circular buildings, structures, and tanks.
- _____ Building floor elevations.
- _____ Floor elevations of structures and tanks as required to define floor slope.
- _____ Top elevations of structures and tanks and weirs.
- _____ Channel floor elevations at each change in slope.
- _____ Channel top elevations.
- _____ Manhole center coordinates for electrical duct banks, sanitary sewer, storm sewer, etc.
- _____ Pipe coordinates at changes in direction.
- _____ Coordinates of all buried valves, and fittings.
- _____ All underground piping invert or centerline elevations.
- _____ All underground pipe invert or centerline elevations at fittings.
- _____ Pipe invert, or centerline, elevations at crossing with other pipe.
- _____ Invert or top of pipe elevations and coordinates of existing pipe at crossing with new underground pipe showing Separations
- _____ Invert elevations of manhole pipe inlets and outlets.
- _____ Duct bank, storm sewer, sanitary sewer coordinates and elevations at changes in direction or offset measurements from existing Structures or Roadways.
- _____ Top and bottom elevations of duct banks at manholes and hand holes showing ID numbers.
- _____ Other horizontal and vertical record data pertinent to completed Work.
- _____ Location of internal utilities and appurtenances concealed in the construction
Referenced to Structure or Roadway off set dimensions
- _____ Details not indicated on the original contract drawings
- _____ Depths of various elements of foundations in relation to finish first floor elevations.
- _____ Location, elevation, and datum of Benchmark used.

- _____ Elevation of all Pump and House keeping Pads
- _____ Weir Elevations
- _____ Identify all other piping type (ex. potable water, raw water, secondary effluent, reclaimed water, aeration, scum, return activated sludge, waste activated sludge, etc.) and identify pipe material type, diameter, etc.
- _____ Field changes of dimensions and or details as relates to; but not limited the following:
 - a. Interior equipment
 - b. Architectural and structural changes, including relocation of doors, windows, etc.
 - c. Architectural schedule changes
- _____ Hydraulic profile sheet--update control elevations and liquid elevations for low flow, average flow, and peak hourly flow conditions including return flows (as required based on equipment selection or field changes)
- _____ Runs of storm sewers identified with size, material and slope (i.e., 300' of 15" RCP at S=.004)
- _____ Ground surface record/information shall include the following:
 1. Spot elevations should be shown at a minimum 100-foot rectangular grid, sufficient to show all the important topographic features.
 2. All elevations shown on the construction drawings shall be confirmed or amended on the record drawing markups if finished elevations are different.

VALVES

Table included with data for each valve:

- Valve number
- Valve Size
- Valve Type
- Valve Manufacturer
- Valve number of turns required to open the valve
- Valve Depth to Nut
- Valve Open Direction (left/right)
- Normal Operation (open/closed)—provide a conditional valve table for any operating scenarios other than normal

WELL INFRASTRUCTURE**WELL:**

- _____ Elevation of top casing
- _____ Depth of casing below land surface
- _____ Diameter, material and thickness of casing(s)
- _____ Depth of well below land surface
- _____ Location of well, in latitude and longitude
- _____ Grade elevation

WELLHEAD:

- _____ Wellhead pad finished elevation
- _____ All materials and sizes of lines and fittings indicated on drawings
- _____ All buried electrical conduit labeled and located
- _____ Pipe coordinates at changes in direction
- _____ Coordinates of buried valves, tees and fittings
- _____ Other horizontal and vertical record data pertinent to completed Work
- _____ Location of internal utilities and appurtenances concealed in the construction –referenced to visible and accessible features
- _____ Field changes of dimensions and or details
- _____ Location, elevation, and datum of Benchmark used

HORIZONTAL DIRECTIONAL DRILLING – SECTION 750 (SMALL DIAMETER PIPE 12 INCHES OR LESS)

I. GENERAL

I.1. SCOPE OF WORK:

The work specified in this section consists of furnishing and installing underground utilities using open-cut method or the horizontal directional drilling (HDD) method of installation for pipes 12 inches and less inside diameter (ID), also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

I.2. QUALITY ASSURANCE:

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit (i.e.: DEP, DOT, Etc.). Adherence to the specifications contained herein, or the JEA Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD contractor shall be responsible for the repair of all damage to private and/or public property (at no expense to JEA). Repair work shall meet all local and state rules and requirements.

I.3. QUALIFICATIONS:

The work specified in this Section requires significant previous experience and expertise in similar work to avoid negative impacts to public safety and the environment. Therefore, the Contractor performing the work shall be qualified, in JEA's judgment, to complete the horizontal directional drilling work specified herein. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JEA, including the following:

- I.3.1. Contractor to have self-performed work comparable in nature to the scope of work required by this project for a minimum of two years.
- I.3.2. Contractor to have successfully self-performed at least (5) horizontal directional drilling projects to install product pipe of a similar nominal diameter and length to the proposed project within the past two years. JEA shall have sole authority to determine the adequacy of representative projects.
- I.3.3. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JEA of the following personnel qualifications:
 - I.3.3.1. The Contractor's project manager, superintendent, drill operator, and guidance system operator assigned to horizontal directional drilling shall be experienced in work of this nature and shall have successfully completed similar projects using horizontal directional drilling. The Contractor shall submit substantiating evidence of

qualifications, in accordance with the provisions of this Section, with the bid submittal documents. Failure to submit the required documentation will cause the Contractor to be declared nonresponsive. If the Contractor elects to employ a specialist subcontractor(s) to perform horizontal directional drilling, the Contractor shall obtain and submit qualification documents for the subcontractor(s). Subcontractor(s) shall be held to the same requirements as those for the Contractor described herein.

I.3.3.2. All drilling, drill guidance, and pipe joining equipment operators shall be experienced in comparable horizontal directional drilling work, and shall have been fully trained in the use of the proposed equipment by an authorized representative of the equipment manufacturer(s) or their authorized training agents.

I.3.3.3. All HDPE/FPVC fusion equipment operators shall be qualified to perform pipe joining using the means, methods and equipment employed by the contractor. Fusion equipment operators shall have current, formal training on all fusion equipment employed the project. Training received more than two years prior to operation of the fusion equipment shall not be considered current. The Contractor shall submit written certification of training provided by the fusion equipment manufacturer.

I.4. 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, and 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 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 systems limitations and provide such work or services at no additional cost to JEA.

I.5. 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.

The pipe manufacturer shall provide a warranty to the contractor that the pipe conforms to these specifications and that the pipe shall be free from defects in materials and workmanship for a period of two (2) years from the date of substantial completion of the installation. The manufacturer's warranty shall be in a form acceptable to and for the benefit of JEA and shall be submitted by the contractor as a condition of final payment. The manufacturer's warranty to the contractor shall in no way relieve the contractor from its unconditional warranty to JEA.

The contractor shall warrant to JEA that the methods used on the contract, where covered by patents or license agreements, are furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The contractor shall defend, indemnify, and hold JEA harmless from and against any and all costs, loss, damage or expense arising out of, or in any way connected with, any claim of infringement of patent, trademark, or violation of license agreement.

I.6. REFERENCED STANDARDS:

- I.6.1. The work shall conform to applicable provisions of the JEA Water and Wastewater Standards, and the following standards, latest editions, except as modified herein.
- I.6.2. American Water Works Association (AWWA) Standards:
- AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.
 - ASTM D638 Standard Test Method for Tensile Properties of Plastics.
 - ASTM D2122 Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.
 - ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
 - ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
 - ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
 - ASTM E3261 Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
 - ASTM F412 Standard Terminology Relating to Plastic Piping Systems.
 - ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

I.7. PERMITS:

The Contractor shall verify the existence of all permits before commencing any work on the project.

I.8. SUBMITTALS (HDD PROJECTS ONLY):

I.8.1. Contractor Qualifications:

- I.8.1.1. The Contractor shall submit information demonstrating compliance with the Contractor and personnel qualification requirements of this Section. The Contractor shall provide the required qualifications submittals along with the bid.
- I.8.1.2. The Contractor shall submit the following information for each referenced project:

- I.8.1.2.1. Name and general description of project.
- I.8.1.2.2. Name, position, address, and telephone number of contact for JEA.
- I.8.1.2.3. Contract start and completion date.
- I.8.1.2.4. Contract type and value.
- I.8.1.2.5. Length and diameter of completed bore(s).
- I.8.1.2.6. Diameter of completed bore(s).
- I.8.1.2.7. Description of pipe(s).
- I.8.1.2.8. Type and manufacturer of drilling and installation equipment used.
- I.8.1.2.9. Ground conditions encountered.
- I.8.1.2.10. If the referenced project is not yet completed, the Contractor shall include:
 - I.8.1.2.10.1. Anticipated completion date.
 - I.8.1.2.10.2. Value of work completed to date and anticipated final contract value.
- I.8.1.3. The Contractor shall submit the following personnel information:
 - I.8.1.3.1. Names and resumes, including specific project experience, for the proposed project manager, superintendent, guidance operator, and drill operator, demonstrating that each meets the requirements of this Section.
 - I.8.1.3.2. Names and qualifications, including specific project experience, for all proposed drilling, drill guidance, and pipe joining equipment operators, including evidence of training in the use of the proposed equipment by an authorized representative of the equipment manufacturer or their qualified agent.

I.8.2. Work Plan:

Prior to beginning work, the Contractor must submit to the JEA Representative a work plan detailing the procedure and schedule to be used to execute the project. Horizontal directional drilling shall not commence until the contractor has received written approval of all work plan submittals from JEA.

- I.8.2.1. Methods: The Contractor shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:
 - I.8.2.1.1. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for preparing as-builts.
 - I.8.2.1.2. Drilling fluid management plan.
 - I.8.2.1.3. Spoils handling and disposal plan.
 - I.8.2.1.4. Pipe storage and handling, addressing: Means and methods for protecting pipe and ensuring temperature control in accordance with the Contractor's installation calculations.

- I.8.2.1.5. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
- I.8.2.1.6. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.
- I.8.2.1.7. Quality control and testing procedures.
- I.8.2.1.8. Safety plan.
- I.8.2.2. Schedule: The Contractor shall provide a schedule for all horizontal directional drilling activities commencing with the site preparation and terminating on completion of testing and final acceptance of the installed pipe. The schedule shall address anticipated subsurface conditions and overall project requirements.
- I.8.2.3. Equipment
 - I.8.2.3.1. The contractor shall provide the make, model, and technical specifications for each of the following:
 - I.8.2.3.1.1. Horizontal directional drill rig.
 - I.8.2.3.1.2. Drilling system components.
 - I.8.2.3.1.3. Downhole drilling assembly and reaming equipment.
 - I.8.2.3.1.4. Downhole pressure sub.
 - I.8.2.3.1.5. Guidance and control system.
 - I.8.2.3.1.6. Pulling head.
 - I.8.2.3.1.7. Swivel.
 - I.8.2.3.1.8. Rollers.
 - I.8.2.3.1.9. Solids separation and drill fluid recirculation systems.
 - I.8.2.3.1.10. Pipe fusion equipment.
 - I.8.2.3.1.11. Pipe fusion data logger.
 - I.8.2.3.1.12. Pipe handling equipment.
 - I.8.2.3.1.13. Pigs and pigging equipment.
 - I.8.2.3.2. The Contractor shall provide the following specific equipment information:
 - I.8.2.3.2.1. Calibration certification for the pilot bore guidance and control system.
 - I.8.2.3.2.2. Calibration certification for the heat fusion datalogger.
- I.8.2.4. Supplemental Work Plan Requirements: The Contractor shall provide the following additional work plan submittals within 30 days of receiving notice to proceed. The submission requirements for additional work plan submittals including number of copies and delivery of submittals shall follow the requirements outlined in the

general requirements. Horizontal directional drilling shall not commence until the Contractor has received written approval of all supplemental work plan submittals.

- I.8.2.4.1. The Contractor shall submit traffic control plans for entry and exit pit sites.
- I.8.2.4.2. Plans for mitigating the potential for inadvertent drilling fluid losses to surface, and for rapidly identifying and cleaning up spills near the investigation borings located along the project alignment. Investigation boreholes along the alignment have been backfilled as reported in the Geotechnical Report. The Contractor's work plans shall address the risk that all investigation boreholes may contribute to the risk of drill fluid loss.
- I.8.2.4.3. Contingency plan for rapidly identifying, locating, and containing any drilling fluid returns.
- I.8.2.4.4. The Contractor shall submit a contingency plan to address procedures to be employed in the event any of the listed items occur.
 - I.8.2.4.4.1. Utility strike, obstruction, or inability to advance drill pipe.
 - I.8.2.4.4.2. Excessive deviation from proposed line and grade, as described within this Section.
 - I.8.2.4.4.3. Inability to move pipe through borehole during pullback.
 - I.8.2.4.4.4. Settlement or heave of roadways and structures within 50 feet of the alignment

I.8.3. Shop Drawing Submittals:

Actual catalog data, brochures and descriptive literature will not be required for items of standard usage which meet the requirements of the JEA Water and Wastewater Standards Manual. Any specialty item not shown in this manual will require a complete 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.8.4. Construction Records:

- I.8.4.1. Daily Reports: The Contractor shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to JEA for approval prior to the commencement of drilling operations. Daily reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 30 feet during drilling, pre-reaming, and pullback:
 - I.8.4.1.1. Downhole tools and equipment in use.
 - I.8.4.1.2. Description of ground conditions encountered.
 - I.8.4.1.3. Description of drilling fluid.
 - I.8.4.1.4. Drilling fluid pumping rate.
 - I.8.4.1.5. Maximum and minimum downhole fluid pressures.

- I.8.4.1.6. Drilling head location - at least every 10 feet along the bore path.
 - I.8.4.1.7. Drill stem torque.
 - I.8.4.1.8. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
 - I.8.4.1.9. Details of any unusual conditions or events.
 - I.8.4.2. Production and As-built Drawings: The Contractor shall maintain at the construction site a complete set of field drawings for recording the as-built conditions. The Contractor shall plot as-built conditions on the field drawings, including the location in plan and elevation of the drill string, reaming head, and installed pipe, at the completion of each production shift. The Contractor shall compile and submit as-built data in accordance with JEA Water and Wastewater Standards Section 501. As-builts shall include all bores successful and failed.
 - I.8.4.3. Testing and Quality Control and Assurance Documentation: The Contractor shall maintain records for all testing and quality control and assurance procedures. The following records shall be provided to JEA or JEA's Representative on the day that information is acquired by the Contractor:
 - I.8.4.3.1. Manufacturer's Field Reports.
 - I.8.4.3.2. Test reports.
 - I.8.4.3.3. Fusion reports. For each weld, provide an electronic and printed report of the downloaded information for each weld.
- I.9. NOTIFICATION:
- The JEA representative must be notified 48 hours (minimum) in advance of starting the drilling work. The Directional Bore shall not begin until the proper preparations (see work plan) for the operation have been completed.
- I.10. SITE PREPARATION:
- I.10.1. Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area. One copy of which shall be given to JEA Representative and one copy to remain with Contractor for a period of two (2) years following the completion of the project.
 - I.10.2. Contractor shall coordinate utilities locates with Sunshine State One-Call of Florida, Inc., (#811 or web site www.callsunshine.com). Once the locate service has field marked all utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, phone, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The Contractor shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

- I.10.3. Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.
- I.10.4. Following drilling operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted to 95% of original density (at a minimum).

I.11. ENVIRONMENTAL PROTECTION:

Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Contractor shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

I.12. SAFETY:

Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

I.13. DOMESTIC WATER:

For the supply of domestic water during construction, the contractor shall utilize a JEA meter assembly (meter & backflow device) and pay for all water consumed except in the case where the new water 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.

II. MATERIALS

II.1. HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:

II.1.1. Materials:

Materials used for the manufacturer of high density polyethylene pipe and fittings shall be PE3608 or PE4710 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

II.2. 2" POLYETHYLENE TUBING LINES (LOW PRESSURE WASTEWATER LINES ONLY):

- II.2.1. 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 or IPS SDR-9 and shall be colored black or green. 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 brass fittings (including couplings) is acceptable if not located under the roadway. The use of 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.2.1.1. Nominal size
- II.2.1.2. Pressure rating
- II.2.1.3. NSF seal
- II.2.1.4. Manufacturer's name or trademark
- II.2.1.5. Standard dimension ratio
- II.2.1.6. ASTM specification

II.2.2. Polyethylene Pipe:

HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

II.2.3. Nominal pipe sizes:

Nominal pipe sizes only are indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter. The HDPE pipe size shall be selected (up-sized) to maintain the internal diameter relatively equal to ductile iron sizes.

II.2.4. Service Identification:

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service (pressure service):

- II.2.4.1. Blue – potable water
- II.2.4.2. Green – wastewater or force main
- II.2.4.3. Purple – reclaimed water
- II.2.4.4. Black – raw water

II.2.5. Manufacturer's Quality Control:

The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.

II.2.6. Polyethylene Mechanical Joint (MJ) Adapters:

Mechanical connections of HDPE pipe to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a fusible mechanical joint. Mechanical joint adapter shall be of the same DR rating as the pipe. Provide the mechanical joint adapter, including but not limited to longer tee bolts or all thread rods with nuts at the mechanical joint bell.

II.2.7. Polyethylene service line tubing shall conform to Water and Wastewater Standards, Chapter III. 1. - Section 350.

II.2.8. Service Connections for water and reuse:

Services 2" and smaller shall include a fused saddle with 2" outlet. Brass corporation stop (straight standard pipe thread) and brass bushings shall be used to provide the correct service size. The position of the fused outlet shall be in accordance with water construction detail W-2. Acceptable saddle shall be Frialen VA or VA-TL or JEA approved equal. The contractor shall supply all adapters, and special connections necessary to transition from the service connection to the JEA standard polyethylene service tubing at both ends. Services are to be in accordance with Plates W-1 through W-4, inclusive. Payment for this item shall be included in the unit price bid amount for the water service.

II.3. FUSIBLE PVC PIPE

May be used on potable water, reuse water or wastewater 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, and pulling force are noted in section XI, plate S-21.

II.4. DRILLING FLUIDS SHALL BE BENTONITE SLURRY.

II.5. DELIVERY, STORAGE AND HANDLING OF MATERIALS:

II.5.1. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.

II.5.2. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris.

II.5.3. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.

II.5.4. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry may be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

III. EQUIPMENT REQUIREMENTS

III.1. GENERAL:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to

accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

III.2. DRILLING SYSTEM:

III.2.1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

III.2.2. Drill Head:

The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

III.2.3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

III.2.4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better.

III.3. GUIDANCE SYSTEM:

Magnetic Guidance System (MGS), wireline, wireless, wire line with surface grid verification or gyroscopic shall provide real time electronic data to the inspector on request. All daily data and project data shall be displayed on the "As Built". If deemed necessary, JEA shall at the contractor's expense request a third party to verify the drill path profile and location of the installed line to JEA satisfaction. The guidance system shall be capable of tracking a depth of 40 feet or 20 feet below design bore path whichever is greater and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction) The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

III.3.1. Bore Tracking and Monitoring:

At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length or every twenty-five (25) feet, whichever is most frequent.

III.3.1.1. Downhole and Surface Grid Tracking System:

Contractor shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be

continuously monitored and recorded at least once per drill pipe-length or at twenty-five (25) feet, whichever is more frequent.

- III.3.1.2. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to JEA. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

III.3.1.3. Drilling Fluid Pressures and Flow Rates:

Drilling fluid pressures and flow rates shall be continuously monitored and recorded by the Contractor. The pressures shall be monitored at the pump. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

III.4. DRILLING FLUID (MUD) SYSTEM:

III.4.1. Mixing System:

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

III.4.2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

III.4.3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

III.4.4. Drilling Fluid Viscosity

In the event that inadvertent returns or returns loss of drilling fluid occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify JEA Representative. JEA Representative and Contractor shall discuss additional options and work will then proceed accordingly.

III.4.5. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

III.4.6. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify JEA of any inadvertent returns or spills and immediately contain and clean up the return or spill.

III.5. OTHER EQUIPMENT:**III.5.1. Pipe Rollers:**

Pipe rollers, if utilized, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

III.5.2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of JEA Representative.

III.5.3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the JEA Representative prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the projects.

III.6. DATA LOGGER:**III.6.1. General:**

A data logger shall be used to record and document all butt weld fusion process. The data logger shall be of rugged, handheld computer as the recording device connected to a data collection device. The data collection device shall record the heater temperature and fusion pressure profile over time. All data shall be recorded and transmitted to the handheld computer where the joint report will be stored, viewed, printed, or transferred to a desk top computer for archiving. The operator associated with the fusion process shall utilize the data logger report as one means to confirm a complete and proper weld. This data shall be made immediately available to the JEA representative, upon request, unless approved otherwise by JEA, a written or downloader report for each fusion weld process shall required and submitted to the JEA representative within ten working days

after the fusion weld process for review and approval. If a potential defect fusion weld is suspected by JEA or the contractor, the work shall stop and a mutually acceptable (between the contractor and JEA) corrective action plan shall be executed.

III.6.2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or JEA approved equal.

IV. DRILLING PROCEDURES

IV.1. DRILL PATH:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

IV.2. GUIDANCE SYSTEM:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial and measure drilling fluid discharge rate and pressure. The JEA Representative shall have access to instrumentation and readings at all times during operation.

IV.3. PILOT HOLE:

The pilot hole shall be drilled along the path shown on the plans and profile drawings or as directed by the JEA Representative in the field. Unless approved otherwise by JEA, the pilot-hole tolerances shall be as follows:

IV.3.1. Elevation:

As shown on the plans.

IV.3.2. Alignment:

Five feet inside of right-of-way or easement boundary.

IV.3.3. Curve Radius:

The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by JEA.

IV.3.4. Entry Point Location:

The exact pilot hole entry point shall be within ± 5 feet of the location shown on the drawing or as directed by the JEA Representative in the field.

IV.3.5. Exit Point Location:

The exit point location shall be within ± 5 feet of the location shown on the drawing or as directed by the JEA Representative in the field.

IV.3.6. Limitations on Depth:

If not noted on the plans, 6" HDPE pipe and smaller shall be installed with a depth of 3 to 5 feet and 8" HDPE pipe thru 12" pipe shall be installed with a depth of 3 to 6 feet unless it is required to install the pipe deeper due to utility conflicts. HDPE pipe larger than 12" shall be specifically designed by the engineer and

approved by JEA. Where utilities cross under DOT roads, the depth of cover shall comply with applicable DOT permit.

IV.3.7. Water Main and Non-Water Main Separation Requirements:

The minimum separation requirements between HDPE water main and a non-water main shall be as outlined in specification chapter III. 1. - Section 350 and Detail Nos. W-10 and W-11.

IV.4. **PULL BACK:**

After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

IV.4.1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.

IV.4.2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.

IV.4.3. External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the JEA.

IV.4.4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the JEA Representative. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.

IV.4.5. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify JEA Representative. JEA Representative and Contractor will discuss options and then work will proceed accordingly.

V. PIPE ASSEMBLY

V.1. Pipe shall be welded/fused together in one length, if space permits. Pipe shall have no more than three (3) welds per 20 foot section. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately .10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

V.2. **DAMAGED PIPE:**

Cuts or gouges that reduce the wall thickness by more than 10% is not acceptable and must be cut out and discarded.

V.3. **BUTT FUSION LOG:**

Each butt fusion shall be recorded and logged by an electronic monitoring device (McElroy Datalogger or JEA approved equal is required) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information, in accordance with this specification.

V.4. BUTT FUSION TESTING:

When requested by a JEA inspector, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test coupons shall be cut out. The test shall involve McElroy' "In Field Tensile Tester" which utilizes test coupons (conducted in accordance with manufactures recommendations) or JEA pre-approved test methods and/or manufacturer.

V.5. MECHANICAL JOINING:

Polyethylene pipe and fittings may be joined together or to the materials by means of flanged connections mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

V.6. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION:

Mains shall be constructed of the materials specified and as shown on the drawings. 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 for 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. 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. 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), at a minimum. 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 Section 408 for over excavation, backfill and compaction requirements.

V.7. AIR RELEASE VALVES

Provide air release valve for all wastewater force main installations as indicated on drawings utilizing Robar Stainless Steel 6626 threaded Outlet Sleeve; or JCM 438 all stainless steel threaded outlet tapping sleeve.

VI. 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.

- VI.1.1. New water, wastewater force, and reclaim mains greater than 12" I.D. (with exceptions as deemed necessary by JEA) shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main.
- VI.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.
- VI.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.
- VI.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.
- VI.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.
- VI.1.6. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
- VI.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.
- VI.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.
- VI.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.
 - VI.1.9.1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
 - VI.1.9.2. Swabbing speed shall range between two and five feet per second.
- VI.1.10. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

VII. TESTING**VII.1. DISINFECTION TESTS:**

- VII.1.1. All water pipe and fittings 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 Chapter III. 1. - Section 350. 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).

VII.1.2. Temporary blow-offs shall be installed for the purpose of cleaning the water main. 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.

VII.1.3. 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. Anytime the new line is reopened (to repair defective joints or pipe, defective fitting or valve) the complete disinfection process shall be repeated. Once bacteriological clearance has been received from the regulatory authority, the new main may be pressure tested.

VII.2. PRESSURE AND LEAKAGE TESTS:

VII.2.1. Contractor shall test pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the JEA. All field tests shall be made in the presence of the JEA Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by JEA, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and ductile iron pipe within the test section. If at all possible, the PVC and D.I.P. test sections shall be left exposed during the pressure test for visual leakage observation. 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. The JEA will not be responsible for failure of the pressure test due to the existing valve leaking. JEA may elect to furnish suitable pressure gauges for these tests. If not, the contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, which increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves. All HDD over 100 LF shall be air pressure tested (above ground) @ 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.

VII.2.2. Unless it has already been done, the section to pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. Reclaimed water may be utilized for filling new reclaimed water or wastewater force main installations. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging

them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.

- VII.2.3. Hydrostatic testing shall consist of a 150 psig test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the JEA Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the JEA Representative.
- VII.2.4. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.
- VII.2.5. Initial Phase of Pressure Testing:
First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and D.I.P. test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).
- VII.2.6. Final Phase of Pressure Testing:
The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails (see enclosed JEA test form).

Table 1: Allowable Make Up Amount	
Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

VII.2.7. 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.

VII.2.8. 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.

VII.3. LOCATE WIRE:

Two locate wires shall be provided on all installations. For HDD projects, locate wire shall be 12 AWG high strength copper-clad carbon steel with 45 mils (min) insulation. For open-cut projects, the locate wire construction and testing shall meet the locate wire requirements, as

specified in Chapter III. 1. - Section 350 and Chapter IV.3.-Section 429 [12 gauge, single strand, UF rated, copper-clad steel wire with 30 mil (minimum) insulation]. The external color shall be either blue for water, green for wastewater, purple for reuse, or black for raw water. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". For HDD projects, there is no maximum length or interval between locate wire stations. The testing and report requirements within Chapter III. 1. - Section 350 and Chapter IV.3.-Section 429 shall be required except as modified herein. If both locate wires break or is not continuous (from end to end), the contractor shall, at the contractor's expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 25 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings as specified here-in.

VIII. COMPLIANCE:

- VIII.1. Failure to comply with the JEA Standards herein or failure to verify "As Builts" as required shall result in; the Contractor, Engineer, and Surveyor will be unable to bid future JEA projects and removed from the JEA approved contractor's list for a minimum of twelve months.



RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

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 2 x operating pressure) End: _____ PSI

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

TYPE OF HDPE PIPE (DR RATING) (1)	DIAMETER OF PIPE (INCHES) (2)	LINEAR FEET (3)	2-HOUR TEST FACTOR (see JEA TABLE) (4)	TOTAL ALLOWABLE LEAKAGE (3x4) (5)
Total Allowable Leakage Amount (Gallons):				

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. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

JEA 2-HOUR TEST FACTORS						
NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14" – 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48" – 0.1350	54" – 0.1570	

FILE No. _____

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HORIZONTAL DIRECTIONAL DRILLING – SECTION 755 (LARGE DIAMETER PIPE GREATER THAN 12 INCHES)

I. GENERAL

I.1. SCOPE OF WORK:

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation for pipe larger than 12 inches inside diameter (ID), also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

I.2. QUALITY ASSURANCE:

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit (i.e.: DEP, DOT, Etc.). Adherence to the specifications contained herein, or the JEA Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD contractor shall be responsible for the repair of all damage to private and/or public property (at no expense to JEA). Repair work shall meet all local and state rules and requirements.

I.3. QUALIFICATIONS:

The work specified in this Section requires significant previous experience and expertise in similar work to avoid negative impacts to public safety and the environment. Therefore, the Contractor performing the work shall be qualified, in JEA's judgment, to complete the horizontal directional drilling work specified herein. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JEA, including the following:

- I.3.1. Contractor to have self-performed work comparable in nature to the scope of work required by this project for a minimum of two years.
- I.3.2. Contractor to have successfully self-performed at least (5) horizontal directional drilling projects to install product pipe of a similar nominal diameter and length to the proposed project within the past two years. JEA shall have sole authority to determine the adequacy of representative projects.
- I.3.3. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JEA of the following personnel qualifications:
 - I.3.3.1. The Contractor's project manager, superintendent, drill operator, and guidance system operator assigned to horizontal directional drilling shall be experienced in work of this nature and shall have successfully completed similar projects using horizontal directional drilling. The Contractor shall submit substantiating evidence of

qualifications, in accordance with the provisions of this Section, with the bid submittal documents. Failure to submit the required documentation will cause the Contractor to be declared nonresponsive. If the Contractor elects to employ a specialist subcontractor(s) to perform horizontal directional drilling, the Contractor shall obtain and submit qualification documents for the subcontractor(s). Subcontractor(s) shall be held to the same requirements as those for the Contractor described herein.

I.3.3.2. All drilling, drill guidance, and pipe joining equipment operators shall be experienced in comparable horizontal directional drilling work, and shall have been fully trained in the use of the proposed equipment by an authorized representative of the equipment manufacturer(s) or their authorized training agents.

I.3.3.3. All HDPE-fusion equipment operators shall be qualified to perform pipe joining using the means, methods and equipment employed by the contractor. Fusion equipment operators shall have current, formal training on all fusion equipment employed the project. Training received more than two years prior to operation of the fusion equipment shall not be considered current. The Contractor shall submit written certification of training provided by the fusion equipment manufacturer.

I.4. 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, and 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 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 systems limitations and provide such work or services at no additional cost to JEA.

I.5. 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.

The pipe manufacturer shall provide a warranty to the contractor that the pipe conforms to these specifications and that the pipe shall be free from defects in materials and workmanship for a period of two (2) years from the date of substantial completion of the installation. The manufacturer's warranty shall be in a form acceptable to and for the benefit of JEA and shall be submitted by the contractor as a condition of final payment. The manufacturer's warranty to the contractor shall in no way relieve the contractor from its unconditional warranty to JEA.

The contractor shall warrant to JEA that the methods used on the contract, where covered by patents or license agreements, are furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The contractor shall defend, indemnify, and hold JEA harmless from and against any and all costs, loss, damage or expense arising out of, or in any way connected with, any claim of infringement of patent, trademark, or violation of license agreement.

I.6. REFERENCED STANDARDS:

I.6.1. The work shall conform to applicable provisions of the JEA Water and Wastewater Standards, and the following standards, latest editions, except as modified herein.

I.6.2. American Water Works Association (AWWA) Standards:

AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.
ASTM D638	Standard Test Method for Tensile Properties of Plastics.
ASTM D2122	Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.
ASTM D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
ASTM E3261	Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
ASTM D3350	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
ASTM F412	Standard Terminology Relating to Plastic Piping Systems.
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

I.7. PERMITS:

The Contractor shall verify the existence of all permits before commencing any work on the project.

I.8. SUBMITTALS (HDD PROJECTS ONLY):

I.8.1. Contractor Qualifications:

I.8.1.1. The Contractor shall submit information demonstrating compliance with the Contractor and personnel qualification requirements of this Section. The Contractor shall provide the required qualifications submittals along with the bid.

I.8.1.2. The Contractor shall submit the following information for each referenced project:

- I.8.1.2.1. Name and general description of project.
- I.8.1.2.2. Name, position, address, and telephone number of contact for JEA.
- I.8.1.2.3. Contract start and completion date.
- I.8.1.2.4. Contract type and value.
- I.8.1.2.5. Length and diameter of completed bore(s).
- I.8.1.2.6. Diameter of completed bore(s).
- I.8.1.2.7. Description of pipe(s).
- I.8.1.2.8. Type and manufacturer of drilling and installation equipment used.
- I.8.1.2.9. Ground conditions encountered.
- I.8.1.2.10. If the referenced project is not yet completed, the Contractor shall include:
 - I.8.1.2.10.1. Anticipated completion date.
 - I.8.1.2.10.2. Value of work completed to date and anticipated final contract value.
- I.8.1.3. The Contractor shall submit the following personnel information:
 - I.8.1.3.1. Names and resumes, including specific project experience, for the proposed project manager, superintendent, guidance operator, and drill operator, demonstrating that each meets the requirements of this Section.
 - I.8.1.3.2. Names and qualifications, including specific project experience, for all proposed drilling, drill guidance, and pipe joining equipment operators, including evidence of training in the use of the proposed equipment by an authorized representative of the equipment manufacturer or their qualified agent.

I.8.2. Work Plan:

Prior to beginning work, the Contractor must submit to the JEA Representative a work plan detailing the procedure and schedule to be used to execute the project. Horizontal directional drilling shall not commence until the contractor has received written approval of all work plan submittals from JEA.

- I.8.2.1. Methods: The Contractor shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:
 - I.8.2.1.1. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for preparing as-builts.
 - I.8.2.1.2. Drilling fluid management plan.
 - I.8.2.1.3. Spoils handling and disposal plan.
 - I.8.2.1.4. Pipe storage and handling, addressing: Means and methods for protecting pipe and ensuring temperature control in accordance with the Contractor's installation calculations.

- I.8.2.1.5. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
- I.8.2.1.6. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.
- I.8.2.1.7. Quality control and testing procedures.
- I.8.2.1.8. Safety plan.
- I.8.2.2. Schedule: The Contractor shall provide a schedule for all horizontal directional drilling activities commencing with the site preparation and terminating on completion of testing and final acceptance of the installed pipe. The schedule shall address anticipated subsurface conditions and overall project requirements.
- I.8.2.3. Equipment
 - I.8.2.3.1. The contractor shall provide the make, model, and technical specifications for each of the following:
 - I.8.2.3.1.1. Horizontal directional drill rig.
 - I.8.2.3.1.2. Drilling system components.
 - I.8.2.3.1.3. Downhole drilling assembly and reaming equipment.
 - I.8.2.3.1.4. Downhole pressure sub.
 - I.8.2.3.1.5. Guidance and control system.
 - I.8.2.3.1.6. Pulling head.
 - I.8.2.3.1.7. Swivel.
 - I.8.2.3.1.8. Rollers.
 - I.8.2.3.1.9. Solids separation and drill fluid recirculation systems.
 - I.8.2.3.1.10. Pipe fusion equipment.
 - I.8.2.3.1.11. Pipe fusion data logger.
 - I.8.2.3.1.12. Pipe handling equipment.
 - I.8.2.3.1.13. Pigs and pigging equipment.
 - I.8.2.3.2. The Contractor shall provide the following specific equipment information:
 - I.8.2.3.2.1. Calibration certification for the pilot bore guidance and control system.
 - I.8.2.3.2.2. Calibration certification for the heat fusion datalogger.
- I.8.2.4. Supplemental Work Plan Requirements: The Contractor shall provide the following additional work plan submittals within 30 days of receiving notice to proceed. The submission requirements for additional work plan submittals including number of copies and delivery of submittals shall follow the requirements outlined in the

general requirements. Horizontal directional drilling shall not commence until the Contractor has received written approval of all supplemental work plan submittals.

- I.8.2.4.1. The Contractor shall submit traffic control plans for entry and exit pit sites.
- I.8.2.4.2. Plans for mitigating the potential for inadvertent drilling fluid losses to surface, and for rapidly identifying and cleaning up spills near the investigation borings located along the project alignment. Investigation boreholes along the alignment have been backfilled as reported in the Geotechnical Report. The Contractor's work plans shall address the risk that all investigation boreholes may contribute to the risk of drill fluid loss.
- I.8.2.4.3. Contingency plan for rapidly identifying, locating, and containing any drilling fluid returns.
- I.8.2.4.4. The Contractor shall submit a contingency plan to address procedures to be employed in the event any of the listed items occur.
 - I.8.2.4.4.1. Utility strike, obstruction, or inability to advance drill pipe.
 - I.8.2.4.4.2. Excessive deviation from proposed line and grade, as described within this Section.
 - I.8.2.4.4.3. Inability to move pipe through borehole during pullback.
 - I.8.2.4.4.4. Settlement or heave of roadways and structures within 50 feet of the alignment

I.8.3. Calculations:

The Contractor shall submit final design calculations for JEA's review and approval within 90 days of receiving notice to proceed. Final design calculations shall support the Contractor's specific proposed means, methods, and products. The Contractor's final design calculations shall be prepared and sealed by a Licensed Professional Engineer registered to practice in the State of Florida, and retained by the Contractor. Horizontal directional drilling shall not commence until the Contractor has received written approval of all design calculation submittals from JEA.

At a minimum, design calculations shall demonstrate that the proposed pipe, equipment, and means and methods comply with the requirements of this Section and have been designed based on the design borepath, and installation means and methods, for anticipated installation and handling, hydrostatic, earth, and live loads, installation temperature and site conditions. Design calculations shall address the considerations and guidelines presented in ASTM F1962.

The Contractor shall supply copies of all other calculations required to support the required submittals for horizontal directional drilling. At a minimum, the following calculations should be included:

- I.8.3.1. Maximum allowable pipe loading limits.

- I.8.3.2. Pullback load calculation based upon proposed drill path plan and profile.
- I.8.3.3. Bouyancy effect calculations.
- I.8.3.4. Effects of ballasting plan on pipe pullback forces.
- I.8.3.5. Hydrofracture analysis. This should include a maximum annular pressure curve and the respective formation pressure versus depth based on the proposed drill plan and profile.
- I.8.3.6. Confirmation that design parameters do not exceed predicted installation stresses including factors such as tensile load, buckling and deformation.
- I.8.4. Shop Drawing Submittals:
Actual catalog data, brochures and descriptive literature will not be required for items of standard usage which meet the requirements of the JEA Water and Wastewater Standards Manual. Any specialty item not shown in this manual will require a complete 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.8.5. Construction Records:
 - I.8.5.1. Daily Reports: The Contractor shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to JEA for approval prior to the commencement of drilling operations. Daily reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 30 feet during drilling, pre-reaming, and pullback:
 - I.8.5.1.1. Downhole tools and equipment in use.
 - I.8.5.1.2. Description of ground conditions encountered.
 - I.8.5.1.3. Description of drilling fluid.
 - I.8.5.1.4. Drilling fluid pumping rate.
 - I.8.5.1.5. Maximum and minimum downhole fluid pressures.
 - I.8.5.1.6. Drilling head location - at least every 10 feet along the bore path.
 - I.8.5.1.7. Drill stem torque.
 - I.8.5.1.8. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
 - I.8.5.1.9. Details of any unusual conditions or events.
 - I.8.5.2. Production and As-built Drawings: The Contractor shall maintain at the construction site a complete set of field drawings for recording the as-built conditions. The Contractor shall plot as-built conditions on the field drawings, including the location in plan and elevation of the drill string, reaming head, and installed pipe, at the completion of each production shift. The Contractor shall compile and submit as-built data in accordance with JEA Water and Wastewater Standards Section 501. As-builts shall include all bores successful and failed.
 - I.8.5.3. Testing and Quality Control and Assurance Documentation: The Contractor shall maintain records for all testing and quality control

and assurance procedures. The following records shall be provided to JEA or JEA's Representative on the day that information is acquired by the Contractor:

- I.8.5.3.1. Manufacturer's Field Reports.
- I.8.5.3.2. Test reports.
- I.8.5.3.3. Fusion reports. For each weld, provide an electronic and printed report of the downloaded information for each weld.

I.9. NOTIFICATION:

The JEA representative must be notified 48 hours (minimum) in advance of starting the drilling work. The Directional Bore shall not begin until the proper preparations (see work plan) for the operation have been completed.

I.10. SITE PREPARATION:

- I.10.1. Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area. One copy of which shall be given to JEA Representative and one copy to remain with Contractor for a period of two (2) years following the completion of the project.
- I.10.2. The Contractor shall coordinate utilities locates with Sunshine State One-Call of Florida, Inc., (#811 or web site www.callsunshine.com). Once the locate service has field marked all utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, phone, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The Contractor shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.
- I.10.3. Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.
- I.10.4. Following drilling operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted to 95% of original density (at a minimum).

I.11. ENVIRONMENTAL PROTECTION:

Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Contractor shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

I.12. SAFETY:

Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

I.13. DOMESTIC WATER:

For the supply of domestic water during construction, the contractor shall utilize a JEA meter assembly (meter & backflow device) and pay for all water consumed except in the case where the new water 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.

II. MATERIALS**II.1. HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:****II.1.1. Materials:**

Materials used for the manufacturer of polyethylene pipe and fittings shall be PE3608 or PE4710 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

II.1.2. Polyethylene Pipe

HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

II.1.3. Nominal Pipe Sizes

Nominal pipe sizes only are indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter. The HDPE pipe size shall be selected (up-sized) to maintain the internal diameter relatively equal to ductile iron sizes.

II.1.4. Service Identification:

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service (pressure service):

II.1.4.1. Blue – potable water

II.1.4.2. Green – wastewater or force main

- II.1.4.3. Purple – reclaimed water
 - II.1.4.4. Black – raw water
 - II.1.5. Back-up Rings and Flange Bolts:

Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convuluted style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.
 - II.1.6. Manufacturer's Quality Control:

The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.
 - II.1.7. Polyethylene Mechanical Joint (MJ) Adapters:

Mechanical connections of HDPE pipe to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a fusible mechanical joint adapter with or without an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same DR rating as the pipe. Note that PE flanged adapters may be utilized for pipe sizes 30 inches and larger.
- II.2. DRILLING FLUIDS SHALL BE A BENTONITE SLURRY.
- II.3. DELIVERY, STORAGE AND HANDLING OF MATERIALS:
 - II.3.1. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.
 - II.3.2. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris.
 - II.3.3. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.
 - II.3.4. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry may be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

III. EQUIPMENT REQUIREMENTS

III.1. GENERAL:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to

accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

III.2. DRILLING SYSTEM:

III.2.1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

III.2.2. Drill Head:

The drillhead shall be steerable and shall provide the necessary cutting surfaces and drilling fluid jets.

III.2.3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

III.2.4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better.

III.3. GUIDANCE SYSTEM:

Magnetic Guidance System (MGS) wireline, wireless or gyroscopic shall provide real time electronic data to the inspector on request. All daily data and project data shall be displayed on the "As Built". If deemed necessary, JEA shall at the contractor's expense request a third party to verify the drill path profile and location of the installed line to JEA satisfaction. The guidance system shall be capable of tracking at all depths up to forty feet (40') below the maximum proposed depth and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction) The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

III.3.1. Bore Tracking and Monitoring:

At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length.

III.3.1.1. Downhole and Surface Grid Tracking System:

Contractor shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be

continuously monitored and recorded at least once per drill pipe-length.

- III.3.1.2. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to JEA. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

III.3.1.3. Drilling Fluid Pressures and Flow Rates:

Drilling fluid pressures including drilling fluid pressure in the borehole annular space and flow rates shall be continuously monitored and recorded by the Contractor. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

III.4. DRILLING FLUID (MUD) SYSTEM:

III.4.1. Mixing System:

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

III.4.2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

III.4.3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system or disposed of properly. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, and disposal facilities.

III.4.4. Drilling Fluid Viscosity

In the event that inadvertent returns or returns loss of drilling fluid occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify JEA Representative. JEA Representative and Contractor shall discuss additional options and work will then proceed accordingly.

III.4.5. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

III.4.6. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify JEA of any inadvertent returns or spills and immediately contain and clean up the return or spill.

III.5. OTHER EQUIPMENT:**III.5.1. Pipe Rollers:**

Pipe rollers, if utilized, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

III.5.2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of JEA Representative.

III.5.3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the JEA Representative prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the projects.

III.6. DATA LOGGER:**III.6.1. General:**

A data logger shall be used to record and document all butt weld fusion processes. A record shall be made of every fusion weld made. The data logger shall be of rugged, handheld computer as the recording device connected to a data collection device. The data collection device shall record the heater temperature and fusion pressure profile over time. All data shall be recorded and transmitted to the handheld computer where the joint report will be stored, viewed, printed, or transferred to a desk top computer for archiving. The operator associated with the fusion process shall utilize the data logger report as one means to confirm a complete and proper weld. This data shall be made immediately available to the JEA representative, upon request, unless approved otherwise by JEA, a written or downloader report for each fusion weld process

shall required and submitted to the JEA representative within ten working days after the fusion weld process for review and approval. If a potential defect fusion weld is suspected by JEA or the contractor, the work shall stop and a mutually acceptable (between the contractor and JEA) corrective action plan shall be executed.

III.6.2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or JEA approved equal.

IV. DRILLING PROCEDURES

IV.1. DRILL PATH:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

IV.2. GUIDANCE SYSTEM:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial forces and measure drilling fluid discharge rate and pressure. The JEA Representative shall have access to instrumentation and readings at all times during operation.

IV.3. PILOT HOLE:

The pilot hole shall be drilled along the path shown on the plans and profile drawings. Unless approved otherwise by JEA, the pilot-hole tolerances shall be as follows:

IV.3.1. Elevation:

As shown on the plans.

IV.3.2. Alignment:

5 feet within the right-of-way or easement boundary.

IV.3.3. Curve Radius:

The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by JEA.

IV.3.4. Entry Point Location:

The exact pilot hole entry point shall be within ± 5 feet of the location shown on the drawing without prior JEA written permission for deviation.

IV.3.5. Exit Point Location:

The exit point location shall be within ± 5 feet of the location shown on the drawing without prior JEA written permission for deviation.

IV.3.6. Limitations on Depth:

HDPE pipe larger than bore hole path shall be specifically designed by the engineer and approved by JEA. Where utilities cross under DOT roads, the depth of cover shall comply with applicable DOT permit.

IV.3.7. Water Main and Non-Water Main Separation Requirements:

The minimum separation requirements between HDPE water main and a non-water main shall be as outlined in specification chapter III. 1. - Section 350 and Detail Nos. W-10 and W-11.

IV.4. PULL BACK:

After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and appropriate tools per the contractor's approved work plan. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull force at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

- IV.4.1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.
- IV.4.2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.
- IV.4.3. External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the JEA.
- IV.4.4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the JEA Representative. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.
- IV.4.5. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify JEA Representative. JEA Representative and Contractor will discuss options and then work will proceed accordingly.

V. PIPE ASSEMBLY

- V.1. Pipe shall be welded/fused together in one length, if space permits. Pipe shall have no more than three (3) welds per 20 foot section. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately .10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.
- V.2. **DAMAGED PIPE:**
Cuts or gouges that reduce the wall thickness by more than 10% is not acceptable and must be cut out and discarded.
- V.3. **BUTT FUSION LOG:**
Each butt fusion shall be recorded and logged by an electronic monitoring device (McElroy Datalogger or JEA approved equal is required) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information, in accordance with this specification.

V.4. BUTT FUSION TESTING:

When requested by a JEA inspector, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test coupons shall be cut out. The test shall involve McElroy' "In Field Tensile Tester" which utilizes test coupons (conducted in accordance with manufactures recommendations) or JEA pre-approved test methods and/or manufacturer.

V.5. MECHANICAL JOINING:

Polyethylene pipe and fittings may be joined together or to the materials by means of flanged connections (flange adapters, electrofused couplings, and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

V.6. AIR RELEASE VALVES:

Provide air release valve for all wastewater force main installations as indicated on drawings utilizing Robar Stainless Steel 6626 threaded Outlet Sleeve; or JCM 438 all stainless steel threaded outlet tapping sleeve.

V.7. SPECIAL CONSTRUCTION REQUIREMENTS FOR 24 INCH AND LARGER PIPE:

For HDPE pipe 24 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 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. All spool pieces between 24 inch and larger ductile fittings and valves shall be at least 5 feet long. No joint deflection shall be allowed at the fittings or valves.

V.8. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION:

Mains shall be constructed of the materials specified and as shown on the drawings. 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 for 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. 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. 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), at a minimum. 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 Section 408 for over excavation, backfill and compaction requirements.

VI. 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.

- VI.1.1. All 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..
- VI.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.
- VI.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.
- VI.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.
- VI.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.
- VI.1.6. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
- VI.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.
- VI.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.

- VI.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.
 - VI.1.9.1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
 - VI.1.9.2. Swabbing speed shall range between two and five feet per second.
- VI.1.10. After the swabbing process, pressure testing and disinfection of the pipe shall be completed in accordance with this MANUAL.

VII. TESTING

VII.1. DISINFECTION TESTS:

- VII.1.1. All water pipe and fittings 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 Chapter III. 1. - Section 350. 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).
- VII.1.2. Temporary blow-offs shall be installed for the purpose of cleaning the water main. Blow-offs installed on water mains up to and including 12 inches shall be the same diameter as the water main. 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.
- VII.1.3. 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. Anytime the new line is reopened (to repair defective joints or pipe, defective fitting or valve) the complete disinfection process shall be repeated. Once bacteriological clearance has been received from the regulatory authority, the new main may be pressure tested.

VII.2. PRESSURE AND LEAKAGE TESTS:

- VII.2.1. Contractor shall test pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the JEA. All field tests shall be made in the presence of the JEA Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by JEA, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line

section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and ductile iron pipe within the test section. If at all possible, the PVC and D.I.P. test sections shall be left exposed during the pressure test for visual leakage observation. 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. The JEA will not be responsible for failure of the pressure test due to the existing valve leaking. JEA may elect to furnish suitable pressure gauges for these tests. If not, the contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, which increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves. All HDD over 100 LF shall be air pressure tested (above ground) @ 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.

- VII.2.2. Unless it has already been done, the section to pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. Reclaimed water may be utilized for filling new reclaimed water or wastewater force main installations. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.
- VII.2.3. For mains larger than 20-inch size, the contractor shall 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.
- VII.2.4. Hydrostatic testing shall consist of a 150 psig test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the JEA Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the JEA Representative.
- VII.2.5. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.
- VII.2.6. Initial Phase of Pressure Testing:
First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and D.I.P. test sections shall be left exposed for visual leak inspection.

Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).

VII.2.7. Final Phase of Pressure Testing:

The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails (see enclosed JEA test form).

Table 1: Allowable Make Up Amount

Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

VII.2.8. 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.

VII.2.9. 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.

VII.3. LOCATE WIRE:

Two locate wires shall be provided on all installations. For HDD projects, locate wire shall be 12 AWG high strength copper-clad carbon steel with 45 mils (min) insulation. For open-cut projects, the locate wire construction and testing shall meet the locate wire requirements, as

specified in Chapter III. 1. - Section 350 and Chapter IV.3.-Section 429 [12 gauge, single strand, UF rated, copper-clad steel wire with 30 mil (minimum) insulation]. The external color shall be either blue for water, green for wastewater, purple for reuse, or black for raw water. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". For HDD projects, there is no maximum length or interval between locate wire stations. The testing and report requirements within Chapter III. 1. - Section 350 and Chapter IV.3.-Section 429 shall be required except as modified herein. If both locate wires break or is not continuous (from end to end), the contractor shall, at the contractor's expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 25 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings as specified here-in.

VIII. COMPLIANCE:

- VIII.1. Failure to comply with the JEA Standards herein or failure to verify "As Builts" as required shall result in; the Contractor, Engineer, and Surveyor will be unable to bid future JEA projects and removed from the JEA approved contractor's list for a minimum of twelve months.
- VIII.2. Failure to comply with the JEA Standards herein or failure to verify "As Builts" as required shall result in; the HDD Contractor shall be unable to bid future JEA projects and removed from the JEA approved contractor's list for a minimum of twelve months.



RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

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 2 x operating pressure) End: _____ PSI

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

TYPE OF HDPE PIPE (DR RATING) (1)	DIAMETER OF PIPE (INCHES) (2)	LINEAR FEET (3)	2-HOUR TEST FACTOR (see JEA TABLE) (4)	TOTAL ALLOWABLE LEAKAGE (3x4) (5)
Total Allowable Leakage Amount (Gallons):				

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. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

JEA 2-HOUR TEST FACTORS						
NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14" – 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48" – 0.1350	54" – 0.1570	

FILE No. _____

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MEASUREMENT AND PAYMENT – SECTION 801

I. GENERAL

The quantities of the Contract Unit Price Items will be measured for payment in accordance with the provisions contained herein and verified by a representative of JEA.

II. SITE PREPARATION, CLEAN UP AND RESTORATION – CHAPTER II. 1. - SECTION 406

No separate payment shall be made for the work covered under this section excluding installation of sodding, sprigging and seeding; and excluding removal and installation of concrete and asphalt work. Payment for the remaining work of this section shall be merged with the items for which the site preparation, clean up and restoration is required. Installation of sodding, sprigging and seeding; and removal and installation of concrete and asphalt work shall be paid as separate pay items, unless indicated otherwise in the Contract Documents or within the payment descriptions below. No payment will be made for clean up and restoration required due to other disturbance by the Contractor beyond local industry standards for the type of work required.

III. DEMOLITION AND ABANDONMENT – CHAPTER II. 2. - SECTION 407

III.1. STRUCTURES:

III.1.1. Abandonment of Structure:

Payment for abandonment of a structure, as specified, shall be at the lump sum unit price set forth in the Contract Documents and shall include all demolition; A-3 soil fill replacement for voids and unsuitable material; removal of grassing; excavating; backfilling; compacting; sealing any and all pipes leading into and out of the structure; placing and removing all traffic signs and barriers; maintaining traffic; transporting and disposal, as required, for a finished abandonment. Payment shall be made for each structure actually abandoned.

III.1.2. Removal of Structure:

Payment for removal of a structure, as specified, shall be at the lump sum unit price set forth in the Contract Documents and shall include all demolition; A-3 soil fill replacement for voids and unsuitable material; removal of grassing; excavating; backfilling; compacting; sealing any and all pipes leading into and out of the structure; placing and removing all traffic signs and barriers; maintaining traffic; transporting and disposal, as required, for complete removal and disposal. Payment shall be made for each structure actually removed.

III.2. PIPING:

III.2.1. Abandonment of Piping by Sealing:

Payment for excavating and sealing ends of abandoned pipe will be at the unit price set forth in the Contract Documents for each concrete seal actually installed as indicated on the drawings or as directed by the Engineer. Payment shall be full compensation for removal of grassing; excavating; sealing; grout/mortar and brick; placing and removing all traffic signs and barriers; maintaining traffic; backfilling and compacting, as required, for a complete abandonment.

III.2.2. Abandonment of Piping by Plugging:

Payment for excavating and plugging ends of abandoned pipe and associated active mains with a plugged fitting will be at the unit price set forth in the Contract Documents for each plug actually installed as indicated on the drawings or as directed by the Engineer. Payment shall be full compensation for removal of grassing; excavating; plugging; placing and removing all traffic signs and barriers; maintaining traffic, backfilling and compacting, as required, for a complete abandonment. The cost associated with valve box and cover abandonment (for grass areas – removal and disposal of B&C and A-3 soil backfill of the box void areas; removal and disposal of any large (over 300 gallons) volume of sewage in wastewaters or force mains, for paved areas – removal and disposal of cover and grout filling valve box) will not be paid for separately but shall be included in the cost of the associated main to be abandoned.

III.2.3. Abandonment of Piping by Grout Filling:

Payment for excavating and grout filling abandoned mains shall be at the per linear foot unit price as set forth in the Contract Documents. Payment for grout filling wastewater laterals shall be included in the per foot price of grout filling gravity wastewater main. Payment will be compensation in full for removal of grassing; excavating as required; grout; grout filling; backfilling and compacting; placing and removing all traffic signs and barriers; maintaining traffic; as required, for a complete abandonment. The cost associated with valve box and cover abandonment (for grass areas – removal, and disposal of B&C and A-3 soil backfill of the box void areas; removal and disposal of any large (over 300 gallons) volume of sewage in wastewaters or force mains, for paved areas – removal and disposal of cover and grout filling valve box) will not be paid for separately but shall be included in the cost of the associated main to be abandoned.

III.2.4. Removing Pipe below Grade:

Payment for removing pipe (including asbestos pipe) below grade shall be at the linear foot unit price as set forth in the Contract Documents for each linear foot of pipe actually removed. Payment will be compensation in full for removal of grassing; excavating; removal of piping; transporting and disposal of the pipe and appurtenances; (including asbestos pipe if noted on the drawings), placing and removing all traffic signs and barriers; maintaining traffic, A-3 soil fill replacement; backfill and compacting as required.

III.2.5. Removing Pipe above Grade:

Payment for removing pipe (including asbestos pipe) above grade shall be at the linear foot unit price as set forth in the Contract Documents for each linear foot of pipe actually removed. Payment will be compensation in full for excavating as required; removal of piping; transporting and disposal of pipe and appurtenances; placing and removing all traffic signs and barriers, maintaining traffic; backfilling and compacting.

III.3. REMOVAL OF EQUIPMENT:

Payment for removal of equipment shall be the lump sum unit price as established in the Contract Documents and shall include complete removal, transporting and disposal of the equipment as directed by the Engineer.

IV. EXCAVATION AND EARTHWORK – CHAPTER II. 3. - SECTION 408

- IV.1. Except as noted, no payment will be made for the work specified in Chapter II.3. - Section 408 (excluding non-native fill) above the proposed pipe invert or structure outside bottom. The cost thereof is included in the unit or lump sum price set forth in the contract for the items to which the excavation and backfill is incidental or appurtenant.
- IV.2. Granular material, when authorized for use as backfill or bedding material, used at the Contractor's convenience instead of A-3 soil, shall be paid for at the unit price set forth in the Contract for AASHTO Class A-3 soil. Granular material used shall be measured in cubic yards, compacted in place, and as specified hereinafter.
- IV.3. Granular material used to backfill unauthorized excavation or for any temporary drainage proposed shall not be measured for payment.
- IV.4. The unit price per cubic yard as set forth in the Contract for AASHTO Class A-3 soil used as backfill shall constitute full compensation for removal from the job site and disposal of all unsuitable material and furnishing, placing and compacting backfill as specified herein. The cost of excavation of unsuitable backfill and de-watering shall be included with the regular cost of pipe installation.
- IV.5. The quantity of granular material and AASHTO A-3 soil (required by JEA) used for backfill (including bedding) below and/or above the normal grade measured for payment shall be the same as the number of cubic yards of unsuitable material ordered removed. Computation shall be based on applicable trench sections as specified below. Length shall be equal to the horizontal distance between vertical planes representing the average ends of the granular materials as placed in the trench, or to pay line limits of an intermediate structure as shown on the Contract Drawings or as required and to a depth equal to the average depth of the unsuitable material removed. Computation shall be based on computed volume of unsuitable material ordered removed, less the volume associated with any utility mains over 12 inch diameter. Native material suitable for use as backfill shall be separated from unsuitable material and stockpiled for use on the Project. No measurement for payment will be made outside of the pay line width. Actual trench dimensions less than defined as maximum herein, shall be used when applicable. Unless approved otherwise by JEA, the quantity calculation for granular material and A-3 soil utilized for the roadway construction (sub-base, and base) shall be excluded (temporary and/or permanent use) from this pay item.
 - IV.5.1. For excavations 5 feet or less in depth and pipe diameters of 4 inch and greater shall be based on vertical side walls, maximum trench width of 3 feet for pipe diameters up to 12 inch. For pipe diameters larger than 12 inches, trench width shall be the pipe diameter plus 2 feet, in 6 inch increments. Trench width for pipe diameters smaller than 4 inch shall be 2 feet with vertical side walls.
 - IV.5.2. Excavations greater than 5 feet in depth, where no trench box or other protection is used, shall be based on trench bottom width equal to the pipe diameter plus 2 feet, in 6 inch increments, minimum width shall be 3 feet. Trench side walls shall be vertical from the trench bottom to a height of 5 feet. Remaining trench wall shall be sloped to grade 1 to 1.5, vertical to horizontal.
 - IV.5.3. Excavations greater than 5 feet in depth and utilizing a trench box shall have a maximum trench box width of 8 feet. Trench side walls shall be vertical from the trench bottom to a height of 5 feet, or top of trench box, whichever is greater. The remaining trench wall shall be sloped to a grade of 1 to 1.5, vertical to horizontal.

- IV.5.4. When roadway replacement is indicated, unsuitable fill material replacement measurement for roadway bedding shall be made for a cross section 2 feet below the sub-grade and extending to 1 foot beyond outside edge of pavement or curbing. Applicable trench section widths, as specified herein, shall be measured below the roadway bedding.
- IV.5.5. Maximum measurement for unsuitable fill material disposal and replacement for structures shall be based on an excavation extending 3 feet from the outside wall or bottom slab projection of the structure. Unprotected excavation walls shall be vertical from the bottom of the structure to a height of 5 feet. Remaining trench wall shall be sloped to grade 1 to 1.5, vertical to horizontal.
- IV.6. No measurement or payment shall be made for steel sheeting driven and pulled, or cut off and left in place (for contractor's convenience) to all depths. The cost shall be merged with the cost of the items to which the sheeting is incidental or appurtenant.
- IV.7. The cost of trench boxes shall be merged with the cost of the items to which the boxes are incidental or appurtenant.
- IV.8. FLOWABLE FILL:
Flowable fill in accordance with FDOT Index 307 shall be used as backfill as noted on the drawings or in accordance to FDOT permit conditions, and shall be paid for at the unit price allowed in the bid form for flowable fill. Flowable fill shall be measured in cubic yards. Flowable fill used to backfill in areas unauthorized by JEA shall not be measured for payment. The unit price per cubic yard as allowed in the bid form for flowable fill used as backfill shall constitute full compensation for removal and disposal of material from the project site, and includes furnishing and installing flowable fill, complete with temporary backfill and steel plates covering the trench. The maximum quantity of flowable fill used for backfill for utilities shall be computed based on the limits as shown on the drawings or, if no limits noted, on the trench configuration outlined in Chapter VII. - Section 801 (above), Item 4.5, less the volume associated with any utility mains.

V. NONFERROUS METALWORK – CHAPTER II. 4. - SECTION 436

No separate payment will be made for any work covered under Chapter II. 4. - Section 436, but the Contract Agreement lump sum price shall include full compensation for all labor, materials and equipment required under Chapter II. 4. - Section 436.

VI. CONCRETE WORK – CHAPTER II. 5. - SECTION 437**VI.1. PIPE ENCASEMENT:**

Measurement of concrete used for pipe encasement shall be by the linear foot of encasement. Minimum encasement shall be at the following stated rates.

Pipe Size	Amount of Concrete Per Linear Foot	Concrete Dimensions Ft X Ft.
6 inch	2.3 cubic feet.	1.58' x 1.58' (1'-7")
8 inch	2.7 cubic feet.	1.75' x 1.75' (1'-9")
10 inch	3.1 cubic feet.	1.91' x 1.91' (1'-11")
12 inch	3.5 cubic feet.	2.07' x 2.07' (2'-1")
14 inch	3.9 cubic feet.	2.23' x 2.23' (2'-3")
15 inch	4.4 cubic feet.	2.37' x 2.37' (2'-4")
18 inch	5.0 cubic feet.	2.60' x 2.60' (2'-7")
21 inch	6.1 cubic feet.	2.92' x 2.92' (2'-11")
24 inch	7.5 cubic feet.	3.26' x 3.26' (3'-3")
36 inch	10.6 cubic feet.	4.20' x 4.20' (4'-2")
42 inch	12.6 cubic feet.	4.71' x 4.71' (4'-9")

Payment for pipe encasement shall be at the unit price stated in the contract. The unit price shall constitute full compensation for furnishing and placing the concrete, forming, vibrating and placing and removing all traffic signs and barriers, and maintaining traffic.

VI.2. OTHER CONCRETE:

Payment for other concrete shall be included in the Contract Price for the item in which it is used such as drop connections and service connections. Payment for concrete driveways, sidewalks and curbs shall be as outlined in Chapter II. 9. - Section 491- Sidewalk, Driveway and Curbing.

VII. GENERAL EQUIPMENT REQUIREMENTS – CHAPTER II. 6. - SECTION 439

No additional compensation shall be provided for the items specified in Section 439. Payment shall be included with the item to which Chapter IV. 3. - Section 439 applies.

VIII. GRASSING – SECTION CHAPTER II. 7. - 441

The unit price per square yard as set forth in the Contract for sodding, sprigging or seeding and mulching shall constitute full compensation for furnishing and installing, fertilizing and maintaining, the sodding, sprigging or seeding and mulching. If a planted area must be replanted due to the Contractor's negligence, excessive amount of damage for type of construction, or failure to provide routine maintenance of the area, such replacement shall be at the Contractor's expense.

IX. PAVING – CHAPTER II. 8. - SECTION 490

Costs incurred by the Contractor to provide new signage (where noted on the plans) and replacement of pavement markers, and removal and replacement of existing signage as noted on the plans shall not be paid for separately but shall be merged with the cost of furnishing and installing new road construction. Signage damaged by the Contractor shall be replaced at the Contractor's expense. All signage and pavement markers shall be in accordance with the drawings and City Traffic Engineer's requirements.

Measurement and payment for projects with paving for dedication to the City of Jacksonville not under contract with JEA shall be in accordance with the City of Jacksonville Standard Specifications

and Details. Measurement and payment for projects with paving to be paid for under contract with JEA shall be as follows: (See Standards Manual for continuation).

IX.1. REMOVAL OF PAVING:

Payment for the removal of paving shall be at the square yard unit price set forth in the Contract Documents for complete removal and disposal of paving including placing and removing all traffic signs and barriers and maintaining traffic. Payment for paving removal shall be the actual square yards of paving removed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork.

IX.2. PAVING REPAIR - CROSS CUTS AND PATCHES:

Cross cuts and patches shall be measured and paid in two separate pay items. The first pay item shall include the sub-base, base course and asphalt for the roadway repair and shall be measured in square yards with a maximum being the trench width described in Chapter II. 3. - Section 408 - Excavation and Earthwork as detailed in the applicable City of Jacksonville Standard Case Detail. Payment shall be for the actual square yards of sub-base/base course/asphalt combination installed and shall include the construction of new or reworked sub-base, new or reworked base course and new asphalt including placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; temporary striping and furnishing all labor, material and equipment. The asphalt overlay shall be a separate pay item measured in square yards and payment shall be full compensation for the asphalt overlay including striping; placing and removing all traffic signs and barriers; maintaining traffic; cleaning up the site and furnishing all labor, material and equipment. Required thickness of sub-grade, base and asphalt and extent of overlay required shall be as detailed or called for on the Contract Documents or drawings.

IX.3. PAVING REPLACEMENT - NEW ROAD CONSTRUCTION:

Payment for entire roadway replacement shall be broken into 3 parts. Payment shall be made for the actual square yards of sub-base and the actual square yards of base course installed and shall be full compensation for preparation and installation of the new or reworked stabilized sub-base or base course including excavation; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site and furnishing all labor, material and equipment. Payment shall be made for the actual square yards of asphalt installed and shall be full compensation for the asphalt paving installed complete including striping; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site and furnishing all labor, material and equipment. Required thickness of sub-grade, base and asphalt shall be as detailed or called for on the contract documents or drawings.

IX.4. PAVING REPLACEMENT – NEW ROAD CONSTRUCTION INCLUDING REGRADING SWALES:

Payment for entire roadway replacement shall be broken into 3 parts. Payment shall be made for the actual square yards of sub-base and the actual square yards of base course installed and shall be full compensation for preparation and installation of the new or reworked stabilized sub-base or base course including excavation; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site and furnishing all labor, material and equipment. All existing swales/ditches shall be regraded to match (new and existing) storm pipe inverts. No separate payment shall be made for regrading and disposing of debris, but shall be included in the unit price for sub-base construction. Payment shall be made for the actual square yards of asphalt installed and shall be full compensation for the asphalt paving installed complete including striping; placing and removing all traffic signs and

barriers and maintaining traffic; cleaning up the site and furnishing all labor, material and equipment. Required thickness of sub-grade, base and asphalt shall be as detailed or called for on the contract documents or drawings.

IX.5. EXISTING PAVEMENT – ASPHALT OVERLAY:

Measurement shall be made for the actual square yards of asphalt overlay installed (minimum of 1 inch final overlay thickness). Payment shall be made for the actual square yards of asphalt installed and shall be full compensation for the asphalt paving installed complete including all temporary and permanent pavement markings; placing and removing all traffic signs and barriers; maintenance of traffic (MOT); cleaning up the site and furnish all labor, material and equipment. Required thickness of asphalt shall be 1-inch final overlay thickness (minimum) unless noted otherwise on the contract documents or drawings.

IX.6. EXISTING PAVEMENT – MILLING AND RESURFACING:

Milling and resurfacing of asphalt surfaces shall be performed with prior approval of JEA, and in accordance with the JEA Standards or the Florida Department of Transportation Standard Specifications and Details. Measurement shall be the amount of square yards to be milled and resurfaced within the limits shown on the drawings. Payment shall be for the actual number of square yards of asphalt surface that is milled and replaced with new asphalt mix (1 inch minimum thickness) including all temporary and permanent pavement markings (MOT), markers, signing, delineators, buttons, stripe, placing and removing all traffic signs and barriers, maintenance of traffic, clean up at the site and furnishing all labor, material and equipment.

IX.7. TRAFFIC LOOPS:

Traffic loops shall be paid per loop. Payment shall be for the actual number of loops, including leaders as far back as necessary, installed, including furnishing and installing all labor materials, tools, and equipment plus all incidental work required to complete the item.

X. SIDEWALK, DRIVEWAY, CURB AND GUTTER – CHAPTER II. 9. - SECTION 491

X.1. REMOVAL OF SIDEWALK:

Payment for the removal of sidewalk shall be at the square yard unit price set forth in the Contract Documents and shall include and be full compensation for complete removal and disposal of sidewalk, including handicap ramps, placing and removing all traffic signs and barriers and maintaining traffic. Payment for sidewalk removal shall be the actual square yards of sidewalk removed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise.

X.2. REMOVAL OF DRIVEWAY:

Payment for the removal of driveway shall be at the square yard unit price set forth in the Contract Documents for either asphalt or concrete driveway removal. Payment shall include and be full compensation for complete removal and disposal of driveway including placing and removing all traffic signs and barriers and maintaining traffic. Payment for driveway removal shall be the actual square yards of driveway removed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise.

X.3. REMOVAL OF CURB AND GUTTER:

Payment for the removal of curb and gutter shall be at the linear foot unit price set forth in the Contract Documents and shall include and be full compensation for complete removal and disposal of curb and gutter including placing and removing all traffic signs and barriers and maintaining traffic. Payment for curb and gutter removal shall be the actual linear feet of curb and gutter removed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise.

X.4. INSTALLATION OF SIDEWALK:

Payment for the installation of sidewalk (including handicap ramps) shall be at the square yard unit price set forth in the Contract Documents and shall include preparation and construction of new sidewalk including forming and vibrating (if required), placing and removing all traffic signs and barriers and maintaining traffic. Payment for the sidewalk shall be the actual square yards of sidewalk installed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise. Sidewalk installation shall include handicap ramps. No separate pay item for construction of handicap ramps. No payment shall be made for sidewalk through concrete driveways.

X.5. INSTALLATION OF DRIVEWAYS:

Payment for the installation of driveways shall be at the square yard unit price set forth in the contract documents for the type of driveway to be installed. If directed by JEA, the contractor shall furnish and install a concrete apron for all existing dirt and aggregate driveways. Payment shall include preparation and construction of driveway including forming and vibrating (if required), placing and removing all traffic signs and barriers and maintaining traffic. Payment for driveway shall be the actual square yards of each type of driveway installed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise or as directed by JEA.

X.6. INSTALLATION OF CURB AND GUTTER:

Payment for the installation of curb and gutter shall be at the linear foot unit price set forth in the contract documents for the type of curb and gutter to be installed. Payment shall include preparation and construction of curb and gutter including forming and vibrating (if required), placing and removing all traffic signs and barriers and maintaining traffic. Payment for curb and gutter shall be the actual linear feet of each type of curb and gutter installed with a maximum corresponding to the pay line trench widths in Chapter II. 3. - Section 408 – Excavation and Earthwork, or to nearest construction joint unless indicated otherwise.

XI. FENCING – CHAPTER II. 10. - SECTION 492

Measurement and payment for projects with fencing for dedication to the City of Jacksonville, not under contract with the JEA, shall be in accordance with the City of Jacksonville Standard Specifications and Details. Measurement and payment for projects with fencing to be paid for under contract with the JEA shall be as follows: Payment shall include removal and disposal of existing fencing system (if applicable); the furnishing, preparation and installation of new fence and gates as required in the Contract Documents. Payment for fencing shall be the actual linear feet of each size and type of fencing installed as indicated on the Contract Documents. Payments for gates shall be at the unit price for each size and type actually installed as indicated on the Contract Documents.

XII. DRAINAGE – CHAPTER II. 11. - SECTION 493

Measurement and payment for projects with drainage improvements for dedication to the City of Jacksonville, not under contract with the JEA, shall be in accordance with the City of Jacksonville Standard Specifications and Details. Measurement and payment for projects with drainage to be paid for under contract with the JEA shall be as follows:

XII.1. INSTALLATION OF DRAINAGE PIPE:

The quantity to be paid for will be the length in linear feet of each size of drainage pipe actually laid. Measurement for drainage pipe installed shall be the actual length of pipe installed, excluding pipe in structures, measured along the horizontal projection of the center line of pipe. Payment for the work will be at the Contract Unit Price and shall be full compensation for the item of work completed, including removal of grassing; excavation; de-watering; native soil backfilling; laying pipe; installing filter fabric at joints; furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all material, labor, tools, and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents. Payment for extra base material (limerock) required in accordance with City of Jacksonville Standard Plate-804 will not be paid for separately, but will be merged with the costs of associated drainage pipe to be provided. No separate payment shall be made for standard connection to existing drainage pipe/structure, but shall be considered incidental and all costs for connecting to existing drainage pipe structure shall be merged with the associated line item on the Bid Form.

XII.2. INSTALLATION OF STRUCTURES:

The quantity to be paid for will be the number of drainage structures actually installed. Payment for the work will be at the Contract Unit Price shown for each respective item and shall be full compensation for the item of work completed, including removal of grassing; excavation; de-watering; native soil backfilling; installing structure; furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers, and maintaining traffic; cleaning up the site; furnishing all material, labor, tools and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents.

XII.3. INSTALLATION OF UNDERDRAIN TRENCH:

Furnishing and installing underdrain: The quantity to be paid for will be the actual linear feet of underdrain trench installed. Measurement shall be made along the horizontal projection of the centerline of pipe. Payment for the Work will be at the Contract Unit Price and shall be full compensation for the item of work completed; including removal of grassing; excavation; de-watering; native soil backfilling; furnishing and installing pipe, filter material (rock and filter fabric), filter media, including all necessary fittings; furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavation in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic (MOT); cleaning up the site; furnishing all material, labor, tools, and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents.

XII.4. INSTALLATION OF UNDERDRAIN TRENCH CLEANOUT:

Furnishing and installing underdrain cleanout: The quantity to be paid for will be the actual number of cleanouts installed. Measurement shall be made for each cleanout. Payment for the Work will be at the Contract Unit Price and shall be full compensation for the item of work completed; including removal of grassing; excavation; de-watering; native soil backfilling; furnishing and installing cleanout; connection to underdrain piping including all necessary fittings; furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavation in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all material, labor, tools, and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract documents.

XIII. POTABLE WATER PIPING – CHAPTER III. 1. - SECTION 350**XIII.1. FURNISHING AND INSTALLING PIPELINE:**

The quantity to be paid for will be the actual number of linear feet of each size, class and type of pipe actually installed. Measurement shall be made along the horizontal projection of the center line of pipe. No deduction in length will be made for the space occupied by valves or fittings. Payment for the work will be at the Contract Unit Price shown for each respective item and shall be full compensation for the item of work completed, including all required removal of grassing; excavation; de-watering; native soil backfilling; laying and jointing pipe; pressure and leakage testing; swabbing, flushing and disinfecting; de-chlorination (if required); furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing and installing locate wiring, locate wire test stations, locate wire-related appurtenances and locate wire testing; furnishing all material, labor, tools, and equipment; as-builts; and all incidental and related work required to complete the work of the item. No additional payment shall be made for vertical deflection of the proposed pipeline to accommodate the vertical installation (minimum required cover) of the gate valves, but all costs shall be merged with the associated line item in the Bid Form. Cost incurred by the Contractor to provide 2 inch fittings associated with the pipe work shall not be paid for separately, but shall be included in the cost of furnishing and installing the 2 inch water main. Should JEA elect the swabbing of mains sized 12 and smaller, the work shall be performed by the Contractor via a Supplemental Work Authorization (SWA). No separate payment shall be made for swabbing of mains larger than 12 inches diameter.

XIII.2. FURNISHING AND INSTALLING FITTINGS:

The quantity to be paid for will be the actual number of fittings furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing fittings and mechanical restraints at fitting joints, complete with all necessary incidental work required to complete the work and all materials, labor, tools and equipment.

XIII.3. FURNISHING AND INSTALLING CASING:

The quantity to be paid for will be the actual number of linear feet of each size casing and method of installation actually installed. Measurement shall be made along the horizontal projection of the center line of the casing. Payment for the work will be made at the Contract

Unit Price and shall be full compensation for the items of work, complete, including casing pipe; casing spacers; pipe joint restraints and total restraining system required on the carrier pipe (water main); locate wiring; excavation; de-watering; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; and all incidental work required to complete the work including all materials, labor, tools and equipment.

XIII.4. FURNISHING AND INSTALLING POLYETHYLENE WRAP:

The quantity to be paid for will be in linear feet of polyethylene wrap actually installed. Measurement shall be made along the horizontal projection of the center line of the pipe being wrapped including fittings and valves. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including all incidental work required to complete the work and all materials, labor, tools and equipment.

XIII.5. FURNISHING AND INSTALLING PIPE SUPPORTS:

The quantity to be paid for will be the actual number of supports furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including furnishing and installing supports and all incidental work required to complete the work and all materials, labor, tools and equipment.

XIII.6. FURNISHING AND INSTALLING PIPE BELL RESTRAINT:

The quantity to be paid for will be the actual number of bell restraints or D.I.P. joint restraint gaskets (or JEA approved restraint device from pipe manufacturer) installed with the maximum required to be installed as indicated in the counted in full 20 foot segments extending from the fitting or for carrier piping bell restraints as required. Payment for the work shall be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing the bell restraint, complete or D.I.P. joint restraint, with all necessary incidental work required, including all materials, labor and equipment. No payment will be made for thrust restraints used for the Contractor's convenience in addition to the bell restraints called for in the Restraint Joint Schedule.

XIII.6.1. SPLIT RING PIPE BELL RESTRAINTS - (Existing Mains)

The quantity to be paid for will be the actual number of each size split ring pipe bell restraints required to be installed, in accordance with Restraint Joint Schedules, Plate W-31A (PVC pipe) and W-31B (DIP pipe), as applicable. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing the split ring pipe bell restraints at locations along the existing mains; all required removal of grassing; excavation; de-watering; native soil backfilling; locating the existing pipe bells, etc.; furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all material, labor, tools, and equipment; as-builts; and all incidental and related work required to complete the work of the item with all necessary incidental work required, including all materials, labor and equipment. No payment will be made for thrust restraints used for the Contractor's convenience in addition to the bell restraints called for in the Restraint Joint Schedule.

XIII.7. FURNISHING AND INSTALLING THRUST COLLAR:

If thrust collar (dead man) is used instead of bell restraints or tie rods to length indicated on the Restraint Joint Schedule on dead end lines, payment shall be for each thrust collar installed (by size of pipe).

XIII.8. FURNISHING AND INSTALLING NEW WATER SERVICES:

The quantity to be paid will be the actual number of services connections installed as detailed on Plate W-1, W-2 and W-5. Payment for the work will be made at the contract unit price for each size of long or short side service type and shall be full compensation for the items of work including furnishing and installing the service piping; connection to water main and plugging to new service termination in meter box; corporation stop (standard or HDPE type); curb stop; locate wiring; boring (if required); flushing and disinfection; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing a steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment and all incidental and related work to complete the item. Payment for a "double 1 inch water service" shall include 1-1/2 inch connections to main, 1-1/2 inch poly pipe, Y-fitting, 1 inch poly to meter boxes, two curb stops, other items as listed above to complete the water service installation to two customers (excluding meter boxes). Payment for a "Gang water service for 3 services" and a "Gang water service for 4 services" shall be based upon a unit price each and include 2" saddle, 2" poly tubing, multi-Y with pack joint couplings, 1" poly line to all associated meter boxes, all curb stops and other items as listed above to complete the water service installation to 3 or 4 customers (excluding meter boxes).

XIII.9. REPLACEMENT/RELOCATION RESIDENTIAL WATER SERVICES:

The quantity to be paid for will be the actual number of each size service replaced. Payment for the work will be made at the Contract Unit Price for each size of long, short type or double 1 inch service (including poly pipe to two meter boxes and associated curb stops and shall be full compensation for the items of work including furnishing and installing service piping; connection to water main; relocating existing meter and meter box at the right-of way(as detailed on Plate W-1); connection to existing private house service piping; corporation stop (standard or HDPE type), curb stop, and service fittings; meter couplings; removal of old service piping (if applicable); cutting and threading existing pipe; all necessary jointing; removing, adjusting and resetting existing meter and meter boxes; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; locate wiring; boring (if required); flushing and disinfection, protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item.

XIII.9.1. EXISTING RESIDENTIAL WATER METER ASSEMBLY ADJUSTMENT (RAISE):

Where the existing grade elevation at the water meter assembly is being raised, the Contractor shall adjust the existing water meter assembly by installing a meter adjustment – resetter. The resetter shall not exceed 12 inches in height; existing service shall not exceed 24 inches in depth from finish grade. Resetters shall not be placed in concrete or drive ways. The quantity to be paid for will be

the actual number of water meter assemblies adjusted. Payment for the work will be made at the Contract Unit Price for each size of water meter assembly adjusted and shall be full compensation for the items of work including furnishing and installing meter adjustment – resetter (Ford 40 series resetter model number VB-41 through 44, 7W through 12W) (height as required not to exceed 12 inches); and miscellaneous service connection fittings/gaskets; all necessary jointing; removing, adjusting and resetting existing meter boxes; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; flushing, protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item.

XIII.10. LINE STOP:

The quantity to be paid will be the actual number of each size line stop actually installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work including, but not limited to plugging of the existing main utilizing the "line stop" method; furnish and install fabricated steel line stop fittings; epoxy coated, w/304 SS nuts and bolts; closure completion plugs (sized as required, or an approved equal); 150# blind flange (sized as required) w/304 SS nuts and bolts; 2" equalization/purge fittings; subsequent removal and disposal of line stop; excavation; removal/disposal and subsequent replacement of pavement; concrete work (support for line stop fittings); concrete thrust collar; restrained joint plug and tie rods as required; lifting and rigging equipment; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; flushing, protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item.

XIII.11. COMPLIANCE SAMPLE TAPS (JEA PLATE W-27):

The quantity to be paid will be the actual number of each compliance sample tap installed and removed in accordance with JEA Water and Wastewater Standards Plate No. W-27. Payment for a temporary sample tap will be made at the Contract Unit Price and shall be full compensation for the item of work including all necessary removal of grassing, and excavation around existing water meter and box assembly; relocation, reconnection, and replacement of meter and meter box; furnishing and installing all necessary piping, fittings, meter resetter, smooth hose/tubing, valve, native backfill material, and sodding; protecting existing structures, utilities and property both public and private; placing and removing traffic barricade; assisting with outage simulations, preparation and distribution of customer notifications and/or boil water notices; cleaning up the site; furnishing all material, labor, tools, and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract documents.

XIII.12. TEMPORARY SAMPLE TAPS:

The quantity to be paid will be the actual number of each size and type of sample tap installed and removed. A sample tap utilizing alternative methods (type) will include a sample tap utilizing a new 1 inch water service or a plug at flushing location (see W-24

detail). There shall be no payment made for temporary sample taps utilizing alternative methods unless this item is specifically listed on the bid form. The cost of a temporary sample tap utilizing alternative methods shall be included in the unit price of the piping. Payment for a temporary sample tap as shown on Detail W-25 or W-26 will be made at the Contract Unit Price and shall be full compensation for the item of work including furnishing and installing, complete, all necessary piping; service saddle; corporation stop; plug; bushings; bends; tees; smooth hose, hose bib; gate valve, furnishing all material, labor, tools and equipment and all incidental and related work required to complete the item.

XIV. WATER VALVES AND APPURTENANCES – CHAPTER III. 2. - SECTION 351

XIV.1. FURNISHING AND INSTALLATING FIRE HYDRANTS:

The quantity to be paid will be the actual number of units furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work, complete, including all required excavation and backfill; placing and removing all traffic signs and barriers and maintaining traffic; furnishing and installing the hydrant (regardless of "bury depth") and hydrant extension (if required); restraint rods; blue pavement reflector; all nuts, bolts, glands, and socket clamps; construction of the hydrant sump including selected stone fill; rod restraints; furnishing all material; labor, tools and equipment; performing hydrostatic and leakage testing; and all incidental and related work required to complete the item. Separate payment will be made for hydrant lateral pipe, fittings, and valves.

XIV.2. FIRE HYDRANT RELOCATION:

The quantity to be paid will be the actual number of existing fire hydrants removed and re-installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work, complete, including all required excavation and backfill; placing and removing all traffic signs and barriers and maintaining traffic; removal, storage, and subsequent re-installation of existing fire hydrant; furnishing and installing the hydrant riser adjustment/extension as required to achieve proper bury depth; furnishing and installing new paint of the existing fire hydrant and above ground piping; reoil and regrease the fire hydrant; furnishing and placing all necessary hydrant sump work as indicated on the standard hydrant detail at fire hydrant; all nuts, bolts, glands, and socket clamps; furnishing all material, labor, tools and equipment; performing hydrostatic and leakage testing; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all material, labor, tools, and equipment; as-builts; and all incidental and related work required to complete the work of the item with all necessary incidental work required, including all materials, labor and equipment. Separate payment will not be made for new coat of paint for fire hydrants. All work shall be in accordance with JEA Water Construction Details W-12 thru 19, inclusive.

XIV.3. FURNISHING AND INSTALLING VALVES:

The quantity to be paid will be the actual number of units of each size and type furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work including furnishing and installing the valve, complete, with all required excavation and backfill, necessary jointing, adapter pieces, concrete supports (if applicable), mechanical restraints at valve, nuts, bolts, socket clamps, sleeves; valve box and cover, valve tags, electronic ball markers; valve box extension (if applicable); debris shield;

placing and removing all traffic signs and barriers, and maintaining traffic; furnishing all material, labor, tools and equipment; flushing and disinfecting; performing hydrostatic and leakage testing; and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XIV.4. FURNISHING AND INSTALLING TAPPING SLEEVES AND VALVES:

The quantity to be paid for will be the actual number of units of each size furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective item and shall be full compensation for the item of work, complete, with all necessary excavation and backfill; jointing, adapter pieces, concrete supports (if applicable); mechanical restraints at valve; electronic ball markers; all nuts, bolts, socket clamps, sleeves; valve boxes, valve box extensions (if applicable) and valve box covers; debris shield; placing and removing all traffic signs and barriers and maintaining traffic; furnishing all material, labor, tools and equipment; flushing and disinfecting; performing hydrostatic and leakage testing and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XIV.5. FURNISHING AND INSTALLING WATER METER BOXES:

The quantity to be paid will be the actual number of units of each size furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective item and shall be full compensation for the item of work, complete, including box and PVC plug (if applicable).

XIV.6. FURNISHING AND INSTALLING BACKFLOW PREVENTION DEVICES:

The quantity to be paid will be the actual numbers of units furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work including furnishing and installing the devices, complete, with all necessary jointing, bends, adapter pieces, concrete supports, tie rods, restraints, nuts, bolts, socket clamps, jackets and sleeves, isolation valves, furnishing all material, labor, tools and equipment and all incidental and related work required to complete the item.

XIV.7. FURNISHING AND INSTALLING VALVES OR FITTINGS IN EXISTING PIPELINES:

The quantity to be paid will be the actual number of each size valve furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective valve or fitting and shall be full compensation for the item of work, complete, including all required excavation; backfill; shutting down and dewatering the pipelines; cutting openings in the pipelines to accept the new valve or fitting and removing, stockpiling or otherwise disposing of the existing pipe section or existing valve or fitting removed; furnishing and installing the new valve or fitting; furnishing and installing all necessary pipe, couplings, sleeves, pipe adapters, concrete supports; mechanical restraints on valve or fitting; electronic ball markers; all nuts, bolts, glands, and socket clamps; furnishing and installing valve box, valve box, operating nut, and stem extension (if applicable) and valve box cover; placing and removing all traffic signs and barriers and maintaining traffic; furnishing all material, labor, tools, and equipment; flushing and disinfecting, performing hydrostatic and leakage testing, and all incidental and related work required to complete the work of the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XIV.7.1. VALVE BOX AND COVER ADJUSTMENT:

The quantity to be paid will be the actual number of valve box and cover when physically adjusted (vertically) to new finish grade as shown on the drawings or as required. Payment will be compensation in full for removal of grassing; excavation; dewatering; native soil backfill; furnishing and placing steel decking over excavation; adjustment of existing valve jacket, or providing new valve box jacket extension if necessary; furnish and install concrete collar; pavement repair (where applicable); placing and removing all traffic signs and barriers, and maintaining traffic; cleaning up the site; furnishing all materials, labor, tools, and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents. All adjustments shall be completed prior to the placement of the final surface.

Valve box components which can be reused shall be carefully removed and the contact areas shall be cleaned of all mortar, concrete, grease and sealing compounds. Any items broken in the process of removal and cleaning shall be replaced in kind by the Contractor at its own expense.

If the adjustment involves slight lowering or raising a valve box, the outside shell of a slip or screw casing shall be excavated to its full length and adjusted to the proposed grade. Pipe castings shall be excavated to the depth required to cut from or weld a section to the casing as may be needed to adjust the ring to the proposed elevation. The ring shall be welded to the casing prior to pouring concrete around the casing.

XIV.8. FURNISHING AND INSTALLING FLUSHING VALVE:

The quantity to be paid will be the actual number of each type (above or below grade) flushing valve assembly furnished and installed. Payment for the work will be made at the contract unit price for each flushing valve assembly and shall be full compensation for the item of work, complete, including all required excavation; backfill; installing box and cover; valves; piping; bedding; flushing and disinfection; sample taps installed and removed; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item.

XIV.9. FURNISHING AND INSTALLING AIR RELEASE VALVES:

The quantity to be paid will be the actual number of air valve assemblies (as detailed) furnished and installed. Payment will be made at the Contract Unit Price for each air valve assembly in manhole (or not in manhole) and shall be full compensation for the item of work, complete, including all excavation; backfill; tapping or cutting opening in pipelines; furnishing and installing air valve with all required appurtenances, manhole (if applicable) with frame and cover or aluminum door, all piping fittings and valves (gate, corp. stop, etc.) between air valve and main, saddle, sleeve or Tee fitting in main, all material, labor, tools and equipment and all incidental and related work to complete the air valve assembly and associated piping between the air valve and the main.

XV. SEWAGE MANHOLES – CHAPTER IV. 1. - SECTION 427

XV.1. FURNISH AND INSTALL SEWAGE MANHOLE:

The depth of the manhole will be measured vertically from the top of the manhole frame to the invert at the center of the manhole bottom. Payment for new sewage manholes will be in accordance with the unit price in the Contract. Prices for manholes will be the installed price, complete, for the type and depth of manhole. Prices will be full compensation for furnishing

and installing the manhole including all required removal of grassing; excavation; de-watering; native soil backfilling; all sheeting, shoring and bracing required to maintain excavation in a safe condition; protecting existing structures, utilities and property; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; as-builts; furnishing all labor, materials, tools and equipment for manhole construction, including manhole frames, covers, inside or outside drops, connections (hole in manhole and boot or sand sleeve), and all work appurtenant thereto.

XV.2. REMOVE EXISTING SEWAGE MANHOLE:

Measurement for payment of removal of existing manhole shall be the actual physical count of manholes removed as called for on the Contract Drawings or as approved by the Engineer. Payment for manholes removed shall be at the unit price set forth in the Contract Documents. Payment will be compensation in full for complete removal of the manhole and transportation and disposal of the debris; sealing any and all pipes leading in and out of the structure; excavation; backfilling; compacting; native backfill and/or ASSHTO A-3 soil fill material in the void left by removing the structure; placing and removing all traffic signs and barriers and maintaining traffic.

XV.3. REMOVE AND CONSTRUCT SEWAGE MANHOLE:

Measurement for payment of Remove and Construct Manhole will be the depth of the new manhole measured vertically from the top of the manhole frame to the invert at the center of the manhole bottom. Payment for existing manholes removed and replaced with new manholes will be at the unit price set forth in the Contract for "Remove and Construct" for the actual number of each depth manhole installed in conjunction with a manhole removal. Payment will be compensation in full for the removal of the existing manhole and disposal of the debris. Payment shall include furnishing and installing the new manhole including all required removal of grassing; excavation; de-watering; native soil backfilling; all sheeting, shoring and bracing; protecting existing structures, utilities and property; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all labor, materials, tools and equipment for the construction of the new manhole complete for the type and depth, including manhole frames, covers, hole in manhole and boot or water stop, inside or outside drop connections, bypass pumping, and all work appurtenant thereto.

XV.4. CONNECTION TO EXISTING SEWAGE MANHOLE:

Payment for standard connections, drop connections, service lateral connections and force main connections to existing manholes will be at the unit price set forth in the Contract for the size and type of connection. The unit price will constitute compensation in full for each connection actually furnished and installed including excavation; native soil backfill; compaction; coring; piping; fittings; rubber boot or sand sleeve; grouting and repair to existing manhole wall section; placing and removing all traffic signs and barriers and maintaining traffic plus all incidental work including all labor, materials, tools and equipment.

XV.5. CONSTRUCT SANITARY MANHOLE FRAME AND COVER ADJUSTMENT:

Measurement for payment of Sanitary Manhole Frame and Cover Adjustment (if shown on the drawings) shall be the actual count of manholes where the frame and cover was physically adjusted (vertically) to new finish grade as shown on the drawings. Where applicable, payment will be compensation in full for removal of the existing manhole frame and cover, and removal/disposal of any debris, removing/replacing all necessary grade adjustment including new manhole frame and cover (if noted) and roadway patch work (where applicable). Payment shall be at the unit price set forth in the contract documents

and shall constitute full compensation for all items of work including all required removal of grassing; excavation; de-watering; native soil backfill and or A3 soil material to fill voids; furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers, and maintaining traffic (MOT); cleaning up the site; furnishing all material, labor, tools and equipment and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents.

XV.6. MANHOLE TOP ADJUSTMENT:

Measurement for payment of manhole top adjustment (including removing the existing City of Jacksonville (COJ) type manhole frames and covers and installing JEA type manhole frames and covers) shall be the actual count where the manhole tops are physically adjusted (vertically) to new finish grade at the locations shown on the drawings or as required. Payment will be compensation in full for removal of grassing; pavement; excavation; dewatering; native soil backfill; furnishing and placing steel decking over excavation; adjusting manhole top to new finish grade, removing existing COJ type manhole frame and cover; furnishing and installing JEA type manhole frame and cover; grout; pavement repair (where applicable); placing and removing all traffic signs and barriers, and maintaining traffic; cleaning up the site; furnishing all materials, labor, tools, and all incidental and related work required to complete the work of the item unless indicated otherwise on the Contract Documents. All work shall be completed prior to the placement of the roadway base course.

Existing cone sections shall be carefully removed and properly disposed. The contact areas shall be cleaned of all mortar, concrete, grease and sealing compounds. No separate payment will be made for furnishing and installing new precast cone section.

COJ type manhole frames and covers shall be carefully removed and shall be cleaned of all mortar, concrete, grout and sealing compounds and shall become the property of the COJ. Such materials shall be delivered by the Contractor to the Streets and Drainage Division yard. Any items broken in the process of removal, cleaning or transportation shall be replaced in kind by the Contractor at its own expense

XVI. GRAVITY WASTEWATERS – CHAPTER IV. 2. - SECTION 428

XVI.1. WASTEWATER PIPING FURNISH AND INSTALL:

XVI.1.1. Measurement of new wastewater piping for payment will be the horizontal distance between manholes with no deduction made for those spaces occupied by manholes, tees or other appurtenances. The depth of cut of wastewater piping will be measured from existing grade elevations along the center line of the pipe, taken on fifty foot stations, down to the wastewater piping invert elevation. The depth of cut will be divided into steps: first step - 2 to 4 feet, second step - 4 to 6 feet, and so on, at 2 foot intervals, unless otherwise specified in the Contract Documents. The method of measurement will be the same for each of the specified pipe materials.

XVI.1.2. Payment for wastewater piping will be at the unit price stated in the Contract for the size and class of pipe, type of material, and depth of wastewater pipe actually installed, measured as previously specified. The unit prices set forth in the Contract will constitute full compensation for excavation; native soil backfilling; de-watering; sheeting and shoring driven and pulled and drag shields for trenches of all depths; placing and removing all traffic signs and barriers and

maintaining traffic; as-builts; furnishing, laying, jointing, TV work and testing the wastewater piping plus all incidental work including all labor, materials, tools and equipment. The unit price will also include stoppers for all ends of pipe and fittings, and transition couplings.

XVI.2. WASTEWATER PIPING – REMOVE AND REPLACE:

XVI.2.1. Measurement of remove and replace wastewater piping for payment will be the horizontal distance between manholes with no deduction made for those spaces occupied by manholes, tees or other appurtenances. The depth of cut of wastewater piping will be measured from existing grade elevations along the center line of the pipe, taken on 50 foot stations, down to the wastewater pipe invert elevation. The depth of cut will be divided into steps: First step – 2 to 4 feet, second step – 4 to 6 feet, and so on, at 2 foot intervals, unless otherwise specified in the Contract Documents. The method of measurement will be the same for each of the specified pipe materials.

XVI.2.2. Payment for wastewater piping will be at the unit price stated in the Contract for the size and class of pipe, type of material, and depth of wastewater pipe actually installed, measured as previously specified. The unit prices set forth in the Contract will constitute full compensation for excavation; native soil backfilling; de-watering; sheeting and shoring driven and pulled and drag shields for trenches of all depths; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing, laying, jointing and testing the wastewaters; removal and disposal of the existing wastewater pipe; stoppers for all ends of pipe and fittings; transition couplings; bypass pumping plus all incidental work including all labor, materials, tools and equipment.

XVI.3. WASTEWATER LATERAL PIPING FURNISH AND INSTALL:

XVI.3.1. Measurement of wastewater lateral pipe for payment shall be measured by the linear foot on a horizontal plane along the projection of the center line of the lateral pipe, from the center of the wastewater main to the terminal point of the lateral pipe, unless specified otherwise in the Contract Documents.

XVI.3.2. Payment for wastewater lateral piping will be at the per linear foot price stated in the Contract for the size, class and type of pipe actually installed. The unit price set forth in the Contract will constitute full compensation for excavation; native soil backfilling; de-watering; sheeting and shoring driven and pulled and drag shields for trenches of all depths; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing and installing the wastewater lateral piping and fittings; electronic marker (if required); stoppers for future connections plus all incidental work including all labor, materials, tools and equipment.

XVI.4. WASTEWATER LATERAL PIPING – REMOVE AND REPLACE:

XVI.4.1. Measurement of wastewater lateral pipe removal and replacement for payment shall be measured by the linear foot on a horizontal plane along the projection of the center line of the lateral pipe, from the center of the wastewater main to the terminal point of the lateral pipe, unless specified otherwise in the Contract Documents.

XVI.4.2. Payment for wastewater lateral piping will be at the per linear foot price stated in the Contract for the size, class and type of pipe actually installed. The unit price

set forth in the Contract will constitute full compensation for excavation and native soil backfilling; de-watering; sheeting and shoring driven and pulled and drag shields for trenches of all depths; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing and installing the wastewater lateral piping and fittings; stoppers for future connections P. T. wood markers (new development projects only) and electronic marker (if required);. The unit price shall also be full compensation for locating existing lateral piping; the removal and disposal of the existing wastewater lateral piping; locating existing yard piping and connecting to existing yard piping including PVC adapters plus all incidental work including all labor, materials, tools and equipment.

XVI.5. LATERAL CONNECTIONS AT WASTEWATER MAIN:

Payment will be made for each wastewater lateral connection furnished and installed at the Contract unit price for the type and size of the lateral connection actually installed as shown on the Contract drawings. The unit prices set forth in the Contract will constitute full compensation for excavation; native soil backfilling; de-watering; sheeting and shoring, driven and pulled; drag shields for trenches of all depths, and furnishing and installing lateral connections of all depths. Payment will consist of the cost of the tee or saddle, over and above the price paid for pipeline length measured through the tee or saddle. The unit price shall also be full compensation for locating existing lateral piping and all incidental work including all labor, materials, tools and equipment.

XVI.6. FURNISH AND INSTALL YARD PIPING SERVICE:

Measurement of privately owned wastewater service (yard piping) shall be in linear feet measured from the right-of-way line, through private property, to the connection point of the existing yard piping as indicated on the drawings. Payment for yard piping shall be full compensation for excavation; backfilling (native and Class A-3 soil); furnishing and installing piping; fittings; sleeves; adapters; landscape restoration; concrete and asphalt removal and replacement; clean outs; plugging existing yard piping; locating and connecting to existing yard piping; abandoning existing yard piping; notifying property owner and resident and obtaining a plumbing permit. Payment will be at the per linear foot unit price as set forth in the Contract measured, as previously specified.

XVI.7. FURNISHING AND INSTALLING CASING:

The quantity to be paid for will be the actual number of linear feet of each size casing and method of installation actually installed. Measurement shall be made along the horizontal projection of the center line of the casing. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including casing pipe; casing spacers; pipe joint restraints and total restraining system required on the carrier pipe (gravity wastewater pipe); locate wiring; excavation; de-watering; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; and all incidental work required to complete the work including all materials, labor, tools and equipment.

XVI.8. FURNISHING AND INSTALLING LOW PRESSURE SERVICE CONNECTION POINT:

The quantity to be paid will be the actual number of units furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work as detailed in Plate No. S-50 of the JEA Water and Wastewater Standards Manual, complete, including the removal of grassing; dewatering; excavation; furnishing and installing check valve, ball valves, plugs, tee, adapters, piping, locate wire; meter box with plugged lid; native soil backfill; furnishing and placing steel decking over excavations; all sheeting,

shoring and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property, both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing all material, labor, tools and equipment and all incidental and related work to complete the assembly. All piping outside the box shall be paid for separately under force main piping line item.

XVII. SEWAGE FORCE MAINS – CHAPTER IV. 3. - SECTION 429

XVII.1. FURNISHING AND INSTALLING PIPELINE:

The quantity to be paid for will be the actual number of linear feet of each size, class and type of pipe actually installed. Measurement shall be made along the horizontal projection of the center line of pipe. No deduction in length will be made for the space occupied by valves or fittings. Payment for the work will be at the Contract Unit Price shown for each respective item and shall be full compensation for the item of work completed, including all required removal of grassing; excavation; de-watering; native soil backfilling; laying and jointing pipe; pressure and leakage testing; potable water (if required); flushing (if required); swabbing, furnishing and placing steel decking over excavations; all sheeting, shoring and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing and installing locate wiring, locate wire test stations, locate wire-related appurtenances and locate wire testing; furnishing all material, labor, tools, and equipment and all incidental and related work required to complete the work of the item. No additional payment shall be made for vertical deflection of the proposed pipeline to accommodate the installation (minimum required cover) of the gate valves, but all costs shall be merged with the associated line item in the Bid Form. Cost incurred by the Contractor to provide 2 inch fittings associated with the 2 inch pipe work shall not be paid for separately, but shall be included in the cost of furnishing and installing the 2 inch force main. Should JEA elect the swabbing of mains sized 12 and smaller, the work shall be performed by the Contractor via a Supplemental Work Authorization (SWA). No separate payment shall be made for swabbing of mains larger than 12 inches diameter.

XVII.2. FURNISHING SEWAGE REMOVAL AND DISPOSAL:

JEA will reimburse the Company at cost for hiring sewage pump/tanker trucking firm(s) to perform all sewage removal and legal disposal as directed by the JEA Project Manager. Company shall clearly mark on its invoices costs associated with sewage pumping truck services identifying the cost to Company of such service. Company agrees to invoice JEA for such services at its cost with no markup.

XVII.3. FURNISHING AND INSTALLING FITTINGS:

The quantity to be paid for will be the actual number of fittings furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing fittings and mechanical restraints at fitting joint, complete and in place, with all necessary incidental work required to complete the work and all materials, labor, tools and equipment.

XVII.4. FURNISHING AND INSTALLING CASING:

The quantity to be paid for will be the actual number of linear feet of each size casing and method of installation actually installed. Measurement shall be made along the horizontal projection of the center line of the casing. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including casing

pipe; casing spacers; pipe joint restraints and total restraining system required on the carrier pipe (force main piping); locate wiring; excavation; de-watering; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; and all incidental work required to complete the work including all materials, labor, tools and equipment.

XVII.5. FURNISHING AND INSTALLING POLYETHYLENE WRAP:

The quantity to be paid for will be in linear feet of polyethylene wrap actually installed. Measurement shall be made along the horizontal project of the center line of the pipe being wrapped including fittings and valves. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including all incidental work required to complete the work and all materials, labor, tools and equipment.

XVII.6. FURNISHING AND INSTALLING PIPE SUPPORTS:

The quantity to be paid for will be the actual number of supports furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including furnishing and installing supports, with all incidental work required to complete the work and all materials, labor, tools and equipment.

XVII.7. FURNISHING AND INSTALLING PIPE BELL RESTRAINT:

The quantity to be paid for will be the actual number of bell restraints or D.I.P. joint restraint gaskets (or JEA approved restraint device from pipe manufacturer), installed with the maximum required to be installed as indicated in the Restraint Joint Schedule counted in full 20 foot segments extending from the fitting or for carrier piping bell restraints as required. Payment for the work shall be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing the bell restraint, or D.I.P. joint restraint, complete, with all necessary incidental work required, including all materials, labor and equipment. No payment will be made for thrust restraints used for the Contractor's convenience in addition to the bell restraints called for in the Restraint Joint Schedules.

XVII.8. FURNISHING AND INSTALLING THRUST COLLAR:

If thrust collar (dead man) is used instead of bell restraints or tie rods to length indicated on the Restrained Joint Schedules on dead end pipelines, payment shall be for each thrust collar installed (by size of pipe).

XVIII. WASTEWATER VALVES AND APPURTENANCES – CHAPTER IV. 4. - SECTION 430

XVIII.1. FURNISHING AND INSTALLING VALVES:

The quantity to be paid will be the actual number of units of each size and type valve furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work including furnishing and installing the valve, complete, with all required excavation and backfill; necessary jointing; adapter pieces; concrete supports (if applicable); mechanical restraints at valve; electronic ball markers; nuts, bolts, socket clamps, sleeves; valve box and cover, valve tags, valve box, operating nut, and stem extension (if applicable); debris shield; placing and removing all traffic signs and barriers and maintaining traffic; furnishing all material, labor, tools and equipment; flushing; performing hydrostatic and leakage testing; and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XVIII.2.FURNISHING AND INSTALLING TAPPING SLEEVES AND VALVES:

The quantity to be paid for will be the actual number of units of each size furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective item and shall be full compensation for the item of work, complete, with all necessary excavation and backfill; jointing; adapter pieces; concrete supports (if applicable), mechanical restraints at valve; electronic ball markers; nuts, bolts, socket clamps, sleeves; valve box, valve box extension (if applicable) and valve box cover; debris shield; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing all material, labor, tools and equipment; performing flushing and hydrostatic and leakage testing and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XVIII.3.FURNISHING AND INSTALLING VALVES OR FITTINGS IN EXISTING PIPELINES:

The quantity to be paid will be the actual number of each size and type valve or fitting furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective valve and shall be full compensation for the item of work, complete, including all required excavation; backfill; shutting down and de-watering the pipelines; bypass pumping; cutting openings in the pipelines to accept the new valve or fitting and removing, stockpiling or otherwise disposing of the existing pipe section or existing valve or fitting removed; furnishing and installing the new valve or fitting; furnishing and installing all necessary pipe, couplings, sleeves, pipe adapters, concrete supports, mechanical restraints on valve or fitting, electronic ball markers; nuts, bolts, glands, socket clamps; furnishing and installing access box and cover; valve box, operating nut, and stem extension (if applicable); furnishing all material, labor, tools, and equipment; and all incidental and related work required to complete the work of the item.

XVIII.4.FURNISHING AND INSTALLING AIR VALVES:

The quantity to be paid will be the actual number of air valve assemblies (as detailed) furnished and installed. Payment will be made at the Contract Unit Price for each air valve assembly in manhole (and not in manhole) and shall be full compensation for the item of work, complete, including all excavation; backfill; tapping or cutting opening in pipelines; furnishing and installing air valve with all required appurtenances, manhole with specialty liner, frame and cover or aluminum door, all piping fittings and valves (gate, corp. stops, etc) between air valve and main, saddle, sleeve or Tee fitting in main, all material, labor, tools and equipment and all incidental and related work to complete the air valve assembly and associated piping between the air valve and the main.

XIX. SUBMERSIBLE SEWAGE PUMPING STATIONS – CHAPTER IV. 5. - SECTION 433

The Contractor's lump sum bid as set forth in the Contract shall constitute full compensation for the work involved in this section including pump station improvements as shown on the drawings (wet well, pumps, standby power generator if applicable, piping, electrical and controls) and security fencing of the construction area; tree removal, clearing and grubbing as required; grassing of disturbed areas; reinforced concrete driveway and site slab; site and driveway compacted A-3 soil fill material; all electrical conduit and service conductor to the service pole unless other established/indicated boundary is indicated. Lump sum price includes the work and improvements inside the landscape zone and those items listed above which are outside the landscape zone (including driveway, sod work, underground, power conduit, water service and associated service piping, etc.).

XX. SPECIALTY COATINGS AND LININGS – CHAPTER IV. 6. - SECTION 446**XX.1. LINING OR COATING NEW MANHOLE:**

The Contractor's lump sum bid for manhole type and depth (in 2 ft. increments), as set forth in the Contract, shall constitute full compensation for the work involved in this section. Lump sum price shall include all surface preparation, ring and cover coating (if applicable), disposal of all debris, installation of liner and warranty all as specified herein.

XX.2. LINING OR COATING EXISTING MANHOLE:

The Contractor's lump sum bid for manhole type and depth (in 2 ft. increments), as set forth in the Contract, shall constitute full compensation for the work involved in this section. Lump sum price shall include all surface preparation, manhole rehabilitation, cone replacement (if applicable), ring and cover coating (if applicable), disposal of all debris, temporary plugging of existing lines, bypass pumping, installation of liner and warranty all as specified herein.

XX.3. LINING OR COATING EXISTING WETWELL:

The Contractor's lump sum bid for wet well diameter and depth as set forth in the Contract shall constitute full compensation for the work involved in this section. Lump sum price shall include all surface preparation, wet well rehabilitation, disposal of all debris, temporary plugging of existing lines, bypass pumping, installation of liner and warranty all as specified herein.

XXI. EMERGENCY GENERATOR (LESS THAN 600 KW) – CHAPTER IV. 8. - SECTION 472

For new generators at existing pump stations, no additional payment shall be made for the work specified in Chapter IV. 7. - Section 472. The Contractor's lump sum bid as set forth in the Contract shall constitute full compensation for the work involved in this section and shall include auto transfer switch in enclosure, diesel engine driven generator set, switchgear, controls, fuel, fuel tank, stainless steel enclosure, generator foundation, fuel tank foundation, warranty, exhaust and muffler, testing and all accessories necessary for a complete and operable installation.

XXII. RECLAIMED WATER PIPING – CHAPTER V. 1. - SECTION 701**XXII.1. FURNISHING AND INSTALLING PIPELINE:**

The quantity to be paid for will be the actual number of linear feet of each size, type and class of pipe actually installed. Measurement shall be made along the horizontal projection of the center line of pipe. No deduction in length will be made for the space occupied by valves or fittings. Payment for the work will be at the Contract Unit Price shown for each respective item and shall be full compensation for the item of work completed, including all required removal of grassing; excavation; de-watering; native soil backfilling; laying and jointing pipe; pressure and leakage testing; potable water (if required); furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; cleaning up the site; furnishing and installing locate wiring, locate wire test stations locate wire related appurtenances and locate wire testing; furnishing all material, labor, tools, and equipment; as-builts; and all incidental and related work required to complete the work of the item. No additional payment shall be made for vertical deflection of the proposed pipeline to accommodate the installation (minimum required cover) of gate valves, but all costs shall be merged with the associated line item in the Bid Form.

XXII.2. FURNISHING AND INSTALLING FITTINGS:

The quantity to be paid for will be the actual number of fittings furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing fittings and mechanical restraints at fitting joints, complete, with all necessary incidental work required to complete the work and all materials, labor, tools and equipment.

XXII.3. FURNISHING AND INSTALLING CASING:

The quantity to be paid for will be the actual number of linear feet of each size casing and method of installation actually installed. Measurement shall be made along the horizontal projection of the center line of the casing. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including casing pipe; all casing spacers; pipe joint restraints and total restraining system required on the carrier pipe (water main pipe); locate wiring; excavation; de-watering; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; and all incidental work required to complete the work including all materials, labor, tools and equipment.

XXII.4. FURNISHING AND INSTALLING POLYETHYLENE WRAP:

The quantity to be paid for will be the actual number of linear feet of polyethylene wrap actually installed. Measurement shall be made along the horizontal projection of the center line of the pipe being wrapped including fittings and valves. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including all incidental work required to complete the work and all materials, labor, tools and equipment.

XXII.5. FURNISHING AND INSTALLING PIPE SUPPORTS:

The quantity to be paid for will be the actual number of supports furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the items of work, complete, including furnishing and installing supports, with all incidental work required to complete the work and all materials, labor, tools and equipment.

XXII.6. FURNISHING AND INSTALLING PIPE BELL RESTRAINT:

The quantity to be paid for will be the actual number of bell restraints or D.I.P. joint restraint gaskets, installed with the maximum required to be installed as indicated in the Restraint Joint Schedules counted in full 20 foot segments extending from the fitting or for carrier piping bell restraints as required. Payment for the work shall be made at the Contract Unit Price and shall be full compensation for the items of work including furnishing and installing the bell restraint, or D.I.P. joint restraint gaskets, complete, with all necessary incidental work required, including all materials, labor and equipment. No payment will be made for thrust restraints used for the Contractor's convenience in addition to the bell restraints called for in the Restraint Joint Schedules.

XXII.7. FURNISHING AND INSTALLING THRUST COLLAR:

If thrust collar (dead man) is used instead of bell restraints or the rods to length indicated on the Restraint Joint Schedules on dead end pipelines, payment shall be for each thrust collar installed (by size of pipe).

XXII.8. FURNISHING AND INSTALLING RECLAIMED WATER SERVICES:

The quantity to be paid for will be the actual number of service connections installed as detailed on Plate W-1, W-2 and W-5. Payment for the work shall be made at the contract

unit price for each size of long or short side service type and shall be full compensation for the items of work including furnishing and installing the service piping; connection to water main and plugging of new service termination in meter box; corporation stop (standard or HDPE type); curb stop; locate wiring; boring (if required); flushing and disinfection; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing a steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment and all incidental and related work to complete the item. Payment for a "double 1 inch water service" shall include 1-1/2 inch connections to main, 1-1/2 inch poly pipe (long side service only), Y-fitting, 1 inch poly to meter boxes, two curb stops, other items as listed above to complete the water service installation to two customers (excluding meter boxes).

XXII.9. REPLACEMENT OF EXISTING RESIDENTIAL RECLAIMED WATER SERVICES:

The quantity to be paid for will be the actual number of each size service replaced. Payment for the work will be made at the Contract Unit Price for each size of long, short type or double 1 inch service (including poly pipe to two meter boxes and associated curb stops and shall be full compensation for the items of work including furnishing and installing service piping; connection to water main; connection to existing private house service piping; corporation stop (standard or HDPE type), curb stop, and service fittings; meter couplings; removal of old service piping (if applicable); cutting and threading existing pipe; all necessary jointing; removing, adjusting and resetting existing meter boxes; all required removal of grassing; excavation; de-watering; native soil backfill; furnishing and placing steel decking over excavations; all sheeting, shoring, and bracing required to maintain excavations in a safe condition; flushing, protecting existing structures, utilities and property both public and private; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; cleaning up the site; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item.

XXIII. RECLAIMED WATER VALVES AND APPURTENANCES – CHAPTER V. 2. - SECTION 702

XXIII.1.FURNISHING AND INSTALLING VALVES:

The quantity to be paid will be the actual number of each size and type of valve furnished and installed. Payment for the work will be made at the Contract Unit Price and shall be full compensation for the item of work including furnishing and installing the valve, complete, with all required excavation and backfill; necessary jointing; adapter pieces; concrete supports (if applicable); mechanical restraints at valve; electronic ball markers; nuts, bolts, socket clamps, sleeves; valve box and cover, valve tag, valve box, operating nut, and stem extension (if applicable) and valve box cover; placing and removing all traffic signs and barriers and maintaining traffic; furnishing all material, labor, tools and equipment; flushing; performing hydrostatic and leakage testing and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XXIII.2.FURNISHING AND INSTALLING TAPPING SLEEVES AND VALVES:

The quantity to be paid for will be the actual number of units of each size furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective item and shall be full compensation for the item of work, complete, with all necessary

excavation and backfill; jointing; adapter pieces; concrete supports (if applicable); mechanical restraints at valve; electronic ball markers; nuts, bolts, socket clamps, sleeves; valve boxes, valve box extensions (if applicable) and valve box covers; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing all material, labor, tools and equipment, performing hydrostatic and leakage testing and all incidental and related work required to complete the item. For HDPE installations, payment shall also include mechanical or flange connection joint adapters and associated electro-fused couplings.

XXIII.3.FURNISHING AND INSTALLING RECLAIMED WATER METER BOXES:

The quantity to be paid will be the actual number of units of each size furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective item and shall be full compensation for the item of work, complete.

XXIII.4.FURNISHING AND INSTALLING VALVES OR FITTINGS IN EXISTING PIPELINES:

The quantity to be paid will be the actual number of each size valve or fitting furnished and installed. Payment for the work will be made at the Contract Unit Price for each respective valve or fitting and shall be full compensation for the item of work, complete, including all required excavation; backfill; shutting down and de-watering the pipelines; cutting openings in the pipelines to accept the new valve or fitting and removing, stockpiling or otherwise disposing of the existing pipe section or existing valve or fitting removed; furnishing and installing the new valve or fitting; furnishing and installing all necessary pipe couplings, sleeves, pipe adapters, concrete supports, mechanical restraints on valve or fitting, electronic ball markers; nuts, bolts, glands, socket clamps; furnishing and installing valve box, valve box extension (if applicable) and valve box cover; placing and removing all traffic signs and barriers and maintaining traffic; as-builts; furnishing all material, labor, tools, and equipment; flushing; performing hydrostatic and leakage testing; and all incidental and related work required to complete the work of the item.

XXIII.5.FURNISHING AND INSTALLING FLUSHING VALVE:

The quantity to be paid will be the actual number of each type (above or below grade) flushing valve assembly furnished and installed. Payment for the work will be made at the Contract Unit Price for each flushing valve assembly and shall be full compensation for the item of work, complete, including all required excavation; backfill; installing box and cover; valves; piping; bedding; flushing; furnishing all material, labor, tools and equipment; and all incidental and related work to complete the item into the JEA system (from Chapter III. 1. - Section 350).

XXIII.6.FURNISHING AND INSTALLING AIR RELEASE VALVES:

The quantity to be paid will be the actual number of air valve assemblies (as detailed) furnished and installed. Payment will be made at the Contract Unit Price for each air valve assembly in manhole (or not in manhole) and shall be full compensation for the item of work, complete, including all excavation; backfill; tapping or cutting opening in pipelines; furnishing and installing air valve with all required appurtenances, manhole (if applicable) with frame and cover or aluminum door, all piping fittings and valves (gate, corp. stops, etc.) between air valve and main, saddle, sleeve or Tee fitting in main, all material labor, tools and equipment and all incidental and related work to complete the air valve assembly and associated piping between the air valve and the main.

XXIV. HORIZONTAL DIRECTIONAL DRILLING – CHAPTER VI. 2. SECTION 750 AND 755**XXIV.1. DIRECTIONAL DRILLING FUSION WELDED PIPE:**

The quantity to be paid for will be the length in linear feet of each size of fusion welded pipe furnished and installed. Measurement shall be made along the horizontal centerline of the pipe installed as shown on the plans. (The Contractor shall include in the Contract Unit Price its allowance for horizontal deflection, vertical deflection and all wastage). Payment for installed pipe will be at the Contract Unit Price shown for each respective pipe size and shall be full compensation for the item of work completed, including project planning and shop drawings; horizontal directional drilling, laying and jointing pipe; locate wire system; pressure and leakage testing; swabbing, flushing, potable water (if required); and disinfection (potable and raw water mains only) and dechlorination (if necessary); protecting existing structures, utilities and property both public and private; cleaning up the site; furnishing all material, labor, tools, and equipment; and all incidental and related work required to complete the installation including entry/back reaming pits, dewatering, as-builts, placing and removing all traffic signs and barriers, maintaining traffic, and site preparation. Contractor shall be responsible for removal and disposal of drill fluid breakouts. Damage to roadways; existing utilities, property both public and private occurring due to the work shall require complete restoration to the satisfaction of the JEA. No separate payment will be made for cleanup, or restoration due to damage, and all associated costs shall be borne by the Contractor. Should JEA elect the swabbing of mains sized 12 and smaller, the work shall be performed by the Contractor via a Supplemental Work Authorization (SWA). No separate payment shall be made for swabbing of mains larger than 12 inches diameter.

XXIV.2. FUSION WELDED FITTINGS:

The quantity to be paid for will be the actual number of fittings furnished and installed unless otherwise noted in the Measurement and Payment items. Payment for the work will be made at the contract unit price and shall be full compensation for the items of work including furnishing fusion welding, and installing fittings including any necessary mechanical or flange connection adapters, electrofused couplings, complete, with all necessary incidental work required to complete the work and all materials, labor, tools, and equipment.

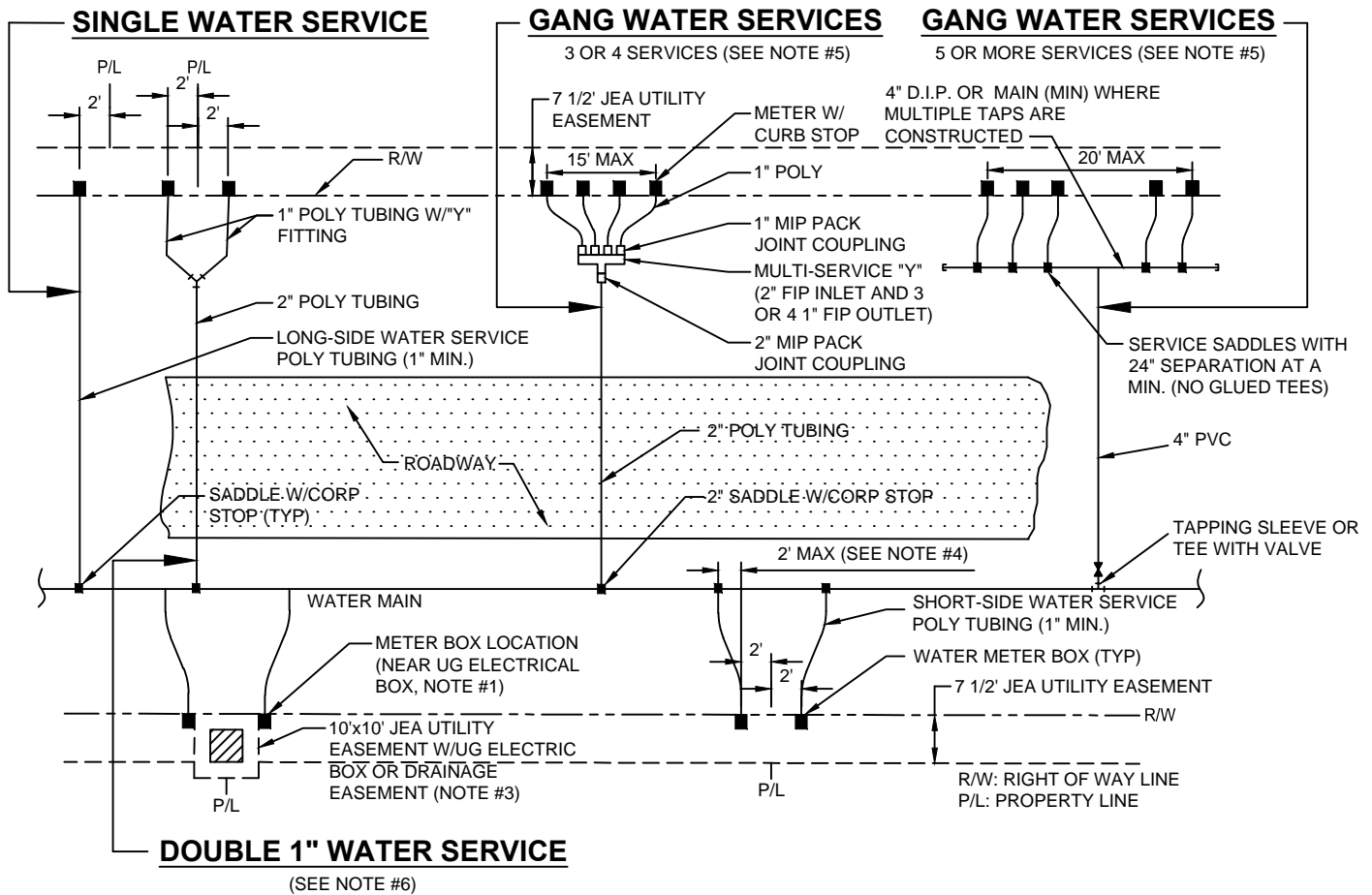
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WATER & RECLAIMED CONSTRUCTION DETAILS**TABLE OF CONTENTS****DETAIL PLATE****NUMBER****DESCRIPTION:**

W - 1	Water Service Installations 2" and Smaller Meter
W - 2	Water Service Detail 2" and Smaller Meter
W - 3	Meter Box & Cover for 1" and Smaller Meters
W - 3A	Meter Box Polymer Cover Model No. 37 - Two Hole
W - 3B	Meter Box Polymer Cover Model No. 37 - One Hole
W - 4	Water Meter Box & Cover for 1-1/2" & 2" Meters
W - 4A	Water Meter Box Polymer Concrete Cover Model No. 65 - Two Hole
W - 5	Large Water Meter Installations
W - 6	Water Meter Installation Details (3" - 20" Meters)
W - 7	Co-Polymer Water Meter Box 36"x60"x 48" (3" & 4" Meters)
W - 7A	Co-Polymer Water Meter Box 48"x72"x48" (4" & 6" Meters)
W - 7B	Co-Polymer Water Meter Box 48"x96"x48" (6" - 20" Meters)
W - 8	Water Meter Box Dimensions (3" - 20" Meters)
W - 9	Water Service Manifold Arrangement
W - 10	Separation Requirements for Water Mains
W - 11	Notes on Utility Separation Requirements - Water
W - 12	Fire Hydrant Installation Using Tapping Sleeve & Valve
W - 13	Fire Hydrant Installation Using Mechanical Joint Tee
W - 14	Fire Hydrant Installation Limited Space
W - 15	Cross Connection Control Device Where Reclaimed Water is Available
W - 16	Water System Valve Box Cover
W - 17	Water System Valve Box
W - 18	Water Valve Installation Detail
W - 19	Water Valve Jacket Adjusted After Roadway Re-Surfacing
W - 20	Bridge Deck Pipe Hanger Detail
W - 21	Sidewall Pipe Hanger Detail
W - 22	Pipe Support & Pole Assembly for Water Main
W - 23	Pipe Support Details for Pole Assembly
W - 24	Temporary Sample Tap - Alternative Methods
W - 25	Temporary Sample Tap
W - 26	2" Temporary Sample Tap for Stub Out
W - 27	Temporary Sample Tap for In-service Mains
W - 28	Flushing Valve Below Grade
W - 29	NOT USED
W - 30	Typical Casing Detail - Water
W - 30A	Typical Split Casing Detail-Water

W – 31A	PVC Pipe Restraint Joint Schedule
W – 31B	D.I.P. Restraint Joint Schedule
W – 31C	Mechanical Restraint Details – I
W – 31D	Mechanical Restraint Details – II
W – 32.....	Adjustment Over Existing Utilities – Mechanical Restraints
W – 33.....	Adjustment Over Existing Utilities Using Tie Rods
W – 34.....	Adjustment Under Existing Utilities – Mechanical Restraints
W – 35.....	Adjustment Under Existing Utilities Using Tie Rods
W – 36.....	Plugged Dead End Using Tie Rods
W – 37.....	Plugged Dead End Using Mechanical Restraints
W – 38.....	Thrust Block Size Chart
W – 39.....	NOT USED
W – 40.....	Adjustment Under Existing Utilities Pipe Joint Deflection
W – 41.....	Adjustment Over Existing Utilities Pipe Joint Deflection
W – 42.....	Open Cut Trench For Pressure Pipe
W – 42A	Open Cut Trench For Pressure Pipe FDOT ROW
W – 43.....	Fusible PVC Bending Radius and Pulling Force for HDD Small Dia. Pipe
W – 44.....	Locate Wire Construction For Water Systems
W – 44A	Locate Wire For Branchmain & Large Services
W – 44B	Locate Wire Box

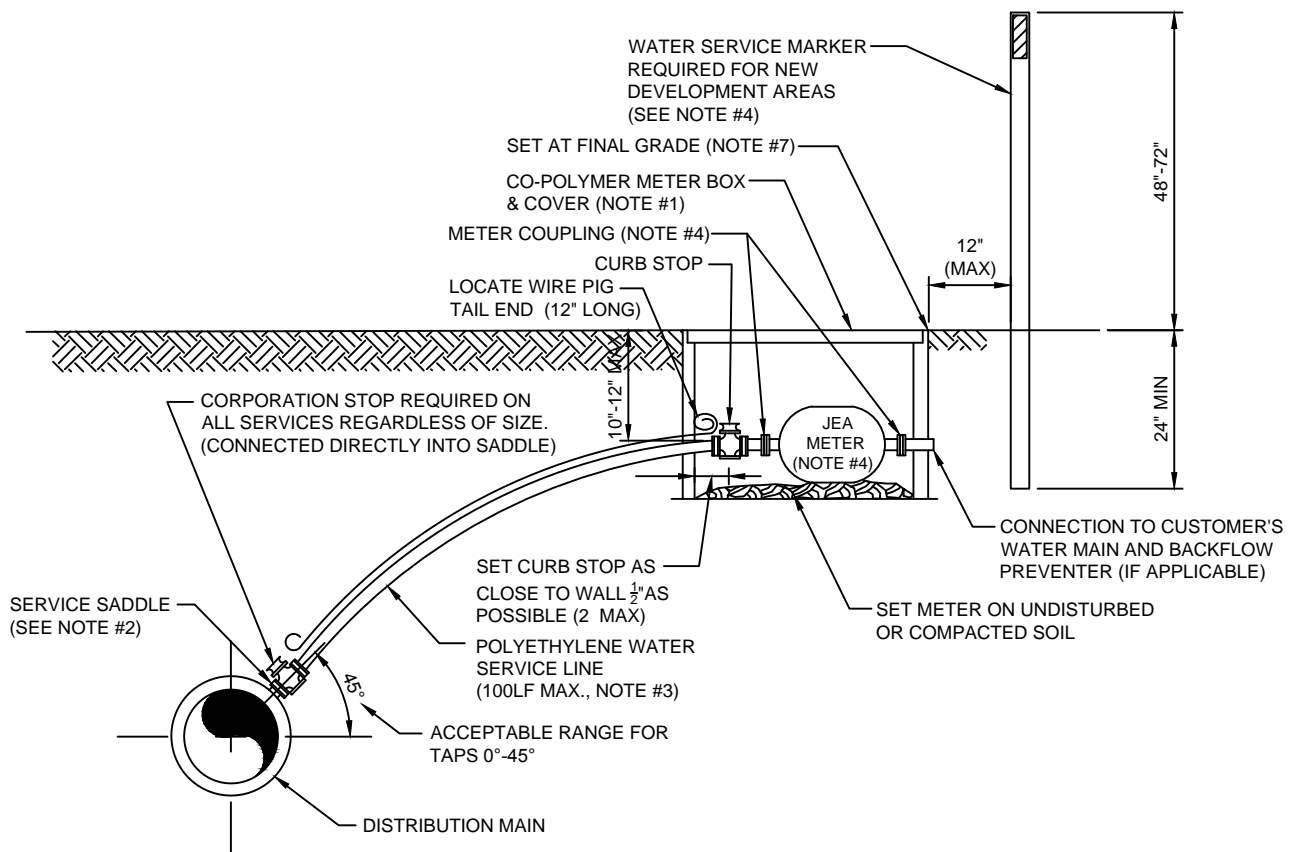
A LOCATE WIRE SHALL BE PLACED ON SERVICES 10FT OR GREATER.



NOTES :

1. THE SKETCHES ABOVE INDICATE TYPICAL WATER SERVICE AND METER BOX LOCATIONS. ACTUAL LOCATIONS OF BOXES MAY VARY SLIGHTLY ACCORDING TO FIELD CONDITIONS ENCOUNTERED. TYPICALLY, THE METER BOX SHALL LOCATED AT THE R/W LINE BUT INSIDE THE 7 1/2' ELECTRIC EASEMENT.
2. UNLESS SPECIFIED OTHERWISE BY THE APPLICABLE COUNTY (NASSAU, CLAY OR ST. JOHNS COUNTY), THE METER BOX SHALL BE LOCATED IN THE JEA 7 1/2' UTILITY EASEMENT, AND TWO FEET INSIDE OF THE PROLONGATION OF ONE OF THE SIDE PROPERTY LINES. IF A CONFLICT EXISTS WITH OTHER UTILITIES, THE METER BOX MAY BE ADJUSTED TO FOUR FEET (MAX.) INSIDE PROPERTY LINES (IN LIEU OF TWO FEET). UNLESS APPROVED OTHERWISE BY JEA, THE WATER METER BOX SHALL BE LOCATED IN NON-TRAFFIC AREAS (NOT IN SIDEWALKS OR DRIVEWAYS). IF THE METER BOX IS APPROVED BY JEA TO BE LOCATED IN A DRIVEWAY OR SIDEWALK, THEN THE CONSTRUCTION SHALL MEET STANDARD DETAIL NUMBERS W-3&4, AT A MINIMUM (SEE W-3 AND W-4 FOR THE REQUIREMENTS OF SPECIAL ORDER POLYMER BOX AND TOP). SET TOP OF BOX AT FINISHED GRADE. IF AN UNAPPROVED METER BOX IS IDENTIFIED BY JEA, THEN THE CONTRACTOR OR CUSTOMER SHALL BE RESPONSIBLE FOR THE COST OF RELOCATING ANY METER BOX WHICH IS LOCATED IN THE SIDEWALK OR DRIVEWAY OR THE COST TO PROVIDE THE CORRECT METER BOX. JEA SHALL APPROVE ALL DEVIATIONS TO THE ABOVE PRIOR TO CONSTRUCTION.
3. IF DRAINAGE OR OTHER EASEMENT LOCATED BETWEEN LOTS, METER BOXES SHALL BE LOCATED AT THE EASEMENT LINE BUT OUTSIDE THE EASEMENT AREA.
4. FOR SINGLE SERVICES, THE HORIZONTAL DISTANCE (PERPENDICULAR TO THE MAIN) BETWEEN THE SERVICES SADDLE AND THE METER BOX SHALL BE 2 FEET MAXIMUM. FOR DOUBLE 1" SERVICES, THE 2" POLY MAIN SHALL BE LOCATED CENTERED BETWEEN THE TWO METER BOXES. LOCATE WIRE IS REQUIRED ON ALL SERVICES 10' OR GREATER IN LENGTH. IF LOCATE WIRE IS REQUIRED, THE WIRE SHALL RUN FROM THE METER BOX (W/ PIG TAIL) TO THE MAIN (DEAD END SHALL BE TAPED WITH NO CONNECTION TO MAIN WIRE WITH THE LAST 24 INCHES STRIPED OF INSULATION/BARE WIRE AS GROUND). ALL EXCEPTIONS TO THIS REQUIREMENT MUST BE APPROVED BY JEA. THIS WILL ASSIST IN LOCATING EXISTING SERVICE LINES IN THE FUTURE.
5. GANG WATER SERVICES: FOR 3 OR 4 SERVICES IN ONE AREA, A DUCTICLE IRON PIPE (D.I.P.) WATER MAIN EXTENSION W/LOCATE WIRE MAY BE UTILIZED ON EITHER SHORT-SIDE OR LONG SIDE SERVICES WHERE SHOWN ON THE DRAWINGS. LOCATE WIRE SHALL EXTEND FROM ONE METER BOX TO CORP STOP AT WATER MAIN. FOR 5 OR MORE SERVICES IN ONE AREA, A WATER MAIN EXTENSION W/LOCATE WIRE MAY BE UTILIZED ON EITHER SHORT-SIDE OR LONG SIDE SERVICES WHERE SHOWN ON THE DRAWINGS (TAPS STAGGERED AND AT 2 FEET ON CENTER-MIN). FOR WATER SUPPLY HEADERS WHERE 5 OR MORE TAPS ARE CONSTRUCTED, THE HEADER PIPE SHALL BE 4" AT A MINIMUM. EXAMPLE: CONSTRUCT A 4" MAIN PVC CROSSING THE STREET FOR 5 RESIDENTIAL CUSTOMERS, UTILIZING 4" DIP, 4" PIPE, 4"x1" SADDLES AND 1" CORP STOPS (NO GLUED TEE FITTINGS). THE 4" OR LARGER D.I.P. WATER MAIN MUST BE SIZED AND DESIGNED BY THE P.E. ENGINEER.
6. DOUBLE 1" WATER SERVICES IS ALLOWED FOR SHORT SIDE OR LONG SIDE SERVICES AND WHERE SHOWN ON THE DRAWINGS.
7. A 1" IRRIGATION SERVICE MAYBE TAPPED INTO THE (1" MIN) DOMESTIC WATER SERVICE LINE (WHICH SERVES THE SAME CUSTOMER) UTILIZING A 1" BRONZE "Y" FITTING. (IN AREAS WHERE NO RECLAIMED WATER IS AVAILABLE).
8. No 2" AND SMALLER WATER SERVICE TAPS PERMITTED ON WATER MAINS WHICH ARE 20" AND LARGER SIZE.
9. RECLAIMED WATER METER BOXES OR SERVICES SHALL BE CONSTRUCTED SIMILAR TO THE ABOVE AND SHALL BE LOCATED, AT A MIN. OF 10' FROM THE POTABLE WATER SERVICE, AND/OR BOX AND NOT ALLOWED IN CONCRETE OR ASPHALT UNLESS APPROVED OTHERWISE BY JEA.

WATER OR RECLAIM SERVICE INSTALLATIONS **2" AND SMALLER METER**



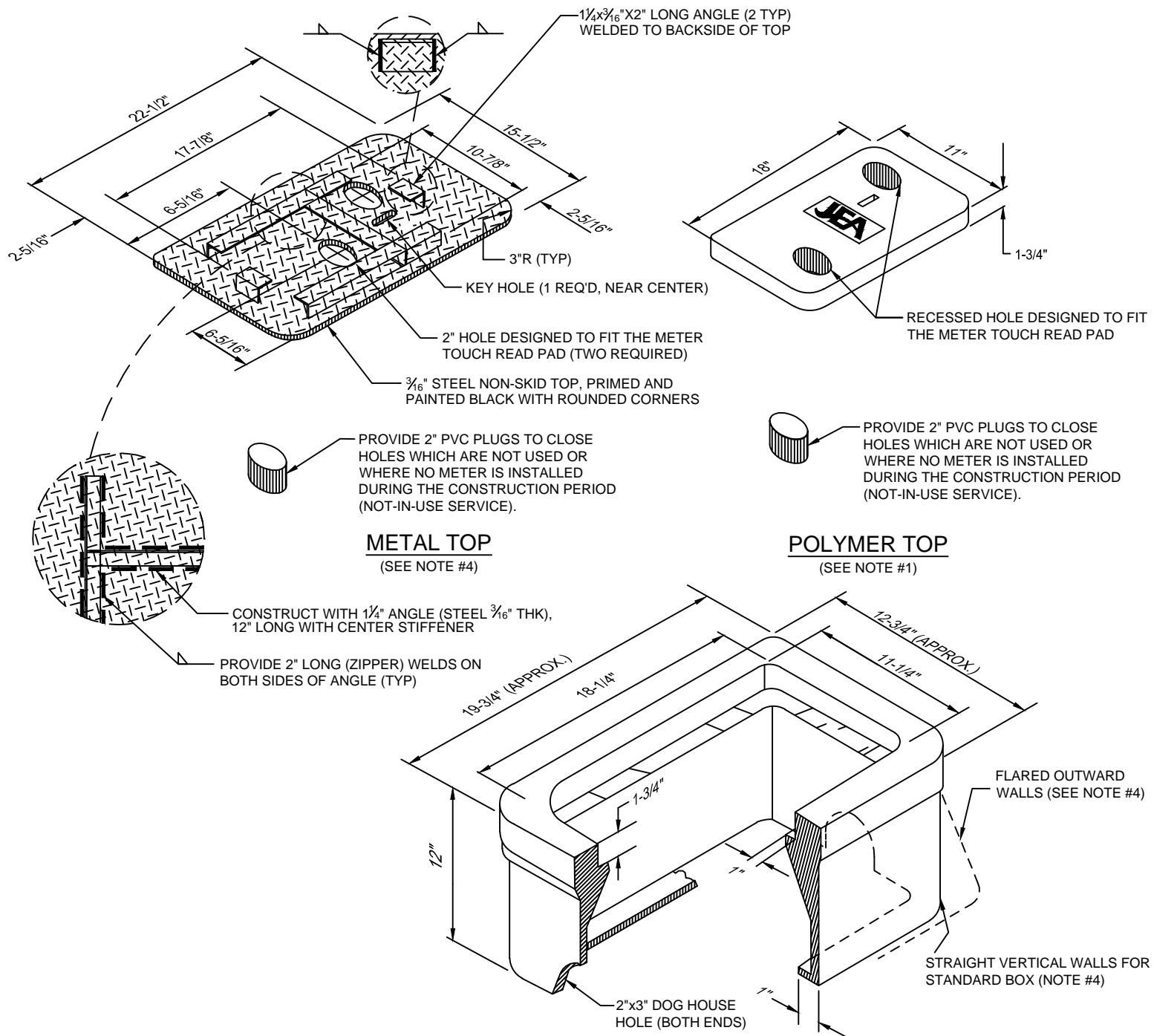
NOTES:

1. SEE PLATE W-1 FOR METER LOCATION REQUIREMENTS.
2. SINGLE BAND SADDLES JANUARYBE UTILIZED ON NEW 1" WATER SERVICES WHICH ARE INSTALLED ON A DRY 10" SIZE OR SMALLER WATER MAIN (NEW WATER MAIN CONSTRUCTION). FOR WET TAPS OR WATER MAINS 12" SIZE AND LARGER, A DOUBLE BAND SADDLE IS REQUIRED. BRASS SADDLES MAY BE UTILIZED ON NEW 1 INCH AND SMALLER WATER SERVICES WHICH ARE INSTALLED ON A DRY 10 INCH OR SMALLER PVC WATER MAIN.
3. NO OPEN CUT UNDER ROADWAY PAVING ALLOWED UNLESS THE ROADWAY IS BEING RECONSTRUCTED OR IF DIRECTED OTHERWISE BY J.E.A. CONSTRUCT POLY LINE WITH 24" (MIN.) COVER UNDER ROADWAYS. THE POLY WATER SERVICE LINE SHALL BE SAME SIZE AS THE METER (1" MINIMUM) AND BE INSTALLED PERPENDICULAR TO THE MAIN AND NOT EXCEED 100LF UNLESS APPROVED OTHERWISE BY JEA.
4. INSTALL PVC PLUG IN ALL CURB STOPS IF WATER SERVICE IS "NOT IN USE" (I.E.: IF NO METER IS INSTALLED). WATER SERVICES SERVING VACANT LOTS (SERVICE NOT IN USE), SHALL INCLUDE A "W" CUT INTO THE CURB (CLOSEST TO THE METER BOX), AND PAINTED BLUE (PAINTED PURPLE FOR RECLAIMED WATER). IN ADDITION, FOR NEW DEVELOPMENT AREAS WHERE THE WATER SERVICE IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED BLUE OR PURPLE FOR RECLAIMED WATER). THE REMOVAL OR TRANSFER OF A WATER SERVICE SHALL INCLUDE BRASS METER COUPLINGS (HEX ON BARREL TYPE).
5. NO 2" AND SMALLER WATER SERVICE TAPS PERMITTED ON WATER MAINS WHICH ARE 20" AND LARGER SIZE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF THE METER OR ELECTRONIC DEVICES IF DAMAGED BY THE CONTRACTOR DURING THE CONSTRUCTION PERIOD.
7. METER BOX AND TOP SHALL BE CLEAR OF ALL DEBRIS TO ALLOW FULL ACCESS TO BOX (I.E. NO DIRT, TRASH OR OTHER DEBRIS PLACED ON TOP OF BOX).
8. LOCATE WIRING REQUIRED ON ALL SERVICES 10' OR GREATER IN LENGTH. SEE PLATE W-44.

WATER SERVICE DETAIL- 2" AND SMALLER METER

JANUARY 2017

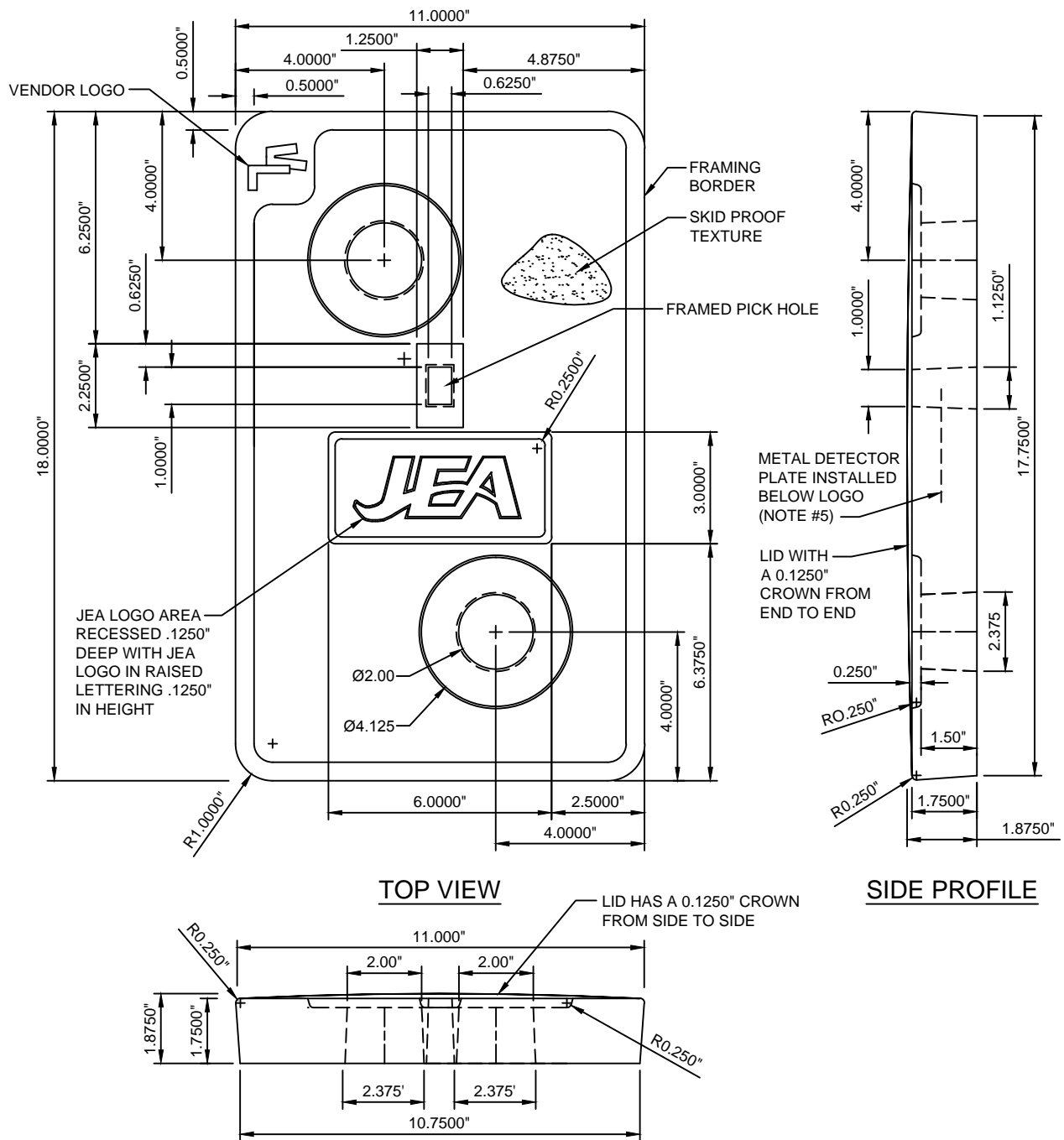
PLATE W-2



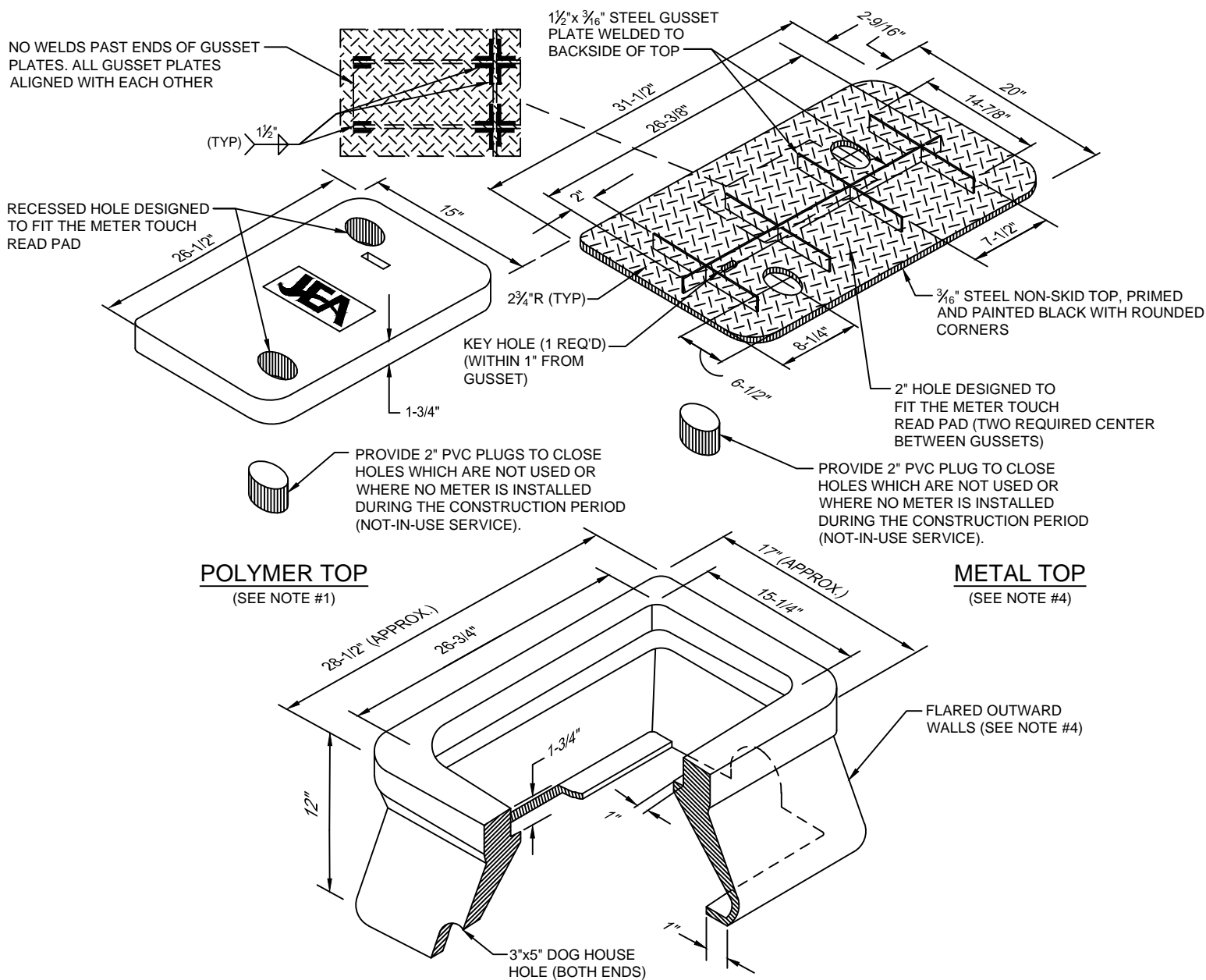
NOTES:

1. THE STANDARD BOX (A-8 (ASTM C857) LOAD RATING WITH STRAIGHT VERTICAL WALLS) & TOP (A-8 (ASTM C857) RATING WITH 2 HOLES) SHALL BE MADE OF POLYMER CONCRETE. (SIMILAR TO OLD BROOKS SERIES 37 BOX). BOX WALLS SHALL BE FIBERGLASS. THE INSIDE LIP OF THE BOX SHALL BE RATED SAME AS THE BOX. THE ONE HOLE LIDS ARE FOR SPECIAL ORDERS ONLY AND REQUIRE JEA'S APPROVAL PRIOR TO USE.
2. ALL SIZES SHOWN ARE IN INCHES AND ARE APPROXIMATE SIZES.
3. POLYMER BOX APPROXIMATE WEIGHT 25lbs. POLYMER TOP APPROXIMATE WEIGHT 20lbs. SEE CONSTRUCTION DETAILS W-3A (TWO HOLE) AND W-3B (ONE HOLE) FOR MANUFACTURING DETAILS FOR COVERS.
4. UNLESS APPROVED OTHERWISE IN WRITING BY JEA, ALL METER BOXES SHALL BE LOCATED IN NON-TRAFFIC AREAS (NOT IN THE ROADWAY, DRIVEWAYS OR SIDEWALKS). IF AN EXCEPTION TO THIS RULE IS APPROVED BY JEA, THEN THE FOLLOWING SHALL BE PROVIDED:
 - A) UNDER NO CIRCUMSTANCE SHALL A METER BOX BE LOCATED IN A COMMERCIAL TRAFFIC AREA.
 - B) IF AN EXCEPTION IS APPROVED IN WRITING THE METER BOX LOCATED IN A SIDEWALK OR RESIDENTIAL DRIVEWAY SHALL INCLUDE A POLYMER BOX WITH FLARED OUTWARD WALLS (NOT STRAIGHT WALLS) AND A POLYMER TOP. BOX AND TOP SHALL COMPLY WITH A-8 (ASTM C857), LOAD RATING.
 - C) METAL TOPS MAY BE UTILIZED IF SPECIFICALLY APPROVED BY JEA MANAGER OR JEA METER O&M STAFF.

WATER METER BOX & COVER FOR 1" AND SMALLER METERS



WATER METER BOX POLYMER COVER MODEL No. 37 - TWO HOLE

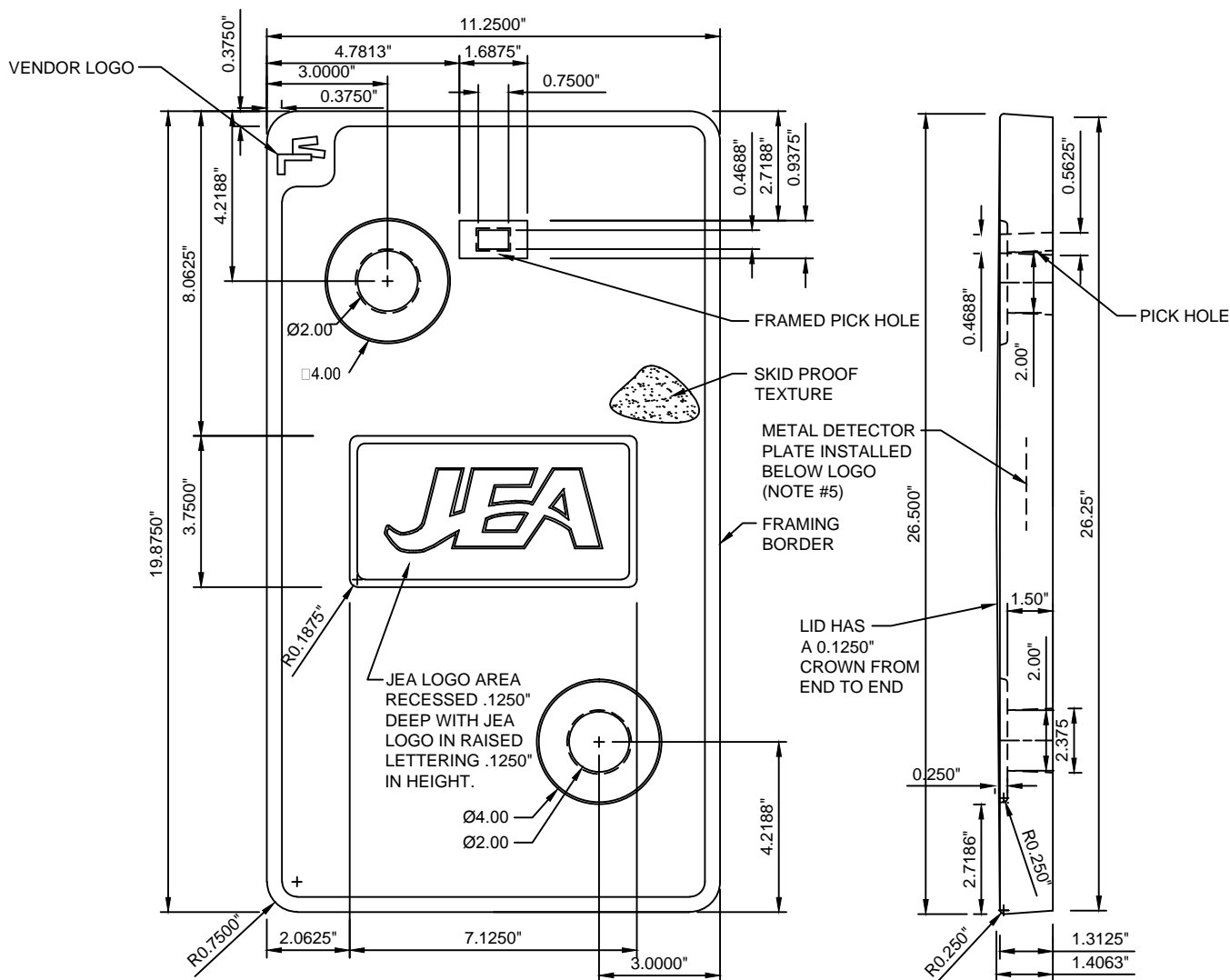


POLYMER BOX

NOTES:

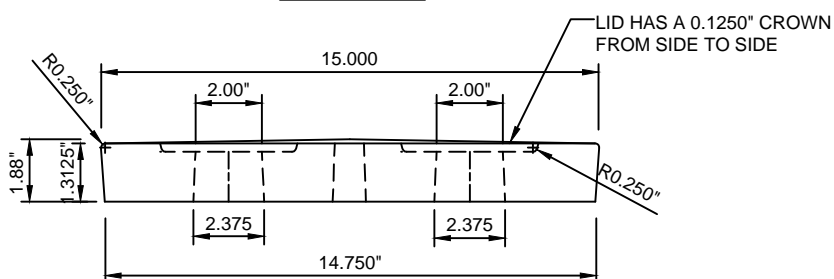
1. THE STANDARD BOX (FLARED OUTWARD WALLS) & TOP (2 HOLE) SHALL BE MADE OF POLYMER CONCRETE. (SIMILAR TO OLD BROOKS SERIES 65). BOX WALLS SHALL BE FIBERGLASS. BOX, INCLUDING THE INSIDE LIP, AND TOP SHALL MEET A-8 (ATSM C857) LOAD RATING.
2. ALL SIZES SHOWN ARE IN INCHES AND ARE APPROXIMATE SIZES.
3. POLYMER BOX APPROXIMATE WEIGHT 50lbs. POLYMER TOP APPROXIMATE WEIGHT 50lbs. SEE CONSTRUCTION DETAIL W-4A FOR MANUFACTURING DETAIL FOR TWO HOLE COVER.
4. UNLESS APPROVED OTHERWISE IN WRITING BY JEA, ALL METER BOXES SHALL BE LOCATED IN NON-TRAFFIC AREAS (NOT IN THE ROADWAY, DRIVEWAYS OR SIDEWALKS).
5. METAL TOPS MAY BE UTILIZED IF SPECIFICALLY APPROVED BY A JEA MANAGER OR BY JEA METER O&M STAFF.

WATER METER BOX & COVER FOR 1-1/2" AND 2" METERS



TOP VIEW

SIDE PROFILE

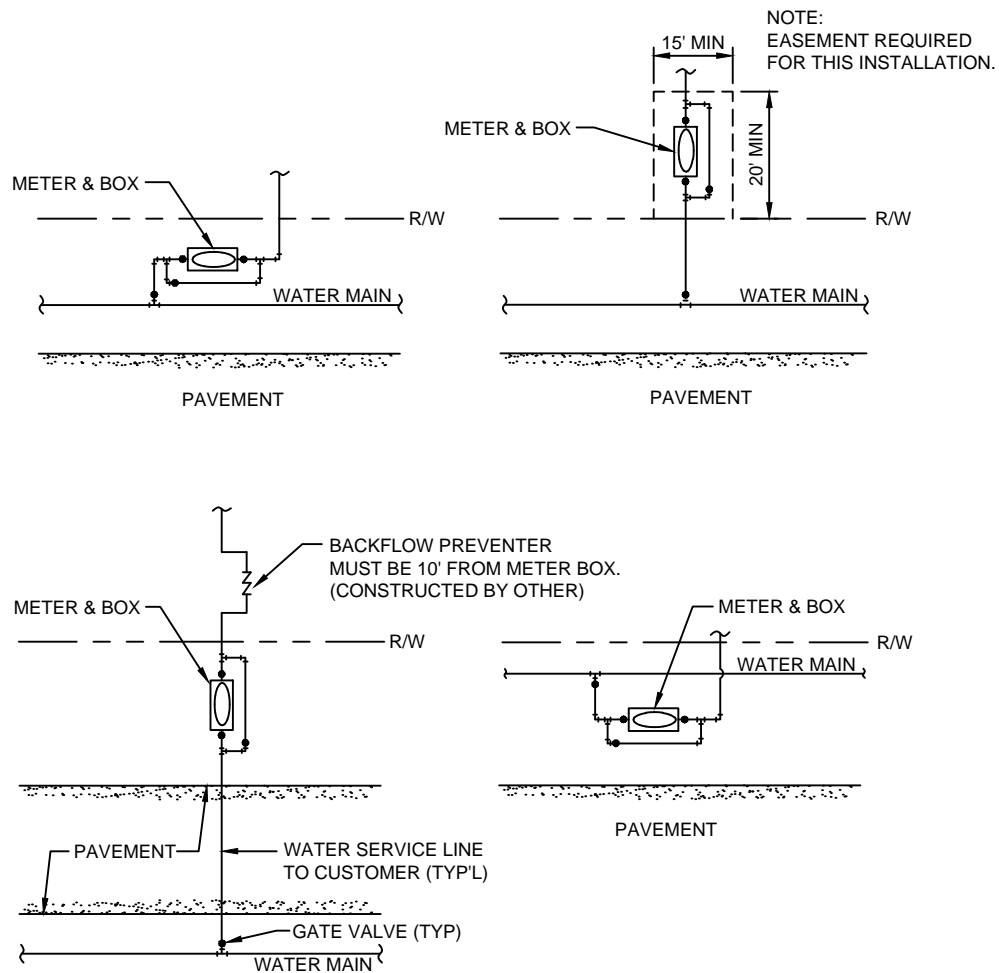


END PROFILE

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. COLOR SHALL BE OFF-WHITE, NON-POROUS, SAND TEXTURED SATIN FINISH.
3. ALL TOPS SHALL MEET A-8 (ASTM C857) LOAD RATING.
4. THE LID SHALL BE CERTIFIED BY CELLNET TECHNOLOGY INC AND SENSUS METERING SYSTEMS TO BE RF COMPATIBLE WITH THE SENSUS MTU.
5. METAL DETECTOR PLATE SHALL BE DETECTABLE BY JEA MAGNETIC LOCATE EQUIPMENT.

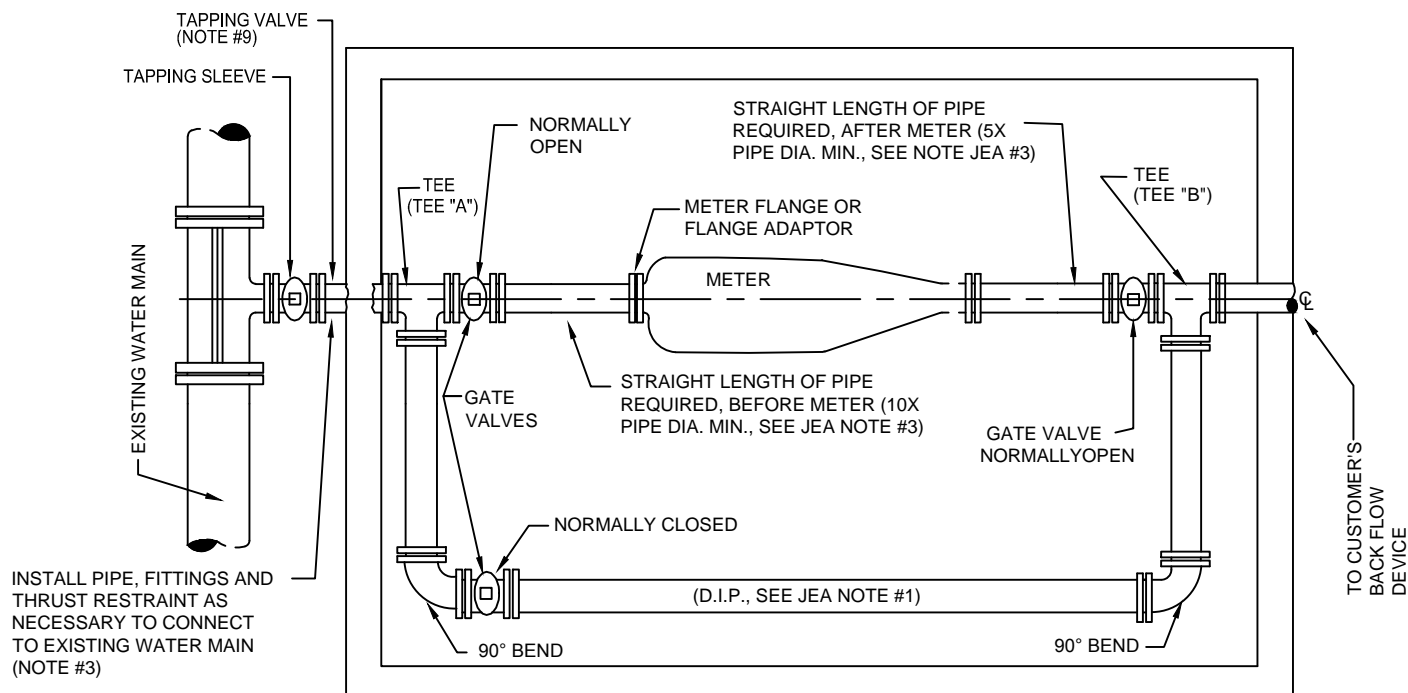
WATER METER BOX POLYMER CONCRETE COVER MODEL No. 65 - TWO HOLE



NOTES:

1. THE SKETCHES ABOVE ARE SUGGESTIONS FOR SOME TYPICAL LARGE METER (3" AND LARGE SIZE METER) INSTALLATIONS. ACTUAL INSTALLATIONS WILL VARY ACCORDING TO FIELD CONDITIONS ENCOUNTERED. FOR OTHER LOCATION LIMITATIONS SEE PLATE NOS. W-10 & W-11.
2. THE WATER METER BOX SHALL BE CO-POLYMER MATERIAL. IF THE BOX IS LOCATED IN A DRIVEWAY OR ROADWAY, THE BOX SHALL BE CONCRETE WITH HEAVY-DUTY ALL GALVANIZED (WITH REINFORCED GALV.) TOP. BOXES LOCATED IN DRIVEWAYS OR ROADWAYS MUST BE APPROVED BY JEA, PRIOR TO CONSTRUCTION.
3. FOR TYPICAL BOX INSTALLATION DETAILS SEE PLATE NO. W-6 THRU W-8.
4. FOR TYPICAL MANIFOLD INSTALLATION, SEE PLATE NO. W-9.

LARGE WATER METER INSTALLATIONS



TO BE INSTALLED BY JEA (SEE NOTE #1)
 MIN. LAYING LENGTH REQUIRED
 3" & 4" METERS.....14'
 6" & 8" METERS.....20'
 10" METERS.....24'
 (D.I.P. REQUIRED, SEE JEA NOTES #1 & #2)

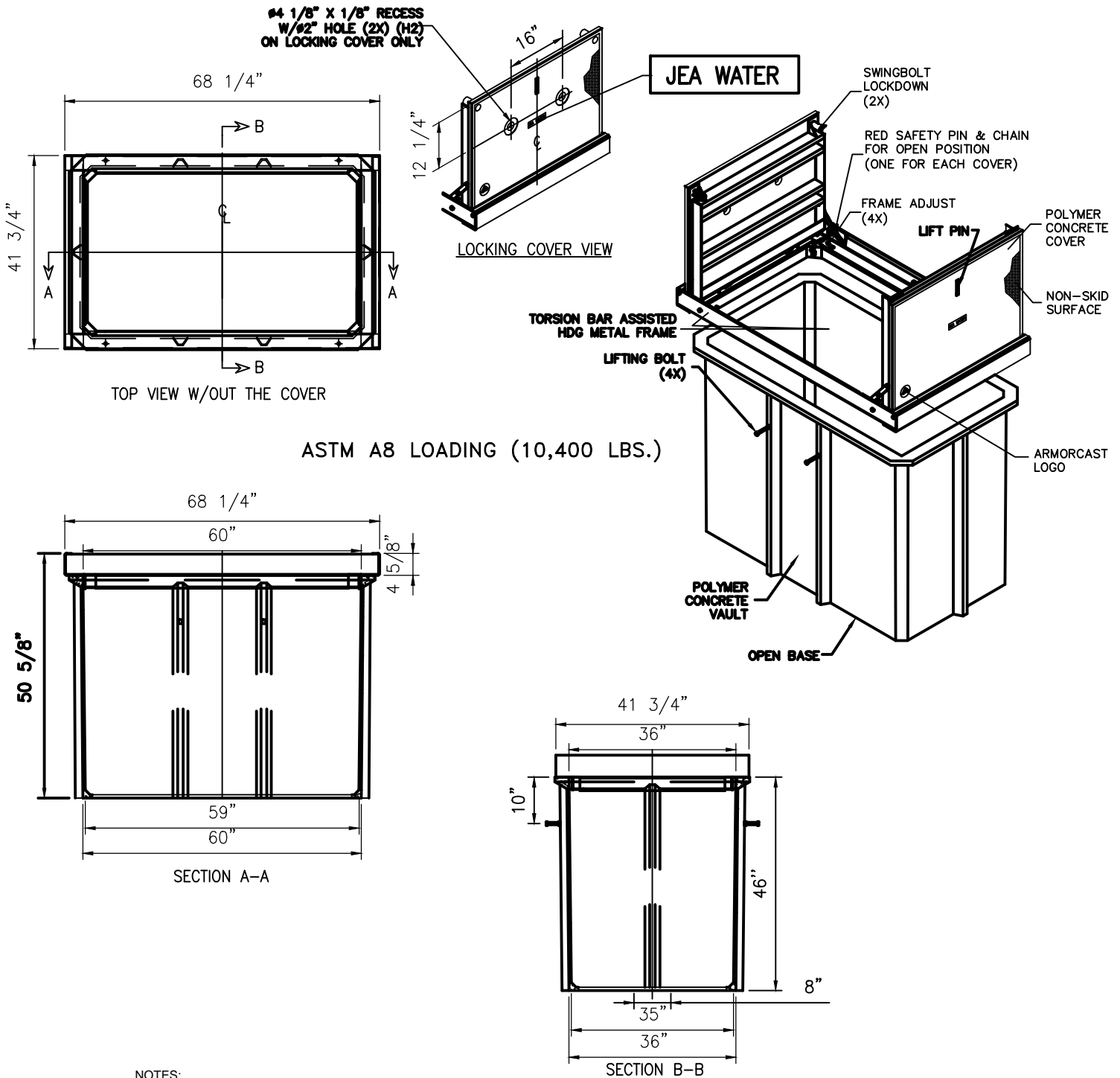
CONTRACTOR NOTES:

1. FOR "PRE-PAVE" INSTALLATIONS, THE CONTRACTOR SHALL CONSTRUCT TAP AND WATER MAIN PIPING (PVC OR D.I.P.) BETWEEN TAPPING VALVE AND R/W PROVIDING AN UN-INSTALLED (OPEN) PIPE SECTION WITH A "MINIMUM LAYING LENGTH" AS SHOWN ABOVE FOR THE METER BOX AND BY PASS PIPING. THE FINISHED GRADE AT THE PROPOSED METER VAULT SHALL BE FLAT. CONTRACTOR SHALL PROVIDE METER BOX. JEA WILL INSTALL METER BOX AND METER ASSEMBLY (INCLUDING METER, THREE (3) GATE VALVES AND ASSOCIATED DUCTILE IRON PIPE ALL THE SAME SIZE).
2. FOR "FULL-TAP" METER ASSEMBLY, JEA WILL PROVIDE AND INSTALL THE TAP, METER BOX AND ALL OF THE ABOVE PIPING WITHIN THE R/W.
3. FOR BOX DETAILS SEE PLATES W-7 AND W-8.
4. ALL POTABLE PIPE AND FITTINGS TO BE SAME SIZE AS METER. IF UTILIZING HDPE PIPE.
5. MECHANICAL RETAINER GLAND RESTRAINTS OR MEGA LUGS SHALL BE UTILIZED TO RESTRAIN ALL JOINTS. THE USE OF THRUST BLOCKS, TIE RODS AND/OR BELL/ROD RESTRAINTS SHALL ONLY BE USED IF SPECIFICALLY APPROVE BY JEA MANAGEMENT.
6. PIPE FROM TAP TO R/W LINE SHALL BE RESTRAINED.
7. MAXIMUM COVER OF LARGE WATER METERS SHALL BE 36" (FROM TOP OF PIPE TO GRADE).
8. LOCATING WIRING REQUIRED FROM EXISTING WATER MAIN TO METER BOX. SEE PLATE W-44.
9. FOR METERS LARGER THAN 10" SIZE, PLEASE CONTACT JEA METER SHOP FOR ADDITIONAL REQUIREMENTS.
10. EACH SERVICE (FIRE MAIN, POTABLE WATER, ETC.) SHALL INCLUDE A SEPARATE ISOLATION VALVE (TAPPING VALVE OR GATE VALVE, BELOW GROUND TYPE) LOCATED PRIOR TO TEE "A". ALSO, UN-METERED FIRE MAIN SERVICES SHALL INCLUDE A SEPARATE ISOLATION VALVE (TAPPING VALVE OR GATE VALVE, BELOW GROUND TYPE).
11. FOR TYPICAL MANIFOLD INSTALLATION, SEE PLATE NO. W-9.

JEA NOTES:

1. ALL POTABLE PIPING BETWEEN TEE FITTINGS (TEE "A" AND TEE "B") SHALL BE DR18 OR CLASS 150 D.I.P., INCLUDING BY-PASS PIPING.
2. ALL POTABLE VALVES AND FITTINGS TO BE DUCTILE IRON RESTRAINED JOINT.
3. MINIMUM LENGTH OF TEN (10) PIPE DIAMETERS OF STRAIGHT PIPE TO BE INSTALLED ON INLET SIDE OF METER AND FIVE (5) PIPE DIAMETERS OF STRAIGHT PIPE TO BE INSTALLED ON OUTLET SIDE OF METER.
4. ALL METER INSTALLATIONS REQUIRE A TEST TEE TO BE INSTALLED BETWEEN THE METER AND VALVE ON CONSUMER SIDE OF METER.

WATER METER INSTALLATION DETAILS 3" - 20" METERS

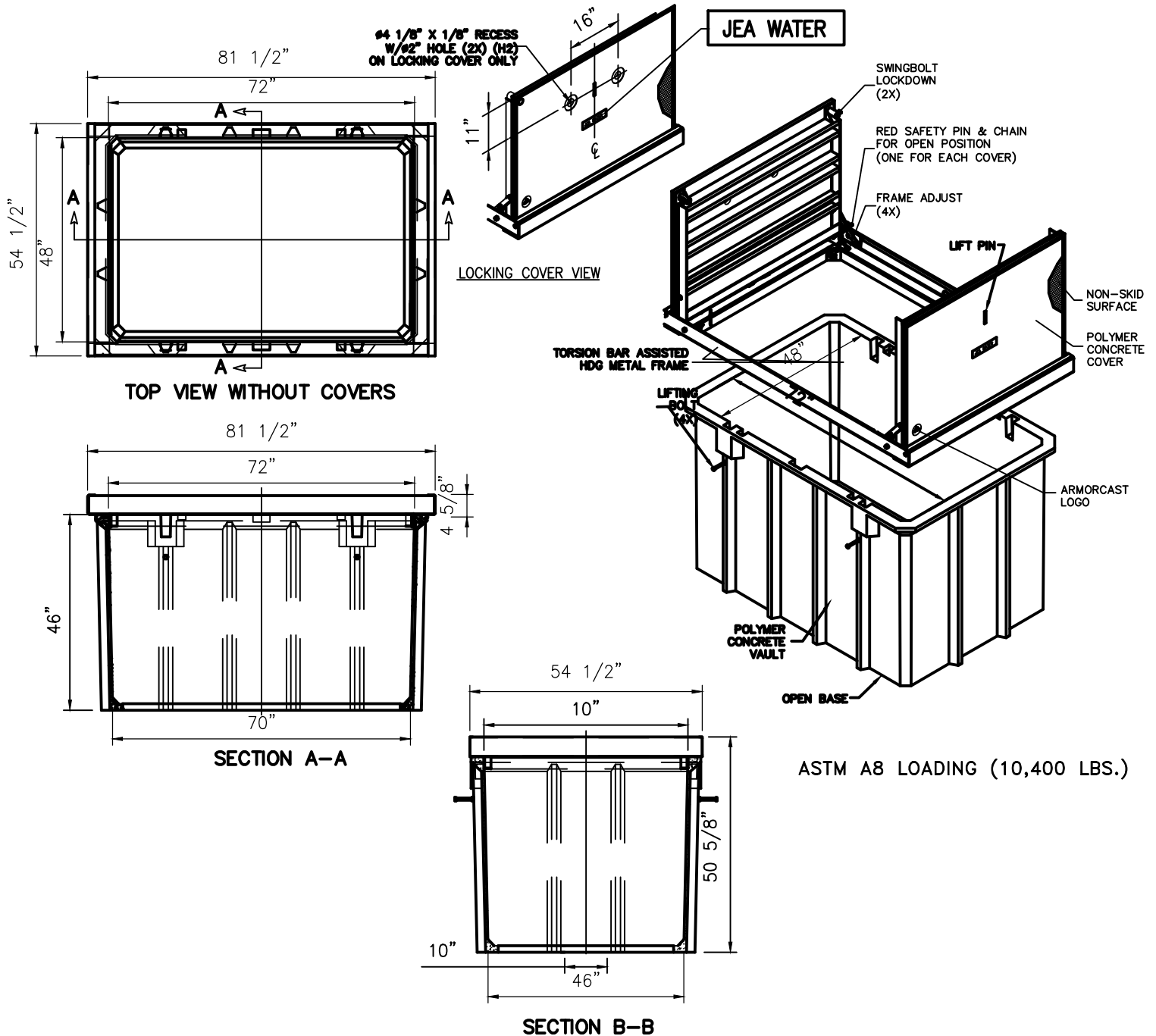


NOTES:

1. THE DIMENSIONS SHOWN ARE FOR A STANDARD 36" WIDE BY 60" LONG BY 48" DEEP BOX. DIMENSIONS VARY ACCORDING TO METER SIZE & TYPE. SEE PLATE W-8. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. CONCRETE OR ASPHALT SLOPE: 1/8 IN./FT.
3. GRADE TO SLOPE AWAY FROM METER BOX.
4. DO NOT INSTALL METER BOX IN AREA SUBJECTED TO FLOODING.
5. LOCATING WIRING REQUIRED. SEE DETAIL W-44.
6. THE LARGE BOXES REQUIRE TWO 2" RECESSED HOLES TO FIT ANTENNA.
7. A 4" THICK CONCRETE BOTTOM SHALL BE CONSTRUCTED DURING THE BOX INSTALLATION.

36" x 60" x 48" CO-POLYMER WATER METER BOX 3" & 4" METERS

APPROX. WT. = 1425 LBS.

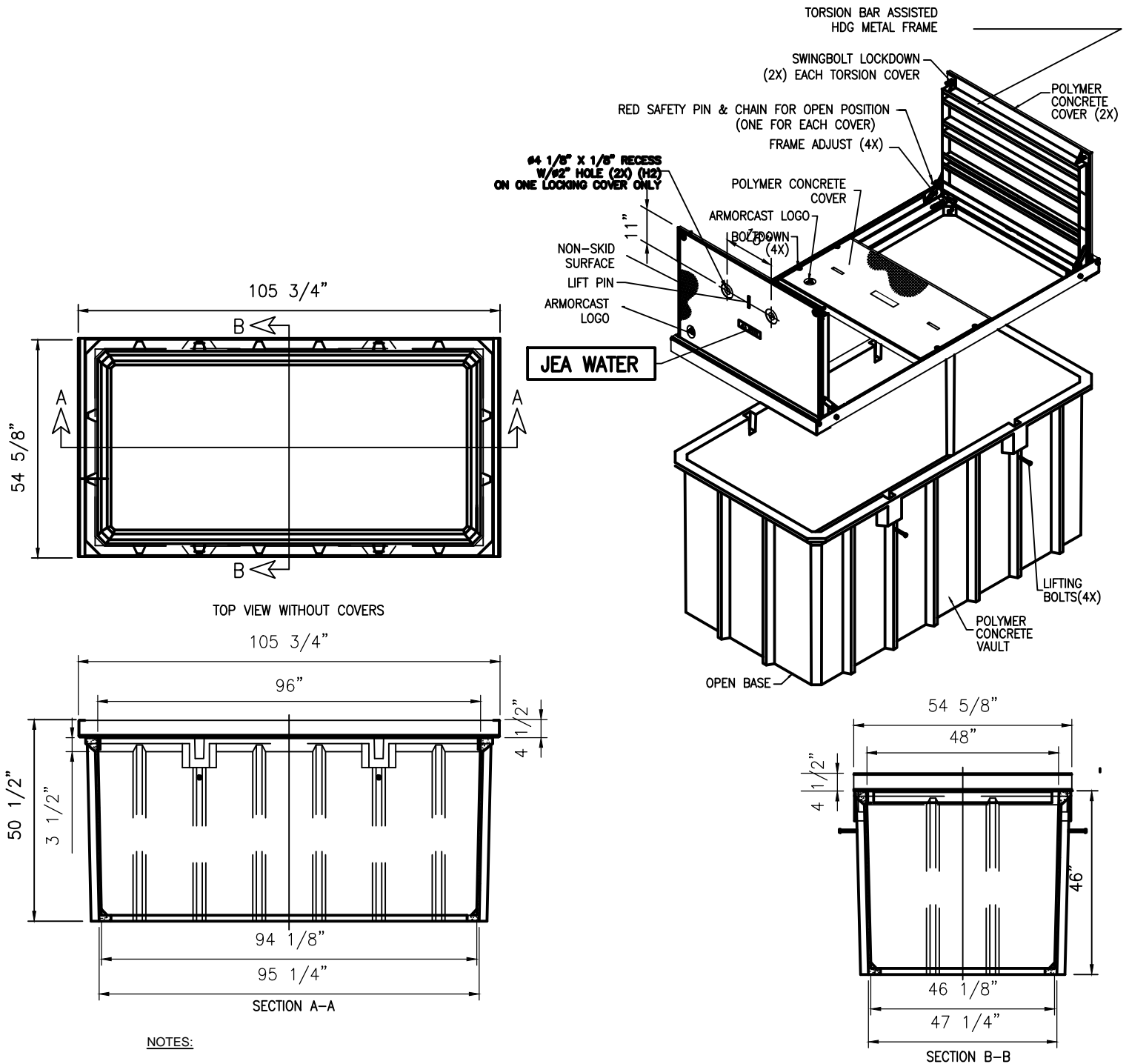


NOTES:

1. THE DIMENSIONS SHOWN ARE FOR A STANDARD 48" WIDE BY 72" LONG BY 48" DEEP BOX. DIMENSIONS VARY ACCORDING TO METER SIZE & TYPE. SEE PLATE W-8. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. CONCRETE OR ASPHALT SLOPE: 1/8 IN./FT.
3. GRADE TO SLOPE AWAY FROM METER BOX.
4. DO NOT INSTALL METER BOX IN AREA SUBJECTED TO FLOODING.
5. LOCATING WIRING REQUIRED. SEE DETAIL W-44.
6. THE LARGE BOXES REQUIRE TWO 2" RECESSED HOLES TO FIT ANTENNA.
7. A 4" THICK CONCRETE BOTTOM SHALL BE CONSTRUCTED DURING THE BOX INSTALLATION.

48" x 72" x 48" CO-POLYMER WATER METER BOX 4" & 6" METERS

APPROX. WT. = 1990 LBS.



NOTES:

1. THE DIMENSIONS SHOWN ARE FOR A STANDARD 48\"
2. CONCRETE OR ASPHALT SLOPE: 1/8 IN./FT.
3. GRADE TO SLOPE AWAY FROM METER BOX.
4. DO NOT INSTALL METER BOX IN AREA SUBJECTED TO FLOODING.
5. LOCATING WIRING REQUIRED. SEE DETAIL W-44.
6. THE LARGE BOXES REQUIRE TWO 2\"
7. A 4\"

48" x 96" x 48" CO-POLYMER WATER METER BOX 6" - 20" METERS

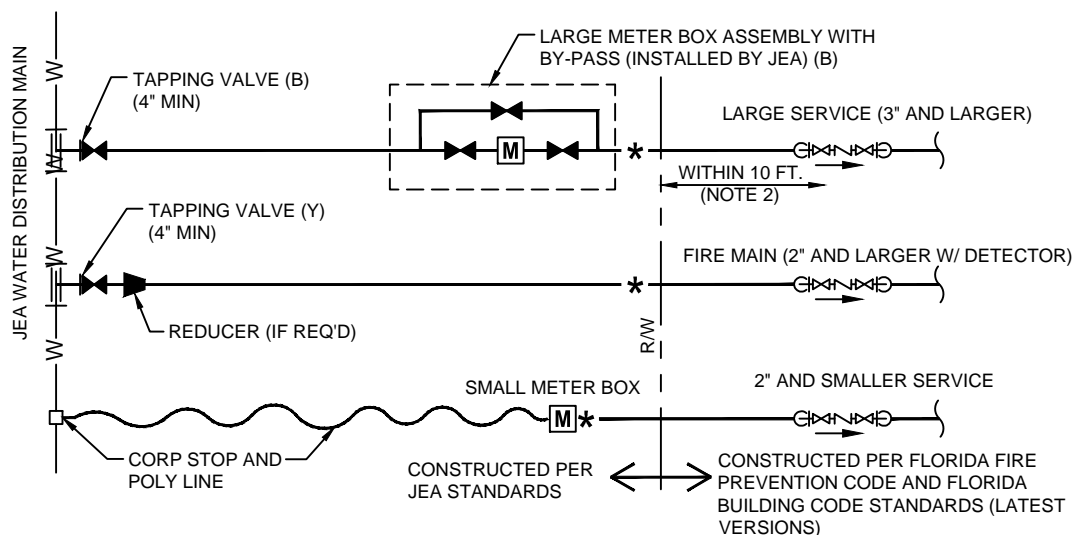
WATER METER BOX DIMENSIONS (3" - 20" METERS)

Meter Description		Polymer Concrete Box Non-Traffic Rated (Note 1)
Type	SIZE	Width x Length x Depth (O.D.)
C-2 or T-2 Omni Style	3"	36" x 60" x 48"
	4"	36" x 60" x 48"
	6"	48" x 72" x 48"
Fire Meter	4"	48" x 72" x 48"
	6"	48" x 96" x 48"
	8"	48" x 96" x 48"
	10"	48" x 96" x 48"
* Includes 6" Thick Bottom		

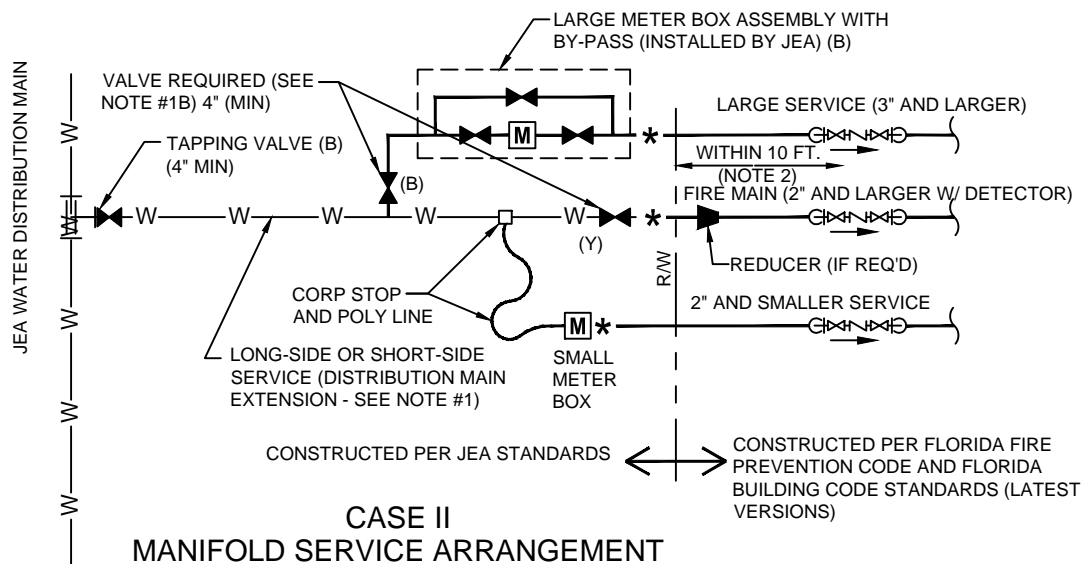
NOTES:

1. POLYMER CONCRETE BOXES SHALL ONLY BE PROVIDED IN NON-TRAFFIC (INCLUDING NOT IN DRIVEWAYS) LOCATIONS. FRP/ POLYMER CONCRETE METER BOX & COVER (BY ARMOURCAST PRODUCTS COMPANY): BOX AND THE EXTENSION IF REQUIRED, SHALL BE MANUFACTURED USING FIBERGLASS REINFORCED MATERIALS AND POLYMER CONCRETE. THE BODY OF THE BOX WITH NO BOTTOM SHALL BE MANUFACTURED USING FIBERGLASS REINFORCED MATERIALS, COMPRISED FROM POLYESTER RESINS AND FIBERGLASS MATTING. THE TOP COLLAR AND COVER SHALL BE MANUFACTURED FROM POURED POLYMER CONCRETE AND SHALL BE CONCRETE GREY COLOR. DURING THE MANUFACTURING PROCESS AND WHILE THE POLYMER CONCRETE IS IN A SOFTENED STATE, THE BODY SHALL BE MARRIED TO THE COLLAR BY INSERTING IT INTO THE COLLAR'S FORM. THE BOX AND COVER SHALL HAVE A LOAD RATING OF A8 (ASTM C857). THE BOX SHALL CONFORM TO THESE DESIGN FUNCTIONS AND DIMENSIONAL REQUIREMENTS AND INCLUDE LIFTING STUDS. BOX EXTENSIONS SHALL BE PROVIDED FOR ALL DEEP INSTALLATIONS. THE BOX SHALL BE A 2-PIECE ASSEMBLY INCLUDING MOLDED/RAISED JEA LOGO (LOGO ON BOTH PIECES). RECESSED HOLES (APPROXIMATELY 2" DIAMETER) DESIGNED TO FIT A SCHLUMBERGER ANTENNA USED WITH A METER INTERFACE UNIT (MIU). TWO COVER HOLD-DOWN BOLTS (1/2 - 13NC S.S. PENTAHEAD BOLTS). TORSION ASSISTED COMPONENTS AND TEXTURED NON-SKID SURFACE. A 2" PVC PLUG SHALL BE PROVIDED FOR EACH 2"-HOLE WHICH CAN BE COMPRESSED (TIGHT FIT) INTO THE 2" HOLE FOR TEMPORARY CLOSURE OF THE HOLE.
2. FOR WATER METERS LARGER THAN 6" OR FIRE MAINS LARGER THAN 10" SIZE, PLEASE CONTACT JEA METER SHOP FOR CONSTRUCTION REQUIREMENTS.

WATER METER BOX DIMENSIONS 3" - 20" METERS



CASE I
SEPARATE INDIVIDUAL SERVICE ARRANGEMENT



CASE II
MANIFOLD SERVICE ARRANGEMENT

KEY

- GATE VALVE
- (B) VALVE COVER PAINT COLOR
(B) = BLUE (Y) = YELLOW
- * JEA POINT OF SERVICE
- BACKFLOW PREVENTER
(NOTE #2)
- W— JEA WATER DISTRIBUTION MAIN
- JEA METER

NOTES:

1. SHOULD AN INSTALLATION INCLUDE MULTIPLE WATER SERVICES FOR THE SAME CUSTOMER (i.e. DOMESTIC, IRRIGATION, FIRE) AND ONE OR MORE OF THOSE SERVICES ARE 3 INCH OR LARGER, A MANIFOLD ARRANGEMENT (SEE CASE II ABOVE) IS ACCEPTABLE PROVIDED:
 - A. THE PROJECT DESIGN ENGINEER (FLORIDA PROFESSIONAL ENGINEER) PROVIDES ACCEPTABLE HYDRAULIC CALCULATION (ENGINEERED, SIGNED AND SEALED) WHICH MEETS THE MOST HYDRAULICALLY DEMANDING CASE.
 - B. TO MEET JEA AND LOCAL FIRE CODE REQUIREMENTS, A SEPARATE ISOLATION VALVE (BELOW GROUND TYPE GATE VALVE OR CORP STOP) SHALL BE PROVIDED FOR EACH SERVICE ON A MANIFOLD ARRANGEMENT.
 - C. THE SPECIFIC PROPOSED WATER SERVICE ARRANGEMENT IS IN ACCORDANCE WITH JEA STANDARDS AND IS REVIEWED AND APPROVED BY JEA.
2. BACKFLOW PREVENTER (BFP) - THE ABOVE GROUND VALVE SHALL MEET JEA'S CROSS-CONNECTION CONTROL PROGRAM. THIS JEA APPROVED VALVE SHALL BE INSTALLED WITHIN TEN (10) FEET OF RIGHT-OF-WAY LINE OR JEA EASEMENT UNLESS APPROVED OTHERWISE BY JEA. ALL BFPs INSTALLED ON A FIRE MAIN SHALL INCLUDE A DETECTOR.

WATER SERVICE MANIFOLD ARRANGEMENT

HORIZONTAL & VERTICAL SEPARATION REQUIREMENTS

PROPOSED UTILITY												
CONFLICTING UTILITY	POTABLE WATER			WASTEWATER GRAVITY AND FORCEMAIN			RECLAIMED WATER			VACUUM SEWERS		
	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*
POTABLE WATER	3' NOTE 1	12"	3' NOTE 2	6' to 10'	12" NOTE 5	6' NOTE 2	3'	12"	6' NOTE 2	3' to 10'	12"	3' NOTE 2
RECLAIMED WATER	3'	12"	6' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3'	12"	6' NOTE 2	3' NOTE 1	12"	3' NOTE 2
WASTEWATER (GRAVITY AND FORCE MAIN)	6' to 10'	12"	6' NOTE 2	3' NOTE 1	12"	6"	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
VACUUM SEWERS	3' to 10'	12"	3' NOTE 2	3' NOTE 1	12"	6"	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
RIGHT OF WAYS	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A
PERMANENT STRUCTURES (SIGNS, TREES, POLES, ETC.)	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A
STORM SEWERS	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
ALL OTHER UTILITIES	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2

NOTES:

1. THIS SEPARATION REQUIREMENT IS TO PROVIDE ACCESSIBILITY FOR CONSTRUCTION AND MAINTENANCE. THREE FEET OF HORIZONTAL SEPARATION IS THE MINIMUM FOR PIPES WITH THREE FEET OF COVER. FOR PIPES INSTALLED AT GREATER DEPTH, PROVIDE AN ADDITIONAL FOOT OF SEPARATION FOR EACH ADDITIONAL FOOT OF DEPTH.
2. THE MINIMUM JOINT SPACING REQUIRED FROM CROSSING FROM OTHER UTILITIES WHILE STILL MAINTAINING MINIMUM VERTICAL SEPARATION.
3. DISTANCES GIVEN ARE FROM OUTSIDE OF PIPE TO OUTSIDE OF PIPE.
4. NO WATER PIPE SHALL PASS THROUGH OR COME INTO CONTACT WITH ANY PART OF SANITARY OR STORM WATER MANHOLE OR STRUCTURES.
5. WATER MAIN SHOULD CROSS ABOVE OTHER PIPES WHENEVER POSSIBLE. WHEN WATER MAIN MUST BE BELOW OTHER UTILITY PIPING, THE MINIMUM SEPARATION SHALL BE 12 INCHES.
6. REFER TO SECTION-350, PARAGRAPH III.4.

SEPARATION REQUIREMENTS FOR WATER, WASTEWATER AND RECLAIMED WATER MAINS

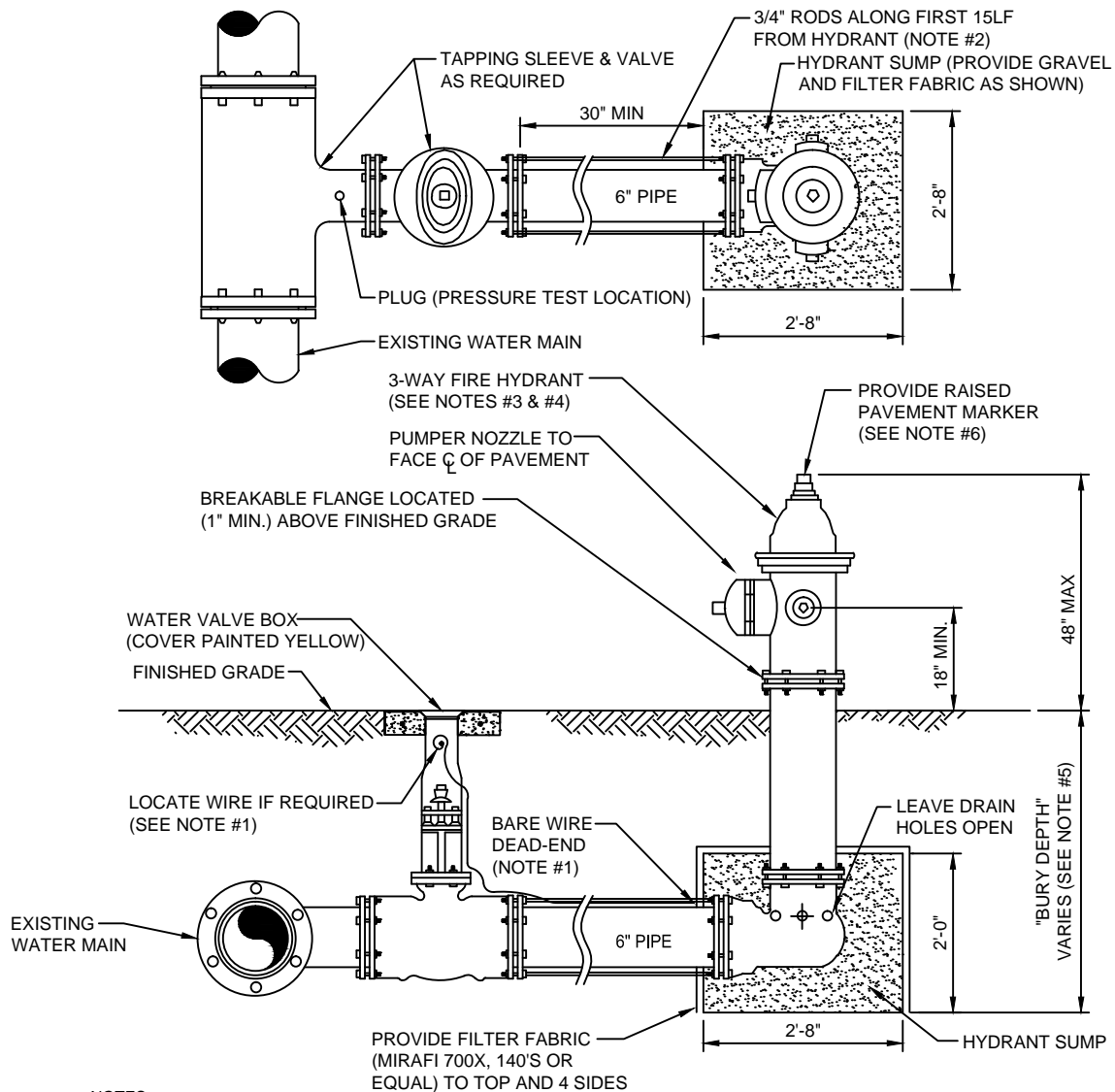
JANUARY 2017

PLATE W-10

WATER MAIN AND NON-WATER MAIN SEPARATION REQUIREMENTS - NOTES

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 SEWER 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.
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 SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER.
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 SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER. THE MINIMUM HORIZONTAL SEPARATION DISTANCE BETWEEN WATER MAINS AND GRAVITY-TYPE SANITARY SEWERS 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 SEWER (SPECIAL CASE).
4. NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED GRAVITY OR VACUUM-TYPE SANITARY SEWER OR STORM SEWER 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.
5. NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED PRESSURE-TYPE SANITARY SEWER, 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.
6. AT THE UTILITY CROSSINGS DESCRIBED IN NOTES 4 AND 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 SEWERS, STORM SEWERS, STORMWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER, AND AT LEAST SIX (6) FEET FROM ALL JOINTS IN GRAVITY OR PRESSURE-TYPE SANITARY SEWERS, WASTEWATER FORCE MAINS, OR PIPELINE CONVEYING RECLAIMED WATER.
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 SEWER, 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 SEWER; AT LEAST SIX (6) FEET, AND PREFERABLY TEN (10) FEET, FROM ANY EXISTING OR PROPOSED GRAVITY OR PRESSURE-TYPE SANITARY SEWER OR WASTEWATER FORCE MAIN.
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.

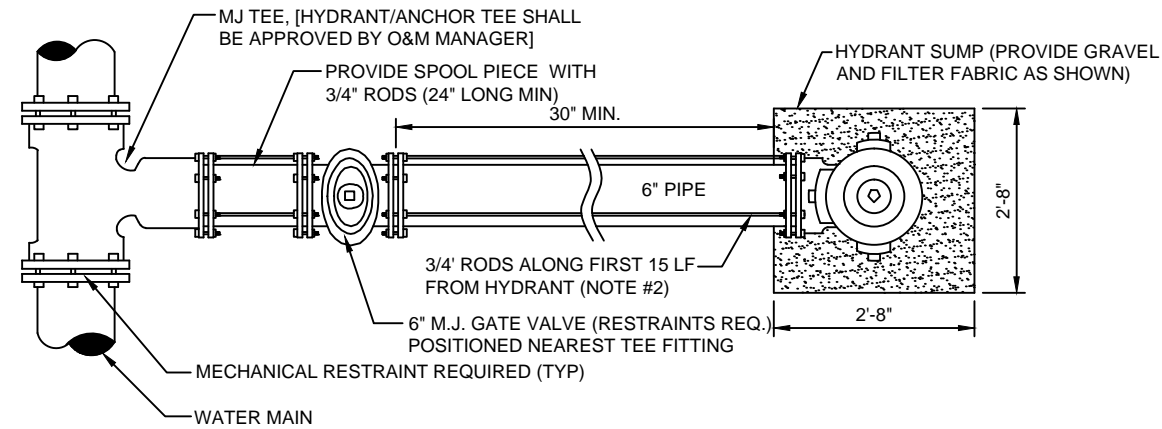
NOTES ON UTILITY SEPARATION REQUIREMENTS



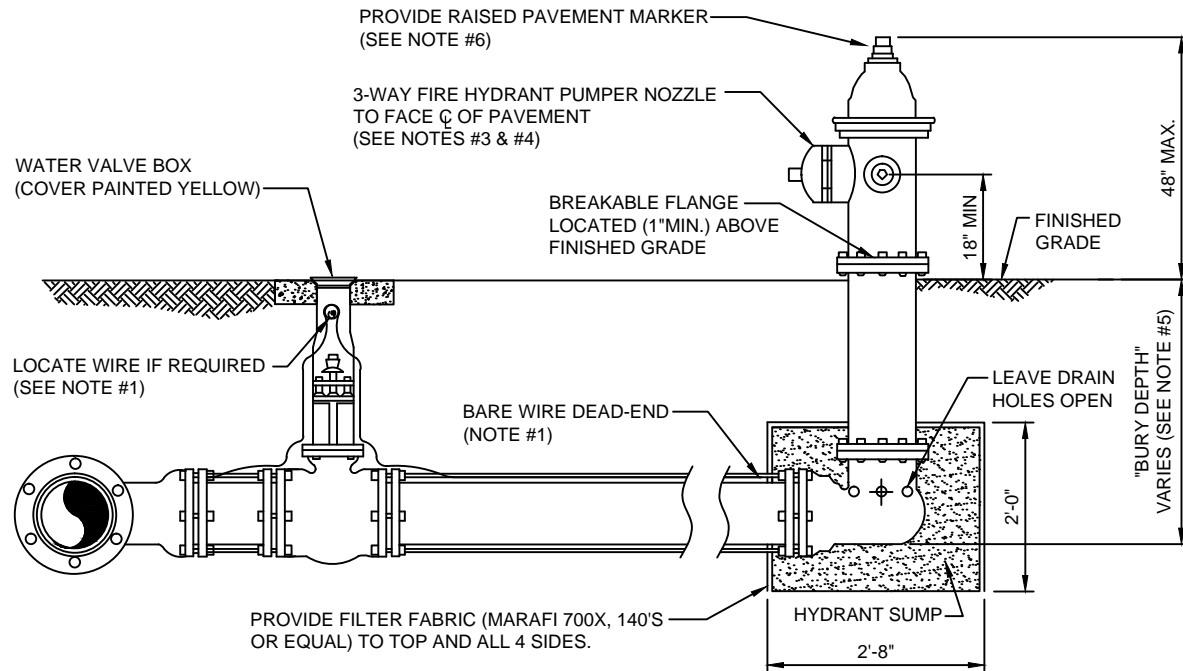
NOTES:

1. LOCATE WIRE IS ONLY REQUIRED IF THE DISTANCE BETWEEN VALVE AND HYDRANT IS OVER 15 LINEAR FEET IF REQUIRED, THE WIRE SHALL BE ROUTED FROM THE VALVE TO THE HYDRANT AS SHOWN ABOVE. THE END OF THE WIRE SHALL BE SECURED TO THE PIPE MAIN. SEE SECTION 350, LOCATE WIRE INSTALLATION PARAGRAPH.
2. FIRE HYDRANTS SHALL BE INSTALLED BETWEEN BACK OF CURB AND FACE OF SIDEWALK. ALL HYDRANTS SHALL BE LOCATED NO LESS THAN THREE (3) FEET FROM THE EDGE OF PAVEMENT OR BACK OF CURB OF THE ADJACENT ROADWAY AND NO LESS THAN THREE (3) FEET FROM ANY PHYSICAL FEATURE WHICH MAY OBSTRUCT ACCESS OR VIEW OF ANY HYDRANT UNLESS OTHERWISE APPROVED BY THE JEA. THE MAXIMUM DISTANCE (BACK OF CURB) SHALL BE IN COMPLIANCE WITH LOCAL COUNTY FIRE DEPARTMENT RULES AND AS APPROVED BY JEA. FOR OTHER LOCATION LIMITATIONS SEE PLATES W-10 AND W-11. IF PIPING BETWEEN TEE AND HYDRANT IS LONGER THAN 80 LF, AN ADDITIONAL 6" GATE VALVE IS REQUIRED AT THE HYDRANT LOCATION (PROVIDE 30" SEPARATION). ALL PIPING, VALVES AND FITTINGS ALONG THE HYDRANT BRANCH MAIN WHICH IS WITHIN 15 LF OF THE HYDRANT SHALL BE RESTRAINED UTILIZING ONLY TWO 3/4" DIA (THREADED ENDS) STEEL RODS AND EYE BOLTS (NO JOINT RESTRAINT DEVICES REQUIRED). A SPLIT SERRATED RING WITH RESTRAINT EARS (EBAA 15 PF06 or EQUAL) MAYBE USED IN THIS ASSEMBLY. ALL OTHER JOINTS ALONG THE HYDRANT BRANCH MAIN OUTSIDE OF THE FIRST 15 LF SHALL INCLUDE JOINT RESTRAINTS.
3. OPERATION OF THE FIRE HYDRANT SHALL BE EITHER FULL OPEN POSITION OR TOTALLY CLOSED POSITION. THE HYDRANT SHALL NOT BE UTILIZED TO THROTTLE OUTLET FLOW.
4. PRIOR TO PROJECT FINAL INSPECTION, THE HYDRANT AND ALL ABOVE GROUND PIPING SHALL BE RE-OILED, GREASED AND REPAINTED (RUS- KIL ENAMEL-INTERNATIONAL YELLOW OR EQUAL). PRIVATELY OWNED AND MAINTAINED FIRE HYDRANTS SHALL BE PAINTED RED.
5. FIRE HYDRANTS SHALL BE ORDERED WITH PROPER "BURY DEPTH" TO MEET ACTUAL FIELD CONDITIONS. THIS IS ESPECIALLY IMPORTANT FOR BRANCH LINES WHICH TEE-OFF A 12" OR LARGER WATER MAIN. UNLESS APPROVED OTHERWISE BY JEA, THE INSTALLATION OF (45°) BENDS IS NOT ACCEPTABLE WHEN UTILIZED TO CORRECT AN IMPROPERLY FURNISHED HYDRANT. THE USE OF HYDRANT EXTENSIONS SHOULD BE MINIMIZED.
6. BLUE REFLECTIVE MARKERS SHALL BE INSTALLED IN SUCH A MANNER THAT THE REFLECTIVE FACE OF THE MARKER IS PERPENDICULAR TO A LINE PARALLEL TO THE ROADWAY CENTERLINE. THE BLUE REFLECTIVE MARKERS SHALL BE PLACED IN THE CENTER OF THE TRAVEL LANE, DIRECTLY ACROSS FROM AND ADJACENT TO EACH FIRE HYDRANT.

FIRE HYDRANT INSTALLATION USING TAPPING SLEEVE & VALVE



PLAN

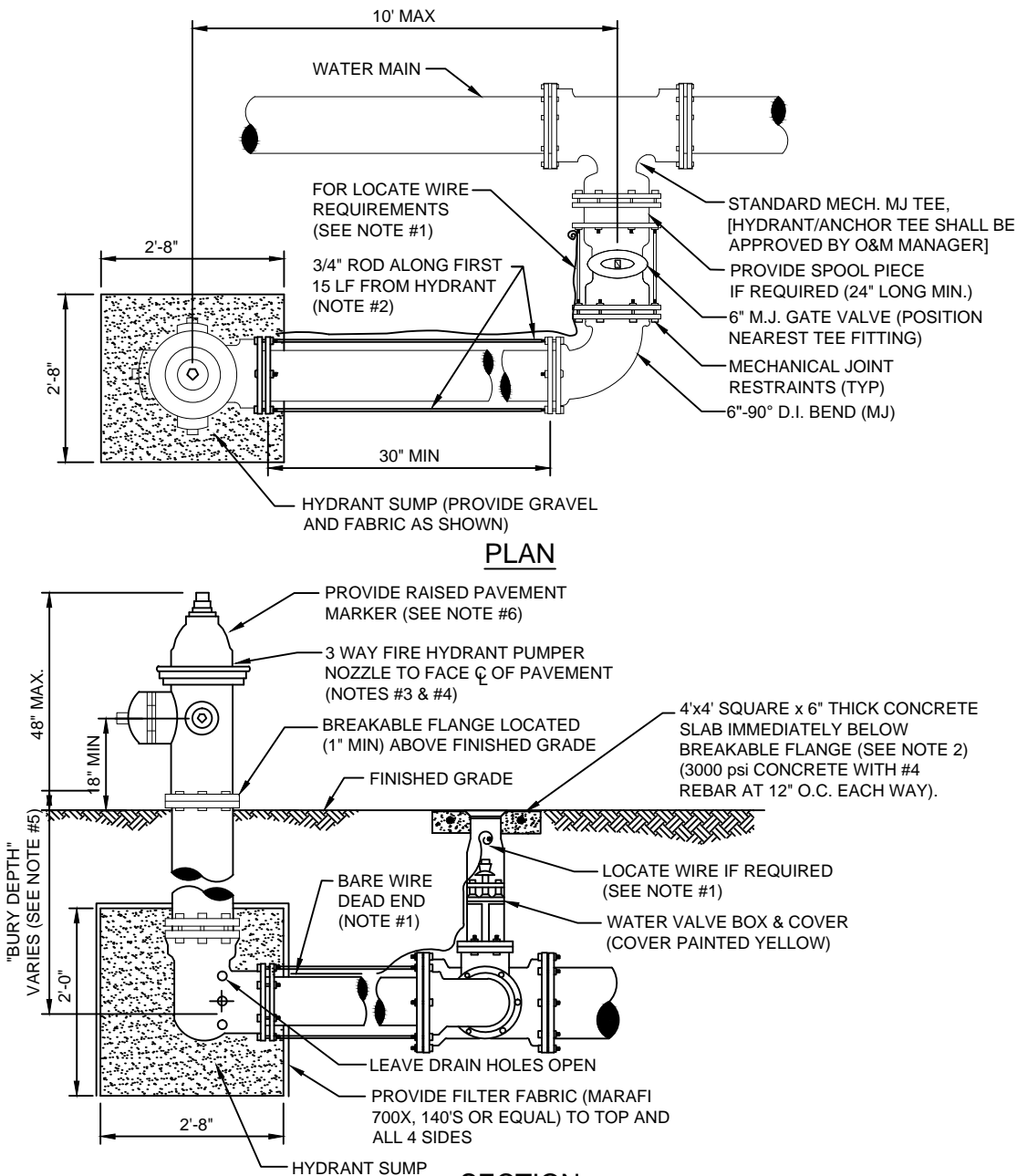


SECTION

NOTES:

1. LOCATE WIRE IS ONLY REQUIRED IF THE DISTANCE BETWEEN VALVE AND HYDRANT IS OVER 15 LINEAR FEET IF REQUIRED, THE WIRE SHALL BE ROUTED FROM THE VALVE TO THE HYDRANT AS SHOWN ABOVE. THE END OF THE WIRE SHALL BE SECURED TO THE PIPE MAIN. SEE SECTION 350, LOCATE WIRE INSTALLATION PARAGRAPH.
2. FIRE HYDRANTS SHALL BE INSTALLED BETWEEN BACK OF CURB AND FACE OF SIDEWALK AND NOT WITHIN SWALE/DITCH AREAS. THE DISTANCE RANGE FROM EDGE OF ADJACENT PAVEMENT, BACK OF CURB AND FACE OF SIDEWALK SHALL BE IN COMPLIANCE WITH LOCAL COUNTY FIRE DEPARTMENT RULES AND AS APPROVED BY JEA AND APPLICABLE PERMITTING AGENCIES. DISTANCE SHALL BE MEASURED TO THE CLOSEST PART OF THE FIRE HYDRANT (I.E. THE PUMPER NOZZLE). THE MAXIMUM DISTANCE (BACK OF CURB) SHALL BE IN COMPLIANCE WITH LOCAL COUNTY FIRE DEPARTMENT RULES AND AS APPROVED BY JEA. FOR OTHER LOCATION LIMITATIONS SEE PLATES W-10 AND W-11. IF PIPING BETWEEN TEE AND HYDRANT IS LONGER THAN 80 LF, AN ADDITIONAL 6" GATE VALVE IS REQUIRED AT THE HYDRANT LOCATION (PROVIDE 30" SEPARATION). ALL PIPING, VALVES AND FITTINGS ALONG THE HYDRANT BRANCH MAIN WHICH IS WITHIN 15 LF OF THE HYDRANT SHALL BE RESTRAINED UTILIZING ONLY TWO 3/4" DIA (THREADED ENDS) STEEL RODS AND EYE BOLTS (NO JOINT RESTRAINT DEVICES REQUIRED). A SPLIT SERRATED RING WITH RESTRAINT EARS (EBAA 15 PF06 or EQUAL) MAYBE USED IN THIS ASSEMBLY. ALL OTHER JOINTS ALONG THE HYDRANT BRANCH MAIN OUTSIDE OF THE FIRST 15 LF SHALL INCLUDE JOINT RESTRAINTS.
3. OPERATION OF THE FIRE HYDRANT SHALL BE EITHER FULL OPEN POSITION OR TOTALLY CLOSED POSITION. THE HYDRANT SHALL NOT BE UTILIZED TO THROTTLE OUTLET FLOW.
4. PRIOR TO PROJECT FINAL INSPECTION, THE HYDRANT AND ALL ABOVE GROUND PIPING SHALL BE RE-OILED, GREASED AND REPAINTED (RUS- KIL ENAMEL-INTERNATIONAL YELLOW OR EQUAL). PRIVATELY OWNED AND MAINTAINED FIRE HYDRANTS SHALL BE PAINTED RED.
5. FIRE HYDRANTS SHALL BE ORDERED WITH PROPER "BURY DEPTH" TO MEET ACTUAL FIELD CONDITIONS. THIS IS ESPECIALLY IMPORTANT FOR BRANCH LINES WHICH TEE-OFF A 12" OR LARGER WATER MAIN. UNLESS APPROVED OTHERWISE BY JEA, THE INSTALLATION OF (45°) BENDS IS NOT ACCEPTABLE WHEN UTILIZED TO CORRECT AN IMPROPERLY FURNISHED HYDRANT. THE USE OF HYDRANT EXTENSIONS SHOULD BE MINIMIZED.
6. BLUE REFLECTIVE MARKERS SHALL BE INSTALLED IN SUCH A MANNER THAT THE REFLECTIVE FACE OF THE MARKER IS PERPENDICULAR TO A LINE PARALLEL TO THE ROADWAY CENTERLINE. THE BLUE REFLECTIVE MARKERS SHALL BE PLACED IN THE CENTER OF THE TRAVEL LANE, DIRECTLY ACROSS FROM AND ADJACENT TO EACH FIRE HYDRANT.

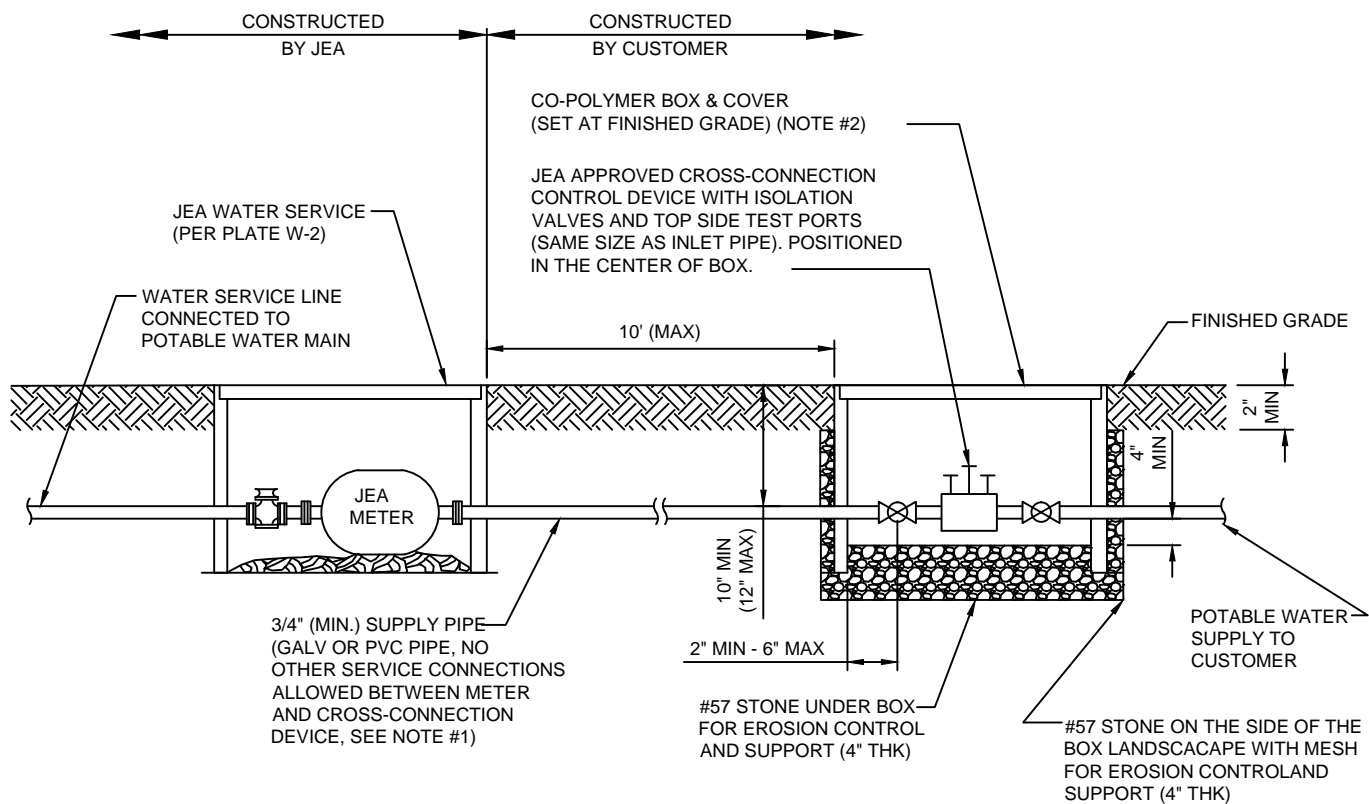
FIRE HYDRANT INSTALLATION USING MECHANICAL JOINT TEE



NOTES:

1. LOCATE WIRE IS ONLY REQUIRED IF THE DISTANCE BETWEEN VALVE AND HYDRANT IS OVER 15 LINEAR FEET IF REQUIRED, THE WIRE SHALL BE ROUTED FROM THE VALVE TO THE HYDRANT AS SHOWN ABOVE. THE END OF THE WIRE SHALL BE SECURED TO THE PIPE MAIN. SEE SECTION 350, LOCATE WIRE INSTALLATION PARAGRAPH.
2. FIRE HYDRANTS SHALL BE INSTALLED BETWEEN BACK OF CURB AND FACE OF SIDEWALK. ALL HYDRANTS SHALL BE LOCATED NO LESS THAN THREE (3) FEET FROM THE EDGE OF PAVEMENT OR BACK OF CURB OF THE ADJACENT ROADWAY AND NO LESS THAN THREE (3) FEET FROM ANY PHYSICAL FEATURE WHICH MAY OBSTRUCT ACCESS OR VIEW OF ANY HYDRANT UNLESS OTHERWISE APPROVED BY THE JEA. THE MAXIMUM DISTANCE (BACK OF CURB) SHALL BE IN COMPLIANCE WITH LOCAL COUNTY FIRE DEPARTMENT RULES AND AS APPROVED BY JEA. FOR OTHER LOCATION LIMITATIONS SEE PLATES W-10 AND W-11. IF PIPING BETWEEN TEE AND HYDRANT IS LONGER THAN 80 LF, AN ADDITIONAL 6" GATE VALVE IS REQUIRED AT THE HYDRANT LOCATION (PROVIDE 30" SEPARATION). ALL PIPING, VALVES AND FITTINGS ALONG THE HYDRANT BRANCH MAIN WHICH IS WITHIN 15 LF OF THE HYDRANT SHALL BE RESTRAINED UTILIZING ONLY TWO 3/4" DIA (THREADED ENDS) STEEL RODS AND EYE BOLTS (NO JOINT RESTRAINT DEVICES REQUIRED). A SPLIT SERRATED RING WITH RESTRAINT EARS (EBAA 15 PF06 or EQUAL) MAYBE USED IN THIS ASSEMBLY. ALL OTHER JOINTS ALONG THE HYDRANT BRANCH MAIN OUTSIDE OF THE FIRST 15 LF SHALL INCLUDE JOINT RESTRAINTS.
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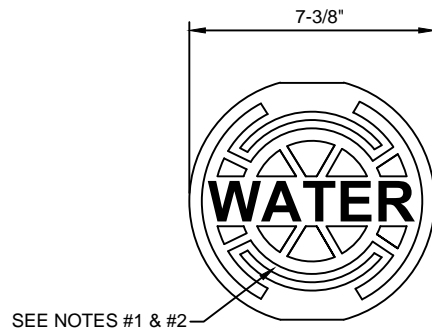
FIRE HYDRANT INSTALLATION LIMITED SPACE



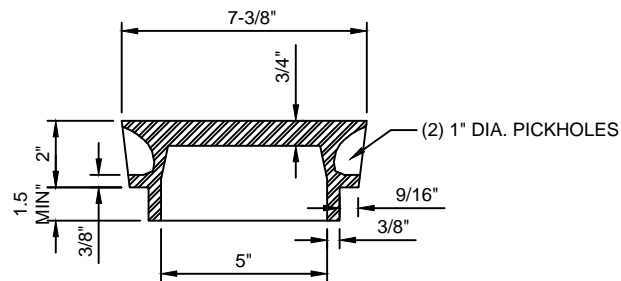
NOTES:

1. THE POTABLE WATER CUSTOMER IS REQUIRED TO INSTALL AND MAINTAIN A JEA APPROVED CROSS-CONNECTION DEVICE ON THEIR POTABLE WATER SERVICE LINE. OPERATION AND MAINTENANCE OF THIS CROSS-CONNECTION DEVICE SHALL COMPLY WITH JEA'S CROSS-CONNECTION CONTROL PROGRAM AND ASSOCIATED OPERATIONS POLICIES. ALL REDUCED PRESSURE ASSEMBLIES SHALL BE MOUNTED ABOVE GRADE.
2. ONLY DOUBLE CHECK VALVE ASSEMBLIES MAY BE INSTALLED BELOW GROUND. THESE DEVICES MAY BE INSTALLED IN A TYPICAL 1" (CO-POLYMER) METER BOX WITH SOLID LID (GENERIC LID WITH NO "JEA" LOGO, SEE ALSO W-3). THE SIZE OF BOX SHALL BE 12"x20", AT A MINIMUM. IT SHALL BE NOTED THAT IF THE HIGH MEAN GROUND WATER LEVEL FALLS INSIDE THIS BOX, THEN THE CROSS-CONNECTION CONTROL DEVICE MUST BE INSTALLED ABOVE GROUND. ACCEPTABLE DOUBLE CHECK VALVE ASSEMBLIES (BRONZE BODY WITH TWO CHECK VALVES, TWO BALL VALVES AND UNION CONNECTIONS BETWEEN BALL VALVES AND THE DEVICE). INCLUDE: WATTS U007M2QT, WILKINS 950XLTU OR JEA APPROVED EQUAL.
3. BACKFLOW PREVENTION DEVICES REQUIRED WHEN:
 IRRIGATION SYSTEMS - REQUIRED ON IRRIGATION SYSTEMS AT THE CONNECTION TO POTABLE SYATEM
 RESIDENTIAL SYSTEMS - REQUIRED ON WATER SERVICE IF RECLAIMED SERVICE WATER AVAILABLE TO SITE
 COMMERCIAL SITES - REQUIRED ON ALL WATER SERVICES
 INDUSTRIAL SITES - REQUIRED ON BOTH WATER AND RECLAIMED SERVICE ON, WATER SERVICE EVEN IF NO RECLAIMED

CROSS CONNECTION CONTROL DEVICE



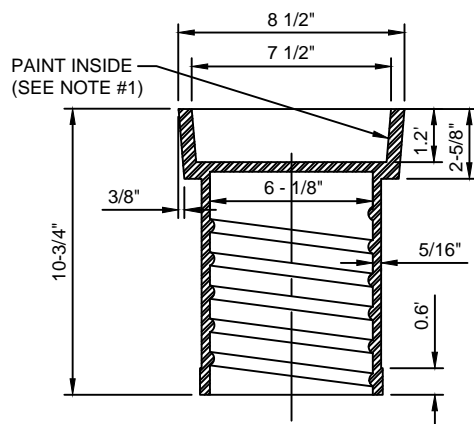
HEAVY DUTY RATING



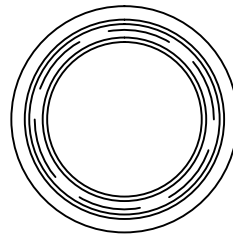
NOTES:

1. PAINT TOP OF THE COVER WITH ENAMEL PAINT (BLUE COLOR) FOR WATER.
2. FOR "REUSE" PAINT TOP PANTONE PURPLE.
3. LID WEIGHT: APPROX. 12 LBS.

WATER SYSTEM VALVE BOX COVER

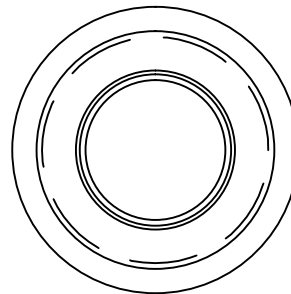
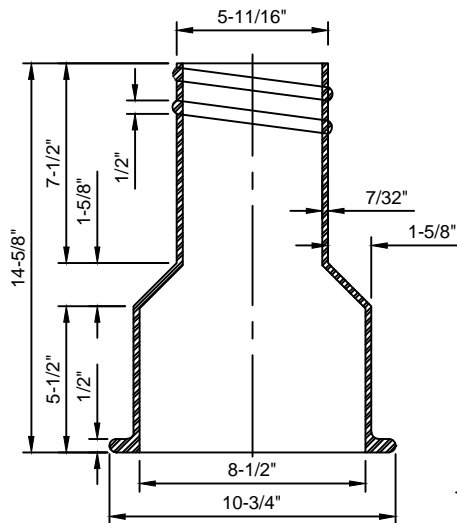


HEAVY DUTY RATING



TOP SECTION VIEW

(23 LBS. APPROX.)



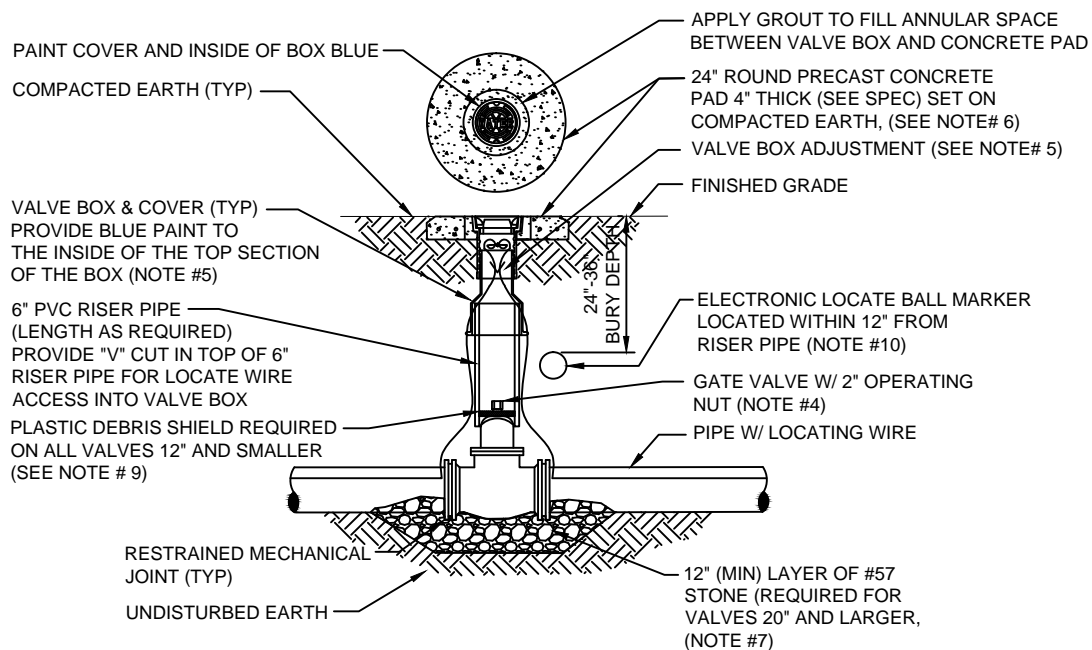
BOTTOM SECTION VIEW

(26 LBS. APPROX.)

NOTES:

1. PAINT THE INSIDE OF THE TOP SECTION OF THE BOX WITH APPLICABLE COLOR (BLUE OR PURPLE)
2. HEAVY DUTY RATING (TOTAL WEIGHT APPROX. 50 LBS.).
3. REFERENCE SECTION 351, PARAGRAPH X.2.

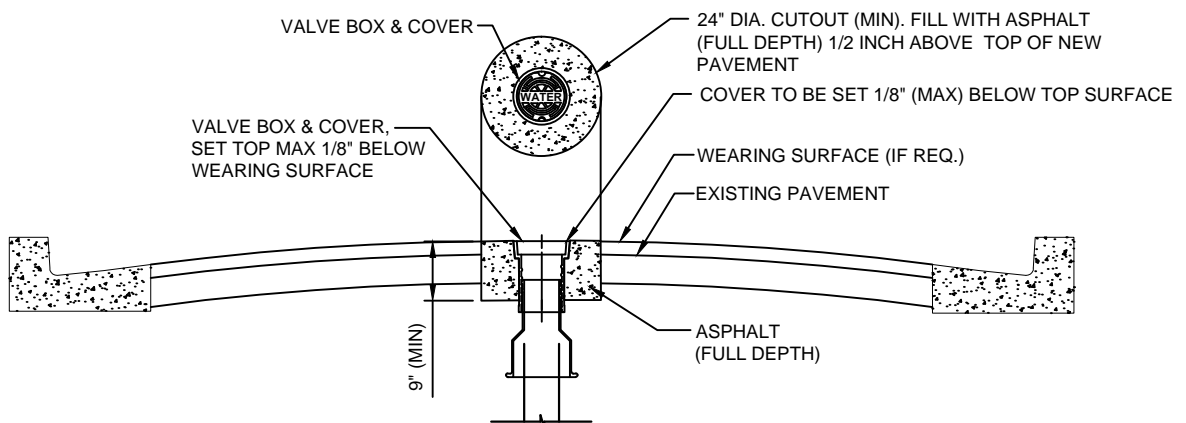
WATER SYSTEM VALVE BOX



NOTES:

1. FOR UNPAVED LOCATIONS, A PRECAST CONCRETE VALVE PAD SHALL BE PROVIDED AND INSTALLED FLUSH WITH GRADE. CONCRETE PAD IS NOT REQUIRED FOR VALVE LOCATED IN THE ROADWAY, UNLESS SHOWN OR NOTED OTHERWISE.
2. LOCATING WIRE IS REQUIRED ON ALL PRESSURE PIPING (SEE DETAILW-44).
3. A "V" CUT SHALL BE CARVED IN THE CURB CLOSEST/ADJACENT/(ASPHALT IF NO CURB) TO ALL BELOW GRADE VALVES. THE "V" CUT IS TO BE PAINTED BLUE WATER/PURPLE RECLAIMED.
4. IN PAVED AREAS, INSTALL VALVE AT A DEPTH TO ALLOW A 12" MIN. DISTANCE BETWEEN THE VALVE COVER PLATE AND THE TOP OF THE VALVE OPERATING NUT. OUTSIDE OF PAVED AREAS (GRASS), INSTALL VALVE AT A DEPTH TO ALLOW A 6" MINIMUM DISTANCE BETWEEN THE VALVE COVER AND THE TOP OF THE VALVE OPERATING NUT. OPERATING NUT/STEM EXTENSION SHALL BE PROVIDED (WHERE APPLICABLE) SO THAT THE OPERATING NUT WILL BE NO MORE THAN 30 INCHES BELOW FINISHED GRADE.
5. FOR NEW CONSTRUCTION, THE VALVE BOX SHALL BE ADJUSTED TO MIDRANGE TO ALLOW FOR FUTURE BOX ADJUSTMENTS. ROUTE LOCATE WIRES THRU A "V" CUT IN THE TOP OF THE 6" PVC RISER PIPE FOR LOCATE WIRE ACCESS INTO VALVE BOX. THE LOCATE WIRES WITH A 12" LONG PIG-TAIL AT THE TOP SHALL BE CONNECTED TOGETHER WITH A WIRE NUT.
6. BRASS IDENTIFICATION TAG INDICATING "WATER", VALVE SIZE, DIRECTION AND TURNS TO OPEN & VALVE TYPE. PROVIDE A 1/2" HOLE IN BRASS TAG AND ATTACH TAG (TWIST WIRE AROUND TAG) TO THE END OF THE LOCATE WIRE. TAGS ARE NOT REQUIRED ON VALVES INSTALLED ON FIRE HYDRANT BRANCH LINES.
7. IN LIEU OF PRECAST CONCRETE PAD, A 6" THICK X 24" (ROUND OR SQUARE) POURED CONCRETE PAD W/2 - #4 REBAR AROUND PERIMETER, MAY BE USED.
8. GRAVEL SHALL BE PROVIDED UNDER ALL VALVES 20" AND LARGER. THE MINIMUM VERTICAL LIMIT OF GRAVEL IS 12" UNDER THE VALVE UP TO 2/3 THE OVERALL HEIGHT OF THE VALVE.
9. FOR VALVES 12 INCH AND SMALLER, PROVIDE A WHITE OR BLACK PLASTIC DEBRIS SHIELD WHICH INSTALLS BELOW THE OPERATING NUT. THIS SHIELD SHALL CENTER THE RISER PIPE BOX OVER THE OPERATING NUT AND MINIMIZE INFILTRATION. SHIELD SHALL BE BY AFC, BOXLOK OR APPROVED EQUAL.
10. ALL VALVES SHALL BE INSTALLED WITH AN ELECTRIC LOCATE MARKER. MARKER SHALL BE 4" DIA. COLOR CODED BALL MARKER (3M-1403XR FOR WATER AND 1408XR FOR RECLAIMED WATER).

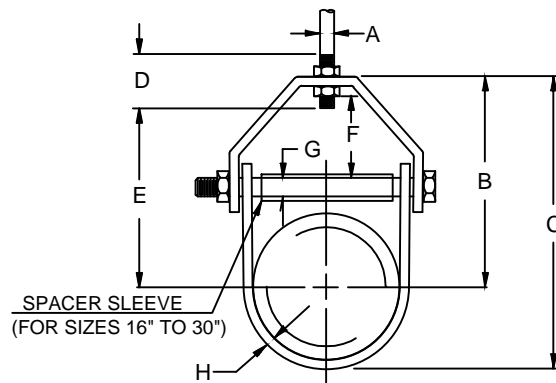
WATER VALVE INSTALLATION DETAIL



NOTES:

1. PROVIDE FULL DEPTH ASPHALT 1/2 INCH ABOVE TOP OF NEW PAVEMENT LEVEL, TO ALLOW FOR FUTURE ASPHALT MATERIAL COMPACTION. PLACE AND COMPACT ASPHALT IN 2" (MAX) LIFTS.

WATER VALVE JACKET ADJUSTED TO ROADWAY AFTER RE-SURFACING

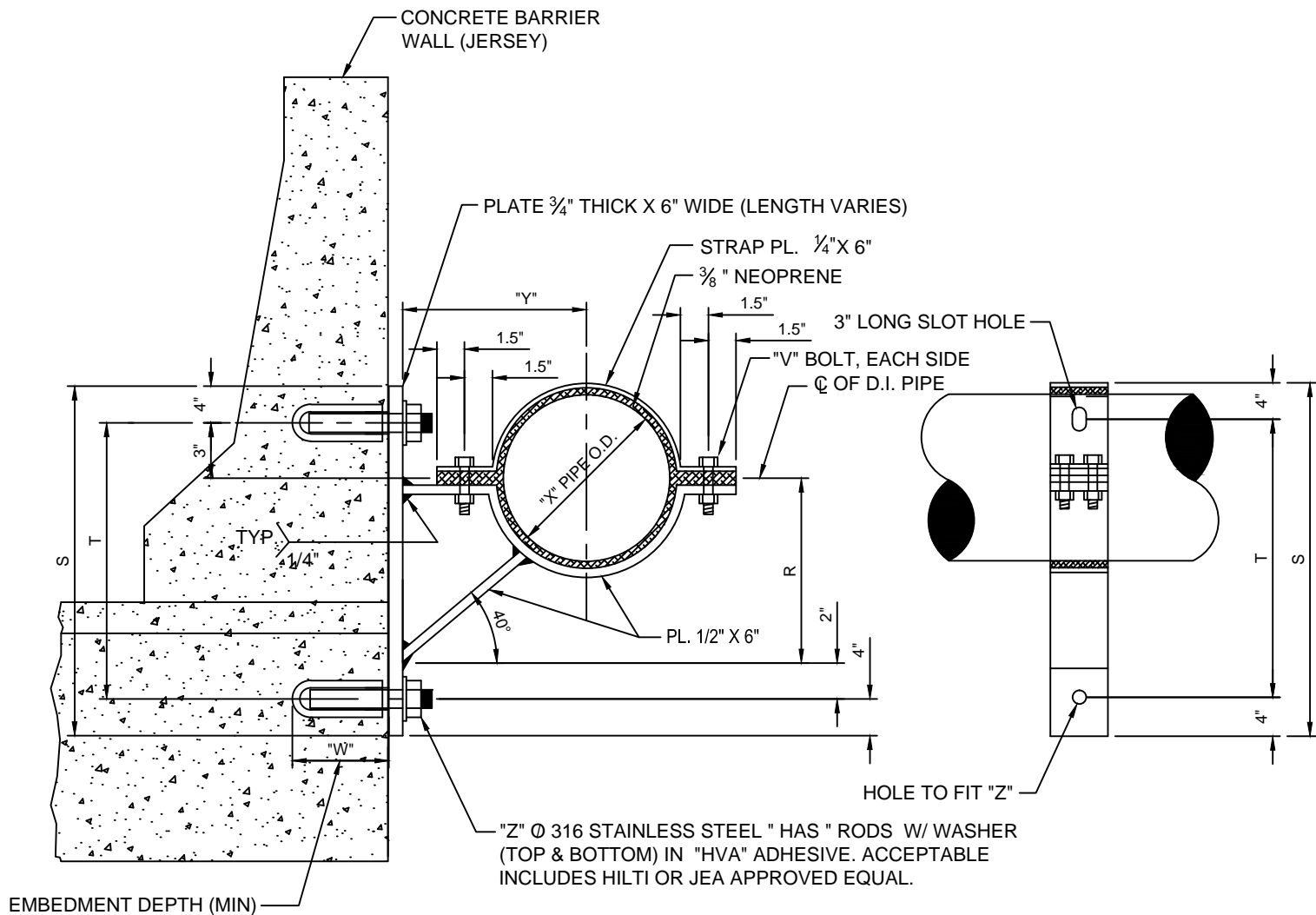


PIPE SIZE	MAX LOAD	SPAN (FT)	WEIGHT	ROD SIZE A	B	C	ROD TAKE OUT E	ADJUST. F	G	H WIDTH LOWER
4	1430	14	1.51	5/8	5-9/16	7-13/16	4-1/2	1-11/16	3/8	1-1/4
6	1940	17	3.10	3/4	6-15/16	10-1/4	5-3/4	1-11/16	1/2	1-7/16
8	2000	19	4.75	3/4	8-3/8	12-11/16	7-3/16	2	1/2	1-7/16
10	3600	22	8.60	7/8	9-7/8	15-1/4	8-7/16	2-1/8	5/8	1-3/4
12	3800	23	11.20	7/8	11-9/16	17-15/16	10-1/8	2-13/16	5/8	2
16	4600	27	19.85	1	14	22	12	2-3/4	1	2-1/2
20	4800	30	40.33	1-1/4	17-9/16	27-9/16	15-3/16	3-7/8	1-1/4	3
24	4800	32	49.83	1-1/4	19-13/16	31-13/16	17-5/16	3-7/8	1-1/4	3
30	6000	33	70.18	1-1/4	24-3/16	39-3/16	21-9/16	5-1/8	1-1/4	3

NOTES :

- ALL HANGER COMPONENTS SHALL BE 316 STAINLESS STEEL UNLESS OTHERWISE NOTED. ALL CUT ENDS SHALL HAVE ROUNDED CORNERS.
- PROVIDE A HANGER AT EACH PIPE BELL. ADDITIONAL HANGERS SHALL BE SPACED AT TEN (10) FOOT CENTERS (MAX).
- PIPE HANGERS LARGER THAN 12" SIZE SHALL BE SPECIFICALLY DESIGNED FOR HORIZONTAL AND VERTICAL STRUCTURAL SUPPORT. FOR LARGER MAINS, HORIZONTAL SUPPORT MAY BE ACHIEVED BY EXTENDING THE BOTTOM ANGLE TO SPAN BETWEEN TWO EXISTING CONCRETE BEAMS (NOT DIRECTLY CONNECTED TO CONCRETE BEAMS).
- THE DIMENSION PROVIDED ABOVE MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS.
- FOR CROSSINGS OVER 250 LINEAR FEET, THE USE OF FLEXIBLE EXPANSION JOINTS SHALL BE UTILIZED.
- TO MINIMIZE THE SNAKING ALIGNMENT OF D.I.P. MAIN, ALL RESTRAINED JOINTS SHALL BE CONDITIONS. BE UTILIZED. DEVICE (PLEASE CONSULT RESTRAINT MANUFACTURER - VERY IMPORTANT). HOMED TOGETHER AND THEN PULLED-BACK SLIGHTLY TO CORRECTLY SET THE RESTRAINT RESTRAINT DEVICE (PLEASE CONSULT RESTRAINT MANUFACTURER - VERY IMPORTANT).

BRIDGE DECK PIPE HANGER DETAIL



CROSS-SECTION

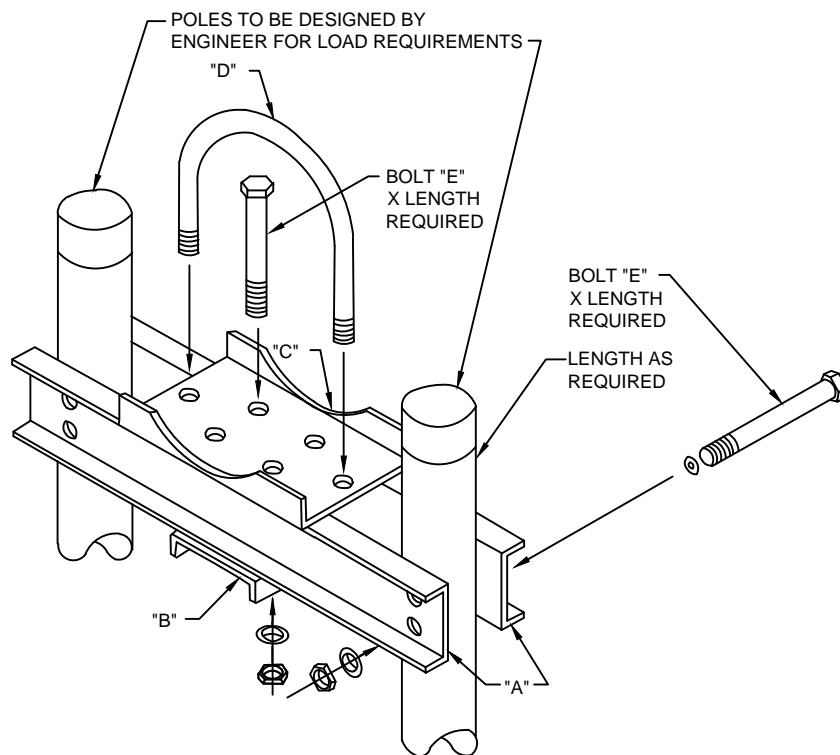
PROFILE

PIPE SIZE	4"	6"	8"	10"	12"	16"	20"	24"
X	4.80"	6.90"	9.05"	11.10"	13.20"	17.40"	21.60"	25.80"
Y	8"	9"	10"	12"	13"	15"	17"	19"
Z	3/4"	3/4"	3/4"	1"	1"	1"	1 1/4"	1 1/4"
W	6.625"	6.625"	6.625"	8.25"	8.25"	8.25"	12"	12"
V	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
R	6.72"	7.55"	8.39"	10.07"	10.91"	12.59"	14.27"	15.94"
S	19.71"	20.55"	21.39"	23.07"	23.91"	25.59"	27.26"	28.94"
T	11.72"	12.55"	13.39"	15.07"	15.91"	17.58"	19.26"	20.94"

NOTES:

1. ALL WELDS TO BE PERFORMED BY A CERTIFIED STRUCTURAL WELDER.
2. ALL SUPPORT BRACKET MEMBERS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. ALL NUTS, BOLTS, AND WASHERS SHALL BE 316 STAINLESS STEEL.
4. THE SPACING OF SIDEWALL PIPE SUPPORTS SHALL BE SPECIFICALLY DESIGNED BASED UPON MANY FACTS INCLUDING PIPE SIZE AND MATERIAL EMBEDEMENT LIMITATIONS. UNLESS APPROVED OTHERWISE BY JEA, IN NO CASE SHALL THE SPACING OF PIPE SUPPORTS EXCEED TWENTY (20) FEET ON-CENTER FOR PIPE SIZES TWELVE (12) INCH AND SMALLER AND TEN (10) FEET ON-CENTER FOR PIPE SIZES GREATER THAN TWELVE (12) INCHES.

SIDEWALL PIPE HANGER DETAIL



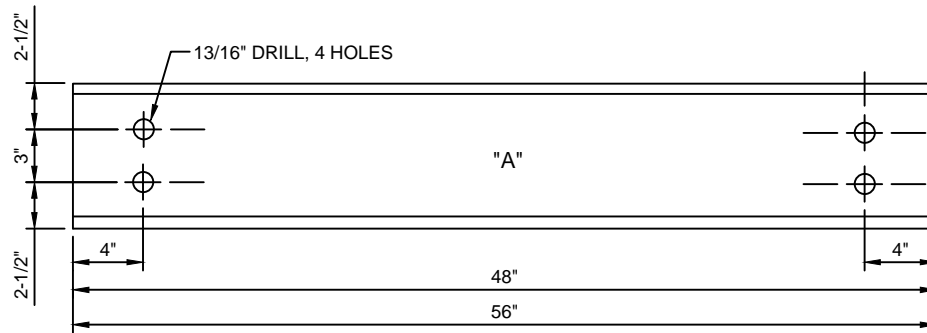
MATERIAL SCHEDULE

ITEM	PIPE 4"-14"		PIPE 16"-24"	
A	8"	[11.5	12"	[25.0
B	10"	[15.3	12"	[25.0
C	12"	[25.0	12"	[25.0
D	1/2" U-BOLT		1-1/8" U-BOLT	
E	3/4" U-BOLT		1-1/8" U-BOLT	

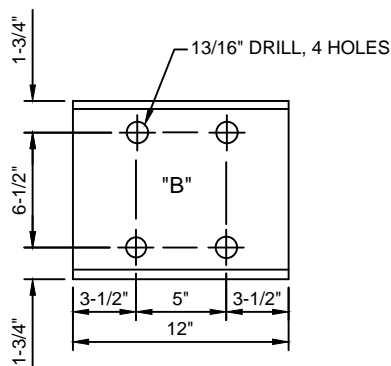
NOTES:

1. ALL PARTS AND FITTINGS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION SEE PLATE S-37 FOR ADDITIONAL DETAILS.
2. AT A MINIMUM, ONE PIPE SUPPORT SHALL BE PROVIDED FOR EACH LENGTH OF (D.I.P.) PIPE UNLESS LONG-SPAN (D.I.P.) PIPE ASSEMBLIES ARE PROVIDED.

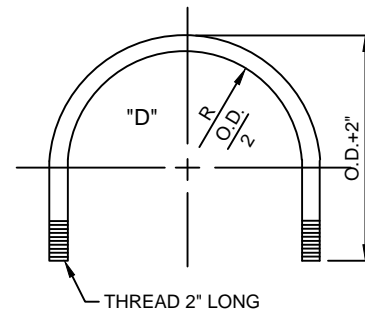
PIPE SUPORT & POLE ASSEMBLY FOR WATER MAIN



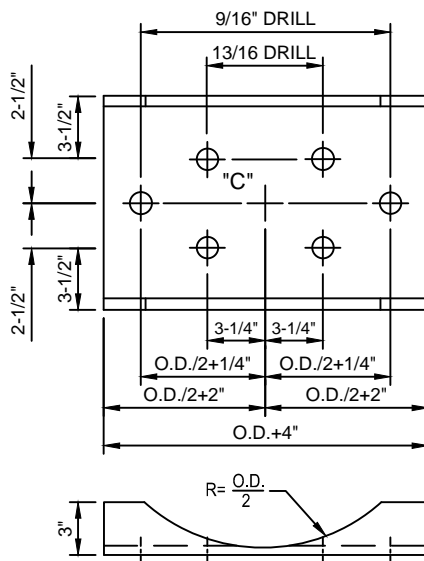
"A" STANDARD 8" CHANNEL 11.5 LBS.



"B" STANDARD 10" CHANNEL 15.3 LBS.



"D" 1/2" U-BOLT



"C" STANDARD 12" CHANNEL 25 LBS.

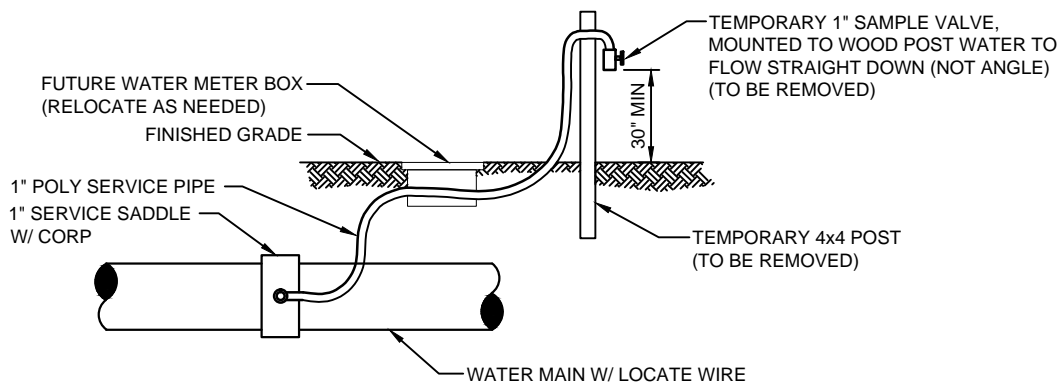
D.I. PIPE	O.D. APPROX
3"	4.71"
4"	5.55"
6"	7.65"
8"	9.80"
10"	11.85"
12"	13.95"
14"	16.05"
16"	18.15"
18"	20.25"
20"	22.35"
24"	26.55"

TABLE

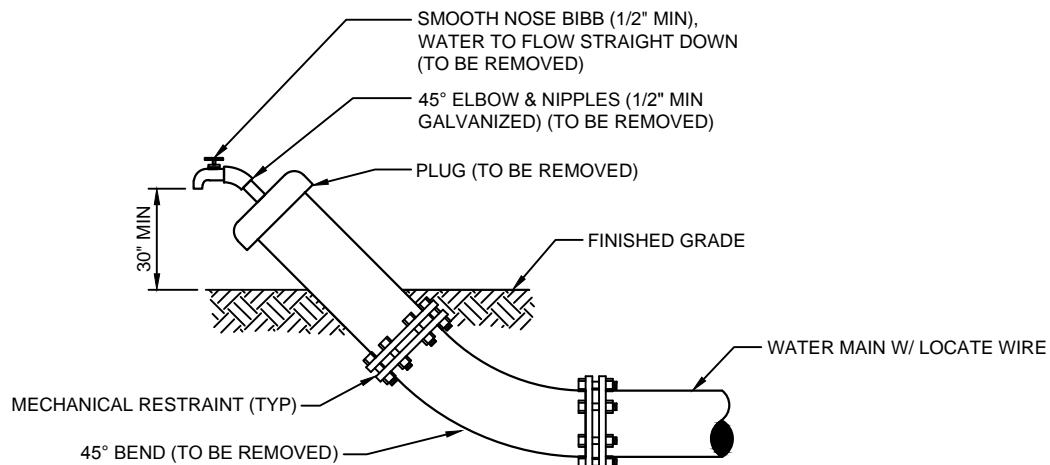
NOTES:

1. FOR PIPE 16" AND LARGER, UTILIZE CHANNEL SIZES AS SCHEDULED ON PLATE W-22, BUT CUSTOMIZE BOLT PATTERN DIMENSIONS TO FIT PIPE SIZE. SEE PLATE W-22 FOR ASSEMBLY LAYOUT.

PIPE SUPPORT DETAILS FOR POLE ASSEMBLY



TEMPORARY SAMPLE TAP UTILIZING A NEW 1" WATER SERVICE

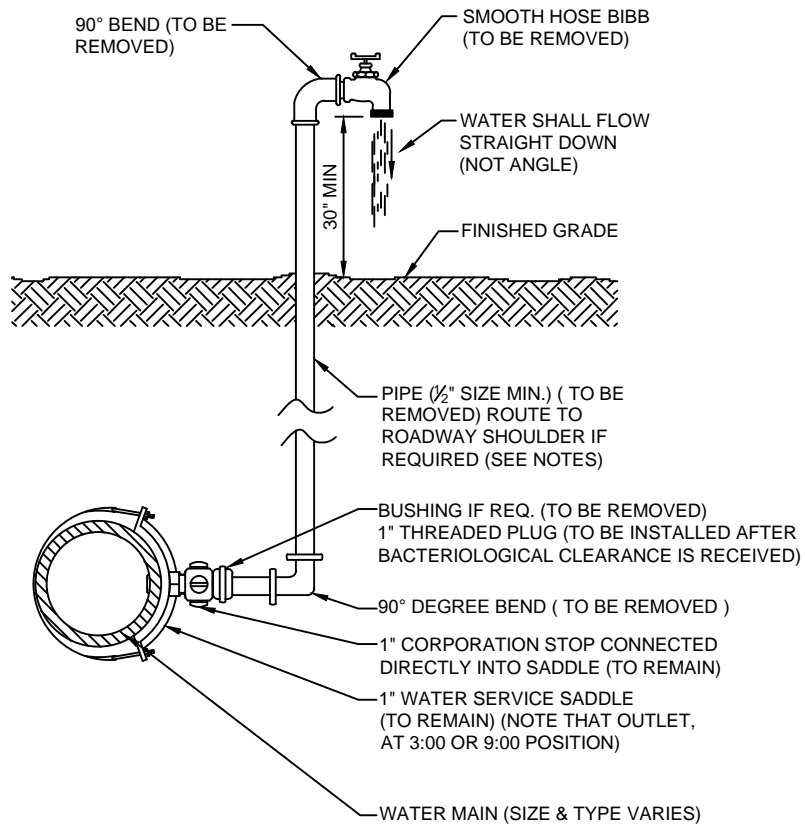


TEMPORARY SAMPLE TAP UTILIZING PLUG AT FLUSHING LOCATION

NOTES::

1. LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT ROUTED TO THE ROAD SHOULDERS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY PIPING & FITTINGS (AS NOTED) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.
3. THE CONTRACTOR SHALL UTILIZE THE ABOVE ALTERNATIVE METHODS FOR CONSTRUCTION OF TEMPORARY SAMPLE POINTS IN ALL AREAS, WHERE POSSIBLE.
4. THE CONTRACTOR SHALL COMPLY WITH ALL JEA RULES AND POLICIES AS OUTLINED BY THE JEA'S ENVIRONMENTAL RESPONSE COORDINATOR (ERC) AND OTHER ASSOCIATED JEA STANDARDS.

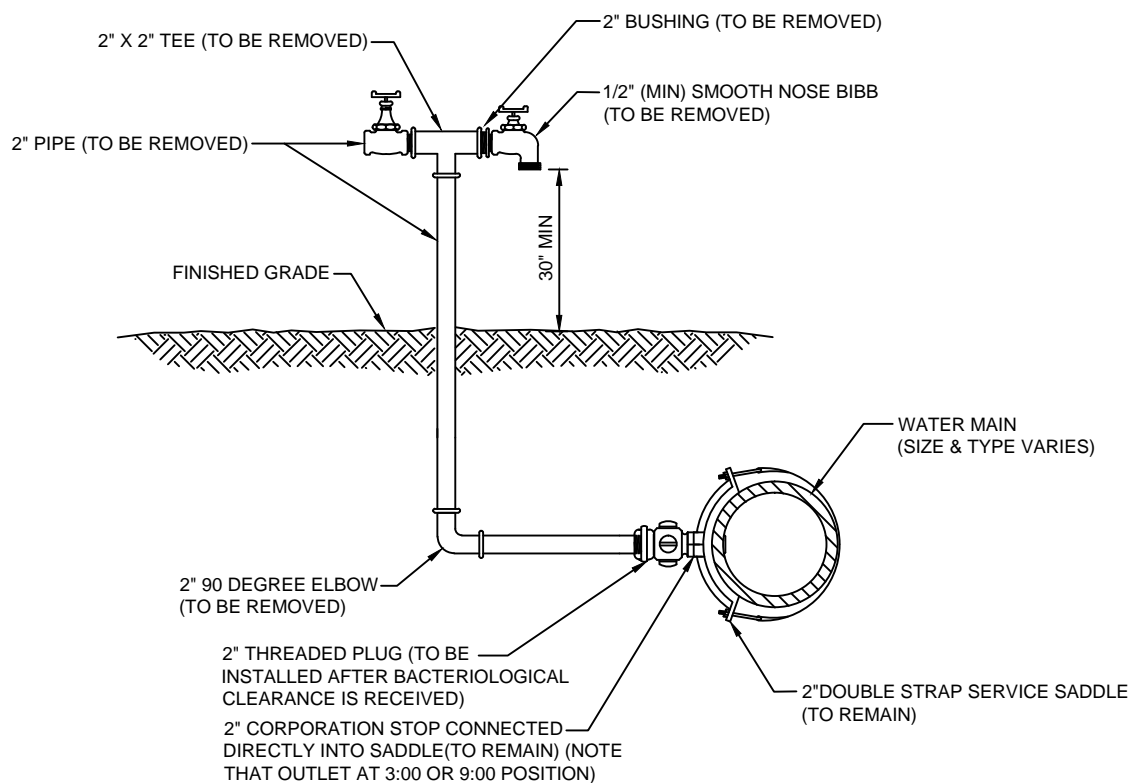
TEMPORARY SAMPLE TAP ALTERNATIVE METHODS



NOTES:

1. LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT ROUTED TO THE ROADWAY SHOULDERS (NON-TRAFFIC AREAS).
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY PIPING & FITTINGS (AS NOTED), AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.
3. PIPE AND FITTINGS SHALL BE PVC (SCH. 40) OR GALV. MATERIAL.
4. THE USE OF THE ABOVE CONSTRUCTION FOR A TEMPORARY SAMPLE POINT SHALL BE LIMITED TO AREAS WHERE A SAMPLE TAP BY ALTERNATIVE METHODS (SEE W-24) IS NOT FEASIBLE OR IF DIRECTED OTHERWISE BY JEA.
5. THE CONTRACTOR SHALL COMPLY WITH ALL JEA RULES AND POLICIES AS OUTLINED BY JEA'S ENVIRONMENTAL RESPONSE COORDINATOR (ERC) AND OTHER ASSOCIATED JEA STANDARDS.

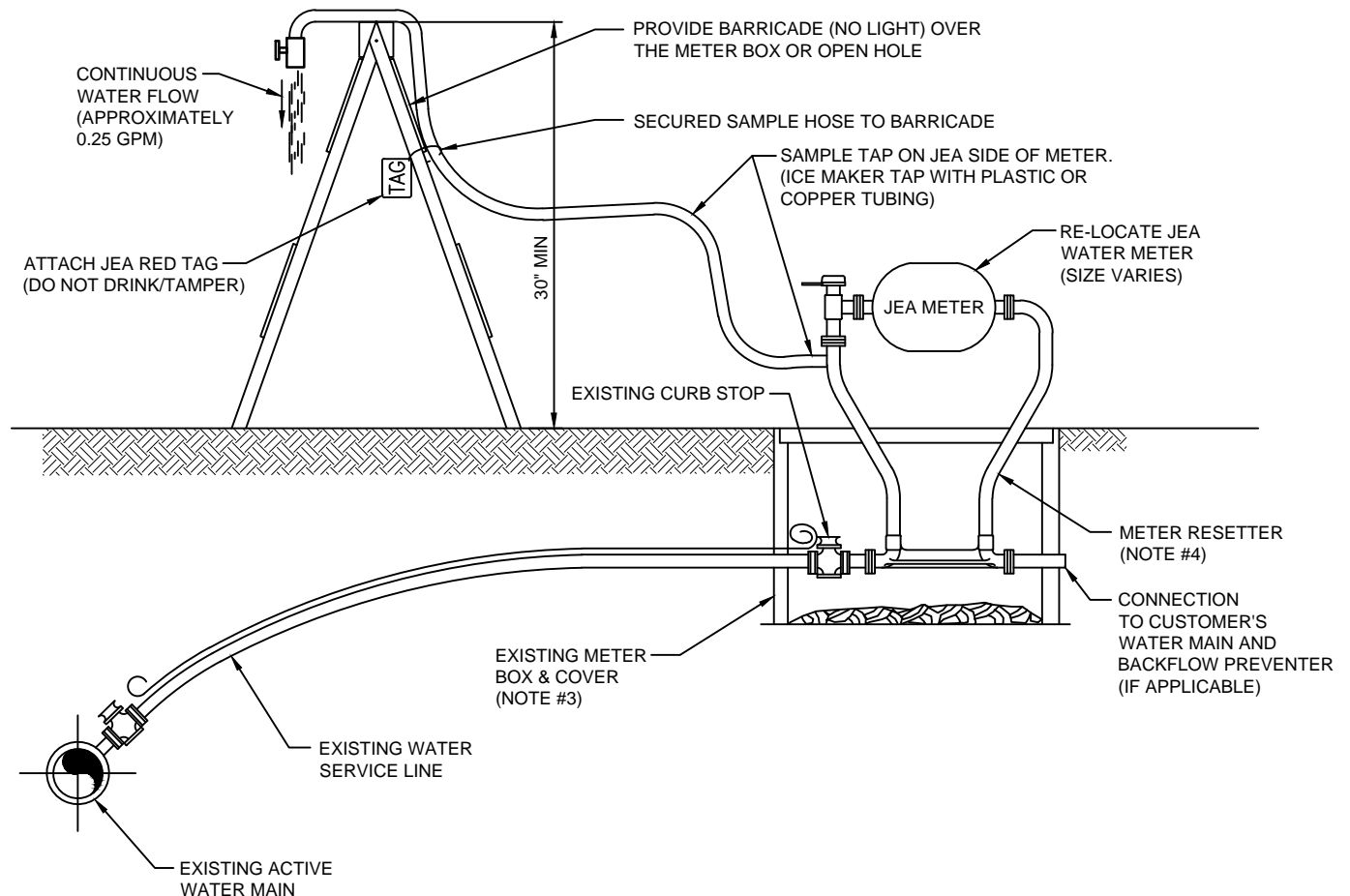
TEMPORARY SAMPLE TAP



NOTES:

1. LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT ROUTED TO THE ROADWAY SHOULDERS (NON-TRAFFIC AREAS).
2. ALL PIPE & FITTING SHALL BE GALVANIZED MATERIAL OR PVC (S-40).
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY PIPING & FITTING (AS NOTED) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED
4. THE CONTRACTOR SHALL COMPLY WITH ALL JEA RULES AND POLICES AS OUTLINED BY THE JEA'S ENVIRONMENTAL RESPONSE COORDINATOR (ERC) AND OTHER ASSOCIATED JEA STANDARDS.

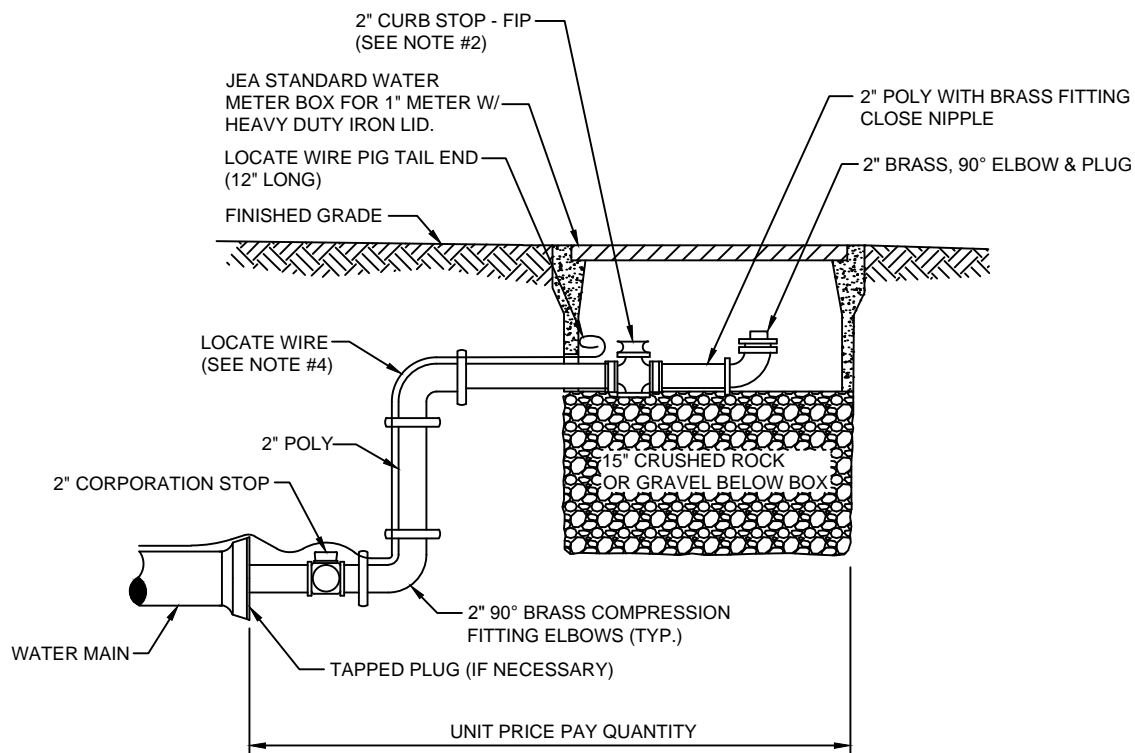
2" TEMPORARY SAMPLE TAP FOR STUB OUT



NOTES :

1. THE ABOVE TEMPORARY WATER SAMPLE TAP IS FOR USE ON ACTIVE WATER MAINS. GENERALLY, THIS SAMPLE TAP IS INSTALLED ADJACENT TO EACH WATER MAIN VALVE BEING CLOSED DURING A WATER OUTAGE. WHEN REQUIRED, THE CONTRACTOR SHALL PROVIDE THE ABOVE TEMPORARY SAMPLE TAP AND THEN REMOVE/RESTORE THE WATER METER SERVICE AFTER BACTERIOLOGICAL CLEARANCE.
2. THE CONTRACTOR SHALL COMPLY WITH ALL JEA RULES AND POLICIES AS OUTLINED BY THE JEA'S ENVIRONMENTAL RESPONSE COORDINATOR (ERC) AND OTHER ASSOCIATED JEA STANDARDS. THESE SERVICES SHALL INCLUDE, AT A MINIMUM, ASSISTANCE WITH OUTAGE SIMULATIONS, ASSISTANCE WITH THE PREPARATION OF CUSTOMER NOTIFICATION AND OR BOIL WATER NOTICES, DISTRIBUTION OF CUSTOMER NOTIFICATIONS AND COORDINATION WITH ERC AND THE JEA ON-SITE REPRESENTATIVES.
3. CONTRACTOR SHALL REMOVE METER BOX LID AND SET IT NEXT TO THE BOX. THE CONTRACTOR SHALL REPAIR, AT THE CONTRACTORS EXPENSE, ANY DAMAGE TO THE ELECTRONIC NMR/MTU IF DAMAGED DURING THE ABOVE BACTERIOLOGICAL TEST PERIOD AND REMOVED AFTER BACTERIOLOGICAL CLEARANCE.
4. A METER "RESETTER" SHALL BE INSTALLED AND REMOVED AFTER BACTERIOLOGICAL CLEARANCE AS SHOWN. THE RESETTER SHALL INCLUDE AN ANGLED INVERTED KEY METER VALVE ON THE INLET, METER COUPLINGS, 12-INCH RISE AND SIZED TO FIT THE ACTUAL FIELD METER THREADS. ACCEPTABLE: FORD 40 SERIES, MUELLER H-14118 OR JEA APPROVED EQUAL.

TEMPORARY SAMPLE TAP FOR IN-SERVICE MAINS

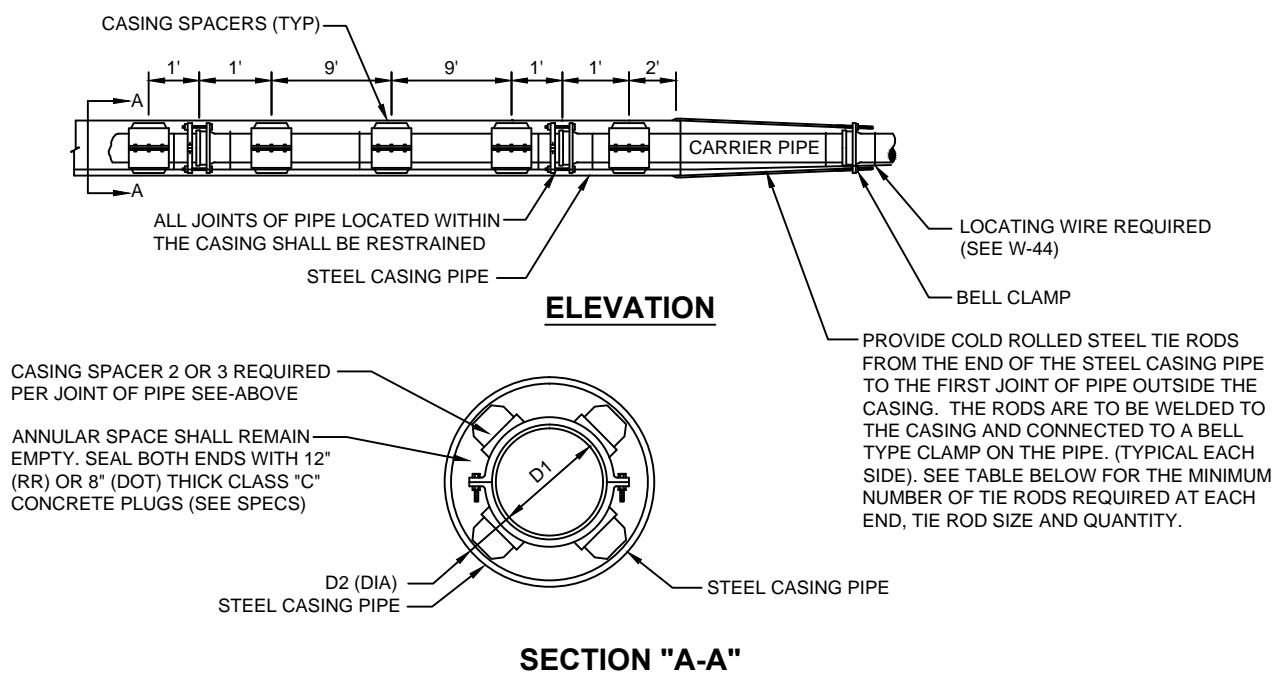


NOTES:

1. PIPE SHALL BE POLYETHYLENE. FITTINGS SHALL BE BRASS.
2. THE 2" CURB STOP SHALL BE ALL BRONZE. FITTINGS SHALL BE BRASS.
3. ANY RECLAIMED WATER VALVE SHALL HAVE RECLAIMED EMBLEM.
4. LOCATE WIRE FOR 10' OR GREATER IN LENGTH.
5. CANNOT BE PLACED UNDER CONCRETE OR PAVEMENT.
6. PLACE 2 FEET PAST LAST WATER MAIN SERVICE CONNECTION.

FLUSHING VALVE BELOW GRADE

W-29
NOT USED



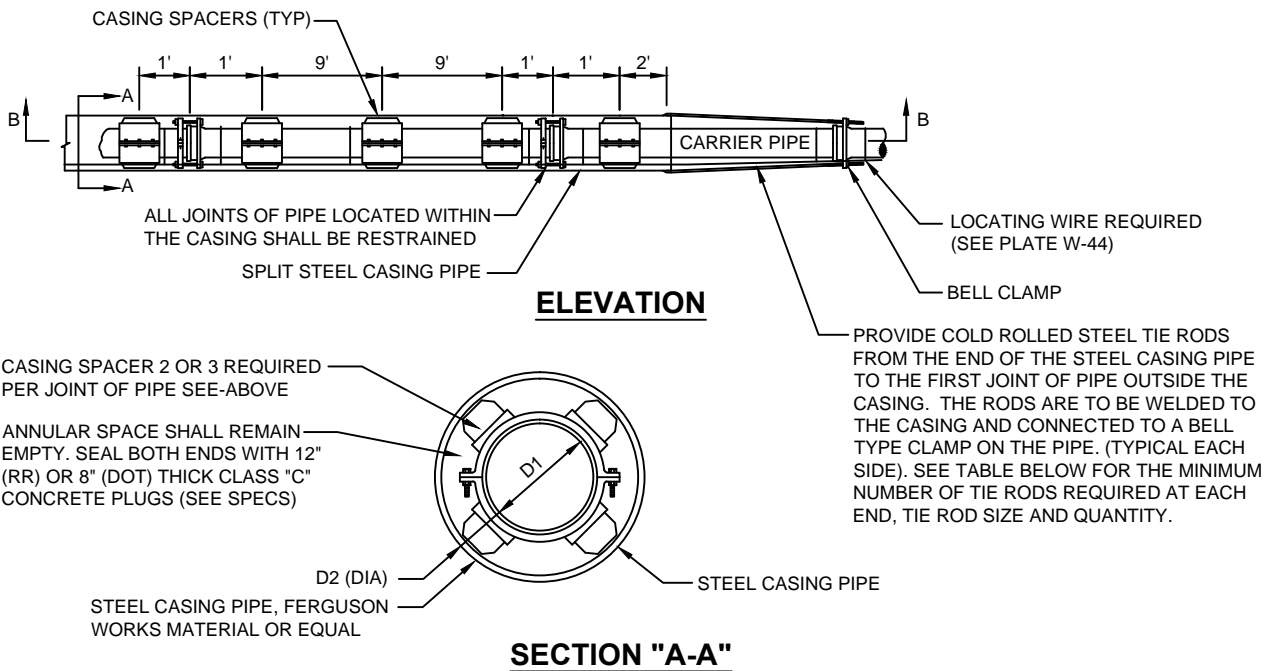
CARRIER TYPE AND CASING PIPE SIZES (MIN) IN INCHES														
CARRIER PIPE NO. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA. (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	1.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50
NUMBER OF TIE RODS (EACH END)	2	2	2	4	4	6	6	8	8	12	14	14	16	16
TIE ROD SIZE (DIA.)	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/4"	1 1/4"

PIPE MAIN CROSSINGS FOR RAILROADS OR HIGHWAYS

NOTES:

- MIN. COVER TO TOP OF CASING; a) FDOT-3.0' b) RAILROAD-5.5' TO BASE OF RAIL, 4.5' FOR SECONDARY OR INDUSTRIAL TRACKS. EXCEPT FOR F.E.C. (SEE NOTE 3)
- THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING. HOWEVER, A MINIMUM OF 6 INCHES IS REQUIRED FOR FLORIDA EAST COAST R.R. CROSSINGS.
- THE MINIMUM COVER FOR CASING UNDER FLORIDA EAST COAST RAILROAD SHALL BE 5.0 FEET BELOW THE BOTTOM OF TIES FOR ALL TRACKS.
- ALL JOINTS WITHIN CARRIER PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
- FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE DOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
- CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY JEA.
- PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE". WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".

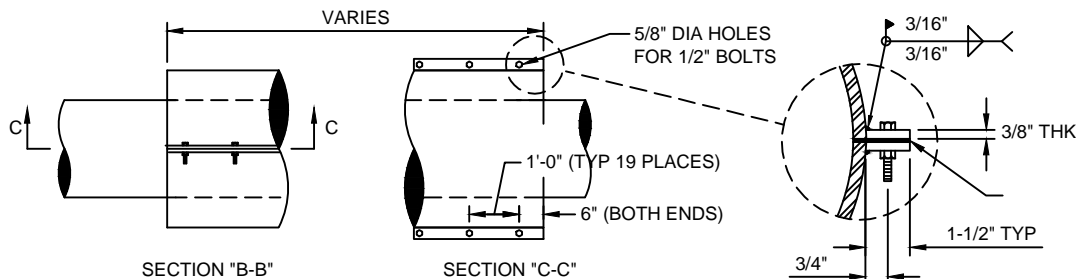
TYPICAL CASING DETAIL - WATER



CARRIER TYPE AND CASING PIPE SIZES (MIN) IN INCHES														
CARRIER PIPE NO. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA. (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	1.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50
NUMBER OF TIE RODS (EACH END)	2	2	2	4	4	6	6	8	8	12	14	14	16	16
TIE ROD SIZE (DIA.)	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/4"	1 1/4"

NOTES

1. NOT ALLOWED UNDER RAILROADS.
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING.
3. ALL JOINTS WITHIN CARRIES PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
4. FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE DOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
5. CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY JEA.
6. PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE". WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".



MATERIAL: PIPE - ATSM A53, GRADE B, ERW, STD WALL, CARBON STEEL
 PLATE - STM A36, GRADE B, CARBON STEEL (THICKNESS AS NOTED)
 WELDS ALL WELDS SHALL BE PERFORMED BY A CERTIFIED WELDER
 LININGS/COATINGS: INTERIOR - BARE
 EXTERIOR - BARE

PIPE MAIN FOR CROSSINGS USING SPLIT CASING PIPE

NOT ALLOWED UNDER RAILROADS

TYPICAL SPLIT CASING DETAIL - WATER

PVC PIPE RESTRAINT NOTES:

1. THIS SCHEDULE SHALL BE UTILIZED ON ALL WATER, SEWER FORCE MAIN OR RECLAIMED WATER SYSTEMS. ALL FITTINGS SHALL BE RESTRAINED TO LENGTHS INDICATED ON THE ABOVE SCHEDULE, AT A MINIMUM.
2. ASSUMPTIONS: PVC PIPE, SAFETY FACTOR=1.5, TEST PRESSURE=150PSI, SOIL=GM OR SM, TRENCH TYPE 3, DEPTH OF COVER=30 INCHES FOR 20" AND SMALLER PIPE SIZE OR 36 INCHES FOR 24" AND LARGER PIPE SIZE.
3. BENDS AND VALVES: SHALL BE RESTRAINED ON EACH SIDE OF FITTING.
4. VERTICAL OFFSETS: ARE APPROX. 3 FEET COVER ON TOP AND APPROX. 8 FEET COVER ON BOTTOM. PER THE DETAILS, Lu IS THE RESTRAINED LENGTH FOR THE UPPER (TOP) LEVEL, Lj IS THE RESTRAINED LENGTH FOR THE LOWER (DEEPER) LEVEL. ASSUME 45 DEGREE BENDS.
5. TEES: TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN). SEE SCHEDULE ABOVE FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.
6. HDPE TO PVC TRANSITIONS: THE PVC PIPE SIDE SHALL BE RESTRAINED 35 FT (MIN).
7. THE INSTALLATION OF BELL HARNESS RESTRAINTS AT PVC JOINTS (DR-18 & 25 PIPE) SHALL BE COMPLETED PER THE MANUFACTURERS RECOMMENDATION, WHICH INCLUDES NOT OVER TIGHTENING THE PARALLEL RODS/NUTS. THESE NUTS SHOULD ONLY BE SNUG TIGHT. THE HOME MARKS ON THE PIPE SHOULD ALWAYS BE VISIBLE AFTER THE RESTRAINT IS INSTALLED. OVERHOMING THE JOINT MAY CAUSE A FAILURE AT THE BELL RESULTING IN A SERVICE OUTAGE.

LENGTH (L) TO BE RESTRAINED

(SEE PLATE Nos. 38C & 38D FOR ADDITIONAL DETAILS)

NOMINAL PIPE SIZE (IN.)	HORIZONTAL BENDS				VERTICAL OFFSETS 45° BENDS (SEE NOTE 4)		VALVES OR DEAD ENDS L (FT.)
	90° BENDS L (FT.)	45° BENDS L (FT.)	22.5° BENDS L (FT.)	11/25° BENDS L (FT.)	UPPER LOWER		
					L (FT.)	L (FT.)	
4	21	9	5	3	17	3	47
6	30	13	6	3	23	4	66
8	38	16	8	4	30	6	86
10	45	19	9	5	36	7	103
12	53	22	11	6	43	8	121
14	61	26	13	6	50	9	140
16	66	28	14	7	55	10	154
18	73	30	15	8	60	11	170
20	79	33	16	8	66	12	186
24	79	33	16	8	77	15	185
30	93	39	19	10	97	17	222
36	106	39	21	11	107	20	257
42	117	49	24	12	120	24	289
48	144	53	26	13	133	26	321

REDUCERS	REDUCERS	
	SIZE (IN.)	L (FT.)
	6x4	34
	8x6	36
	8x4	62
	10x8	35
	10x6	63
	12x10	36
	12x8	64
	16x12	66
	16x10	92
	20x18	35
	20x16	66
	20x12	117
	24x20	56
	24x18	80
	24x16	101
	30x24	78
	30x20	121

TEES SEE NOTE 5		REDUCERS
RUN SIZE (IN.)	BRANCH SIZE (IN.)	
4	4	34
4	6 4 < LESS	36 F.O.
8	8 6 < LESS	29 F.O.
10	10 8 6 < LESS	45 13 F.O.
12	12 10 8 < LESS	62 32 F.O.
16	16 12 10 10 < LESS	94 39 5 F.O.
20	20 16 12 10 < LESS	125 76 14 F.O.
24	24 20 16 12 < LESS	124 84 36 F.O.
30	30 24 20 16 16 < LESS	159 104 60 5 F.O.
36	36 30 24 20 16 < LESS	192 142 83 33 F.O.
42	42 36 30 24 20 16 < LESS	223 178 124 59 5 F.O.
48	48 42 36 30 24 20 < LESS	253 209 162 104 34 F.O.

F.O. = FITTING ONLY

PVC PIPE RESTRAINT JOINT SCHEDULE

JANUARY 2017

PLATE W-31A

DUCTILE IRON PIPE RESTRAINT NOTES:

1. THIS SCHEDULE SHALL BE UTILIZED ON ALL WATER, SEWER FORCE MAIN OR RECLAIMED WATER SYSTEMS. ALL FITTINGS SHALL BE RESTRAINED TO LENGTHS INDICATED ON THE ABOVE SCHEDULE, AT A MINIMUM.
2. ASSUMPTIONS: DUCTILE IRON PIPE (WITHOUT POLY WRAP), SAFETY FACTOR=1.5, TEST PRESSURE=150PSI, SOIL=GM OR SM, TRENCH TYPE 3, DEPTH OF COVER=30 INCHES FOR 20" AND SMALLER PIPE SIZE OR 36 INCHES FOR 24" AND LARGER PIPE SIZE. FOR D.I.P. W/POLY WRAP, USE RESTRAINT JOINT SCHEDULE FOR PVC PIPE.
3. BENDS AND VALVES: SHALL BE RESTRAINED ON EACH SIDE OF FITTING.
4. VERTICAL OFFSETS: ARE APPROX. 3 FEET COVER ON TOP AND APPROX. 8 FEET COVER ON BOTTOM. PER THE DETAILS, LU IS THE RESTRAINED LENGTH FOR THE UPPER (TOP) LEVEL, LI IS THE RESTRAINED LENGTH FOR THE LOWER (DEEPER) LEVEL. ASSUME 45 DEGREE BENDS.
5. TEES: TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN). SEE SCHEDULE ABOVE FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.
6. HDPE TO D.I.P. TRANSITIONS: THE D.I.P. PIPE SIDE SHALL BE RESTRAINED 35 FT (MIN).

LENGTH (L) TO BE RESTRAINED

(SEE PLATE Nos. 38C & 38D FOR ADDITIONAL DETAILS)

NOMINAL PIPE SIZE (IN.)	HORIZONTAL BENDS				VERTICAL OFFSETS 45° BENDS (SEE NOTE 4)		VALVES OR DEAD ENDS
	90° BENDS L (FT.)	45° BENDS L (FT.)	22.5° BENDS L (FT.)	11.25° BENDS L (FT.)	UPPER	LOWER	
4	17	7	4	2	11	3	30
6	24	15	5	3	15	4	42
8	31	13	6	3	20	5	55
10	36	15	8	4	23	6	65
12	42	18	9	5	27	7	77
14	48	20	10	5	31	7	87
16	53	22	11	6	35	8	97
18	58	24	12	6	39	9	107
20	63	27	13	6	42	10	118
24	63	27	13	7	49	12	118
30	75	31	15	8	59	14	141
36	86	36	17	9	68	17	163
42	95	40	19	10	76	19	183
48	117	43	21	11	84	21	203

REDUCERS	
SIZE (IN.)	L (FT.)
6x4	22
8x6	23
8x4	39
10x8	22
10x6	40
12x10	23
12x8	41
16x12	42
16x10	58
20x18	22
20x16	42
20x12	74
24x20	36
24x18	51
24x16	64
30x24	50
30x20	77
36x30	50
36x24	89
42x36	48
42x30	89
48x42	48
48x36	88

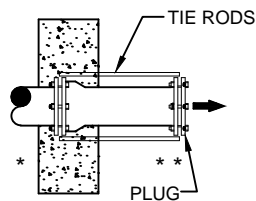
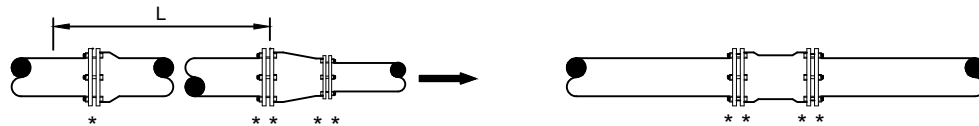
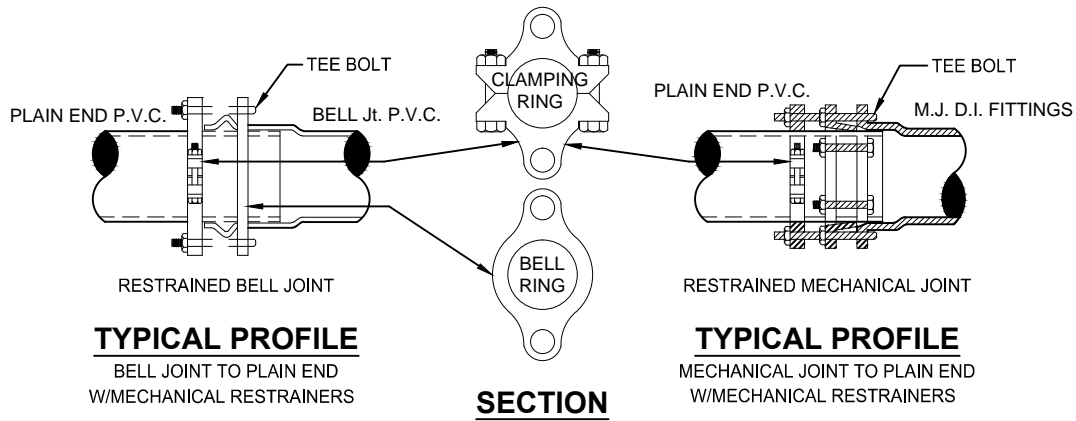
TEE SEE NOTE 5	
RUN SIZE (IN.)	BRANCH SIZE (IN.)
4	4
4	6
4	4 < LESS
8	8
8	6 < LESS
10	10
10	8
10	6 < LESS
12	12
12	10
12	8 < LESS
16	16
16	12
16	10
16	8 < LESS
20	20
20	16
20	12
20	10 < LESS
24	24
24	20
24	16
24	12 < LESS
30	30
30	24
30	20
30	16
30	12 < LESS
36	36
36	30
36	24
36	20
36	16
36	12 < LESS
42	42
42	36
42	30
42	24
42	20
42	16
42	12 < LESS
48	48
48	42
48	36
48	30
48	24
48	20 < LESS

F.O. = FITTING ONLY

DUCTILE IRON PIPE RESTRAINT JOINT SCHEDULE

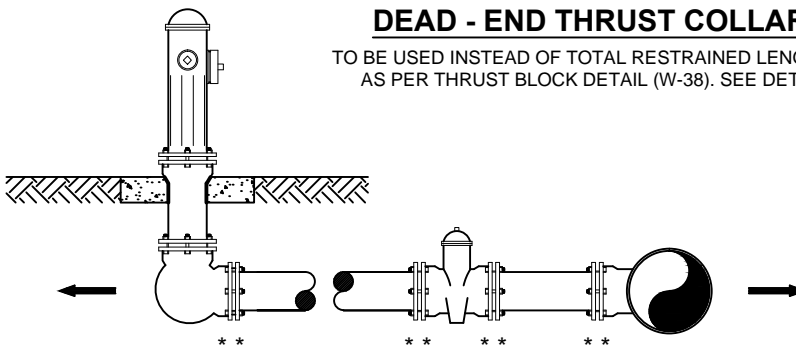
JANUARY 2017

PLATE W -31B



NO. OF TIE RODS REQUIRED

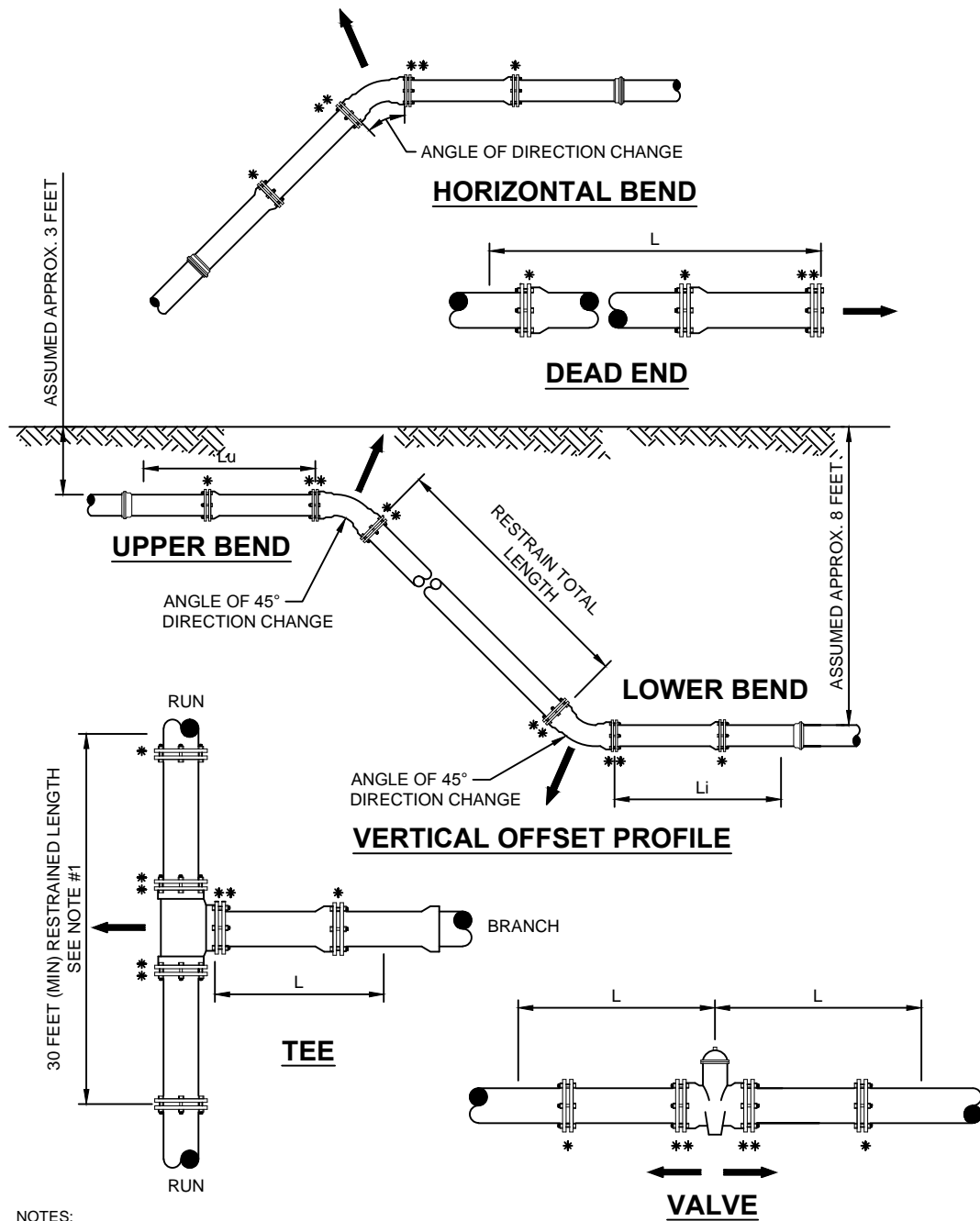
3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
10" - 12"	DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
14" - 16"	DIAMETER MAIN - 6 TIE RODS REQUIRED PER JOINT (3/4" ROD)
18" - 20"	DIAMETER MAIN - 8 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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30" - 36"	DIAMETER MAIN - 14 TIE RODS REQUIRED PER JOINT (1" ROD)
42" - 48"	DIAMETER MAIN - 16 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)



GENERAL NOTE:

1. PAY ITEM " * " DENOTES A RESTRAINT WHICH IS PAID FOR ON A PER EACH BASIS.
2. PAY ITEM " * * " DENOTES A RESTRAINT WHICH IS INCLUDED IN THE UNIT PRICE BID FOR FITTING OR VALVE.
3. ➡ INDICATES DIRECTION OF THRUST FORCE.

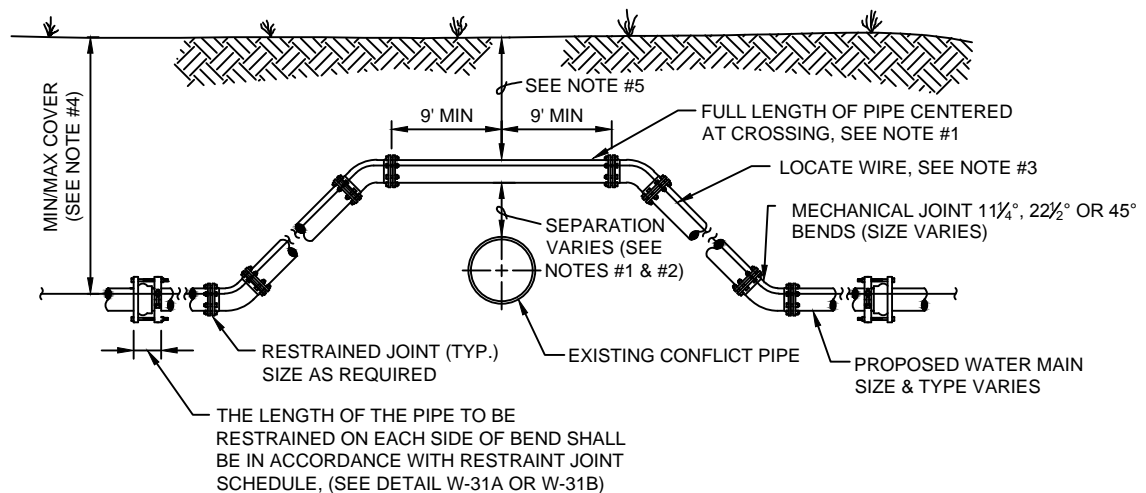
MECHANICAL RESTRAINT DETAILS - I



NOTES:

1. TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN.).
2. PAY ITEM *** DENOTES A RESTRAINT WHICH IS PAID FOR ON A PER EACH BASIC.
3. PAY ITEM **** DENOTES A RESTRAINT WHICH IS INCLUDED IN THE UNIT PRICE BID FOR FITTING OR VALVE.

MECHANICAL RESTRAINT DETAILS - II

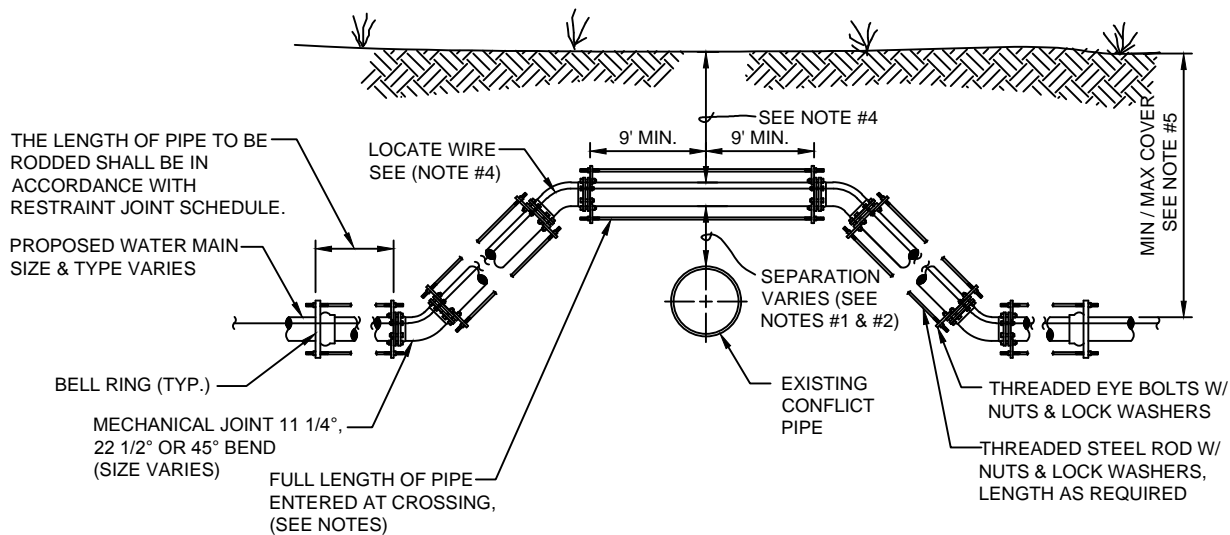


CASE "A" CROSSING

NOTES:

1. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557.
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE DETAIL (W-10 AND W-11).
3. LOCATING WIRE REQUIRED: SEE DETAIL W-44.
4. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 30" (MIN) IN UNPAVED AREAS, 36" (MIN) IN PAVED AREAS AND A MAXIMUM COVER OF 60", UNLESS APPROVED BY JEA. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) IN PAVED AND UNPAVED AREAS AND A MAXIMUM COVER OF 84", UNLESS APPROVED BY JEA.
5. IF UTILITY CONFLICT IS LOCATED IN A NON-TRAFFIC AREA (NO TRAFFIC LOADS) AND THE NEW PIPE IS D.I.P., THEN THE MINIMUM COVER MAY BE REDUCED TO 24 INCHES (ONLY IN THE AREA OF THE CONFLICT).

ADJUSTMENT OVER EXISTING UTILITIES MECHANICAL RESTRAINTS



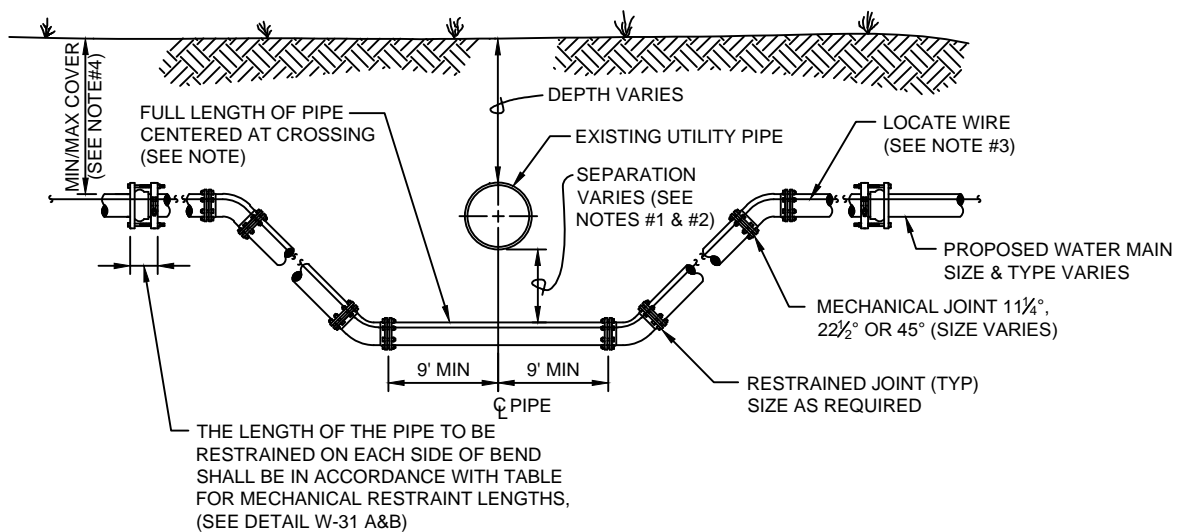
CASE "A" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
2. FOR OTHER LOCATION LIMITATIONS SEE PLATES W-10 & W-11.
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. LOCATING WIRE REQUIRED: SEE PLATE W-44.
5. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 30" (MIN) IN UNPAVED AREAS, 36" (MIN) IN PAVED AREAS AND A MAXIMUM COVER OF 60", UNLESS PRE-APPROVED BY JEA. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) IN PAVED AND UNPAVED AREAS AND A MAXIMUM COVER OF 84", UNLESS APPROVE BY JEA.
6. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.

ADJUSTMENT OVER EXISTING UTILITIES TIE RODS

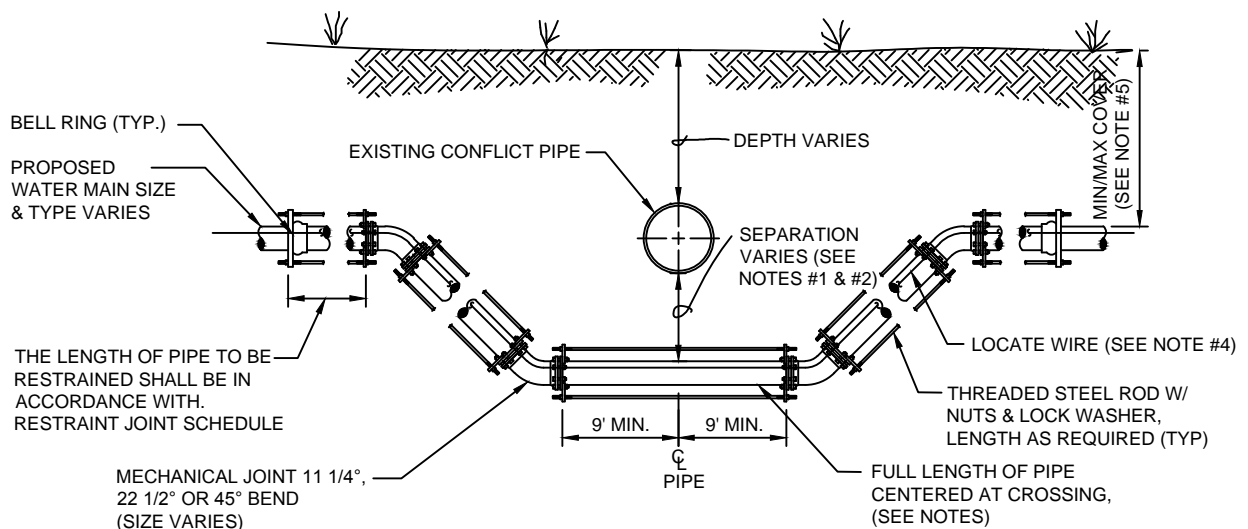


CASE "B" CROSSING

NOTES:

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ADJUSTMENT UNDER EXISTING UTILITIES MECHANICAL RESTRAINTS



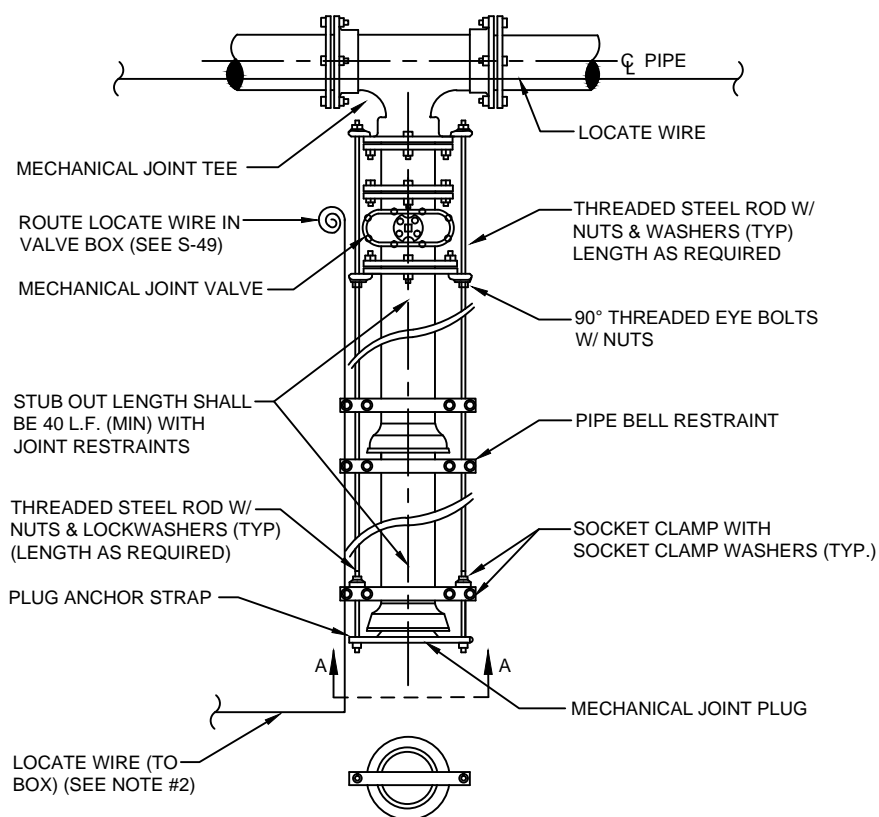
CASE "B" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
2. FOR OTHER LOCATION LIMITATIONS SEE PLATE W-10 & W-11.
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

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6. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.

ADJUSTMENT UNDER EXISTING UTILITIES TIE RODS

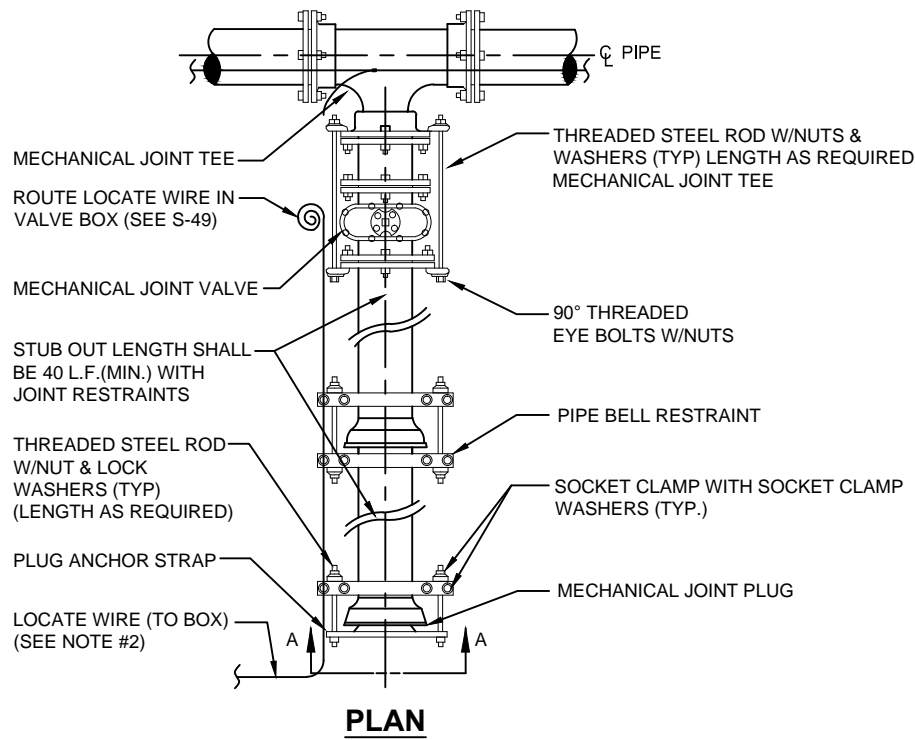


NOTES:

1. IN LIEU OF BELL/ROD RESTRAINTS, MECHANICAL JOINT RESTRAINTS MAY BE USED.
2. LOCATING WIRE REQUIRED, UTILIZING A LOCATE WIRE BOX INSTALLED AT PLUG LOCATION.
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

PLUGGED DEAD END USING TIRE RODS

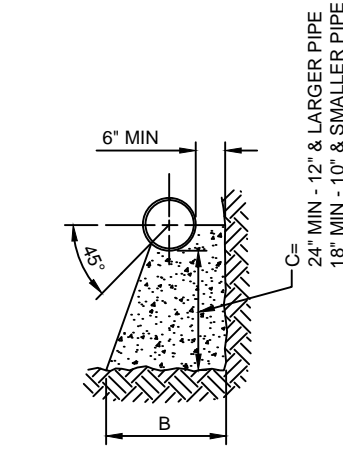
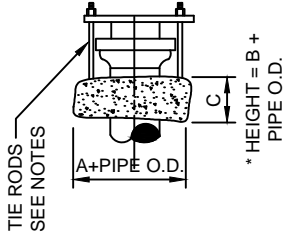
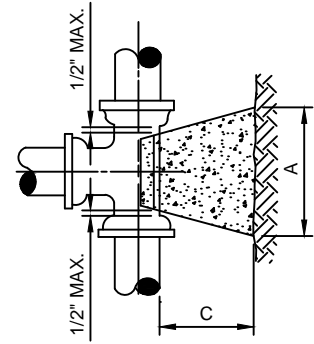


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4. THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

PLUGGED DEAD END USING MECHANICAL RESTRAINTS



NOTES:

1. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED SOIL.
2. THESE TABLES SHOW MINIMUM SIZES FOR THRUST BLOCKS IN GOOD SOIL (A-1 THRU A-3, CLEAN SANDS AND GRAVELS) WITH MINIMUM BEARING CAPACITY OF 2000 psi.
3. POOR SOILS A-4 THRU A-8, SILTY SOILS, CLAYS, MUCK AND PEAT WILL REQUIRE LARGER THRUST BLOCKING.
4. BOTH CONCRETE THRUST BLOCKS AND TIE RODS MUST BE USED WHEN, IN THE JUDGEMENT OF THE ENGINEER, THE NATURE AND CRITICALITY OF AN INSTALLATION IS SUCH AS TO REQUIRE POSITIVE ASSURANCE OF STABILITY.
5. 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.
6. CONCRETE COLLARS WITH TIE RODS MAY BE USED ON DEAD END LINES AT THE CONTRACTOR'S DISCRETION.
 - NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:
 - 3" - 8" DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
 - 10" - 12" DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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 - 54" DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
7. MAXIMUM TEST PRESSURE TO BE 150 PSI.

THRUST BLOCK FOR TEES & PLUGS

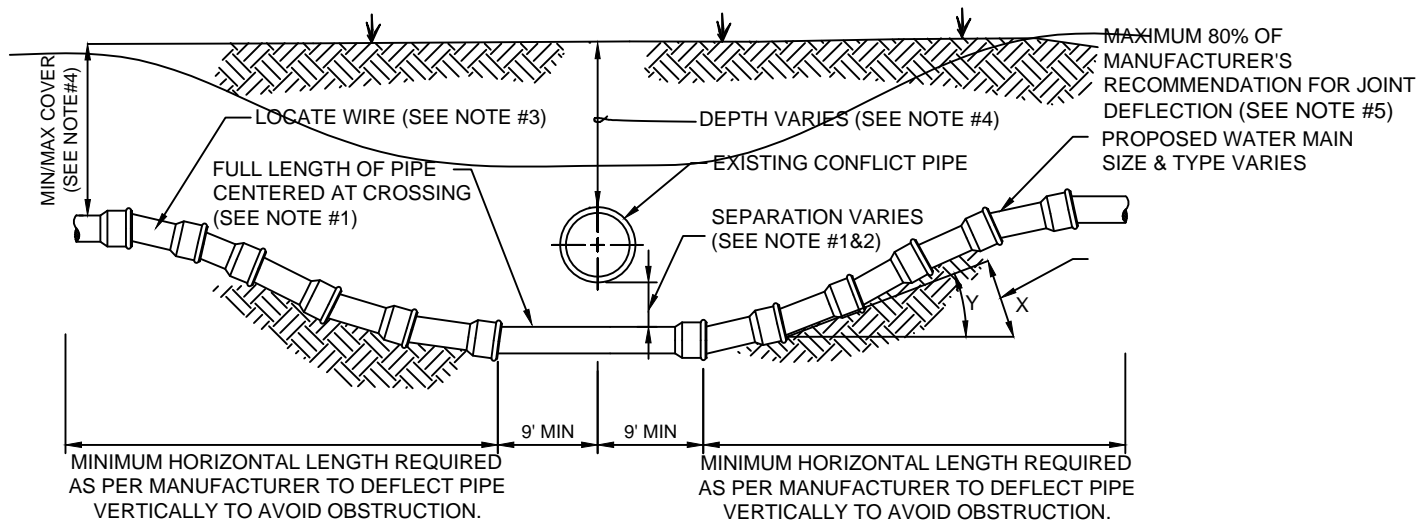
SIZE	90° BEND			S.F. BEARING SURFACE
	A	B	C	
4"	16"	16"	18"	1.78
6"	20"	24"	18"	3.33
8"	26"	32"	18"	5.78
10"	32"	40"	18"	8.89
12"	36"	48"	24"	12.00
14"	40"	56"	24"	15.56
16"	48"	60"	24"	20.00
18"	56"	64"	24"	24.89
20"	60"	76"	24"	31.67
24"	72"	90"	24"	45.00
30"	86"	102"	24"	60.67
36"	116"	108"	24"	86.11

THRUST BLOCK FOR BENDS

SIZE	90° BEND			S.F. BEARING SURFACE	45° BEND			S.F. BEARING SURFACE	22-1/2° BEND			S.F. BEARING SURFACE	11-1/4° BEND			S.F. BEARING SURFACE
	A	B	C		A	B	C		A	B	C		A	B	C	
4"	16"	16"	18"	1.78	14"	16"	18"	1.56	14"	16"	18"	1.56	14"	16"	18"	1.56
6"	22"	32"	18"	4.89	16"	18"	18"	2.00	14"	16"	18"	1.56	14"	16"	18"	1.56
8"	32"	36"	18"	8.00	24"	28"	18"	4.67	16"	18"	18"	2.00	14"	16"	18"	1.56
10"	36"	46"	18"	11.50	26"	36"	18"	6.50	20"	24"	18"	3.33	14"	18"	18"	1.75
12"	44"	56"	24"	17.11	32"	40"	24"	8.89	24"	30"	24"	5.00	16"	20"	24"	2.22
14"	52"	62"	24"	22.39	36"	48"	24"	12.00	26"	36"	24"	6.50	20"	24"	24"	3.33
16"	58"	72"	24"	29.00	40"	54"	24"	15.00	32"	38"	24"	8.44	22"	26"	24"	3.97
18"	64"	80"	24"	35.56	46"	60"	24"	19.17	36"	42"	24"	10.50	24"	32"	24"	5.33
20"	72"	88"	24"	44.00	52"	66"	24"	23.83	38"	48"	24"	12.67	26"	36"	24"	6.50
24"	96"	96"	24"	36.89	64"	78"	24"	34.67	46"	56"	24"	17.89	32"	40"	24"	8.89
30"	122"	102"	24"	86.11	72"	94"	24"	47.00	56"	62"	24"	24.11	36"	48"	24"	12.00
36"	166"	104"	24"	123.33	88"	108"	24"	66.00	64"	78"	24"	34.67	44"	54"	24"	16.50

THRUST BLOCK SIZE CHART

W-39
NOT USED



CASE "B" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSING.
2. FOR OTHER LOCATION LIMITATIONS SEE DETAIL (W-10 & W-11).
3. LOCATING WIRE REQUIRED: SEE DETAIL W-44.
4. THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 30" IN UNPAVED AREAS AND 36" IN PAVED AREAS WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY JEA. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" (PAVED AND UNPAVED) AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY JEA. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.
5. JEA ONLY ALLOWS 80% OF THE PIPE MANUFACTURER'S RECOMMENDATION FOR JOINT DEFLECTION. BENDING THE PIPE BARREL IS NOT ALLOWED. UNLESS OTHERWISE APPROVED BY JEA, THE MAXIMUM ARE LISTED IN TABLE BELOW. ONLY MANUAL FORCE CAN BE UTILIZED TO OBTAIN THESE JOINT DEFLECTION. ALL OFFSETS ARE BASED ON MINIMUM 20LF PIPE LENGTH.

MAXIMUM ALLOWED OFFSET FOR PIPE BY JOINT DEFLECTION

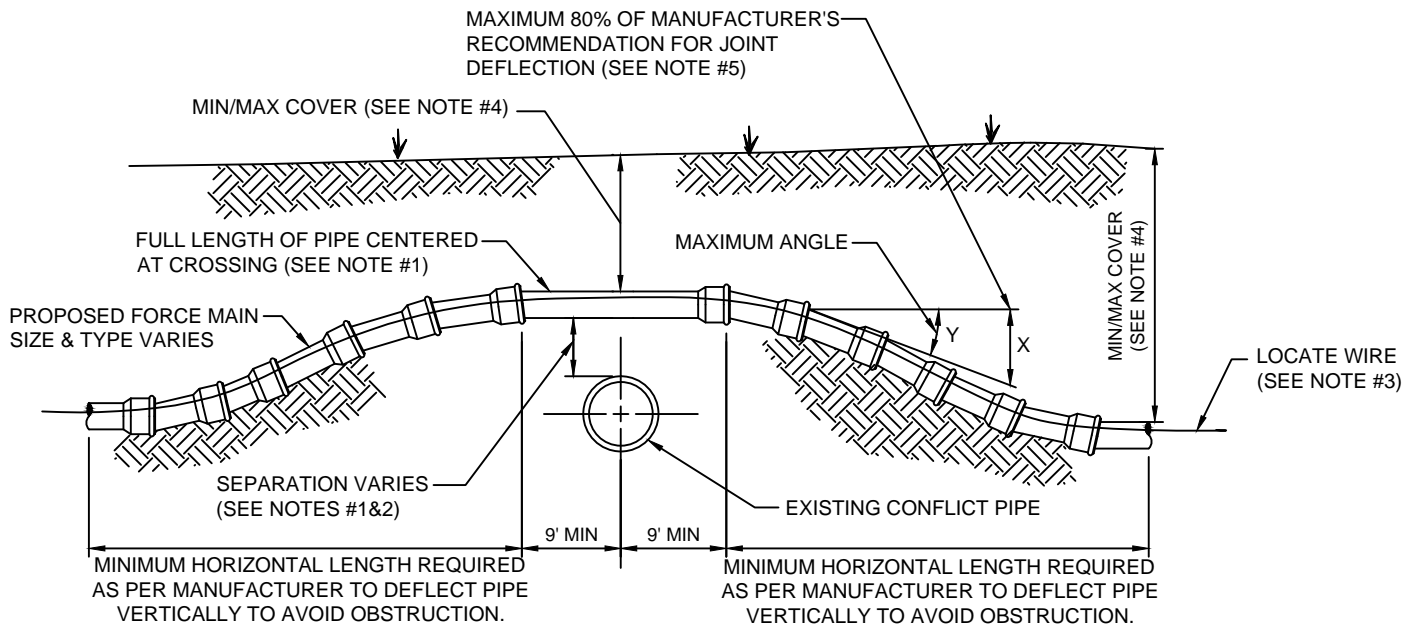
PVC PIPE

PIPE SIZE (IN.)	(X) MAX. OFFSET (IN.)	(Y) ANGLE AT ONE BELL	RESULTING RADIUS OF CURVE WITH 20FT. LENGTHS
2	30	7°	158 FT
4	10	2.4°	480 FT
6	10	2.4°	480 FT
8	10	2.4°	480 FT
10	10	2.4°	480 FT
12	8.5	2°	564 FT
14 - 24	5	1.2°	960 FT
30 - 48	3.25	0.8°	1477 FT

DUCTILE IRON PIPE (Mechanical Joint)

PIPE SIZE (IN.)	(X) MAX. OFFSET (IN.)	(Y) ANGLE AT ONE BELL	RESULTING RADIUS OF CURVE WITH 20FT. LENGTHS
-	-	-	-
4	27	6.5°	177 FT
6	24	5.7°	200 FT
8 - 12	17.5	4.2°	273 FT
14 - 16	12	2.9°	400 FT
18 - 20	10	2.4°	477 FT
24 - 30	8	1.9°	600 FT
36	7	1.7°	687 FT
42 - 48	6.7	1.6°	716 FT

ADJUSTMENT UNDER EXISTING UTILITIES PIPE JOINT DEFLECTION



CASE "A" CROSSING

NOTES:

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MAXIMUM ALLOWED OFFSET FOR PIPE BY JOINT DEFLECTION

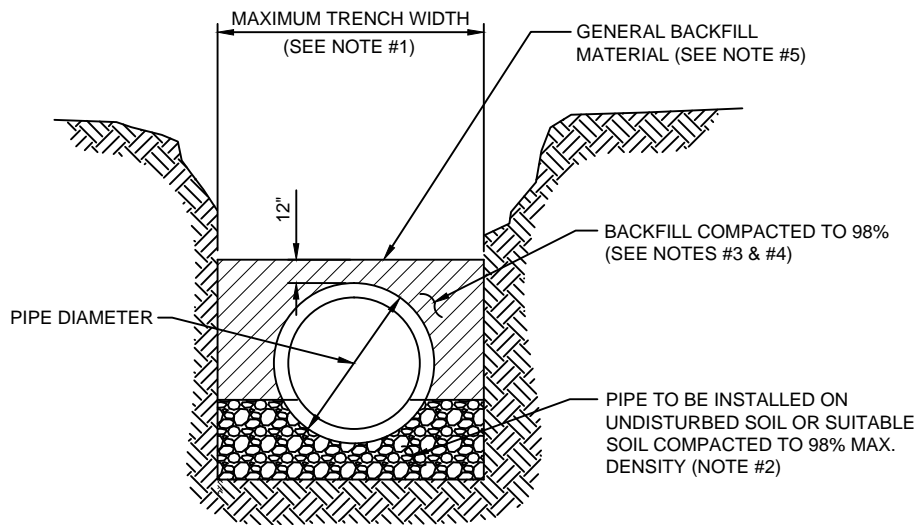
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ADJUSTMENT OVER EXISTING UTILITIES PIPE JOINT DEFLECTION

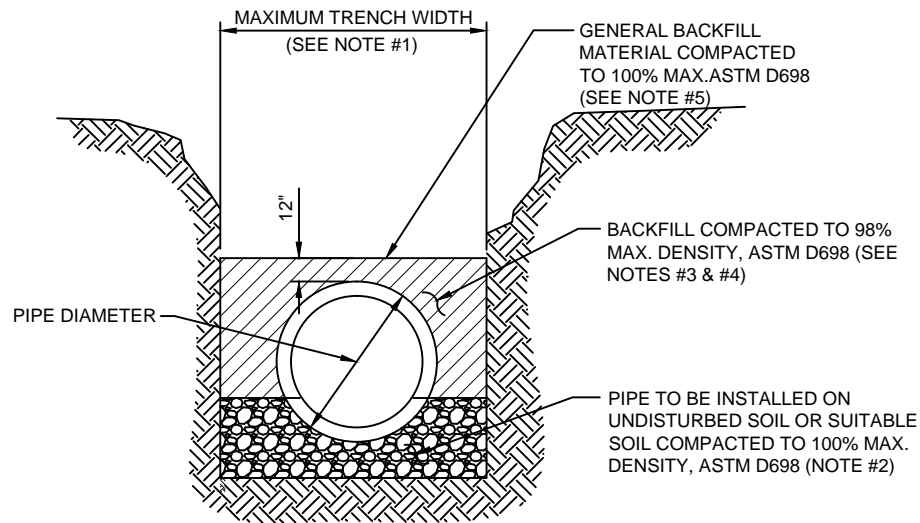


TYPICAL TRENCH

NOTES:

1. TRENCH SIDES SHALL BE APPROXIMATELY VERTICAL BETWEEN AN ELEVATION OF 1 FOOT ABOVE THE TOP OF THE PIPE AND THE CENTER LINE OF THE PIPE; OTHERWISE, TRENCH SIDES SHALL BE AS VERTICAL AS POSSIBLE OR AS REQUIRED BY OSHA STANDARDS. REFER TO THE MEASUREMENT AND PAYMENT SECTION (SECTION #801, PARAGRAPH #4)) TO DETERMINE MAXIMUM PAYLINE WIDTHS.
2. BELL HOLE SHALL BE DUG TO PERMIT THE ENTIRE STRAIGHT BARREL OF THE PIPE TO REST ON THE UNDISTURBED TRENCH BOTTOM. BOULDERS OR LOOSE ROCKS LARGER THAN 3/4 INCH IN SIZE WILL NOT BE PERMITTED IN BACKFILL UP TO 1 FOOT ABOVE THE TOP OF THE PIPE.
3. BACK FILL MATERIAL UP TO A LEVEL OF 1 FOOT OVER THE PIPE SHALL CONSIST OF AASHTO CLASS A-3 SOIL (SUITABLE SOIL) AND SHALL EXCLUDE CLAY MATERIALS AND LOOSE ROCKS LARGER THAN 3/4 INCH SIZE.
4. BACKFILL MATERIAL UP TO A LEVEL 1 FOOT OVER THE TOP OF PIPE OR BOTTOM OF STRUCTURES SHALL BE PLACED IN 6 INCH COMPACTED THICKNESS LAYERS AND SHALL BE COMPACTED TO 98% OF IT'S MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D1557.
5. SEE " EXCAVATION AND EARTHWORK", SECTION 408 FOR ADDITIONAL REQUIREMENTS INCLUDING REMOVAL AND REPLACEMENT OF UNSUITABLE SOILS, DEWATERING, COMPACTION REQUIREMENTS AND DENSITY TESTING OF COMPACTED SOILS.

OPEN CUT TRENCH FOR PRESSURE PIPE

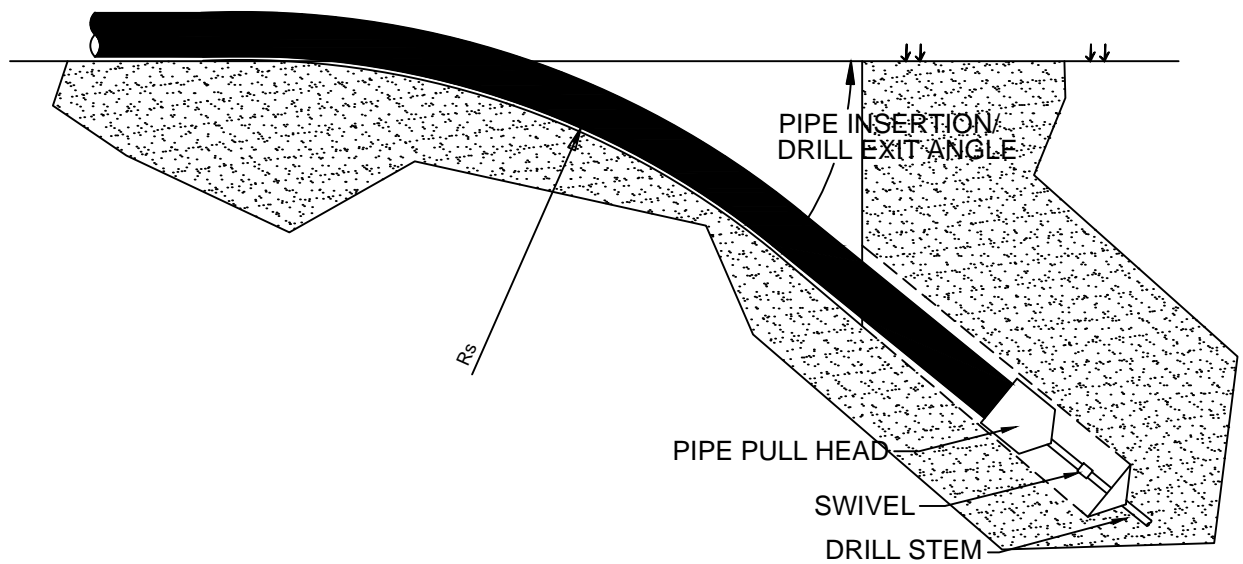


TYPICAL TRENCH

NOTES:

1. TRENCH SIDES SHALL BE APPROXIMATELY VERTICAL BETWEEN AN ELEVATION OF 1 FOOT ABOVE THE TOP OF THE PIPE AND THE CENTER LINE OF THE PIPE; OTHERWISE, TRENCH SIDES SHALL BE AS VERTICAL AS POSSIBLE OR AS REQUIRED BY OSHA STANDARDS. REFER TO THE MEASUREMENT AND PAYMENT SECTION (SECTION #801, PARAGRAPH #4)) TO DETERMINE MAXIMUM PAYLINE WIDTHS.
2. BELL HOLE SHALL BE DUG TO PERMIT THE ENTIRE STRAIGHT BARREL OF THE PIPE TO REST ON THE UNDISTURBED TRENCH BOTTOM. BOULDERS OR LOOSE ROCKS LARGER THAN 3/4 INCH IN SIZE WILL NOT BE PERMITTED IN BACKFILL UP TO 1 FOOT ABOVE THE TOP OF THE PIPE.
3. BACK FILL MATERIAL UP TO A LEVEL OF 1 FOOT OVER THE PIPE SHALL CONSIST OF AASHTO CLASS A-3 SOIL (SUITABLE SOIL) AND SHALL EXCLUDE CLAY MATERIALS AND LOOSE ROCKS LARGER THAN 3/4 INCH SIZE.
4. BACKFILL MATERIAL UP TO A LEVEL 1 FOOT OVER THE TOP OF PIPE OR BOTTOM OF STRUCTURES SHALL BE PLACED IN 6 INCH COMPACTED THICKNESS LAYERS AND SHALL BE COMPACTED TO 100% OF IT'S MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D698.
5. SEE " EXCAVATION AND EARTHWORK", SECTION 408 FOR ADDITIONAL REQUIREMENTS AND EXCEPTIONS INCLUDING REMOVAL AND REPLACEMENT OF UNSUITABLE SOILS, DEWATERING, COMPACTION REQUIREMENTS AND DENSITY TESTING OF COMPACTED SOILS.

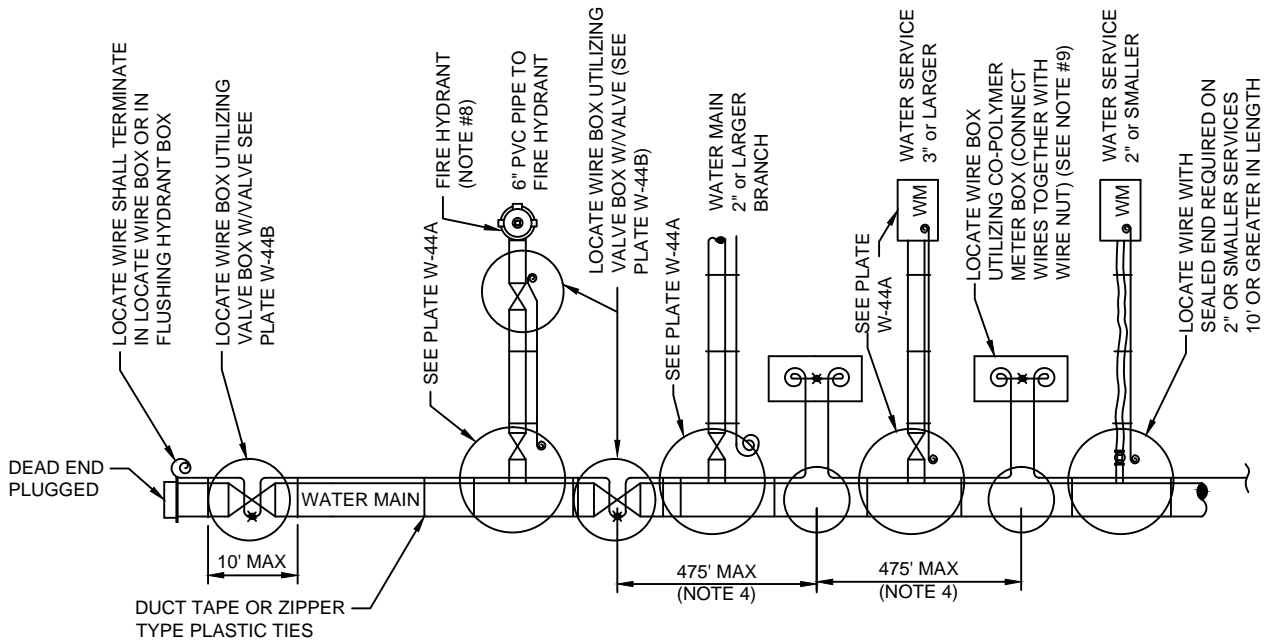
OPEN CUT TRENCH FOR PRESSURE PIPE



PIPE SIZE	MAXIMUM ALLOWABLE BENDING RADIUS - R_s (FT)	MAXIMUM ALLOWABLE PULLING FORCE (DR18) (K-LBS)
4"	100	10
6"	144	21
8"	189	37
10"	231	56
12"	275	80

12" AND SMALLER FUSIBLE PVC PIPE ALLOWABLE BEND RADIUS AND PULLING FORCE

A LOCATE WIRE SHALL BE PLACED ON SERVICES 10FT OR GREATER.



LOCATE WIRE SYSTEM

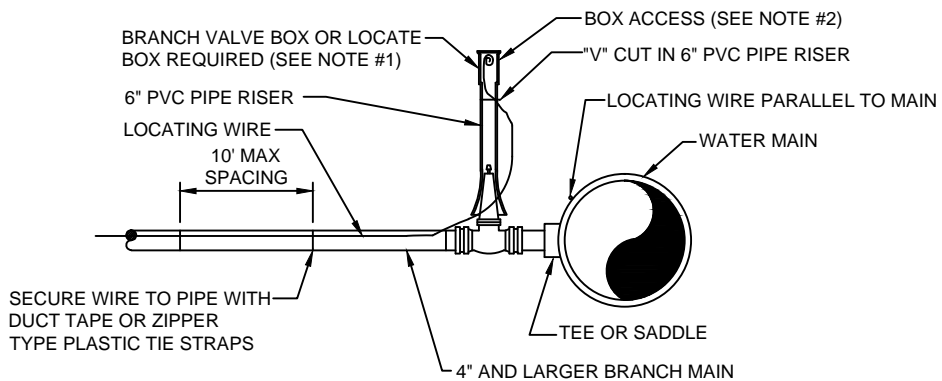
NOTES:

1. LOCATING WIRE TO BE INSTALLED IN EITHER THE ONE OR ELEVEN O'CLOCK POSITION ON ALL DUCTILE IRON OR PVC (PRESSURE MAINS). LOCATE WIRE SHALL ALSO BE INSTALLED ON ALL (HDPE) POLY MAIN PIPING (1:00 OR 11:00 POSITION, IF POSSIBLE).
2. SECURE LOCATING WIRE TO PVC & D.I.P. WATER MAIN BY USE OF DUCT TAPE OR ZIPPER TYPE PLASTIC TIE STRAPS SPACED AT A MAXIMUM DISTANCE OF TEN (10') AND AT EACH SIDE OF BELL JOINT OR FITTING.
3. THE ENTIRE LOCATING SYSTEM SHALL BE SUBJECTED TO TESTING TO DETERMINE ITS RELIABILITY. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO THE PLACEMENT OF PAVEMENT, UNLESS APPROVED OTHERWISE BY JEA.
4. LOCATING WIRE SHALL TERMINATE WITHIN AN ACTIVE VALVE BOX (WITH A VALVE) OR A METER BOX (IF NO VALVE) AT 475' INTERVALS. SEE DETAIL PLATE W-44B. WIRE CONNECTIONS BELOW GROUND (OUTSIDE OF A BOX) SHALL BE AVOIDED.
5. REFER TO SECTION 350 FOR LOCATE WIRE SPECIFICATIONS.
6. "X" INDICATES THAT THE WIRES ARE CONNECTED TOGETHER.
7. "⊗" INDICATES A WIRE PIG-TAIL (12" LONG)
8. FOR FIRE HYDRANT LOCATE WIRE REQUIREMENTS AND EXCLUSIONS, SEE PLATES W-12,13 AND 14.
9. AN "LW" CUT SHALL BE CARVED IN THE CONCRETE CURB AND PAINTED AT ALL LOCATE WIRE BOXES.
10. FOUR LANES OF TRAFFIC (HAVING TWO LANES OF TRAFFIC IN EACH DIRECTION) OR GREATER THE LOCATE WIRE SHALL AND VALVE BOX BE OFF-SET TO THE RIGHT-OF-WAY.

LOCATE WIRE CONSTRUCTION FOR WATER MAINS

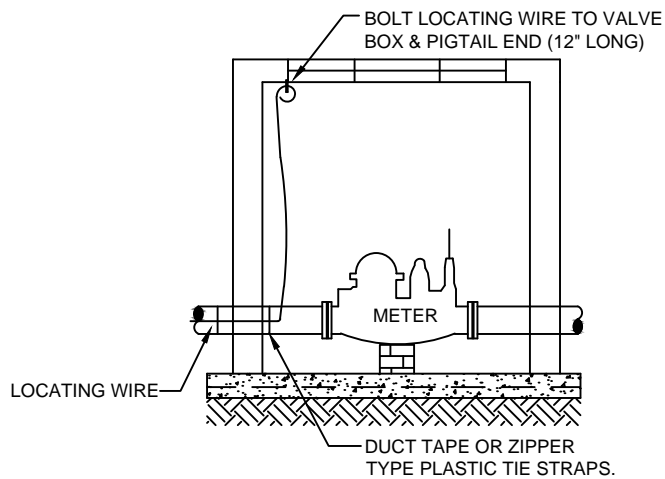
JANUARY 2017

PLATE W-44



BRANCH FORCE MAIN

(2" AND LARGER WATER MAIN OR 3" AND LARGER WATER SERVICE PIPE)



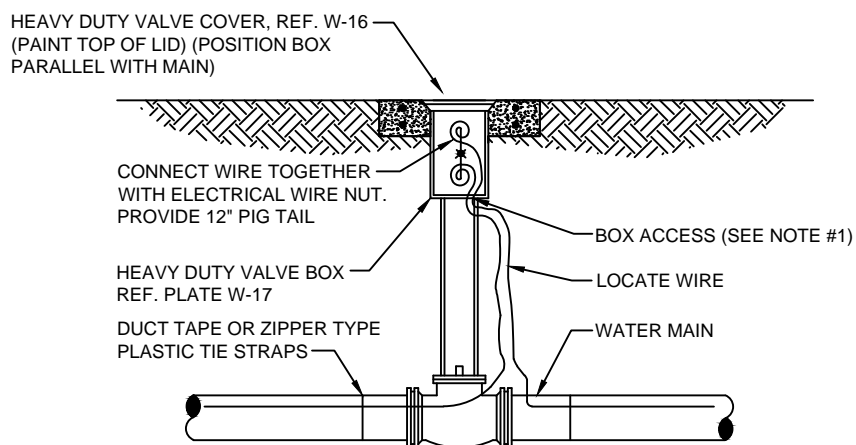
CONNECTION AT LARGE METER BOX

(3" OR LARGER SERVICE)

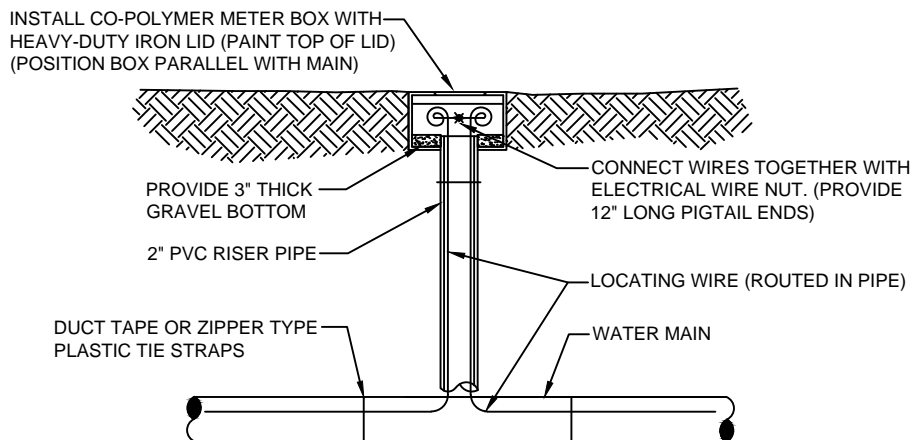
NOTES:

1. NOTE THAT THE BRANCH WIRE IS NOT CONNECTED TO THE MAIN WIRE.
2. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A "V" CUT IN THE 6" PVC RISER PIPE SECTION (SEE W-18).

LOCATE WIRE FOR BRANCH MAIN



LOCATE WIRE BOX UTILIZING VALVE BOX



LOCATE WIRE BOX UTILIZING METER BOX

NOTES:

1. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A "V" CUT IN THE 6" PVC RISER PIPE (SEE W-18).

LOCATE WIRE BOX

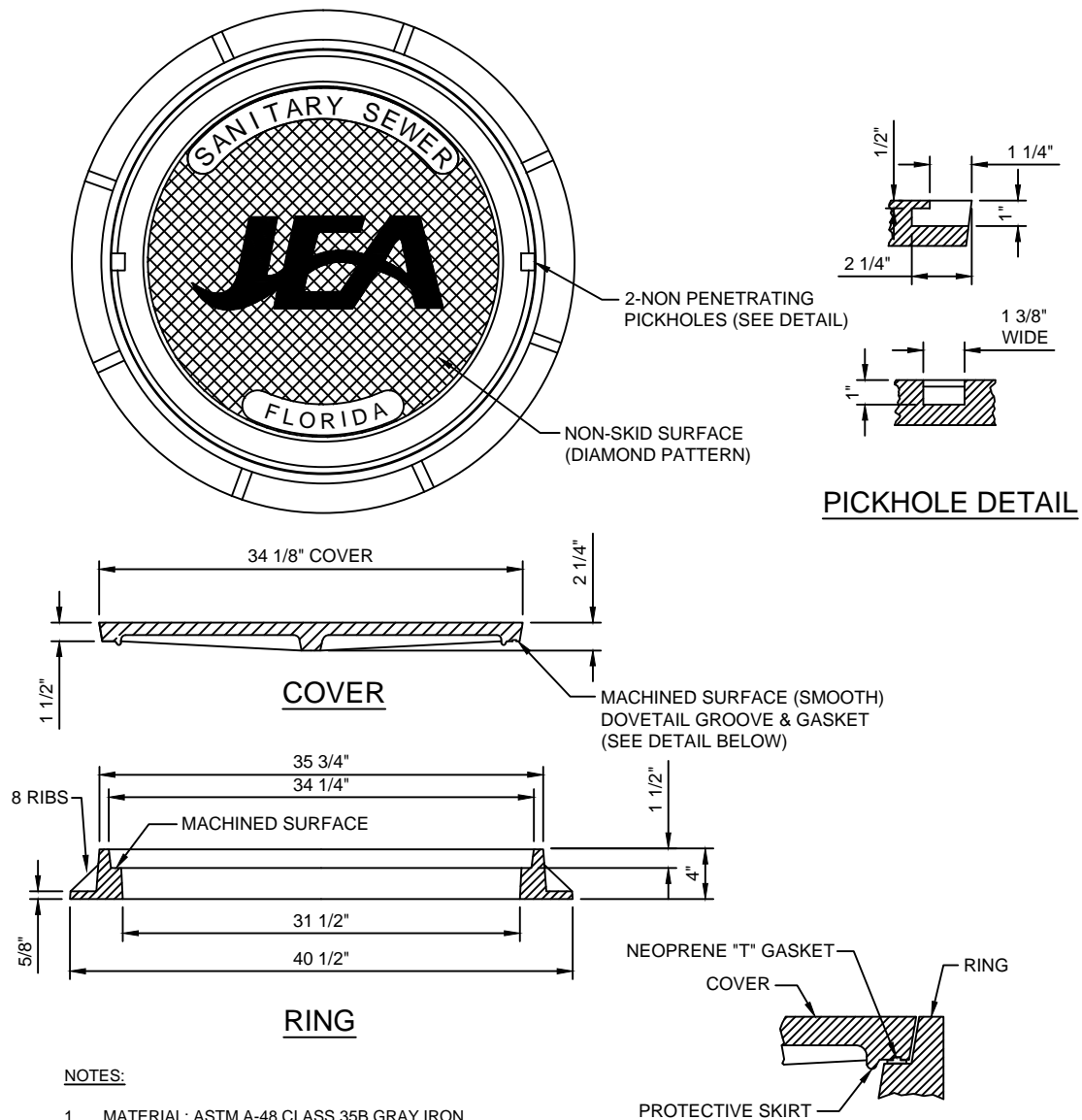
WASTEWATER CONSTRUCTION DETAILS

TABLE OF CONTENTS

DETAIL PLATE

NUMBER	DESCRIPTION:
S - 1	Sanitary Sewer Manhole Frame and Cover
S - 2	Sanitary Sewer Type "A" Manhole 8" - 21" Sewers
S - 2B	Micro-Tunneling Work Shaft
S - 3	Plan View, Type "A" Manhole 8" - 21" Sewers
S - 4	Sanitary Sewer Type "B" Manhole 8" - 10" Sewers
S - 5	Plan View, Type "B" Manhole 8" - 10" Sewers
S - 6	Sanitary Sewer Type "C" Manhole 8" - 21" Sewers
S - 7	Sanitary Sewer Type "D" Manhole 12" - 21" Sewers
S - 8	Plan View Type "D" Manhole 12" - 21" Sewers
S - 9	Sanitary Sewer Type "E" Manhole (Conflict Manhole)
S - 10	Sanitary Sewer Type "F" Manhole 12" - 21" Sewers
S - 11	Sanitary Sewer Type "G" Manhole 24" - 60" Sewers
S - 12	Sanitary Sewer Type "H" Manhole 24" - 60" Sewers
S - 13	Sanitary Sewer Type "I" Manhole 24" - 60" Sewers
S - 14	Fiberglass Manhole
S - 15	Manhole Pipe Connection & Alternate Manhole Bottom
S - 16	Miscellaneous Manhole Connections
S - 17	Precast Sewer Manhole Joint Detail
S - 18	Typical Force Main Connection to Manhole
S - 19	House Lateral Plan View
S - 20	House Lateral Section View
S - 21	Fusible PVC Bending Radius and Pulling Force for HDD Small Dia. Pipe
S - 22	F M Connection 16" and Larger Piping For Private Pumping Stations
S - 23	House Lateral Over Conflict Pipe
S - 24	House Lateral Under Conflict Pipe
S - 25	Typical Casing Detail - Sewer
S - 25A	Casing Detail - Sewer
S - 26	Separation Requirements for Sewer Mains
S - 27	Notes on Utility Separation Requirements - Sewer
S - 28	Bridge Deck Pipe Hanger Detail
S - 29	Air Valve Assembly Inside Manhole
S - 29A	Optional Low Profile Air Valve Assembly Inside Manhole
S - 29B	Air Valve Assembly Inside Manhole in ROW
S - 30	Sewer Valve Installation Detail

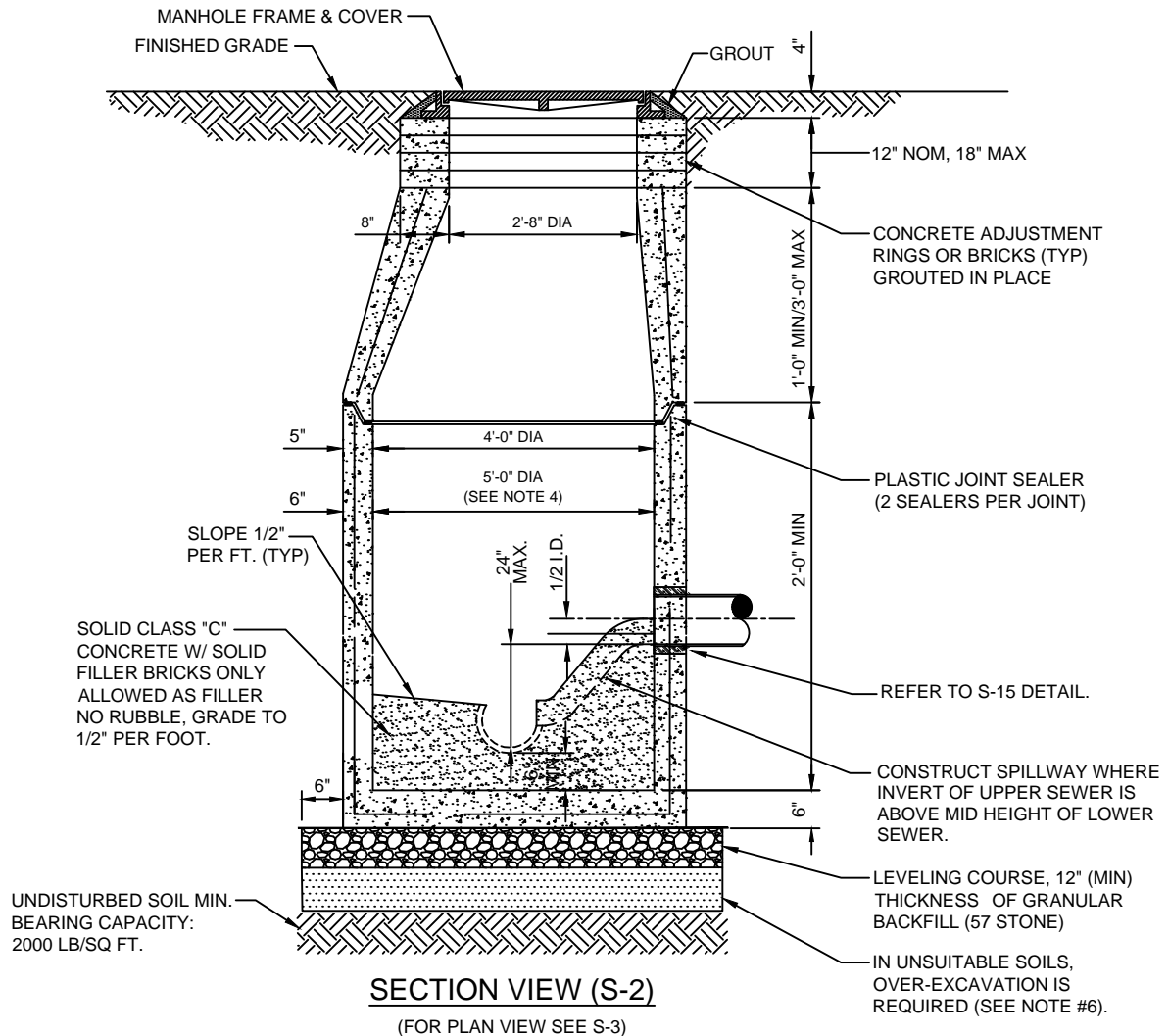
S – 31.....	Sewer System Valve Box Cover
S – 32.....	Sewer System Valve Box
S – 33.....	Sewer Valve Jacket Adjusted After Roadway Re-Surfacing
S – 34.....	Manhole Frame and Cover Adjustment After Roadway Re-Surfacing
S – 35.....	Sidewall Pipe Hanger Detail
S – 36.....	Pipe Support & Pole Assembly for Force Main
S – 37.....	Pipe Support Details for Pole Assembly
S – 38A	PVC Pipe Restraint Joint Schedule
S – 38B	NOT USED
S – 38C	Mechanical Restraint Details – I
S – 38D	Mechanical Restraint Details – II
S – 39.....	Adjustment Over Existing Utilities – Mechanical Restraints
S – 40.....	Adjustment Over Existing Utilities Using Tie Rods
S – 41.....	Adjustment Under Existing Utilities – Mechanical Restraints
S – 42.....	Adjustment Under Existing Utilities Using Tie Rods
S – 43.....	Plugged Dead End Using Tie Rods
S – 44.....	Plugged Dead End Using Mechanical
S – 45.....	Thrust Block Size Chart
S – 46.....	Private Pump Out Detail Assembly
S – 47.....	Adjustment Under Existing Utilities Pipe Joint Deflection
S – 48.....	Adjustment Over Existing Utilities Pipe Joint Deflection
S – 49.....	Locate Wire Construction for Force Mains
S – 49A	Locate Wire for Branch Main
S – 49B	Locate Wire Box
S – 50.....	Low Pressure Residential Sewer Force Main Connection(s)
S – 51.....	Gang Sewer Services for Condo's / Town-Homes.
S – 52.....	Sewer Lateral Vacuum System
S – 53.....	NOT USED
S – 53A	Prefabricated Concrete Enclosure
S – 53B	Prefabricated Concrete Enclosure
S – 53C	Prefabricated Concrete Enclosure



SANITARY SEWER MANHOLE FRAME AND COVER

JANUARY 2017

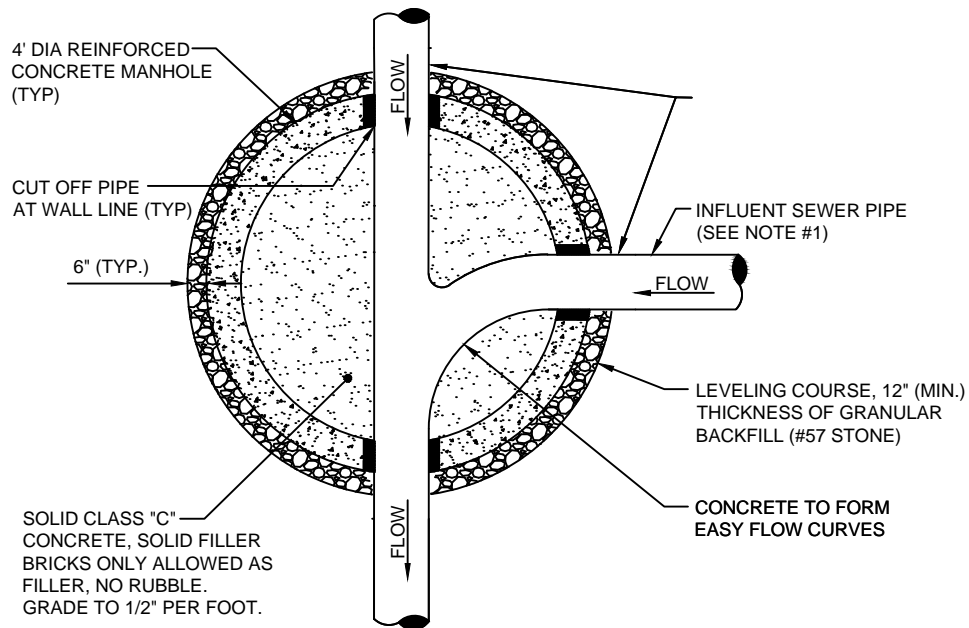
PLATE S-1



NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. THE INTERIOR AND EXTERIOR OF MANHOLE AND ADJUSTING RINGS SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
3. IF SPECIALTY LINER IS TO BE INSTALLED ON INSIDE SURFACE OF MANHOLE, THE BITUMINOUS WATERPROOFING MATERIAL SHALL BE OMITTED ON THE INSIDE.
4. JUNCTION MANHOLE (CLOSEST TO WETWELL) SHALL BE 5' DIA WITH SPECIALTY LINER.
5. ALL MANHOLE JOINTS BELOW THE TOP COVER SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (WITH PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL. SEE PLATE S-17.
6. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "A" MANHOLE 8"-21" SEWERS

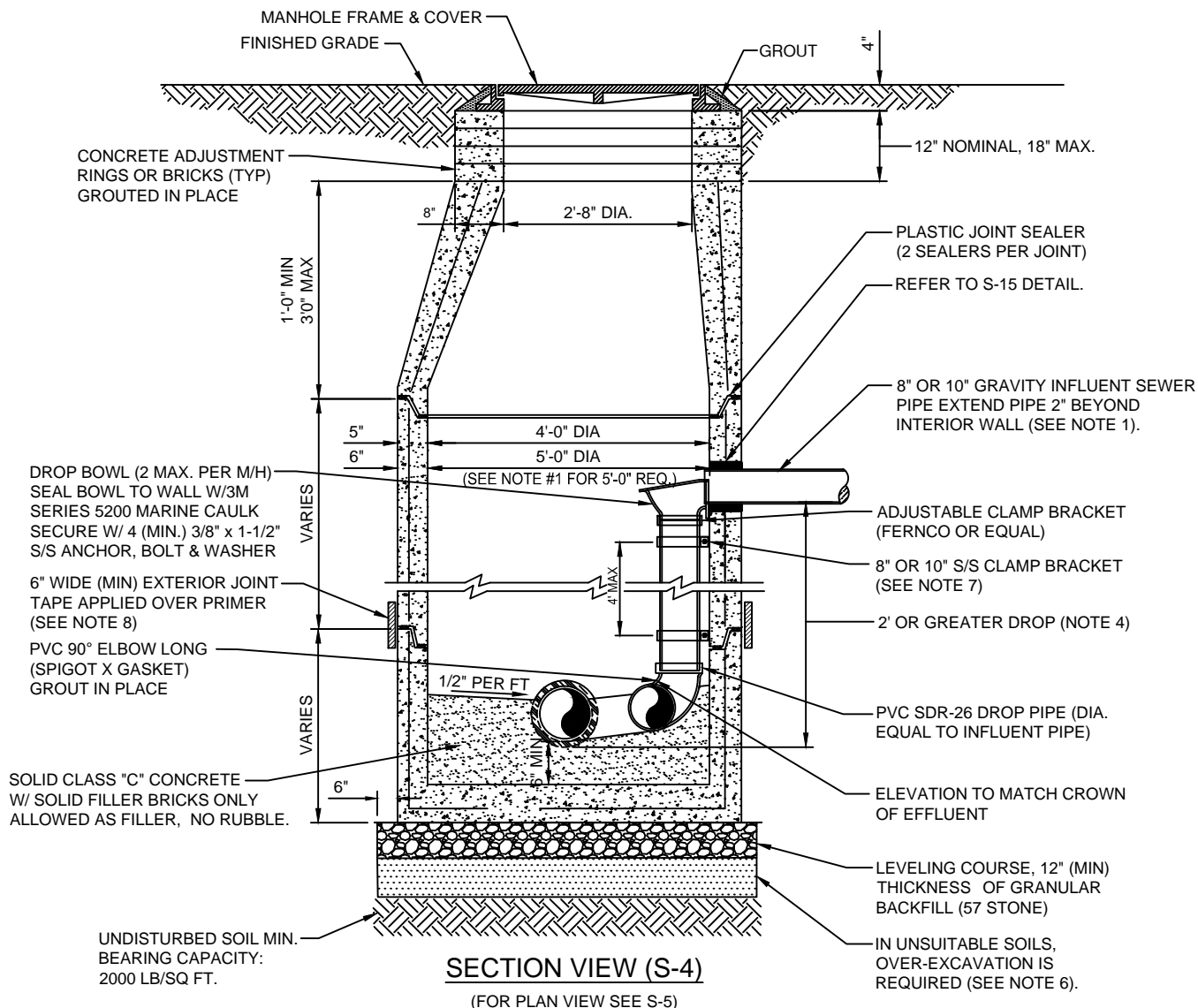


NOTES:

1. THE ANGLE BETWEEN ALL INFLUENT FLOW CHANNELS AND EFFLUENT PIPE SHALL BE BETWEEN 90° - 180° UNLESS OTHERWISE APPROVED BY JEA.

PLAN VIEW (S-3)

(FOR SECTION VIEW SEE S-2)

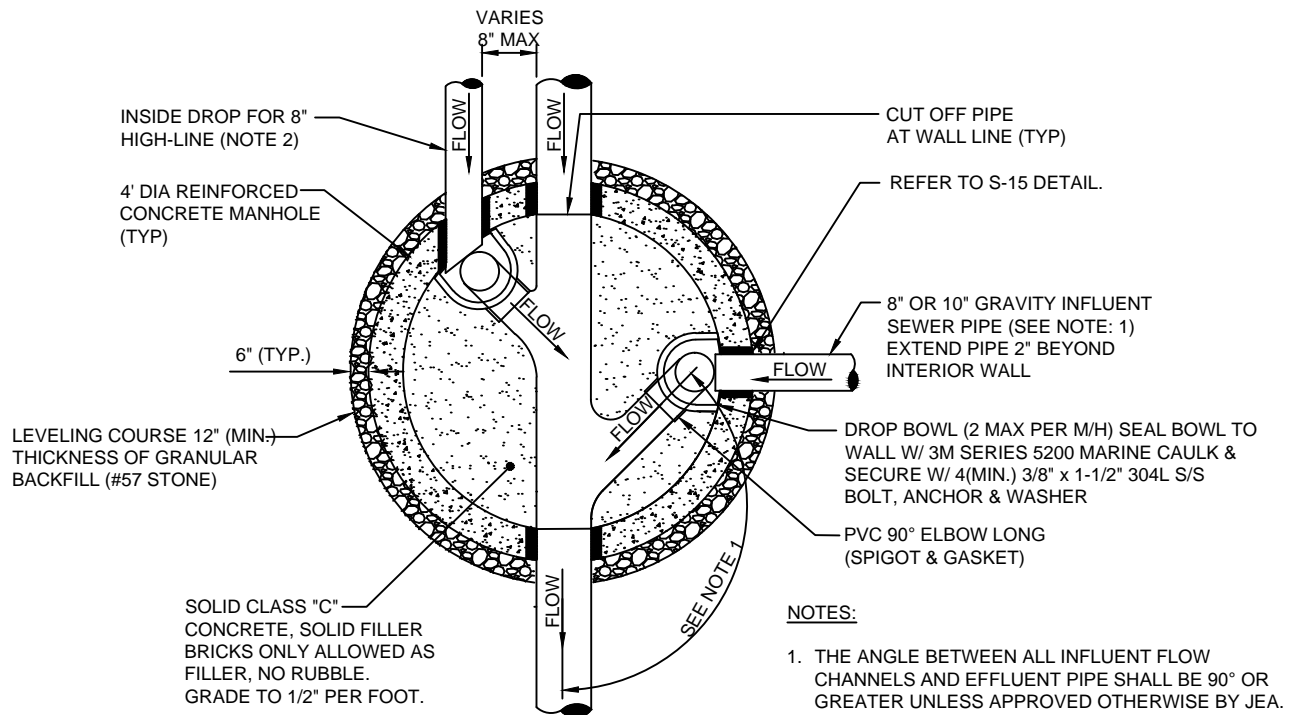


NOTES:

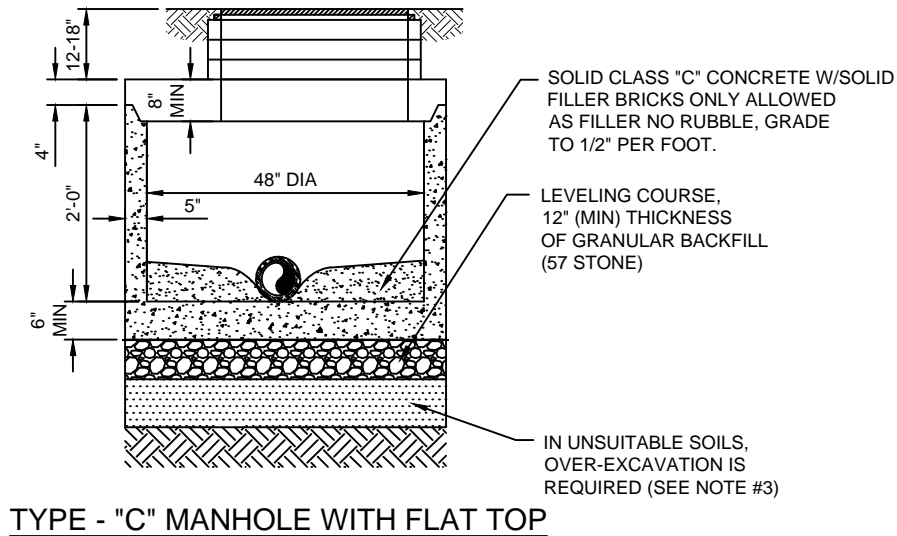
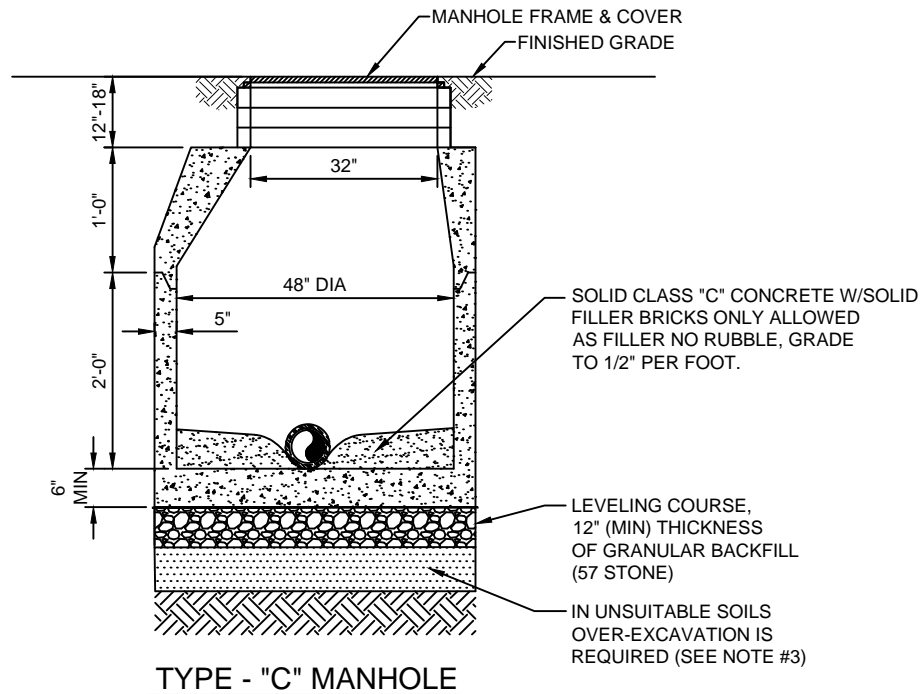
- THIS ASSEMBLY IS FOR 8" OR 10" GRAVITY INFLUENT LINES ONLY. NEW CONSTRUCTION ONLY NO FORCE MAINS LARGER THAN 6". MAXIMUM OF 2 INSIDE DROP BOWLS PER MANHOLE. A 5'-0" DIA. MANHOLE (6" THICK WALLS) IS REQUIRED IF TWO INSIDE DROPS ARE CONSTRUCTED WITH ONE OR BOTH BEING 10" SIZE. DROP BOWL BY RELINER OR APPROVED EQUAL REQUIRED. THE INSIDE DROP FOR AN 8" HIGH-LINE SHALL BE CONSTRUCTED SIMILAR TO ABOVE (SEE PLATE S-5).
- PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
- THE INTERIOR AND EXTERIOR OF MANHOLE AND THE INTERIOR OF ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
- TYPE "B" MANHOLE MUST BE USED FOR 2' OR GREATER INFLUENT PIPE DROPS.
- THE DROP BOWL ASSEMBLY SHALL BE INSTALLED PRIOR TO APPLICATION OF SPECIALTY LINING MATERIAL.
- A TYPE "D" MANHOLE SHALL BE UTILIZED WHEN THREE OR MORE (2' OR GREATER) DROPS ARE INVOLVED OR WHEN INFLUENT PIPES AREA LARGER THAN 10" IN SIZE.
- ADJUSTABLE CLAMPING BRACKET (MIN. 2 PER DROP BOWL ASSY). 1-1/2" WIDE, 11 GA. W/ 3/8" DIA. 18-8 PINCH BOLTS AND NUTS. SECURE TO M/H WALL WITH (2) 3/8" x 1" BOLT, ANCHOR & WASHER PER BRACKET ASSY. ALL 304 OR 316 STAINLESS STEEL MATERIALS.
- ALL M/H JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL.
- IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "B" MANHOLE

8"-10" SEWERS



PLAN VIEW (S-5)
(FOR SECTION VIEW SEE S-4)

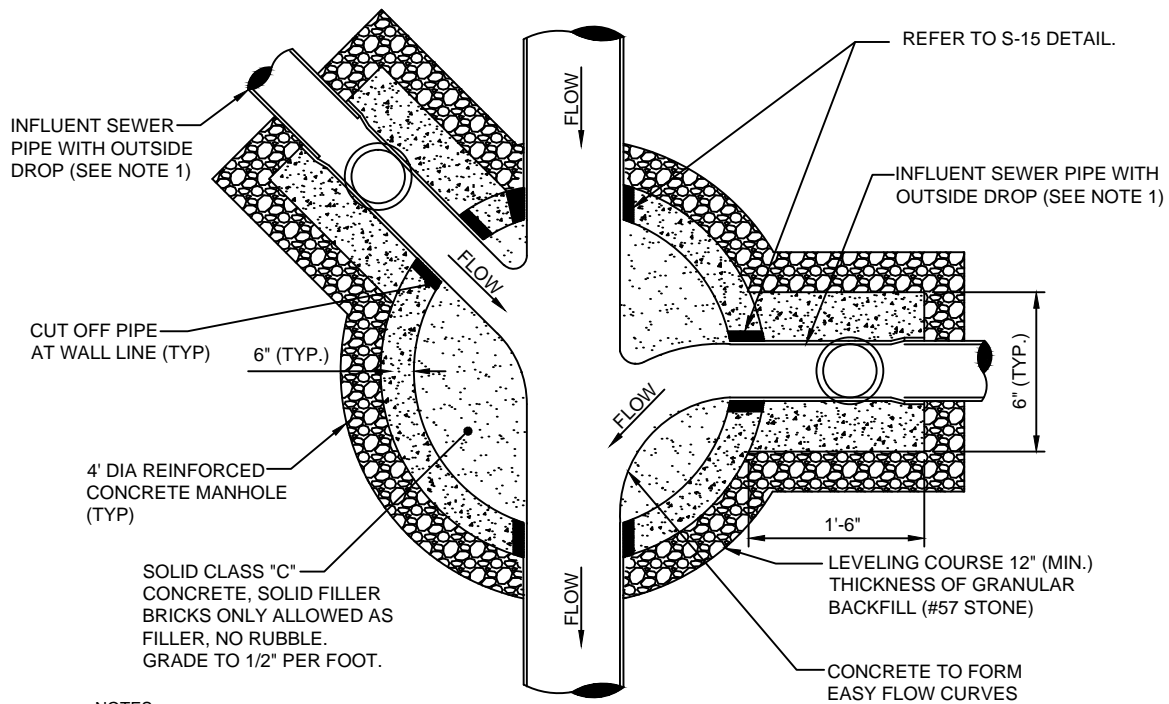


SECTION VIEWS

NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. THE INTERIOR AND EXTERIOR OF MANHOLE AND INTERIOR OF ADJUSTMENT RINGS SHALL BE GIVEN TWO COAT OF BITUMINOUS WATERPROOFING MATERIAL.
3. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "C" MANHOLE 8"-21" SEWERS

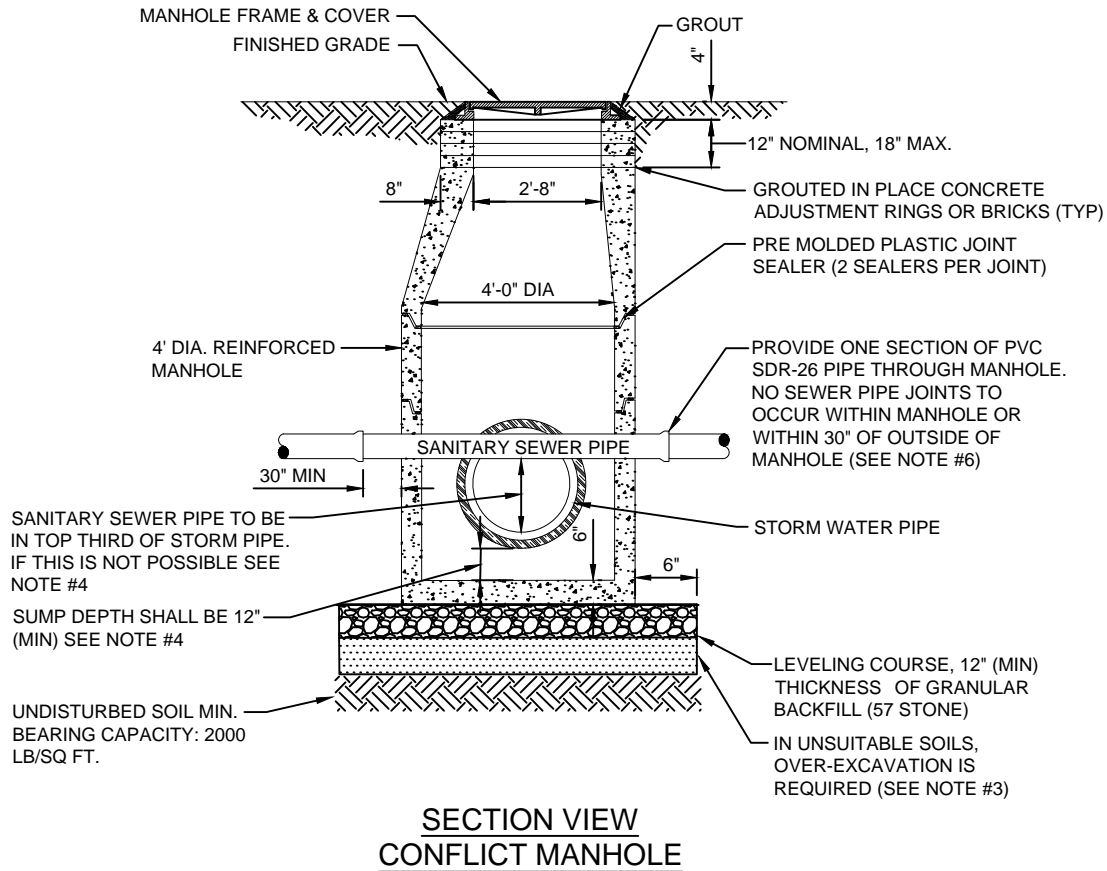


NOTES:

1. THE ANGLE BETWEEN ALL INFLUENT FLOW CHANNELS AND EFFLUENT PIPE SHALL BE 90° OR GREATER UNLESS APPROVED OTHERWISE BY JEA.
2. THE INTERIOR AND EXTERIOR OF THE MANHOLE AND THE INTERIOR OF THE ADJUSTMENT RINGS SHALL BE GIVEN 2 COATS OF BITUMINOUS WATERPROOFING MATERIAL.
3. IF SPECIALITY LINER IS TO BE INSTALLED ON INSIDE OF MANHOLE, THE BITUMINOUS WATERPROOFING MATERIAL SHALL BE OMITTED ON THE INSIDE.
4. TYPE "D" MANHOLES SHALL BE USED FOR 12" OR LARGER INFLUENT PIPES W/ 2' OR GREATER INFLUENT DROP.

PLAN VIEW (S-8)

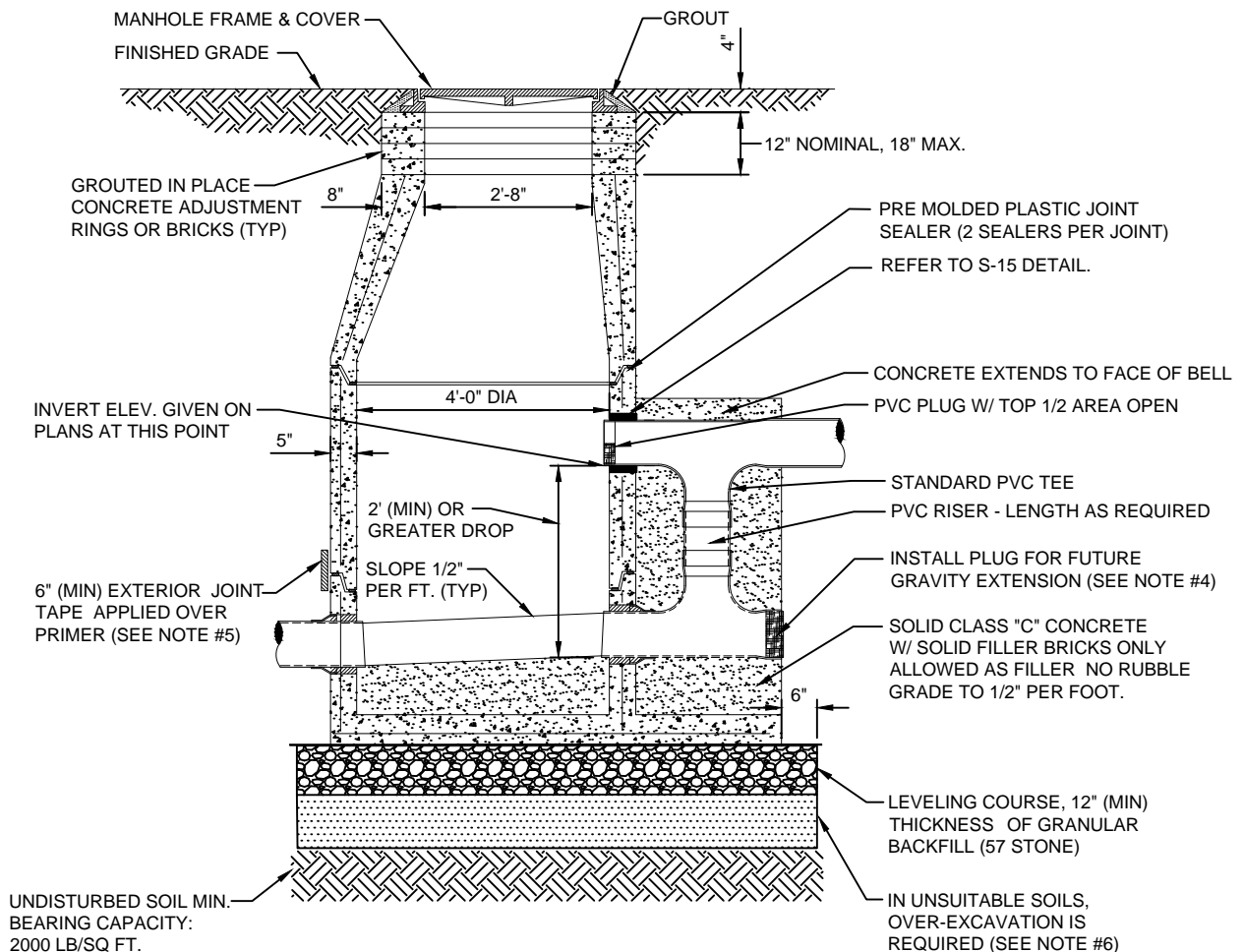
(FOR SECTION VIEW SEE S-7)



NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. TYPE "E" MANHOLES ARE TO BE UTILIZED WHERE CONFLICT EXISTS BETWEEN STORM WATER PIPE AND SANITARY SEWER PIPES. THE USE OF THIS STYLE OF MANHOLE SHALL BE MINIMIZED WHERE POSSIBLE.
3. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).
4. IF THE GRAVITY SEWER PIPE IS LOCATED BELOW THE TOP THIRD OF THE STORM WATER PIPE, THEN THE SUMP DEPTH SHALL BE AS FOLLOWS:
 - a) FOR STORM PIPES 36" AND SMALLER, A 24" DEEP SUMP IS REQUIRED.
 - b) FOR STORM PIPES LARGER THAN 36", A 36" DEEP SUMP IS REQUIRED.
5. NO WATER MAIN, RECLAIMED WATER MAIN OR SEWER FORCE MAIN SHALL BE ALLOWED TO PENETRATE A STORM WATER STRUCTURE.
6. SPECIAL APPROVAL IS REQUIRED FOR GRAVITY SEWER PIPES 12" AND LARGER AND WILL BE CONSIDERED ON A CASE BY CASE BASIS. IF APPROVED, CONSTRUCTION DETAILS MAY BE REQUIRED.

SANITARY SEWER TYPE "E" MANHOLE THRU STORM WATER MANHOLE

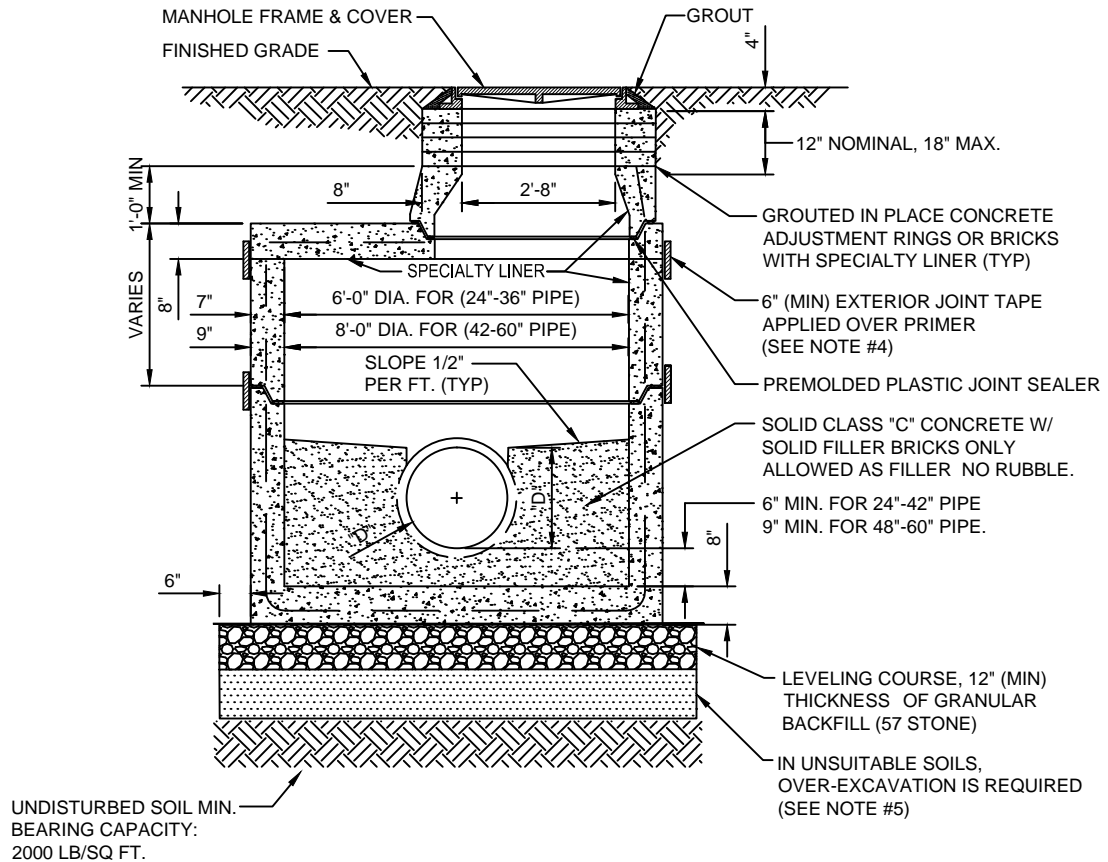


SECTION VIEW

NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. THE INTERIOR AND EXTERIOR OF MANHOLE AND THE INTERIOR OF THE ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
3. IF SPECIALTY LINER IS TO BE INSTALLED ON INSIDE SURFACE OF MANHOLE, THE BITUMINOUS WATERPROOFING SHALL BE OMITTED ON INSIDE.
4. TYPE "F" MANHOLE SHALL BE USED FOR 12" OR LARGER INFLUENT PIPES W/ 2' OR GREATER INFLUENT DROP THIS MANHOLE IS TO BE USED WHERE THE INFLUENT GRAVITY LINE IS TO BE EXTENDED IN THE FUTURE (SEE DETAIL).
5. ALL M/H JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL.
6. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "F" MANHOLE 12" - 21" SEWERS

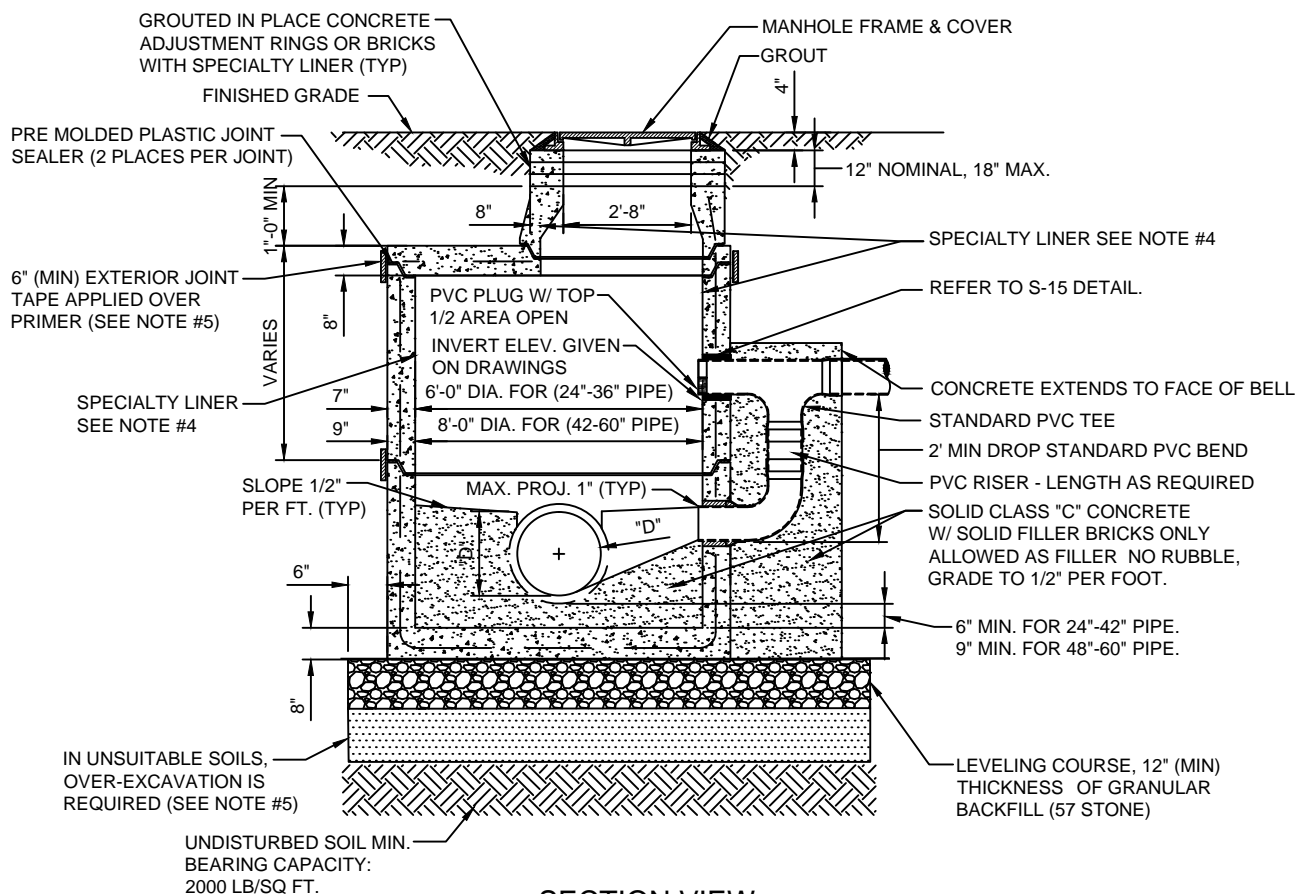


SECTION VIEW

NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. THE EXTERIOR ONLY OF MANHOLE SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
3. SPECIALTY LINER IS TO BE INSTALLED ON INSIDE SURFACE OF MANHOLE IN ACCORDANCE WITH AS-602, THEREFORE, THE BITUMINOUS WATERPROOFING SHALL BE OMITTED ON INSIDE.
4. ALL M/H JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL.
5. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "G" MANHOLE 24" - 60" SEWERS

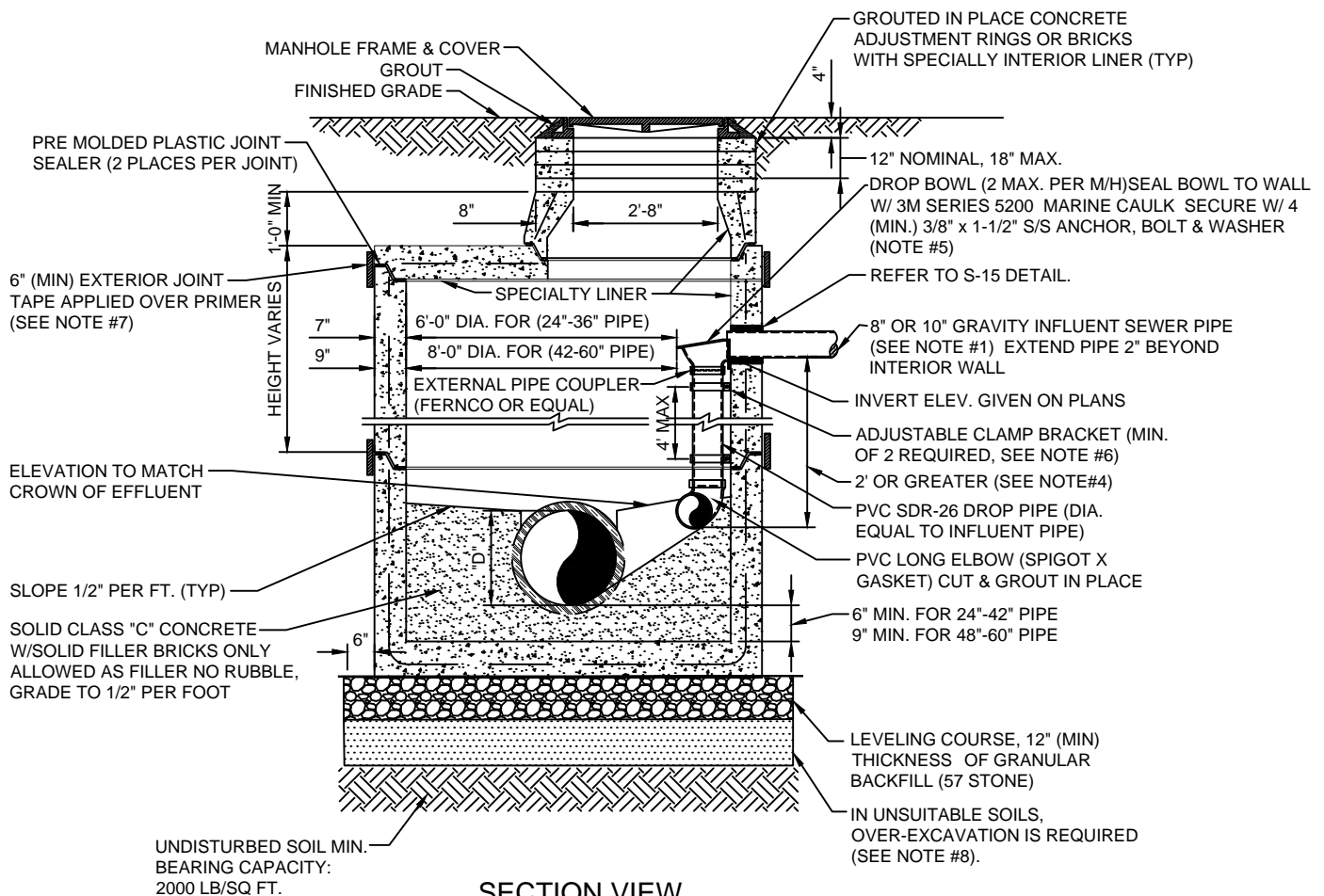


SECTION VIEW

NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
2. THE EXTERIOR OF MANHOLE SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
3. OUTSIDE DROPS REQUIRED IF DROPS ARE 2' OR GREATER.
4. SPECIALTY LINER IS TO BE INSTALLED ON INSIDE SURFACE OF MANHOLE IN ACCORDANCE WITH AS-602, THEREFORE, THE BITUMINOUS WATERPROOFING SHALL BE OMITTED ON INSIDE. SEE SPECIFICATIONS FOR APPROVED SPECIALTY LINERS.
5. ALL M/H JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL.
6. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

SANITARY SEWER TYPE "H" MANHOLE 24" - 60" SEWERS

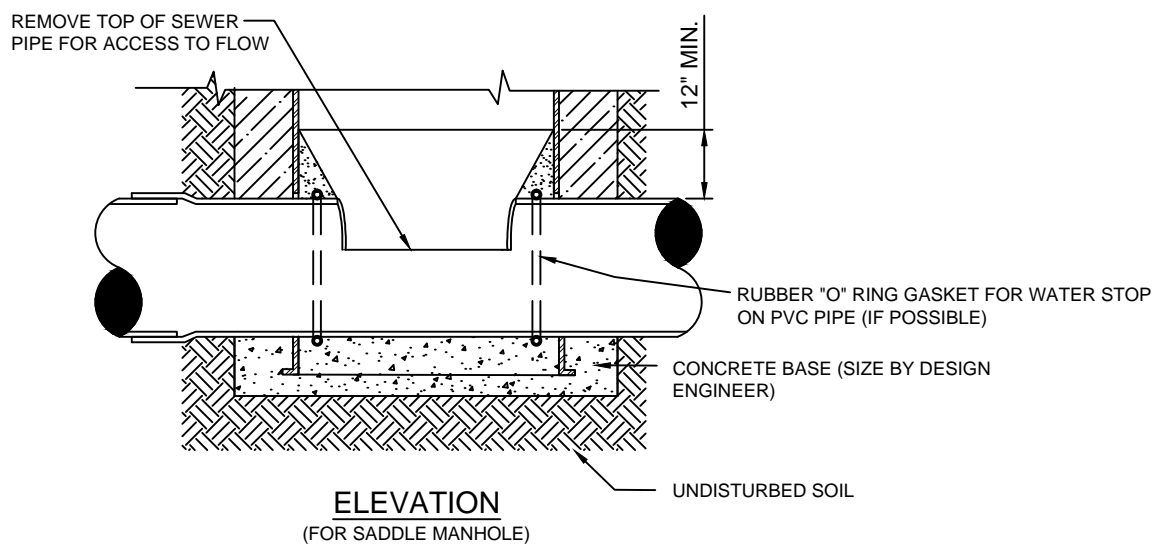
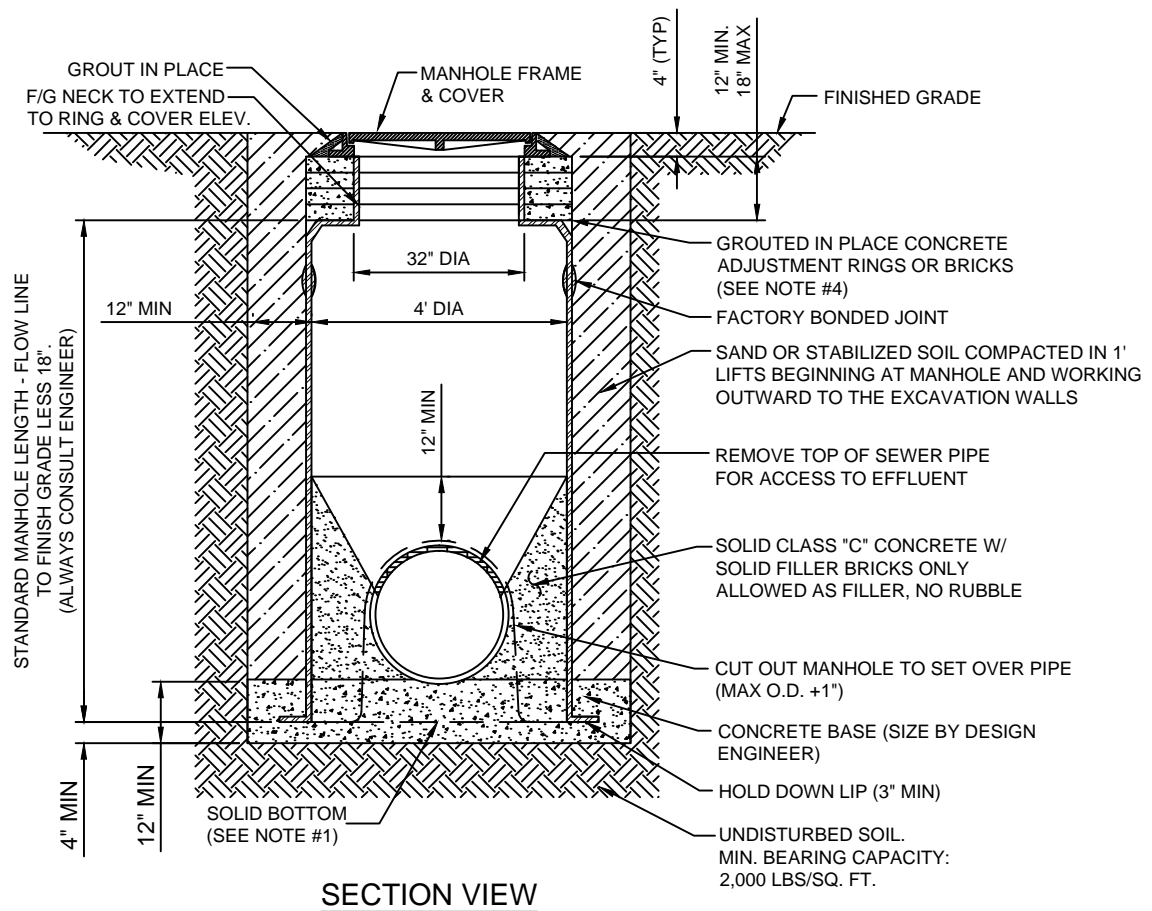


SECTION VIEW

NOTES:

1. THIS ASSEMBLY IS FOR 8" OR 10" GRAVITY INFLUENT LINES ONLY. NO DROPS ALLOWED FOR FORCE MAINS. DROP BOWL BY RELINER OR APPROVED EQUAL REQUIRED.
2. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL.
3. THE EXTERIOR OF THE MANHOLE AND INTERIOR OF ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL.
4. THIS DETAIL FOR 2' OR GREATER ELEVATIONS DIFFERENCE BETWEEN INVERT OF INCOMING PIPE AND ELBOW OUTLET.
5. THE DROP BOWL ASSEMBLY SHALL BE INSTALLED PRIOR TO APPLICATION OF SPECIALTY LINING MATERIAL IN ACCORDANCE WITH AS-602, THEREFORE, BITUMINOUS WATERPROOFING MATERIAL SHALL BE OMITTED FROM THE INSIDE OF MANHOLE. SEE SPECIFICATIONS FOR THE INSTALLATION OF SPECIALTY LINING MATERIAL SECTION 446.
6. ADJUSTABLE CLAMPING BRACKET (MIN. 2 PER DROP BOWL ASSY). 1-1/2" WIDE, 11 GA. W/ 3/8" DIA. 18-8 PINCH BOLTS AND NUTS. SECURE TO M/H WALL WITH (2) 3/8" X 1" BOLT, ANCHOR & WASHER PER BRACKET ASSY. ALL 304 OR 316 STAINLESS STEEL MATERIALS.
7. ALL M/H JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS OPTIONAL.
8. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 98%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL (57 STONE).

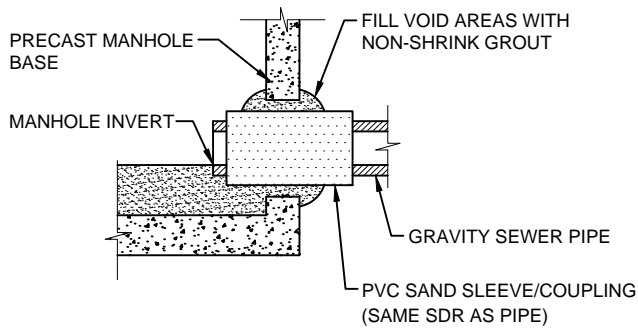
SANITARY SEWER TYPE "I" MANHOLE 24" - 60" SEWERS



NOTES:

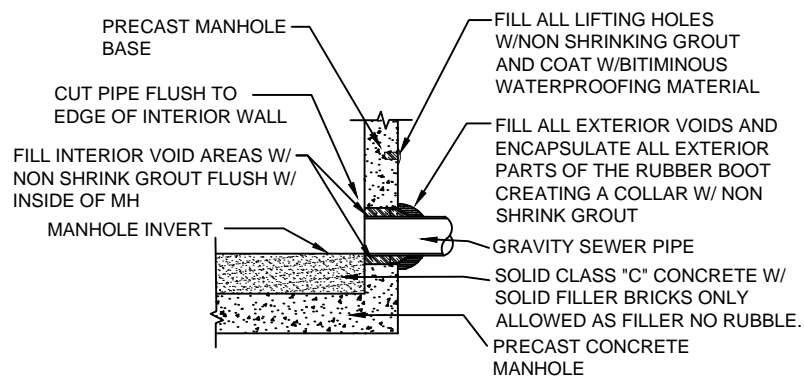
1. A STANDARD TYPE "A" MANHOLE SHALL INCLUDE A SOLID BOTTOM WITH 3" HOLD DOWN FLANGE.
2. CONCRETE BASE TO BE SIZE BY ENGINEER. THE MINIMUM SIZE IS SHOWN ABOVE.
3. IF EXPOSED, THE INTERIOR OF CONCRETE ADJUSTING RINGS WILL BE GIVEN 2 COATS OF BITUMINOUS WATERPROOFING MATERIAL.

FIBERGLASS MANHOLE



PVC SAND SLEEVE

(FOR EXISTING AND NEW M/H CONSTRUCTION)

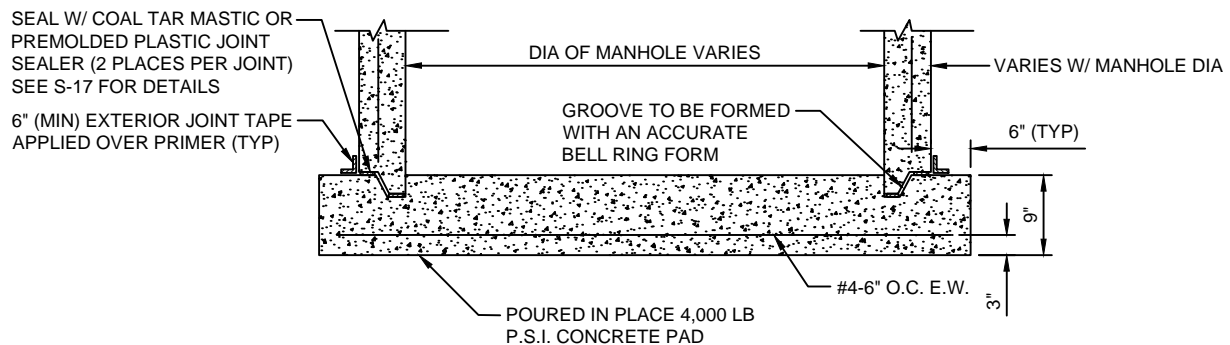


NOTES:

RUBBER BOOT, DOUBLE BANDED, 316 S/S CLAMPS, MEETING THE ASTM C923 STANDARD. Kor-N-Seal® I EX SERIES CONNECTOR WITH DOUBLE STAINLESS STEEL BANDS OR EQUAL.

RUBBER BOOT

(FOR NEW M/H CONSTRUCTION ONLY, MAXIMUM DEPTH 15FT)

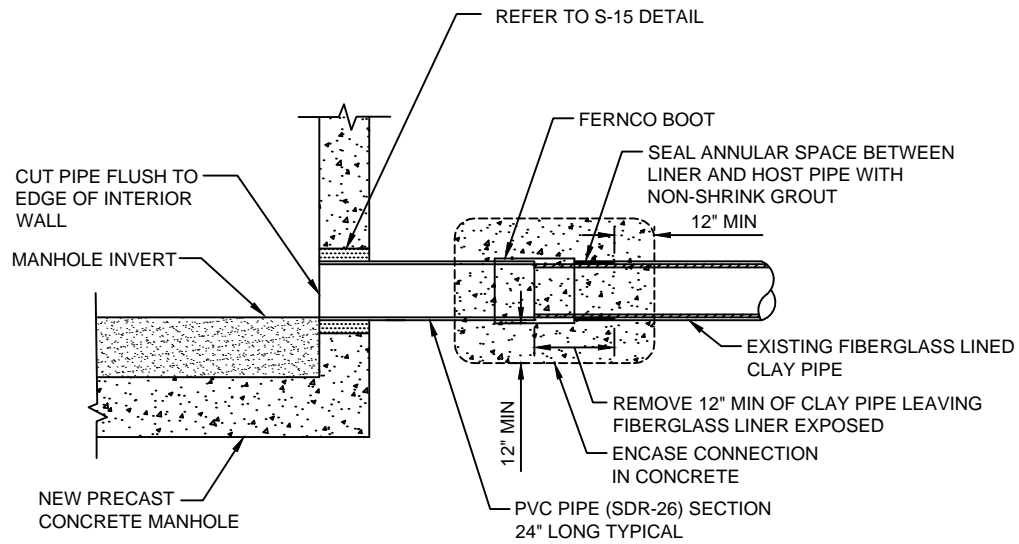


NOTES:

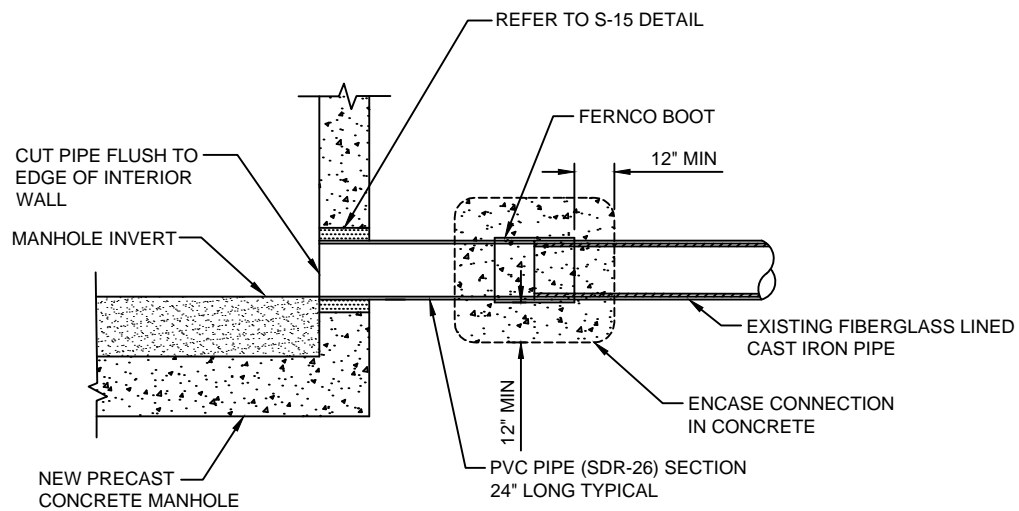
THE USE OF THE POURED IN PLACE MANHOLE BOTTOM SHALL BE MINIMIZED AND SHALL BE SPECIFICALLY APPROVED BY JEA PRIOR TO CONSTRUCTION.

MANHOLE BOTTOM

MANHOLE PIPE CONNECTION DETAIL

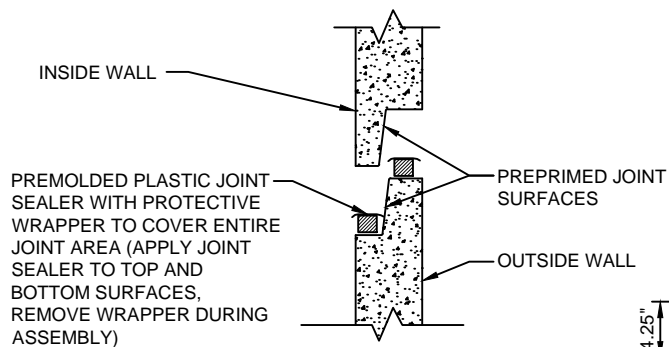


EXISTING CLAY PIPE WITH LINER



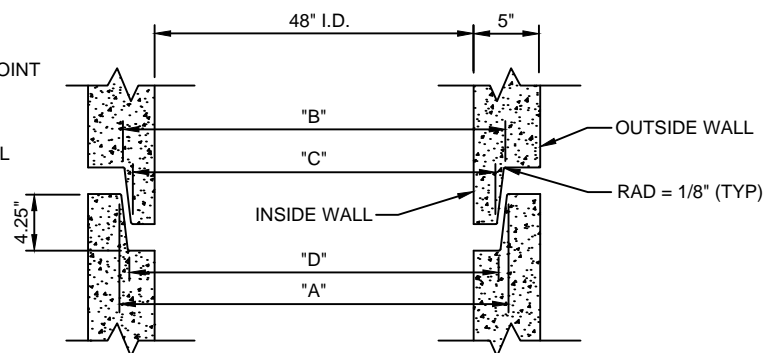
EXISTING CAST IRON PIPE WITH LINER

MISCELLANEOUS MANHOLE CONNECTIONS

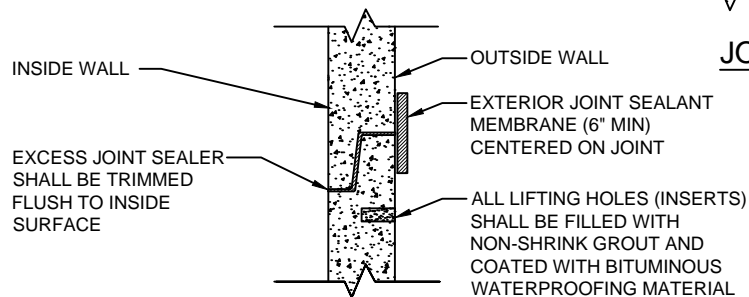


JOINT ASSEMBLY DETAIL

MANHOLE JOINT	"A"	"B"	"C"	"D"
7° JOINT ANGLE	53.043	52.543	51.500	52.000



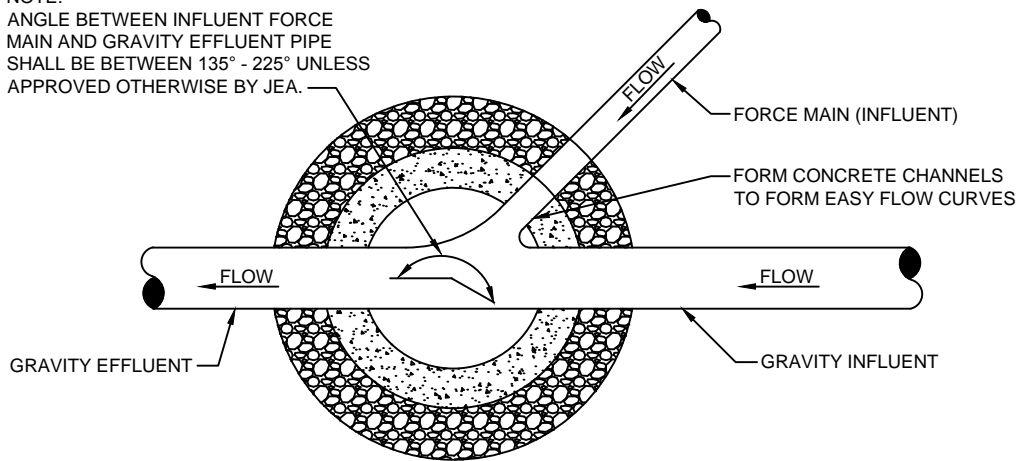
JOINT CONSTRUCTION DETAIL



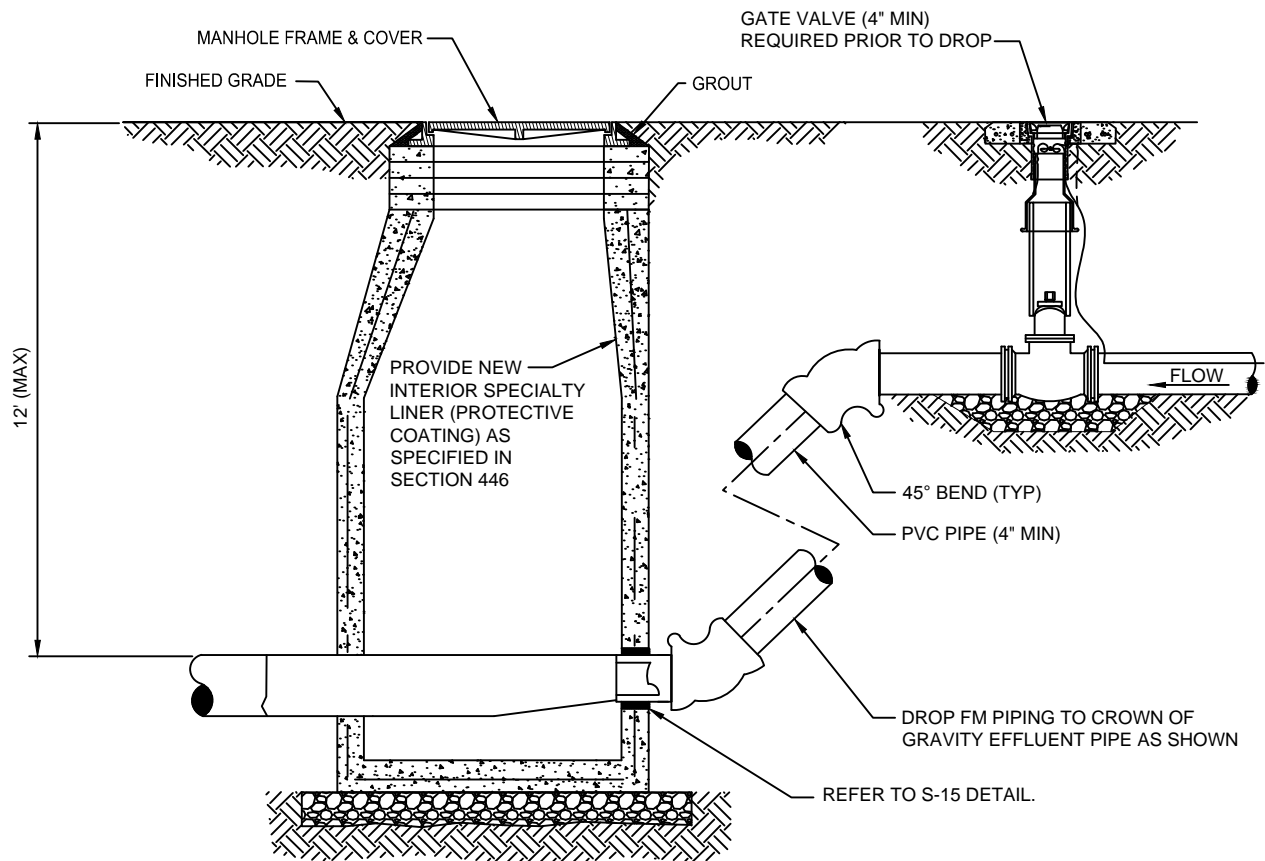
COMPLETED JOINT DETAIL

PRECAST SEWER MANHOLE JOINT DETAIL

NOTE:
ANGLE BETWEEN INFLUENT FORCE
MAIN AND GRAVITY EFFLUENT PIPE
SHALL BE BETWEEN 135° - 225° UNLESS
APPROVED OTHERWISE BY JEA.



PLAN

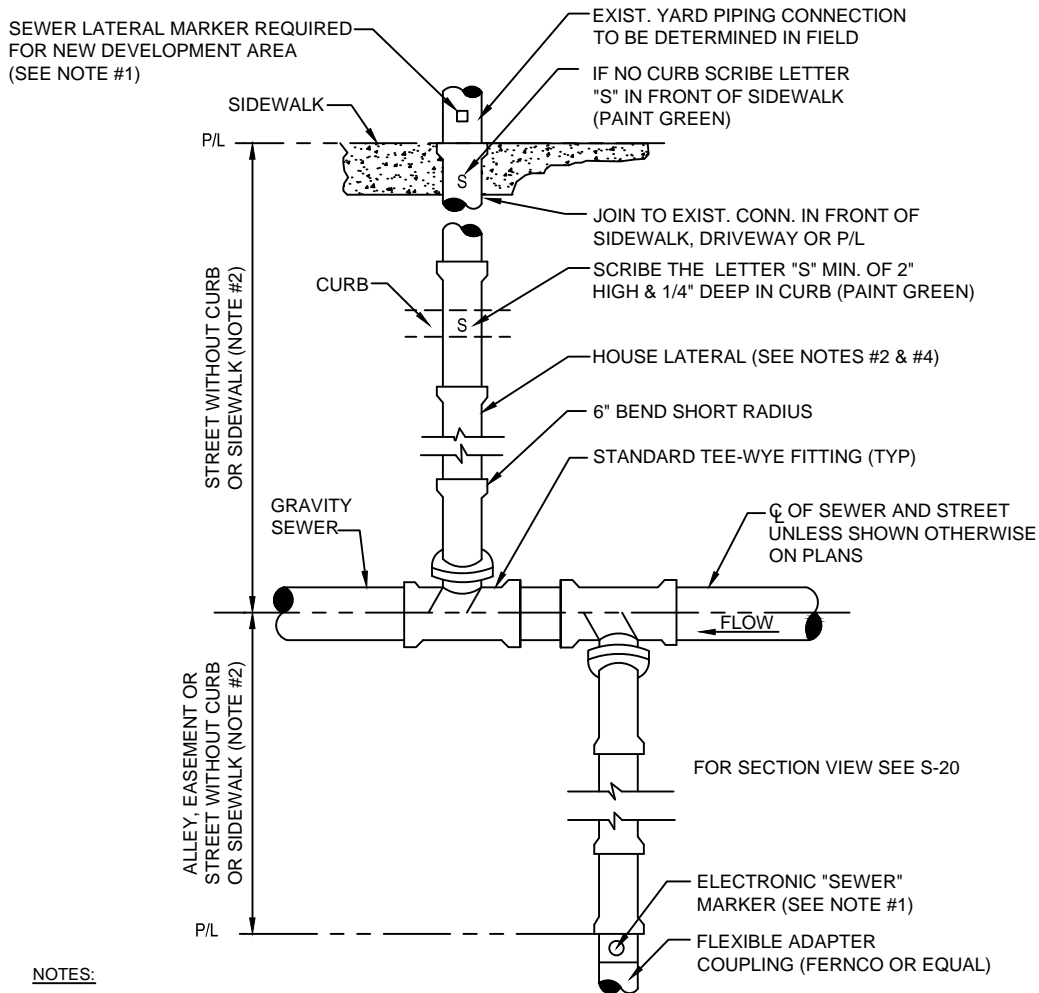


SECTION

TYPICAL FORCE MAIN CONNECTION TO MANHOLE

JANUARY 2017

PLATE S-18



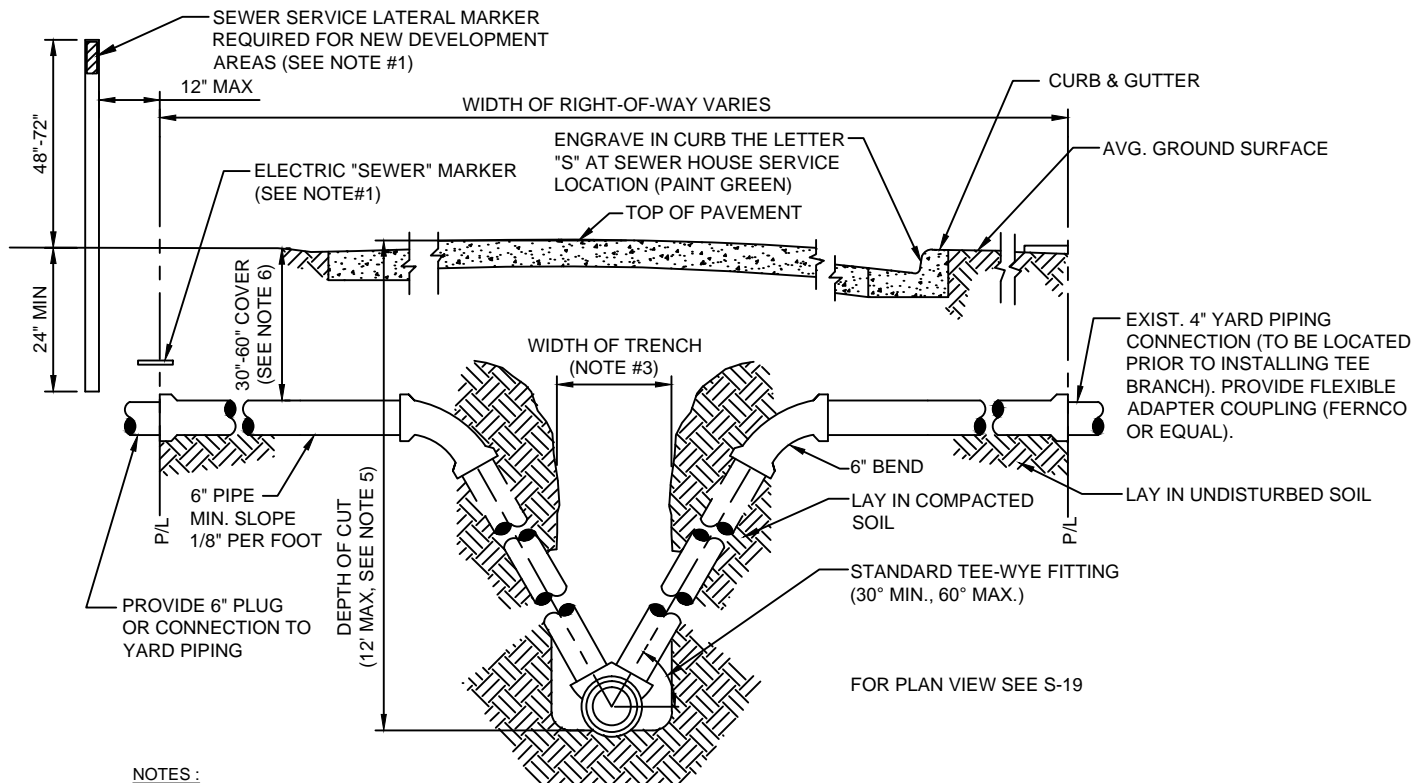
NOTES:

1. TO MARK THE LOCATION OF THE 6" PLUG FOR NEW SERVICE: FOR PROJECTS WHERE NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT" IN USE". FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED. WHERE REQUIRED BY JEA OR NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER SHALL BE INSTALLED TO MARKER SHALL ALSO BE INSTALLED..
2. THE MINIMUM SIZE OF ALL HOUSE LATERALS SHALL BE 6 INCHES. THE MAXIMUM LENGTH OF A HOUSE LATERAL SHALL BE 60 FEET (LENGTH BETWEEN SEWER MAIN OR MANHOLE TO CUSTOMERS PROPERTY LINE).
3. NO SEWER SERVICE CONNECTIONS PERMITTED ON GRAVITY SEWER PIPE WHICH ARE 16" AND LARGER.
4. ALL GRAVITY SEWER MAINS AND ASSOCIATED SEWER LATERAL PIPE AND FITTINGS (INCLUDING THE TEE-WYE FITTING) SHALL BE PVC SDR-26.

HOUSE LATERAL - PLAN VIEW

JANUARY 2017

PLATE S-19



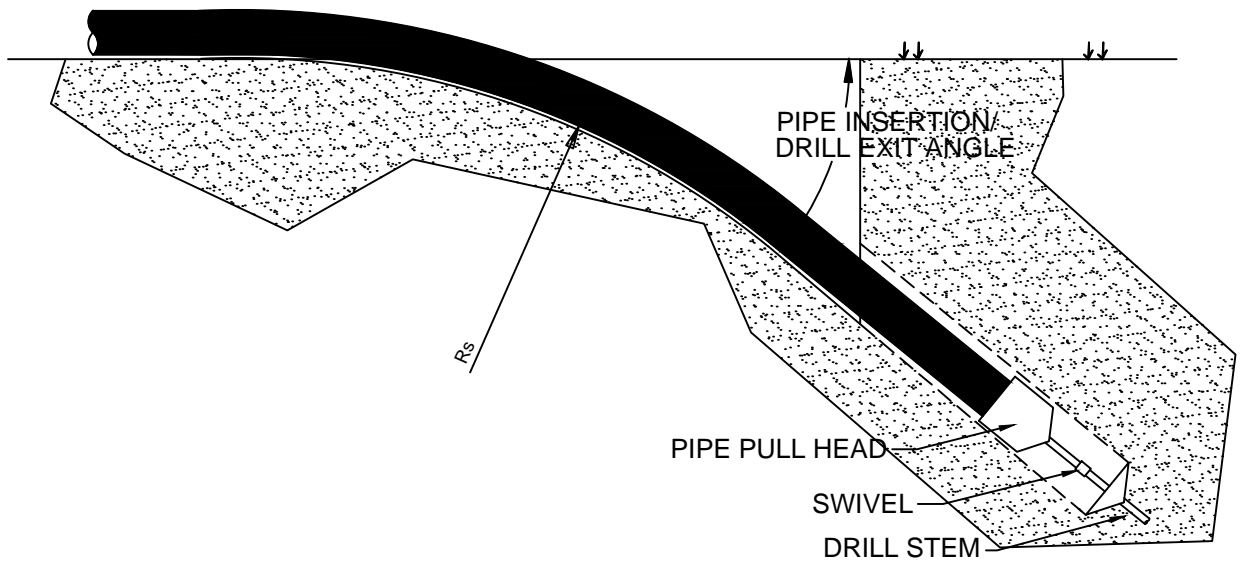
NOTES :

1. TO MARK THE LOCATION OF THE 6" PLUG FOR NEW SERVICE: FOR PROJECTS WHERE NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT" IN USE". FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED. WHERE REQUIRED BY JEA OR NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER SHALL BE INSTALLED TO MARKER SHALL ALSO BE INSTALLED.
2. THE MINIMUM SIZE OF ALL HOUSE LATERALS SHALL BE 6 INCHES. THE MAXIMUM LENGTH OF A HOUSE LATERAL SHALL BE 60 FEET (LENGTH BETWEEN SEWER MAIN OR MANHOLE TO CUSTOMERS PROPERTY LINE).
3. SEE MEASUREMENT AND PAYMENT SECTION FOR MAXIMUM PAYMENT WIDTHS.
4. ALL GRAVITY SEWER MAINS AND ASSOCIATED SEWER LATERAL PIPE AND FITTINGS (INCLUDING THE TEE-WYE FITTINGS) SHALL BE PVC SDR-26.
5. UNLESS APPROVED OTHERWISE BY A JEA O&M MANAGER, NO GRAVITY SEWER MAIN WITH SEWER SERVICE LATERALS SHALL BE CONSTRUCTED WITH A "DEPTH OF CUT" GREATER THAN 12 FEET.
6. SEWER SERVICE LATERALS ASSOCIATED WITH GRAVITY SEWER MAINS WHICH ARE DEEPER THAN 12 FEET, MUST BE ROUTED TO A GRAVITY SEWER HIGH-LINE, A MANHOLE OR OTHER JEA APPROVED METHOD.
7. THE SEWER SERVICE LATERAL SHALL BE CONSTRUCTED AT A DEPTH TO ALLOW A GRAVITY CONNECTION BY THE CUSTOMER, WHERE POSSIBLE (CONTINGENT UPON MEETING THE CUSTOMER'S ON-SITE CONDITIONS AND LOCAL CONSTRUCTION STANDARDS). A LATERAL REQUIRING MORE THAN 60" OF COVER MUST BE APPROVED, PRIOR TO CONSTRUCTION, BY JEA.

HOUSE LATERAL - SECTION VIEW

JANUARY 2017

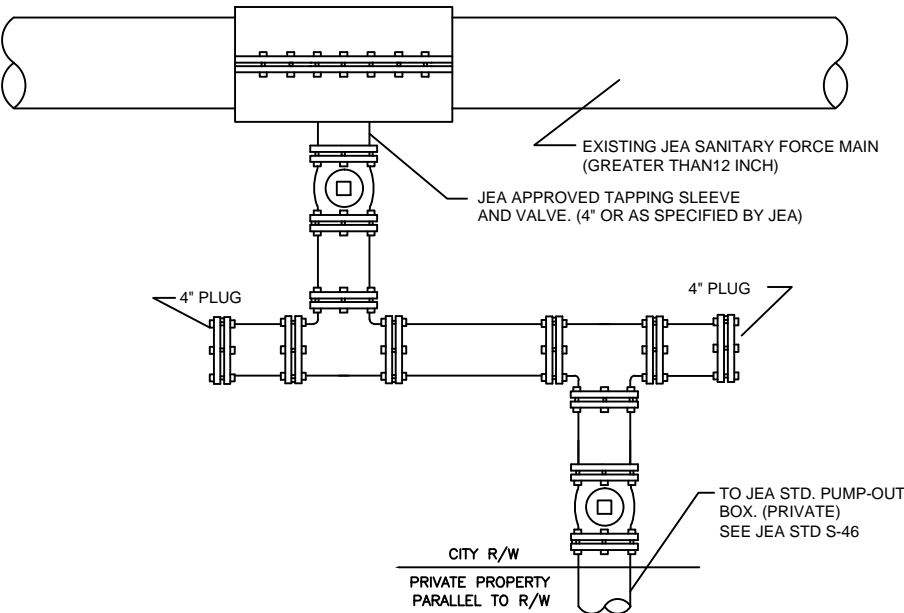
PLATE S-20



PIPE SIZE	MAXIMUM ALLOWABLE BENDING RADIUS - R_s (FT)	MAXIMUM ALLOWABLE PULLING FORCE (DR18) (K-LBS)
4"	100	10
6"	144	21
8"	189	37
10"	231	56
12"	275	80

12" AND SMALLER FUSIBLE PVC PIPE ALLOWABLE BEND RADIUS AND PULLING FORCE

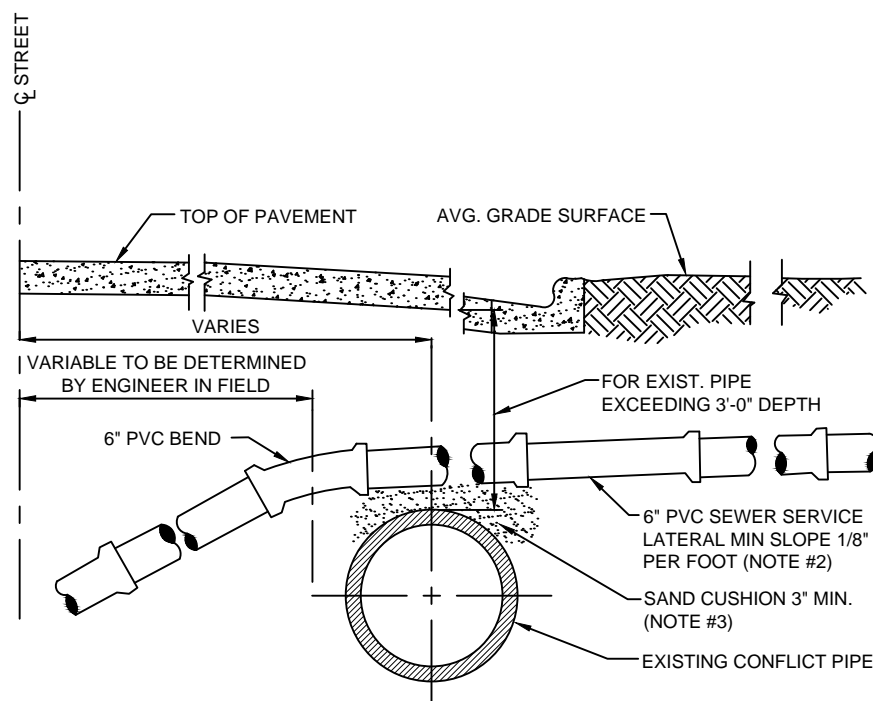
COMMON SANITARY STUB-OUT ALONG
CONTINUOUS RIGHT-OF-WAY



FORCE MAIN
SERVICE STUB FOR
16" AND LARGER PIPING

FORCE MAIN SIZE	DISTANCE BETWEEN TAPS
16"	300LF
20"	500LF
24"	1000LF
30"	1000LF

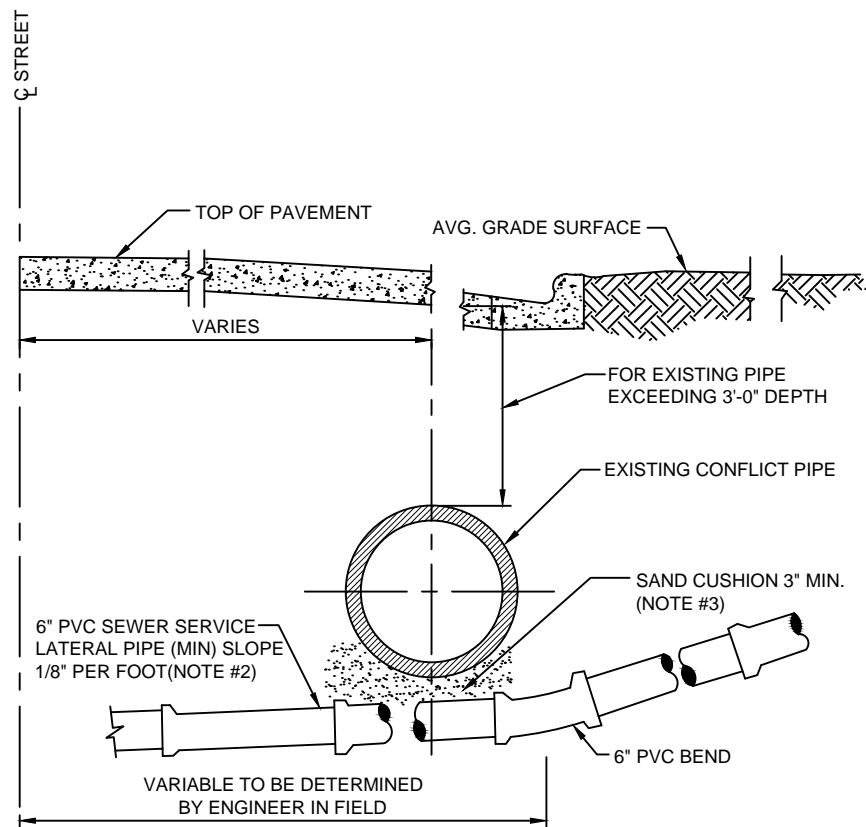
SANITARY FORCE MAIN CONNECTION
FOR 16" AND LARGER PIPING FOR
PRIVATE PUMPING STATIONS



NOTES:

1. ALTERNATE GRADIENT FOR 6 INCH LATERAL SEWERS AT CONFLICTS WITH EXISTING UTILITIES.
2. FLATTER SLOPES MUST BE PRE-APPROVED BY JEA O&M MANAGER (ONLY) PRIOR TO CONSTRUCTION.
3. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557.

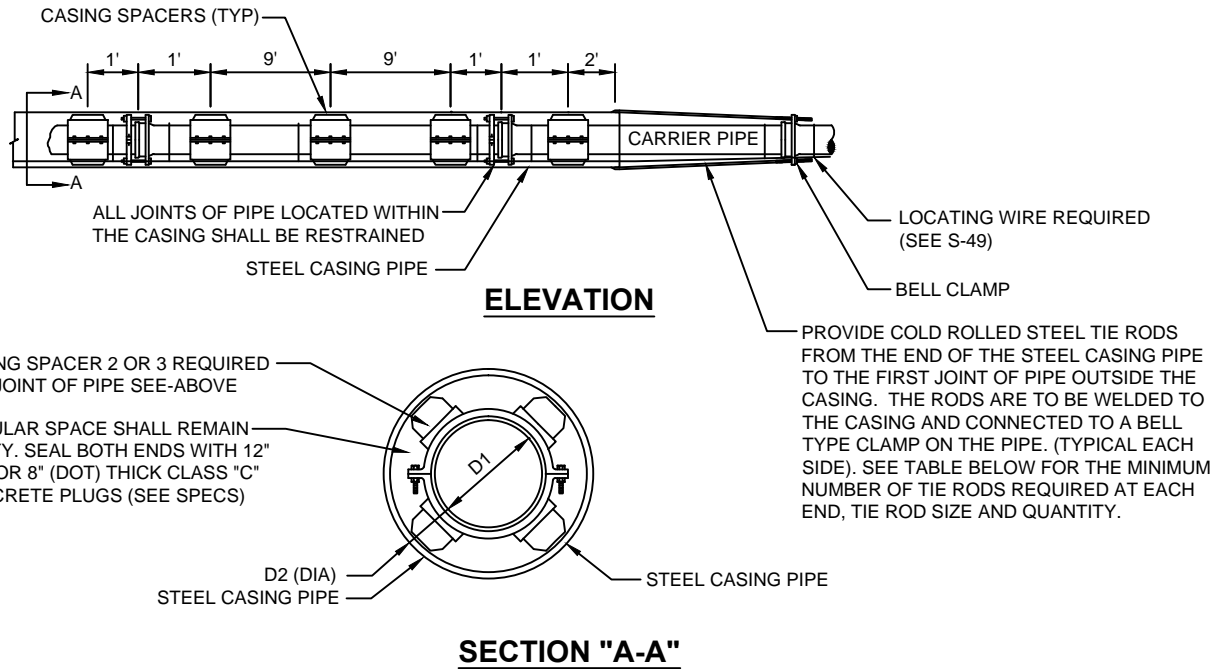
HOUSE LATERAL OVER CONFLICT PIPE



NOTES :

1. ALTERNATE GRADIENT FOR 6 INCH LATERAL SEWERS AT CONFLICTS WITH EXISTING UTILITIES.
2. FLATTER SLOPE MUST BE PRE-APPROVED BY JEA O&M MANAGER (ONLY) PRIOR TO CONSTRUCTION
3. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557.

HOUSE LATERAL UNDER CONFLICT PIPE



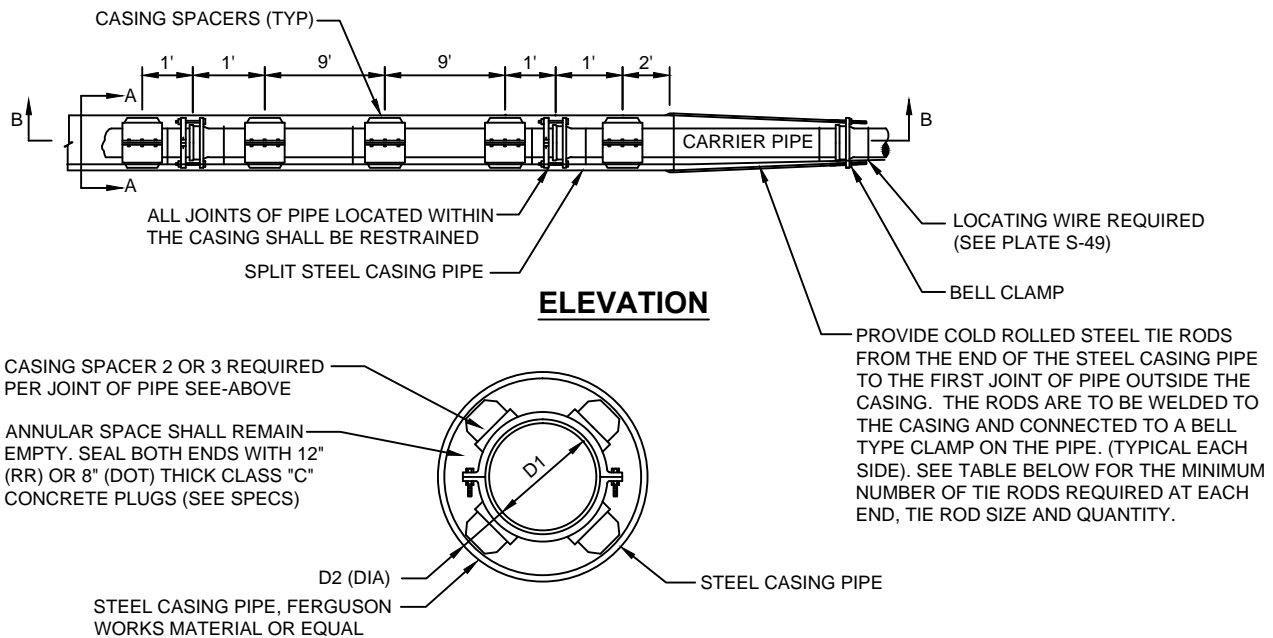
CARRIER TYPE AND CASING PIPE SIZES (MIN) IN INCHES														
CARRIER PIPE NO. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA. (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	1.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50
NUMBER OF TIE RODS (EACH END)	2	2	2	4	4	6	6	8	8	12	14	14	16	16
TIE ROD SIZE (DIA.)	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/4"	1 1/4"

PIPE MAIN CROSSINGS FOR RAILROADS OR HIGHWAYS

NOTES:

- MIN. COVER TO TOP OF CASING; a) FDOT-3.0' b) RAILROAD-5.5' TO BASE OF RAIL, 4.5' FOR SECONDARY OR INDUSTRIAL TRACKS. EXCEPT FOR F..E.C. (SEE NOTE 3)
- THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING. HOWEVER, A MINIMUM OF 6 INCHES IS REQUIRED FOR FLORIDA EAST COAST R.R. CROSSINGS.
- THE MINIMUM COVER FOR CASING UNDER FLORIDA EAST COAST RAILROAD SHALL BE 5.0 FEET BELOW THE BOTTOM OF TIES FOR ALL TRACKS.
- ALL JOINTS WITHIN CARRIES PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
- FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE DOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
- CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY JEA.
- PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE". WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".

TYPICAL CASING DETAIL - SEWER

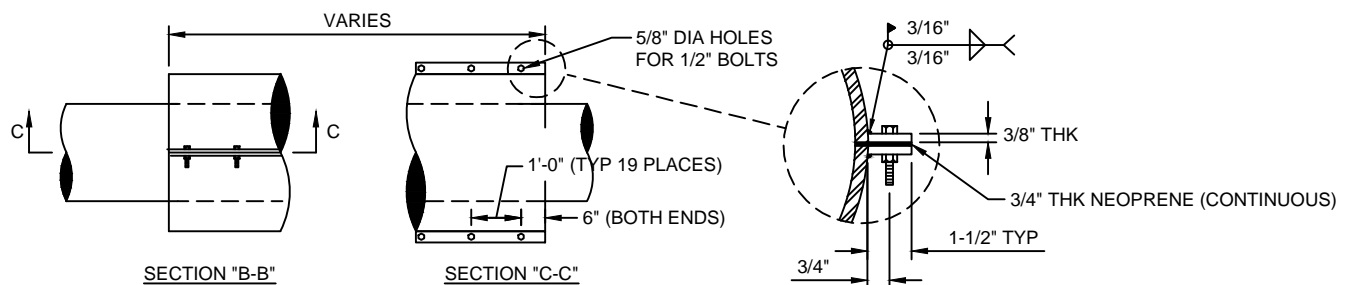


SECTION "A-A"

CARRIER TYPE AND CASING PIPE SIZES (MIN) IN INCHES														
CARRIER PIPE NO. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA. (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	1.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50
NUMBER OF TIE RODS (EACH END)	2	2	2	4	4	6	6	8	8	12	14	14	16	16
TIE ROD SIZE (DIA.)	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1 1/4"	1 1/4"

NOTES

1. NOT ALLOWED UNDER RAILROADS.
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING.
3. ALL JOINTS WITHIN CARRIES PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
4. FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE DOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
5. CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY JEA.
6. PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE". WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".



MATERIAL:

PIPE - ATSM A53, GRADE B, ERW, STD WALL, CARBON STEEL

PLATE - STM A36, GRADE B, CARBON STEEL (THICKNESS AS NOTED)

WELDS - ALL WELDS SHALL BE PERFORMED BY A CERTIFIED WELDER

LININGS/COATINGS:

INTERIOR - BARE

EXTERIOR - BARE

PIPE MAIN FOR CROSSINGS USING SPLIT CASING PIPE

NOT ALLOWED UNDER RAILROADS

TYPICAL SPLIT CASING DETAIL - SEWER

HORIZONTAL & VERTICAL SEPARATION REQUIREMENTS

PROPOSED UTILITY

CONFLICTING UTILITY	POTABLE WATER			WASTEWATER GRAVITY AND FORCE MAIN			RECLAIMED WATER			VACUUM SEWERS		
	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*	HORIZ.	VERT.	JOINT SPACING*
POTABLE WATER	3' NOTE 1	12"	3' NOTE 2	6' to 10'	12" NOTE 5	6' NOTE 2	3'	12"	6' NOTE 2	3' to 10'	12"	3' NOTE 2
RECLAIMED WATER	3'	12"	6' NOTE 2	3' NOTE 1	3' NOTE 1	3' NOTE 2	3'	12"	6' NOTE 2	3' NOTE 1	12"	3' NOTE 2
WASTEWATER (GRAVITY AND FORCE MAIN)	6' to 10'	12"	6' NOTE 2	3' NOTE 1	3' NOTE 1	6"	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
VACUUM SEWERS	3' to 10'	12"	3' NOTE 2	3' NOTE 1	3' NOTE 1	6"	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
RIGHT OF WAYS	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A
PERMANENT STRUCTURES (SIGNS, TREES, POLES, ETC.)	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A	3' NOTE 1	N/A	N/A
STORM SEWERS	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2
ALL OTHER UTILITIES	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2	3' NOTE 1	12"	3' NOTE 2

NOTES:

1. THIS SEPARATION REQUIREMENT IS TO PROVIDE ACCESSIBILITY FOR CONSTRUCTION AND MAINTENANCE. THREE FEET OF HORIZONTAL SEPARATION IS THE MINIMUM FOR PIPES WITH THREE FEET OF COVER. FOR PIPES INSTALLED AT GREATER DEPTH, PROVIDE AN ADDITIONAL FOOT OF SEPARATION FOR EACH ADDITIONAL FOOT OF DEPTH.
2. THE MINIMUM JOINT SPACING REQUIRED FROM CROSSING FROM OTHER UTILITIES WHILE STILL MAINTAINING MINIMUM VERTICAL SEPARATION.
3. DISTANCES GIVEN ARE FROM OUTSIDE OF PIPE TO OUTSIDE OF PIPE.
4. NO WATER PIPE SHALL PASS THROUGH OR COME INTO CONTACT WITH ANY PART OF SANITARY OR STORM WATER MANHOLE OR STRUCTURES.
5. WATER MAIN SHOULD CROSS ABOVE OTHER PIPES WHENEVER POSSIBLE. WHEN WATER MAIN MUST BE BELOW OTHER UTILITY PIPING, THE MINIMUM SEPARATION SHALL BE 12 INCHES.

SEPARATION REQUIREMENTS FOR WATER, WASTEWATER AND RECLAIMED WATER MAINS

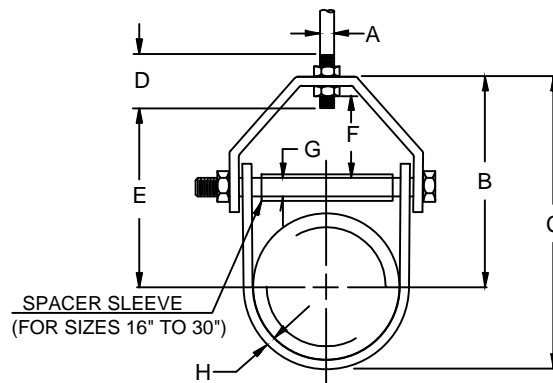
JANUARY 2017

PLATE S-26

WATER MAIN AND NON-WATER MAIN SEPARATION REQUIREMENTS - NOTES

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 SEWER 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.
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 SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER.
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 SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER. THE MINIMUM HORIZONTAL SEPARATION DISTANCE BETWEEN WATER MAINS AND GRAVITY-TYPE SANITARY SEWERS 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 SEWER (SPECIAL CASE).
4. NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED GRAVITY OR VACUUM-TYPE SANITARY SEWER OR STORM SEWER 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.
5. NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED PRESSURE-TYPE SANITARY SEWER, 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.
6. AT THE UTILITY CROSSINGS DESCRIBED IN NOTES 4 AND 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 SEWERS, STORM SEWERS, STORMWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER, AND AT LEAST SIX (6) FEET FROM ALL JOINTS IN GRAVITY OR PRESSURE-TYPE SANITARY SEWERS, WASTEWATER FORCE MAINS, OR PIPELINE CONVEYING RECLAIMED WATER.
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 SEWER, 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 SEWER; AT LEAST SIX (6) FEET, AND PREFERABLY TEN (10) FEET, FROM ANY EXISTING OR PROPOSED GRAVITY OR PRESSURE-TYPE SANITARY SEWER OR WASTEWATER FORCE MAIN.
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.

NOTES ON UTILITY SEPARATION REQUIREMENTS - SEWER

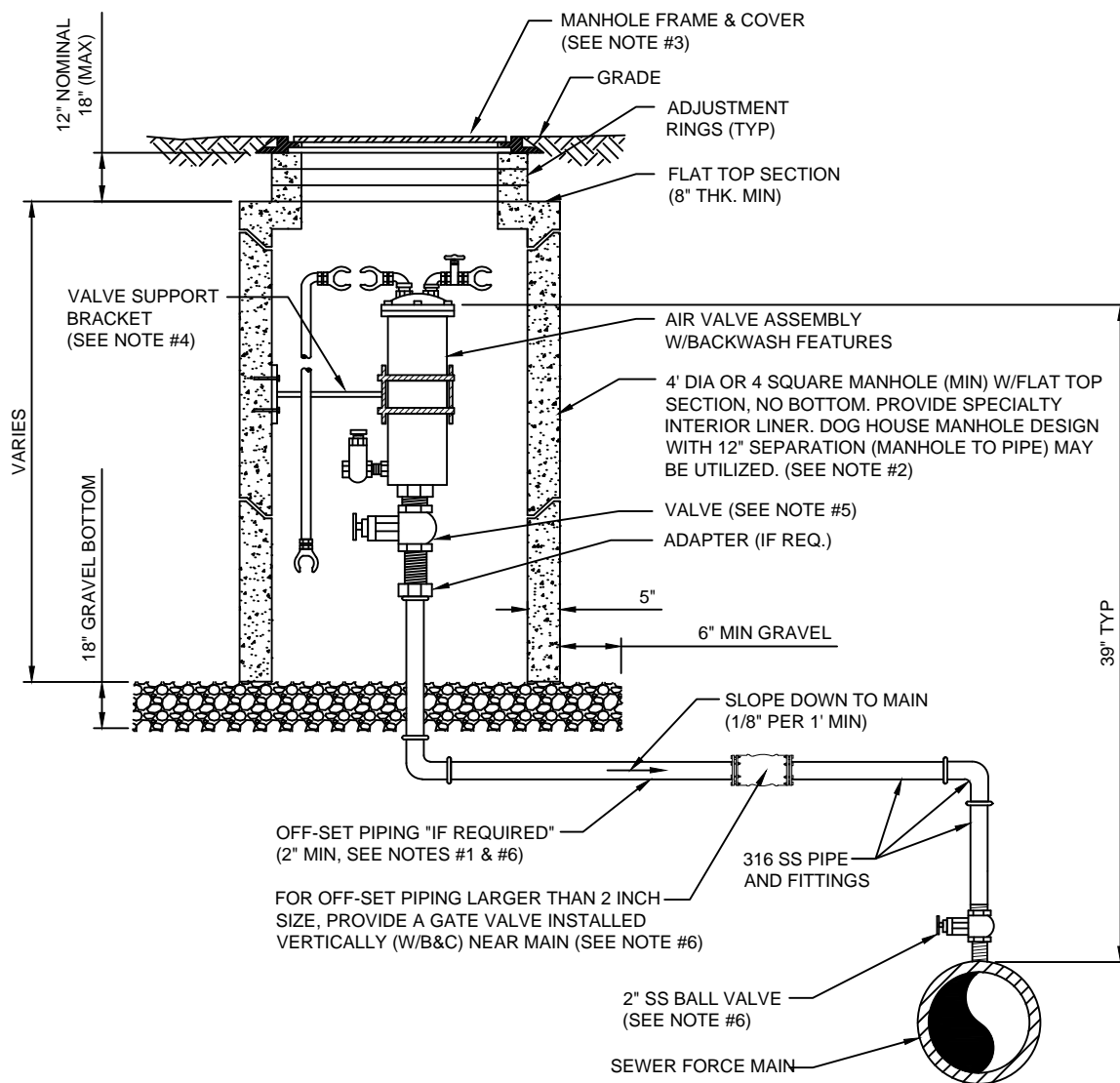


PIPE SIZE	MAX LOAD	SPAN (FT)	WEIGHT	ROD SIZE A	B	C	ROD TAKE OUT E	ADJUST. F	G	H WIDTH LOWER
4	1430	14	1.51	5/8	5-9/16	7-13/16	4-1/2	1-11/16	3/8	1-1/4
6	1940	17	3.10	3/4	6-15/16	10-1/4	5-3/4	1-11/16	1/2	1-7/16
8	2000	19	4.75	3/4	8-3/8	12-11/16	7-3/16	2	1/2	1-7/16
10	3600	22	8.60	7/8	9-7/8	15-1/4	8-7/16	2-1/8	5/8	1-3/4
12	3800	23	11.20	7/8	11-9/16	17-15/16	10-1/8	2-13/16	5/8	2
16	4600	27	19.85	1	14	22	12	2-3/4	1	2-1/2
20	4800	30	40.33	1-1/4	17-9/16	27-9/16	15-3/16	3-7/8	1-1/4	3
24	4800	32	49.83	1-1/4	19-13/16	31-13/16	17-5/16	3-7/8	1-1/4	3
30	6000	33	70.18	1-1/4	24-3/16	39-3/16	21-9/16	5-1/8	1-1/4	3

NOTES :

1. ALL HANGER COMPONENTS SHALL BE 316 STAINLESS STEEL UNLESS OTHERWISE NOTED. ALL CUT ENDS SHALL HAVE ROUNDED CORNERS.
2. PROVIDE A HANGER AT EACH PIPE BELL. ADDITIONAL HANGERS SHALL BE SPACED AT TEN (10) FOOT CENTERS (MAX).
3. PIPE HANGERS LARGER THAN 12" SIZE SHALL BE SPECIFICALLY DESIGNED FOR HORIZONTAL AND VERTICAL STRUCTURAL SUPPORT. FOR LARGER MAINS, HORIZONTAL SUPPORT MAY BE ACHIEVED BY EXTENDING THE BOTTOM ANGLE TO SPAN BETWEEN TWO EXISTING CONCRETE BEAMS (NOT DIRECTLY CONNECTED TO CONCRETE BEAMS).
4. THE DIMENSION PROVIDED ABOVE MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS.
5. FOR CROSSINGS OVER 250 LINEAR FEET, THE USE OF FLEXIBLE EXPANSION JOINTS SHALL BE UTILIZED.
6. TO MINIMIZE THE SNAKING ALIGNMENT OF D.I.P. MAIN, ALL RESTRAINED JOINTS SHALL BE CONDITIONS. BE UTILIZED. DEVICE (PLEASE CONSULT RESTRAINT MANUFACTURER - VERY IMPORTANT). HOMED TOGETHER AND THEN PULLED-BACK SLIGHTLY TO CORRECTLY SET THE RESTRAINT RESTRAINT DEVICE (PLEASE CONSULT RESTRAINT MANUFACTURER - VERY IMPORTANT).

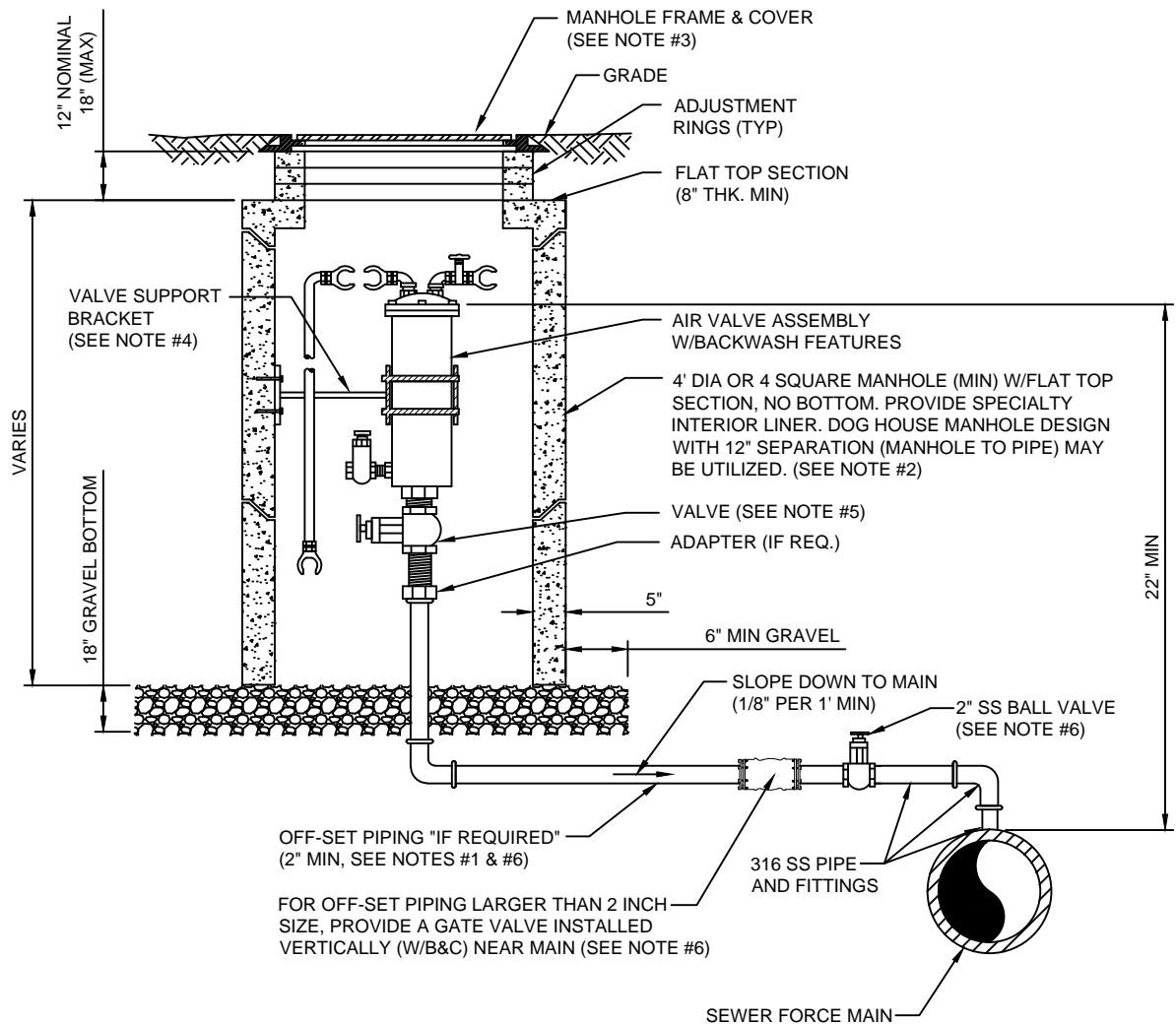
BRIDGE DECK PIPE HANGER DETAIL



NOTES:

1. THE AIR ASSEMBLY MANHOLE SHALL BE LOCATED OUTSIDE OF THE ROADWAY PAVEMENT AREA (I.E. LOCATED IN NON-TRAFFIC AREAS). IF OFF-SET PIPING IS REQUIRED, THE PIPING SHALL BE 2 INCH MINIMUM, (SAME SIZE AS AIR VALVE INLET). FOR PIPE SIZES 3 INCH AND SMALLER: PIPING SHALL BE 316 STAINLESS STEEL SCH.40, STD GRADE, THREADED. FOR PIPE SIZES 4 INCH AND LARGER: PIPING SHALL BE 316 STAINLESS STEEL SCH. 10 (MIN), WELDED OR PVC DR-18 PIPE AND FITTINGS-RESTRAINED.
2. THE CONCRETE MANHOLE SHALL INCLUDE A POLYURETHANE SPECIALTY LINER (PER SPEC SECTION 446) TO BE INSTALLED ON THE INTERIOR SURFACES INCLUDING THE RISER SECTION TOP AND THE ADJUSTMENT RINGS. A BITUMINOUS WATERPROOFING MATERIAL SHALL BE PROVIDED ON THE OUTSIDE SURFACES OF THE MANHOLE.
3. FRAME AND COVER SHALL BE JEA STANDARD. THE COVER SHALL HAVE NO GASKET TO ALLOW AIR TO EXIT VAULT (REMOVE GASKET IF NECESSARY FROM THE UNDER SIDE OF STANDARD JEA COVER). THE COVER (WHEN FLIPPED OPEN) MUST CLEAR THE AIR VALVE ASSEMBLY AT ALL TIMES OR A SQUARE TOP WITH ALUMINUM DOOR SHALL BE PROVIDED (NON-TRAFFIC LOCATIONS ONLY).
4. A VALVE SUPPORT BRACKET IS ONLY REQUIRED FOR ASSEMBLIES WHICH INCLUDE OFF-SET PIPING. THE BRACKET SHALL BE WELDED AND FABRICATED FROM ALL 316 STAINLESS STEEL MATERIALS AND INCLUDE 6" x 6" x $\frac{3}{8}$ " THICK END PLATES (CONTOURED TO MATCH ATTACHING SURFACES), 3" ANGLE IRON FOR SUPPORT ARM AND TWO U-BOLTS $\frac{3}{8}$ " DIA TO ATTACH AROUND AIR VALVE. SECURE TO CONCRETE MANHOLE WITH FOUR $\frac{1}{2}$ " DIA X 2" LONG S/S ANCHOR (MIN). MODIFY THE ABOVE AS REQUIRED TO FIT SPECIFIC AIR VALVE AND TO ASSURE A SOLID SUPPORT BRACKET.
5. FOR PIPE SIZES 3 INCH AND SMALLER, PROVIDE A STAINLESS STEEL BALL VALVE (2" MIN). FOR PIPE SIZES 4 INCH AND LARGER, PROVIDE A FLANGE GATE VALVE (WHEEL OPERATOR) OR PLUG VALVE. (LEVER ARM OPERATOR) SEE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.
6. FOR A 2" AIR VALVE, PROVIDE 2" STAINLESS STEEL BALL VALVE AT THE MAIN. FOR AIR VALVES LARGER THAN 2" SIZE, PROVIDE A TAPPING SLEEVE OR DUCTILE IRON TEE FITTING. ALSO, FOR OFF-SET PIPING LARGER THAN 2 INCH SIZE, PROVIDE A GATE VALVE (INSTALLED VERTICALLY NEAR MAIN). SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

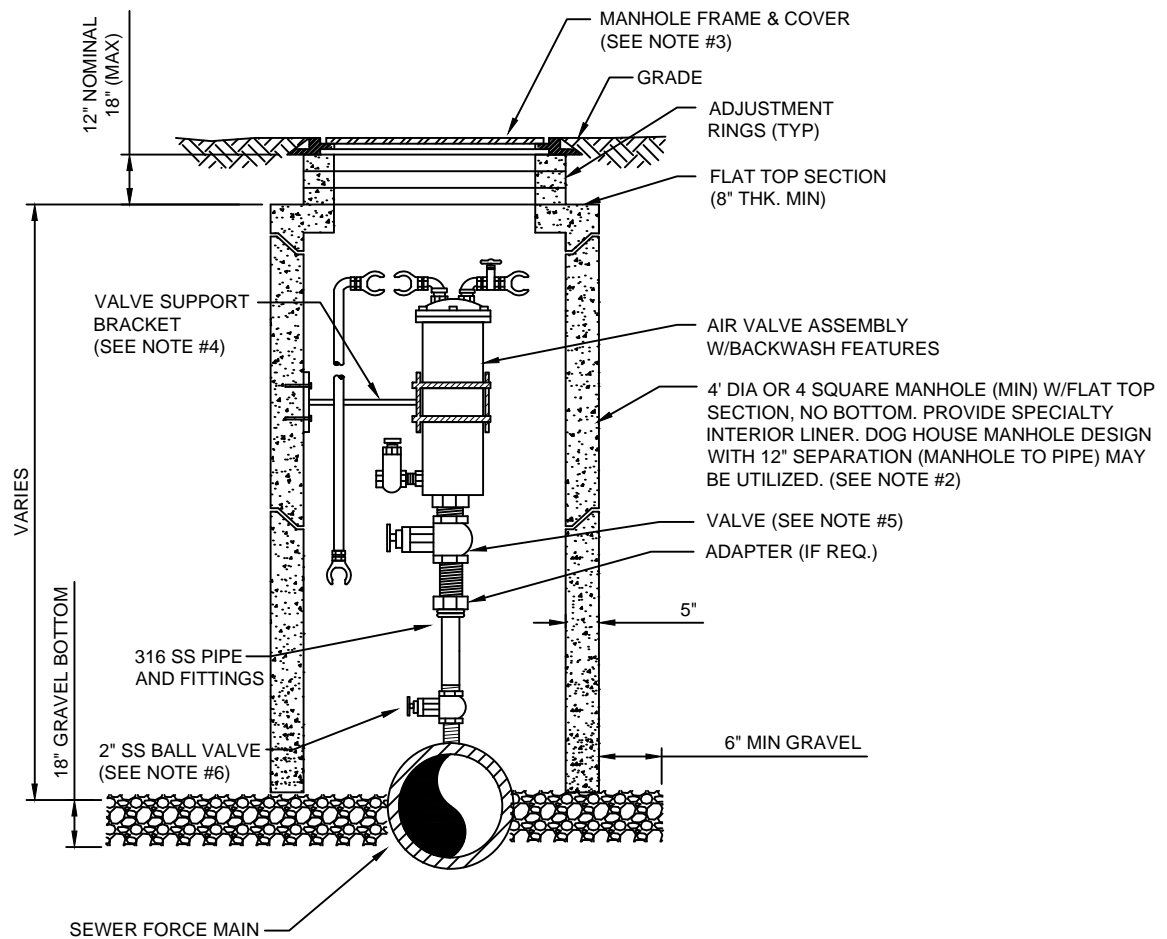
AIR VALVE ASSEMBLY INSIDE MANHOLE



NOTES:

1. THE AIR ASSEMBLY MANHOLE SHALL BE LOCATED OUTSIDE OF THE ROADWAY PAVEMENT AREA (I.E. LOCATED IN NON-TRAFFIC AREAS). IF OFF-SET PIPING IS REQUIRED, THE PIPING SHALL BE 2 INCH MINIMUM, (SAME SIZE AS AIR VALVE INLET). FOR PIPE SIZES 3 INCH AND SMALLER: PIPING SHALL BE 316 STAINLESS STEEL SCH.40, STD GRADE, THREADED. FOR PIPE SIZES 4 INCH AND LARGER: PIPING SHALL BE 316 STAINLESS STEEL SCH. 10 (MIN), WELDED OR PVC DR-18 PIPE AND FITTINGS-RESTRAINED.
2. THE CONCRETE MANHOLE SHALL INCLUDE A POLYURETHANE SPECIALTY LINER (PER SPEC SECTION 446) TO BE INSTALLED ON THE INTERIOR SURFACES INCLUDING THE RISER SECTION TOP AND THE ADJUSTMENT RINGS. A BITUMINOUS WATERPROOFING MATERIAL SHALL BE PROVIDED ON THE OUTSIDE SURFACES OF THE MANHOLE.
3. FRAME AND COVER SHALL BE JEA STANDARD. THE COVER SHALL HAVE NO GASKET TO ALLOW AIR TO EXIT VAULT (REMOVE GASKET IF NECESSARY FROM THE UNDER SIDE OF STANDARD JEA COVER). THE COVER (WHEN FLIPPED OPEN) MUST CLEAR THE AIR VALVE ASSEMBLY AT ALL TIMES OR A SQUARE TOP WITH ALUMINUM DOOR SHALL BE PROVIDED (NON-TRAFFIC LOCATIONS ONLY).
4. A VALVE SUPPORT BRACKET IS ONLY REQUIRED FOR ASSEMBLIES WHICH INCLUDE OFF-SET PIPING. THE BRACKET SHALL BE WELDED AND FABRICATED FROM ALL 316 STAINLESS STEEL MATERIALS AND INCLUDE 6" x 6" x $\frac{3}{8}$ " THICK END PLATES (CONTOURED TO MATCH ATTACHING SURFACES), 3" ANGLE IRON FOR SUPPORT ARM AND TWO U-BOLTS $\frac{3}{8}$ " DIA TO ATTACH AROUND AIR VALVE. SECURE TO CONCRETE MANHOLE WITH FOUR $\frac{1}{2}$ " DIA X 2" LONG S/S ANCHOR (MIN). MODIFY THE ABOVE AS REQUIRED TO FIT SPECIFIC AIR VALVE AND TO ASSURE A SOLID SUPPORT BRACKET.
5. FOR PIPE SIZES 3 INCH AND SMALLER, PROVIDE A STAINLESS STEEL BALL VALVE (2" MIN). FOR PIPE SIZES 4 INCH AND LARGER, PROVIDE A FLANGE GATE VALVE (WHEEL OPERATOR) OR PLUG VALVE. (LEVER ARM OPERATOR) SEE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.
6. FOR A 2" AIR VALVE, PROVIDE 2" STAINLESS STEEL BALL VALVE AT THE MAIN. FOR AIR VALVES LARGER THAN 2" SIZE, PROVIDE A TAPPING SLEEVE OR DUCTILE IRON TEE FITTING. ALSO, FOR OFF-SET PIPING LARGER THAN 2 INCH SIZE, PROVIDE A GATE VALVE (INSTALLED VERTICALLY NEAR MAIN). SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

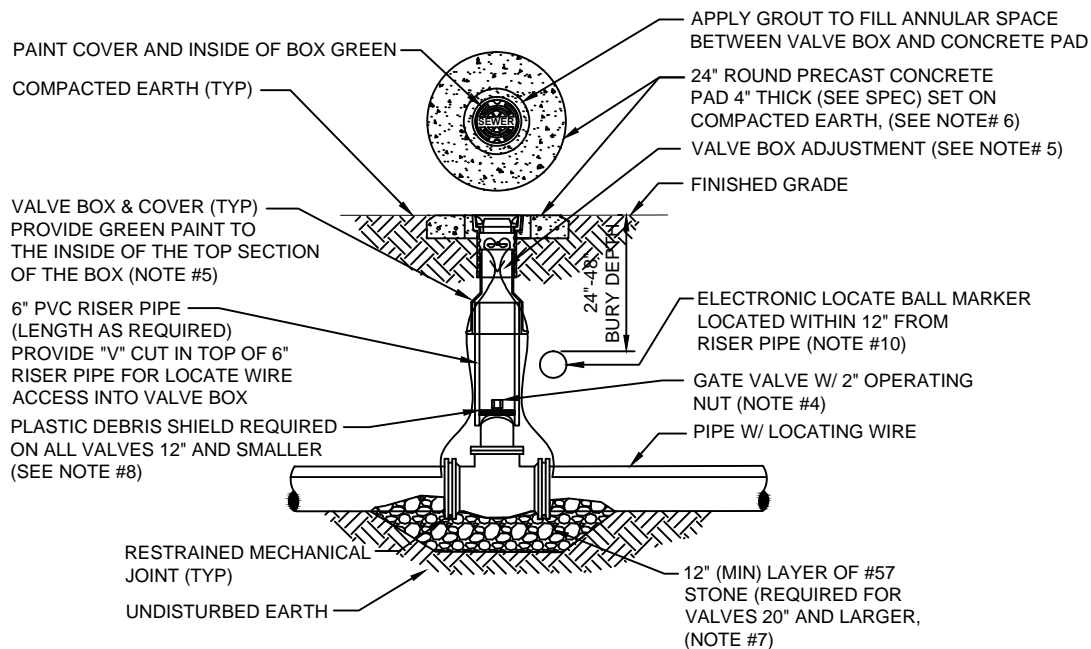
OPTIONAL LOW PROFILE AIR VALVE ASSEMBLY INSIDE MANHOLE



NOTES:

1. THE AIR ASSEMBLY MANHOLE SHALL BE LOCATED OUTSIDE OF THE ROADWAY PAVEMENT AREA (I.E. LOCATED IN NON-TRAFFIC AREAS).
2. THE CONCRETE MANHOLE SHALL INCLUDE A POLYURETHANE SPECIALTY LINER (PER SPEC SECTION 446) TO BE INSTALLED ON THE INTERIOR SURFACES INCLUDING THE RISER SECTION TOP AND THE ADJUSTMENT RINGS. A BITUMINOUS WATERPROOFING MATERIAL SHALL BE PROVIDED ON THE OUTSIDE SURFACES OF THE MANHOLE.
3. FRAME AND COVER SHALL BE JEA STANDARD. THE COVER SHALL HAVE NO GASKET TO ALLOW AIR TO EXIT VAULT (REMOVE GASKET IF NECESSARY FROM THE UNDER SIDE OF STANDARD JEA COVER). THE COVER (WHEN FLIPPED OPEN) MUST CLEAR THE AIR VALVE ASSEMBLY AT ALL TIMES OR A SQUARE TOP WITH ALUMINUM DOOR SHALL BE PROVIDED (NON-TRAFFIC LOCATIONS ONLY).
4. A VALVE SUPPORT BRACKET IS ONLY REQUIRED FOR ASSEMBLIES WHICH INCLUDE OFF-SET PIPING. THE BRACKET SHALL BE WELDED AND FABRICATED FROM ALL 316 STAINLESS STEEL MATERIALS AND INCLUDE 6" x 6" x $\frac{3}{8}$ " THICK END PLATES (CONTOURED TO MATCH ATTACHING SURFACES), 3" ANGLE IRON FOR SUPPORT ARM AND TWO U-BOLTS $\frac{5}{8}$ " DIA TO ATTACH AROUND AIR VALVE. SECURE THE AIR VALVE MANHOLE WITH FOUR $\frac{1}{2}$ " DIA X 2" LONG S/S ANCHOR (MIN). MODIFY THE ABOVE AS REQUIRED TO FIT SPECIFIC AIR VALVE AND TO ASSURE A SOLID SUPPORT BRACKET.
5. FOR PIPE SIZES 3 INCH AND SMALLER, PROVIDE A STAINLESS STEEL BALL VALVE (2" MIN). FOR PIPE SIZES 4 INCH AND LARGER, PROVIDE A FLANGE GATE VALVE (WHEEL OPERATOR) OR PLUG VALVE. (LEVER ARM OPERATOR) SEE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.
6. FOR A 2" AIR VALVE, PROVIDE 2" STAINLESS STEEL BALL VALVE AT THE MAIN. FOR AIR VALVES LARGER THAN 2" SIZE, PROVIDE A TAPPING SLEEVE OR DUCTILE IRON TEE FITTING. ALSO, FOR OFF-SET PIPING LARGER THAN 2 INCH SIZE, PROVIDE A GATE VALVE (INSTALLED VERTICALLY NEAR MAIN). SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

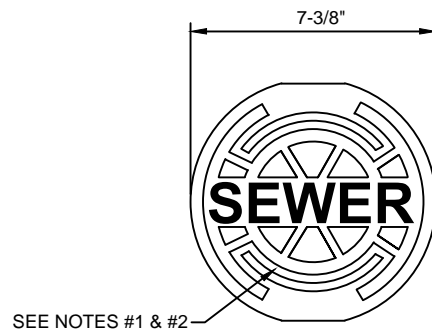
AIR VALVE ASSEMBLY INSIDE MANHOLE IN ROW



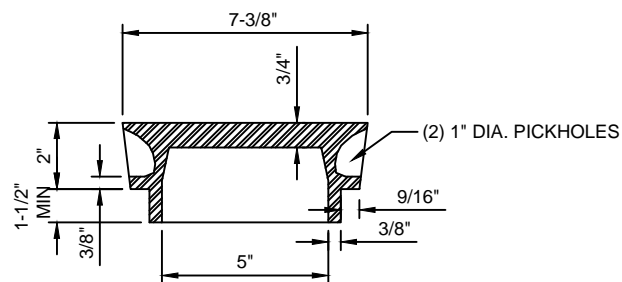
NOTES:

1. FOR UNPAVED LOCATIONS, A PRECAST CONCRETE VALVE PAD SHALL BE PROVIDED AND INSTALLED FLUSH WITH GRADE. CONCRETE PAD IS NOT REQUIRED FOR VALVE LOCATED IN THE ROADWAY, UNLESS SHOWN OR NOTED OTHERWISE.
2. LOCATING WIRE IS REQUIRED ON ALL PRESSURE PIPING (SEE DETAIL S-49).
3. A "V" CUT SHALL BE CARVED IN THE CURB CLOSEST/(ASPHALT IF NO CURB) ADJACENT TO ALL BELOW GRADE VALVES. THE "V" CUT IS TO BE PAINTED GREEN.
4. IN PAVED AREAS, INSTALL VALVE AT A DEPTH TO ALLOW A 12" MIN. DISTANCE BETWEEN THE VALVE COVER PLATE AND THE TOP OF THE VALVE OPERATING NUT. OUTSIDE OF PAVED AREAS (GRASS), INSTALL VALVE AT A DEPTH TO ALLOW A 6" MINIMUM DISTANCE BETWEEN THE VALVE COVER AND THE TOP OF THE VALVE OPERATING NUT. OPERATING NUT/STEM EXTENSION SHALL BE PROVIDED (WHERE APPLICABLE) SO THAT THE OPERATING NUT WILL BE NO MORE THAN 30 INCHES BELOW FINISHED GRADE.
5. FOR NEW CONSTRUCTION, THE VALVE BOX SHALL BE ADJUSTED TO MIDRANGE TO ALLOW FOR FUTURE BOX ADJUSTMENTS. ROUTE LOCATE WIRES THRU A "V" CUT IN THE TOP OF THE 6" PVC RISER PIPE FOR LOCATE WIRE ACCESS INTO VALVE BOX. THE LOCATE WIRES WITH A 12" LONG PIG-TAIL AT THE TOP SHALL BE CONNECTED TOGETHER WITH A WIRE NUT.
6. BRASS IDENTIFICATION TAG INDICATING "SEWER", VALVE SIZE, DIRECTION AND TURNS TO OPEN & VALVE TYPE. PROVIDE A $\frac{1}{8}$ " HOLE IN BRASS TAG AND ATTACH TAG (TWIST WIRE AROUND TAG) TO THE END OF THE LOCATE WIRE. TAGS ARE NOT REQUIRED ON VALVES INSTALLED ON FIRE HYDRANT BRANCH LINES.
7. IN LIEU OF PRECAST CONCRETE PAD, A 6" THICK X 24" (ROUND OR SQUARE) POURED CONCRETE PAD W/2 - #4 REBAR AROUND PERIMETER, MAY BE USED.
8. GRAVEL SHALL BE PROVIDED UNDER ALL VALVES 20" AND LARGER. THE MINIMUM VERTICAL LIMIT OF GRAVEL IS 12" UNDER THE VALVE UP TO $\frac{1}{2}$ THE OVERALL HEIGHT OF THE VALVE.
9. FOR VALVES 12 INCH AND SMALLER, PROVIDE A WHITE OR BLACK PLASTIC DEBRIS SHIELD WHICH INSTALLS BELOW THE OPERATING NUT. THIS SHIELD SHALL CENTER THE RISER PIPE BOX OVER THE OPERATING NUT AND MINIMIZE INFILTRATION. SHIELD SHALL BE BY AFC, BOXLOK OR APPROVED EQUAL.
10. ALL VALVES SHALL BE INSTALLED WITH AN ELECTRIC LOCATE MARKER. MARKER SHALL BE 4" DIA. COLOR CODED BALL MARKER (3M-1404XR FOR SEWER).

SEWER VALVE DETAIL



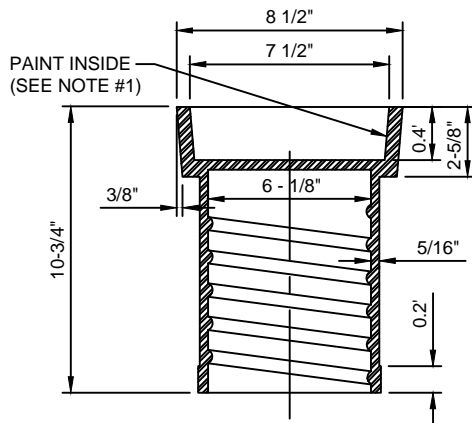
HEAVY DUTY RATING



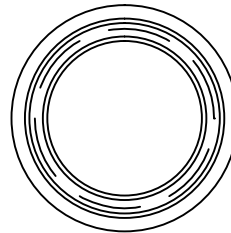
NOTES:

1. PAINT TOP OF THE COVER WITH ENAMEL PAINT (GREEN COLOR).
2. LID WEIGHT: APPROX. 12 LBS.

SEWER SYSTEM VALVE BOX COVER

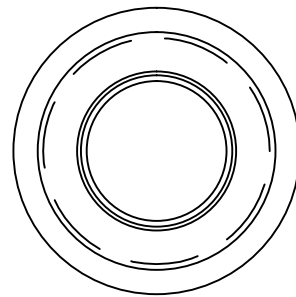
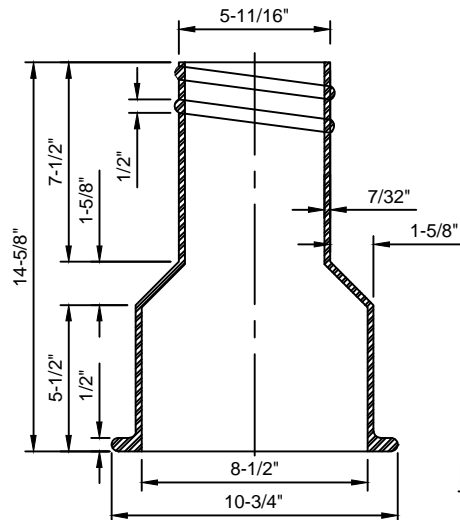


HEAVY DUTY RATING



TOP SECTION VIEW

(23 LBS. APPROX.)



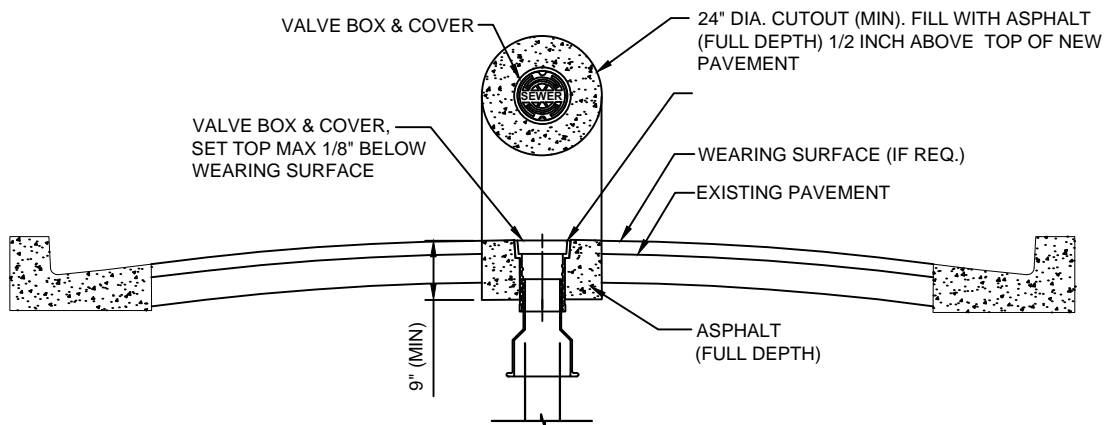
BOTTOM SECTION VIEW

(26 LBS. APPROX.)

NOTES:

1. PAINT THE INSIDE OF THE TOP SECTION OF THE BOX WITH GREEN COLOR.
2. HEAVY DUTY RATING (TOTAL WEIGHT APPROX. 50 LBS.).
3. REFERENCE SECTION 430, PARAGRAPH VI.2.

SEWER SYSTEM VALVE BOX

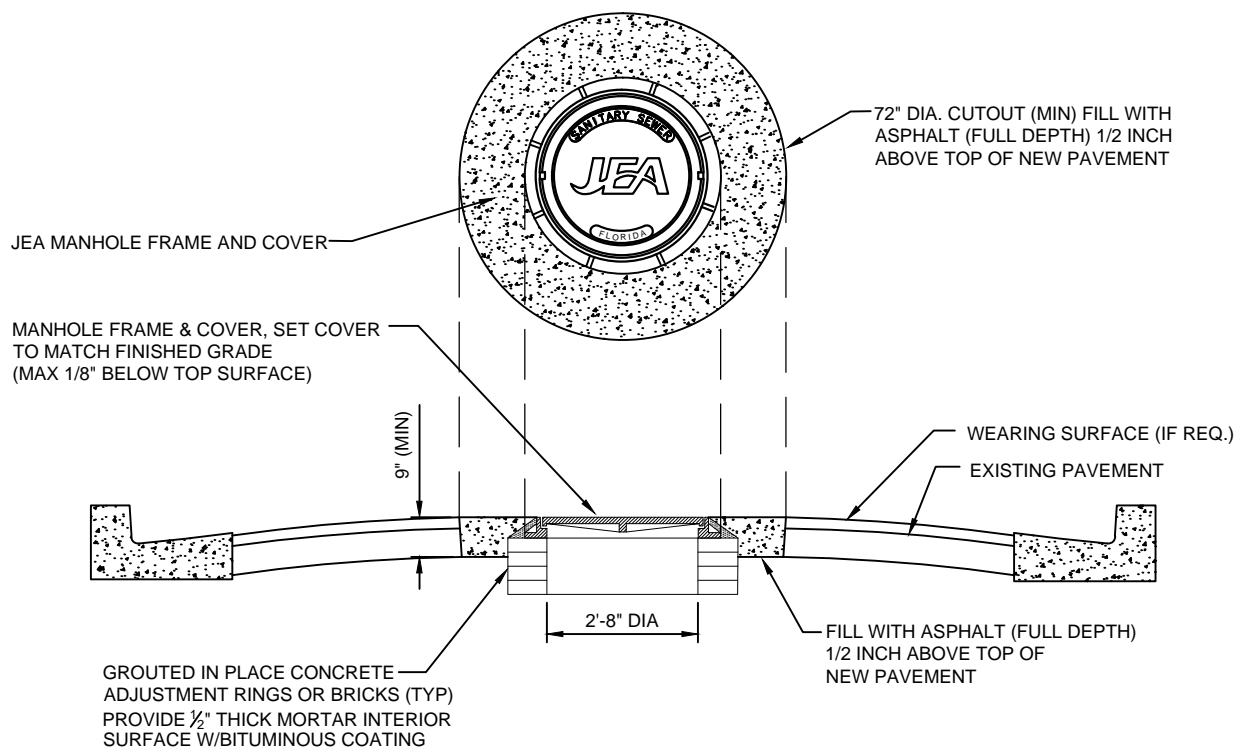


NOTES :

COVER TO BE SET 1/8" (MAX) BELOW TOP SURFACE

1. PROVIDE FULL DEPTH ASPHALT 1/2 INCH ABOVE TOP OF NEW PAVEMENT LEVEL, TO ALLOW FOR FUTURE ASPHALT MATERIAL COMPACTION. PLACE AND COMPACT ASPHALT IN 2" (MAX) LIFTS.

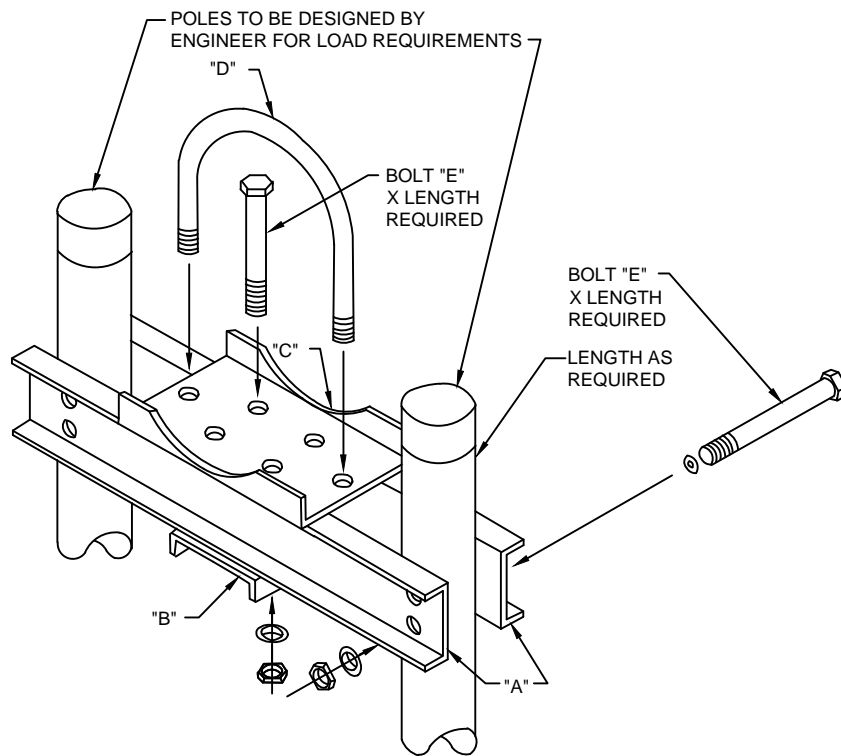
SEWER VALVE JACKET ADJUSTMENT AFTER ROADWAY RE-SURFACING



NOTES :

1. PROVIDE FULL DEPTH ASPHALT 1/2 INCH ABOVE TOP OF NEW PAVEMENT LEVEL, TO ALLOW FOR FUTURE ASPHALT MATERIAL COMPACTION. PLACE AND COMPACT ASPHALT IN 2" (MAX) LIFTS.

MANHOLE FRAME AND COVER ADJUSTMENT AFTER ROADWAY RE-SURFACING



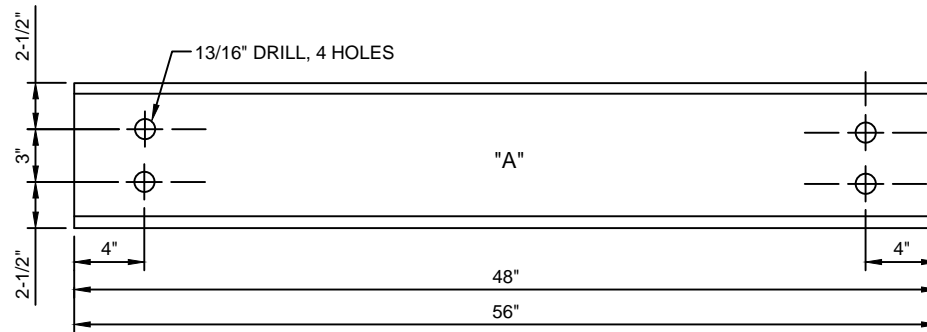
MATERIAL SCHEDULE

ITEM	PIPE 4"-14"		PIPE 16"-24"	
A	8"	[11.5	12"	[25.0
B	10"	[15.3	12"	[25.0
C	12"	[25.0	12"	[25.0
D	1/2" U-BOLT		1-1/8" U-BOLT	
E	3/4" U-BOLT		1-1/8" U-BOLT	

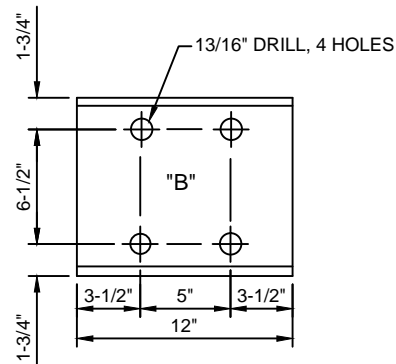
NOTES:

1. ALL PARTS AND FITTINGS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION SEE PLATE S-37 FOR ADDITIONAL DETAILS.
2. AT A MINIMUM, ONE PIPE SUPPORT SHALL BE PROVIDED FOR EACH LENGTH OF (D.I.P.) PIPE UNLESS LONG-SPAN (D.I.P.) PIPE ASSEMBLIES ARE PROVIDED.

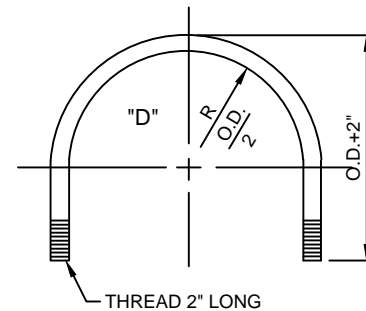
PIPE SUPPORT & POLE ASSEMBLY FOR FORCE MAIN



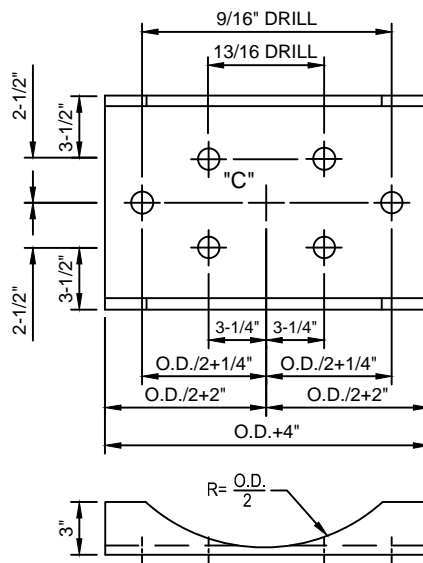
"A" STANDARD 8" CHANNEL 11.5 LBS.



"B" STANDARD 10" CHANNEL 15.3 LBS.



"D" 1/2" U-BOLT



"C" STANDARD 12" CHANNEL 25 LBS.

D.I. PIPE	O.D. APPROX
3"	4.71"
4"	5.55"
6"	7.65"
8"	9.80"
10"	11.85"
12"	13.95"
14"	16.05"
16"	18.15"
18"	20.25"
20"	22.35"
24"	26.55"

TABLE

NOTES:

1. FOR PIPE 16" AND LARGER, UTILIZE CHANNEL SIZES AS SCHEDULED ON PLATE S-36, BUT CUSTOMIZE BOLT PATTERN DIMENSIONS TO FIT PIPE SIZE. SEE PLATE S-36 FOR ASSEMBLY LAYOUT.

PIPE SUPPORT DETAILS FOR POLE ASSEMBLY

PVC PIPE RESTRAINT NOTES:

1. THIS SCHEDULE SHALL BE UTILIZED ON ALL WATER, SEWER FORCE MAIN OR RECLAIMED WATER SYSTEMS. ALL FITTINGS SHALL BE RESTRAINED TO LENGTHS INDICATED ON THE ABOVE SCHEDULE, AT A MINIMUM.
2. ASSUMPTIONS: PVC PIPE, SAFETY FACTOR=1.5, TEST PRESSURE=150PSI, SOIL=GM OR SM, TRENCH TYPE 3, DEPTH OF COVER=30 INCHES FOR 20" AND SMALLER PIPE SIZE OR 36 INCHES FOR 24" AND LARGER PIPE SIZE.
3. BENDS AND VALVES: SHALL BE RESTRAINED ON EACH SIDE OF FITTING.
4. VERTICAL OFFSETS: ARE APPROX. 3 FEET COVER ON TOP AND APPROX. 8 FEET COVER ON BOTTOM. PER THE DETAILS, Lu IS THE RESTRAINED LENGTH FOR THE UPPER (TOP) LEVEL, Lj IS THE RESTRAINED LENGTH FOR THE LOWER (DEEPER) LEVEL. ASSUME 45 DEGREE BENDS.
5. TEES: TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN). SEE SCHEDULE ABOVE FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.
6. HDPE TO PVC TRANSITIONS: THE PVC PIPE SIDE SHALL BE RESTRAINED 35 FT (MIN).
7. THE INSTALLATION OF BELL HARNESS RESTRAINTS AT PVC JOINTS (DR-18 & 25 PIPE) SHALL BE COMPLETED PER THE MANUFACTURERS RECOMMENDATION, WHICH INCLUDES NOT OVER TIGHTENING THE PARALLEL RODS/NUTS. THESE NUTS SHOULD ONLY BE SNUG TIGHT. THE HOME MARKS ON THE PIPE SHOULD ALWAYS BE VISIBLE AFTER THE RESTRAINT IS INSTALLED. OVERHOMING THE JOINT MAY CAUSE A FAILURE AT THE BELL RESULTING IN A SERVICE OUTAGE.

PVC PIPE RESTRAINT JOINT SCHEDULE

JANUARY 2017

PLATE S-38A

LENGTH (L) TO BE RESTRAINED

(SEE PLATE Nos. 38C & 38D FOR ADDITIONAL DETAILS)

NOMINAL PIPE SIZE (IN.)	HORIZONTAL BENDS				VERTICAL OFFSETS 45° BENDS (SEE NOTE 4)		VALVES OR DEAD ENDS L (FT.)
	90° BENDS L (FT.)	45° BENDS L (FT.)	22.5° BENDS L (FT.)	11 25° BENDS L (FT.)	45° BENDS (SEE NOTE 4)		
					UPPER	LOWER	
4	21	9	5	3	17	3	47
6	30	13	6	3	23	4	66
8	38	16	8	4	30	6	86
10	45	19	9	5	36	7	103
12	53	22	11	6	43	8	121
14	61	26	13	6	50	9	140
16	66	28	14	7	55	10	154
18	73	30	15	8	60	11	170
20	79	33	16	8	66	12	186
24	79	33	16	8	77	15	185
30	93	39	19	10	97	17	222
36	106	39	21	11	107	20	257
42	117	49	24	12	120	24	289
48	144	53	26	13	133	26	321

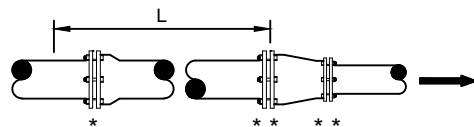
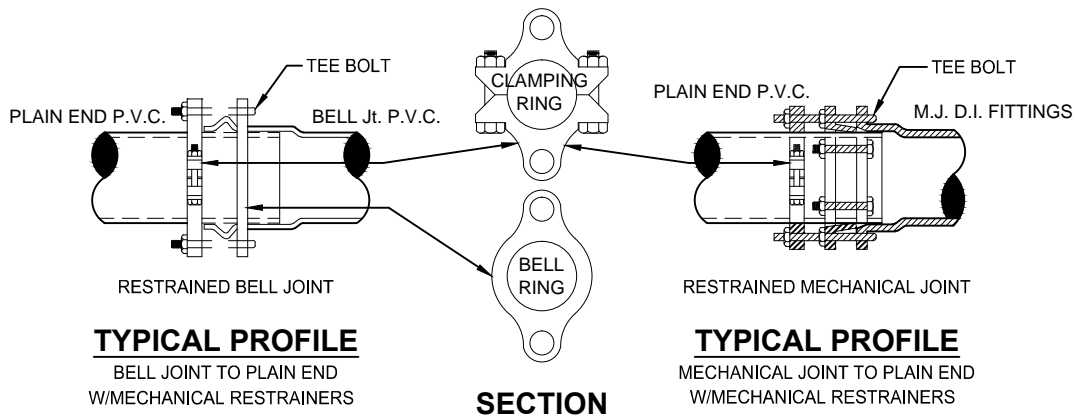
REDUCERS		TEES SEE NOTE 5
SIZE (IN.)	L (FT.)	
6x4	34	4
8x6	36	4
8x4	62	4 < LESS
10x8	35	8
10x6	63	6 < LESS
12x10	36	10
12x8	64	10
16x12	66	12
16x10	92	12
20x18	35	8 < LESS
20x16	66	16
20x12	117	12
24x20	56	10 < LESS
24x18	80	20
24x16	101	16
30x24	78	12 < LESS
30x20	121	24
36x30	78	10 < LESS
36x24	141	30
42x36	75	30
42x30	140	24
48x42	75	20
48x36	139	16 < LESS
36	192	36
	142	30
	83	24
	33	20
	F.O.	16 < LESS
42	223	42
	178	36
	124	30
	59	24
	5	20
	F.O.	16 < LESS
48	253	48
	209	42
	162	36
	104	30
	34	24
	F.O.	20 < LESS

F.O. = FITTING ONLY

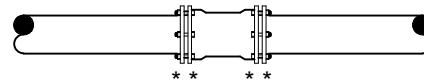
NT JOINT SCHEDULE

PLATE S-38A

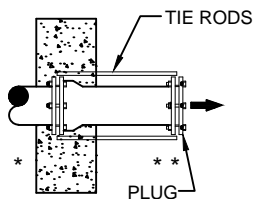
S-38B
NOT USED



REDUCER



MECHANICAL JOINT SLEEVES



NO. OF TIE RODS REQUIRED

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
10" - 12"	DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
14" - 16"	DIAMETER MAIN - 6 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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42" - 48"	DIAMETER MAIN - 16 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
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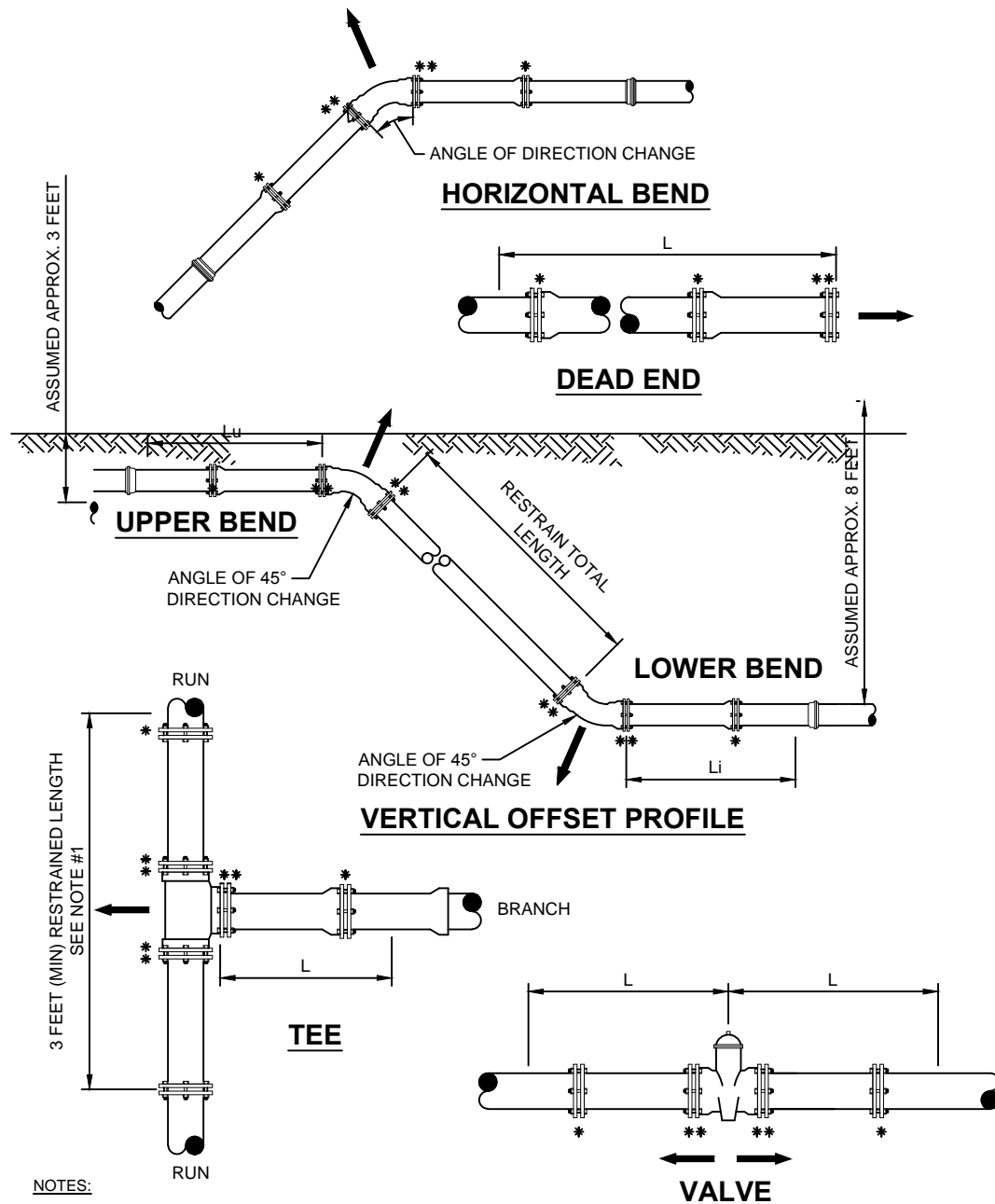
DEAD - END THRUST COLLAR ANCHOR

TO BE USED INSTEAD OF TOTAL RESTRAINED LENGTH (OPTIONAL) SIZE AS PER THRUST BLOCK DETAIL (W-38). SEE DETAILS W-36 & W-37.

GENERAL NOTE:

1. PAY ITEM " * " DENOTES A RESTRAINT WHICH IS PAID FOR ON A PER EACH BASIS.
2. PAY ITEM " ** " DENOTES A RESTRAINT WHICH IS INCLUDED IN THE UNIT PRICE BID FOR FITTING OR VALVE.
3. INDICATES DIRECTION OF THRUST FORCE.

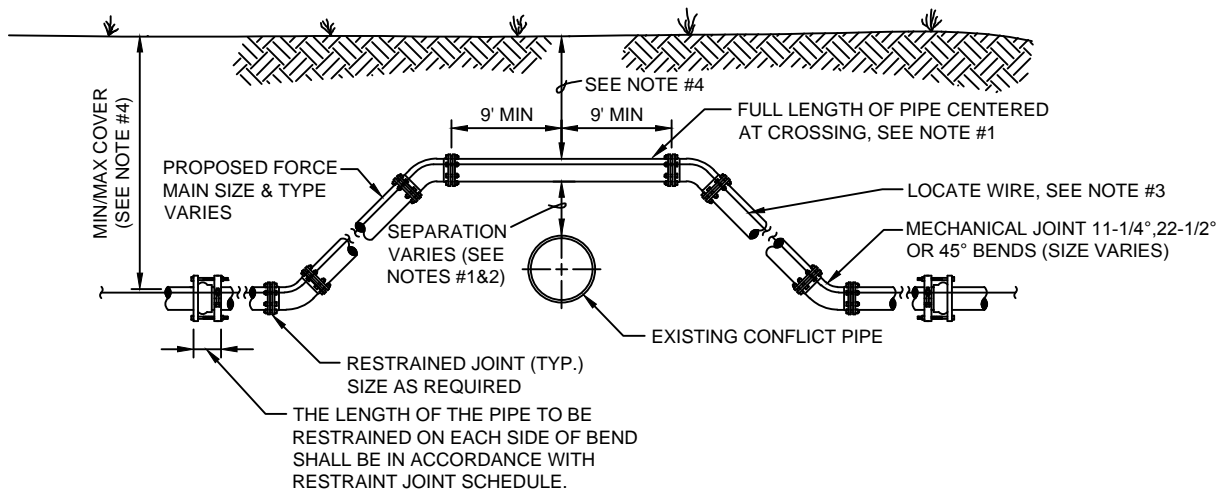
MECHANICAL RESTRAINT DETAILS - I



NOTES:

1. TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 6 FEET (MIN.). THE PROJECT ENGINEER CAN INCREASE THIS LENGTH TO REDUCE THE NUMBER OF RESTRAINS REQUIRED. ANY CHANGES TO THIS TABLE MUST BE SUMMITTED TO JEA FOR APPROVAL.
2. PAY ITEM *** DENOTES A RESTRAINT WHICH IS PAID FOR ON A PER EACH BASIC.
3. PAY ITEM **** DENOTES A RESTRAINT WHICH IS INCLUDED IN THE UNIT PRICE BID FOR FITTING OR VALVE.

MECHANICAL RESTRAINT DETAILS - II

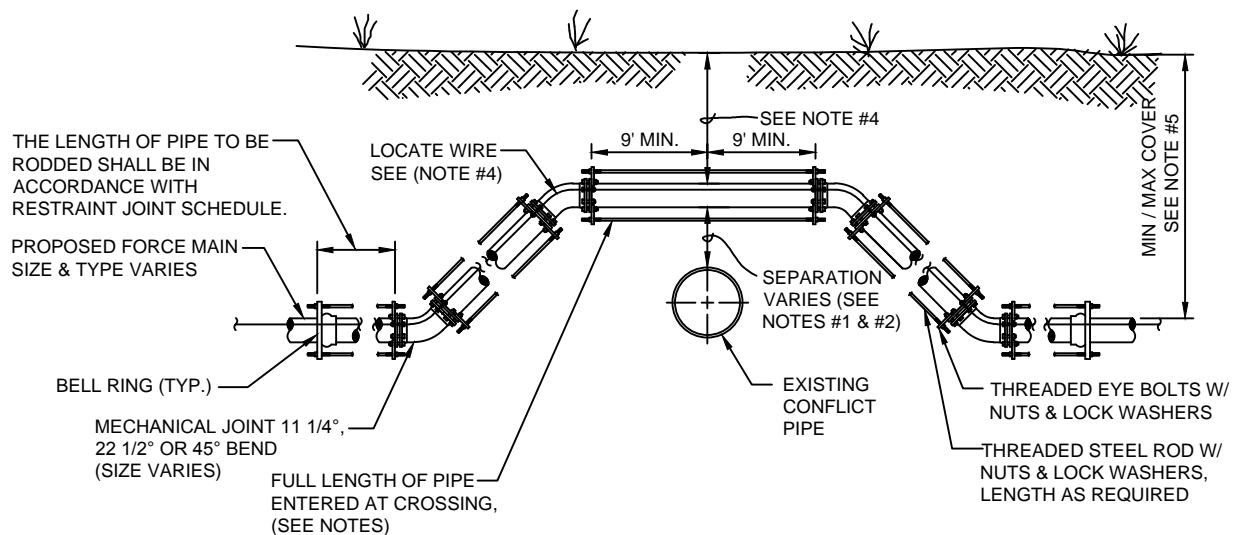


CASE "A" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER OR RECLAIMED WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
2. FOR OTHER LOCATION LIMITATIONS SEE DETAIL (S-26 & S-27).
3. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
4. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 30" (MIN) IN UNPAVED AREAS, 36" (MIN) IN PAVED AREAS AND A MAXIMUM COVER OF 60", UNLESS PRE-APPROVED BY JEA. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) IN PAVED AND UNPAVED AREAS AND A MAXIMUM COVER OF 84", UNLESS APPROVED BY JEA.
5. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.

ADJUSTMENT OVER EXISTING UTILITIES MECHANICAL RESTRAINTS



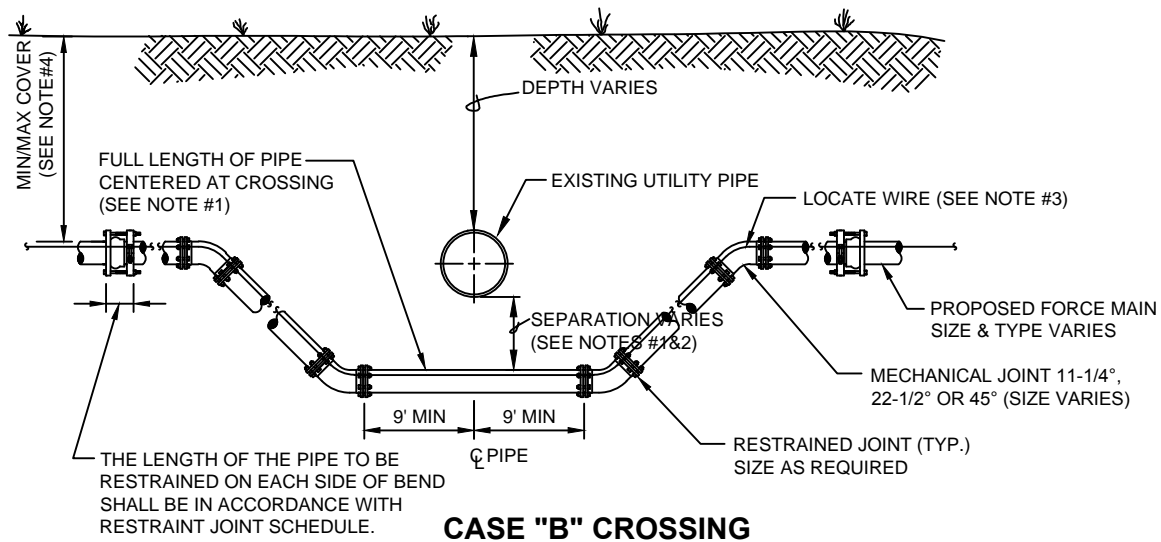
CASE "A" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
2. FOR OTHER LOCATION LIMITATIONS SEE DETAIL (S-26 & S-27).
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
10" - 12"	DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
5. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 30" (MIN) IN UNPAVED AREAS, 36" (MIN) IN PAVED AREAS AND A MAXIMUM COVER OF 60", UNLESS PRE-APPROVED BY JEA. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) IN PAVED AND UNPAVED AREAS AND A MAXIMUM COVER OF 84", UNLESS APPROVE BY JEA.
6. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.

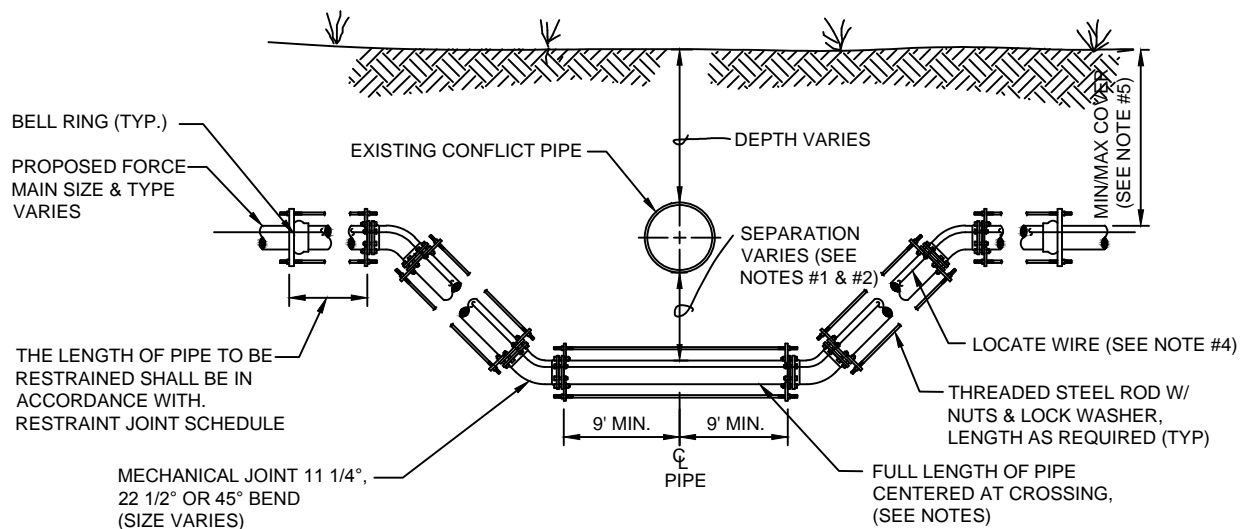
ADJUSTMENT OVER EXISTING UTILITIES TIE RODS



NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER OR RECLAIMED WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
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3. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
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5. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.

ADJUSTMENT UNDER EXISTING UTILITIES MECHANICAL RESTRAINTS



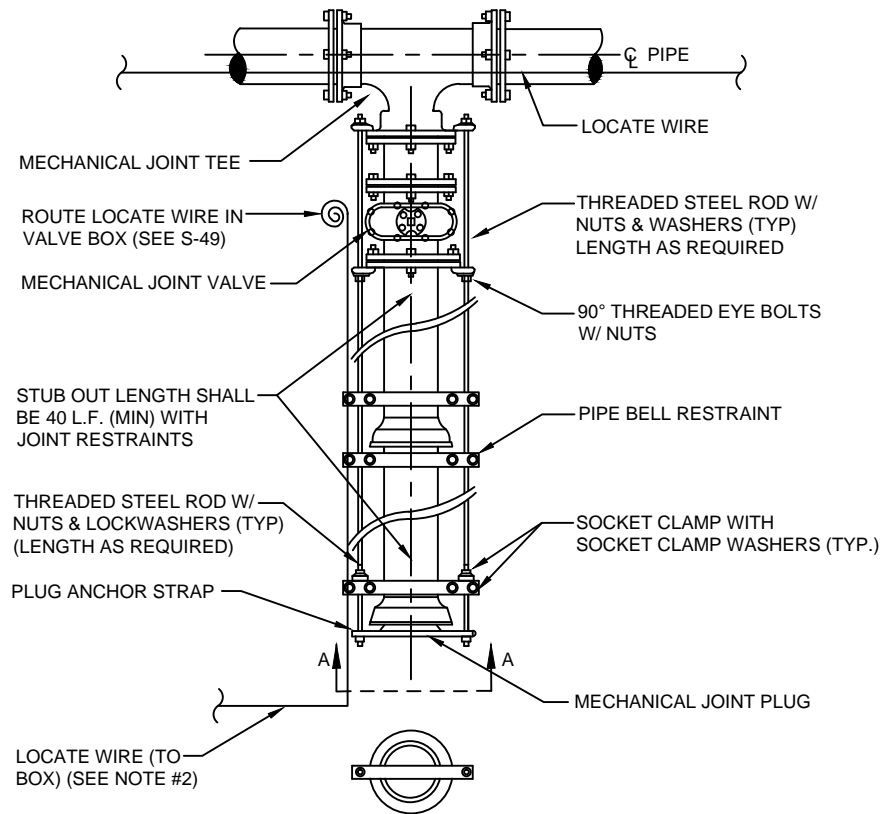
CASE "B" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER OR RECLAIM WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSINGS.
2. FOR OTHER LOCATION LIMITATIONS SEE DETAIL (S-26 & S-27).
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
5. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 30" (MIN) IN UNPAVED AREAS, 36" (MIN) IN PAVED AREAS AND A MAXIMUM COVER OF 60", UNLESS PRE-APPROVED BY JEA. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) IN PAVED AND UNPAVED AREAS AND A MAXIMUM COVER OF 84", UNLESS APPROVE BY JEA.
6. THE SOILS BETWEEN THE MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST. ASTM D 1557.

ADJUSTMENT UNDER EXISTING UTILITIES TIE RODS

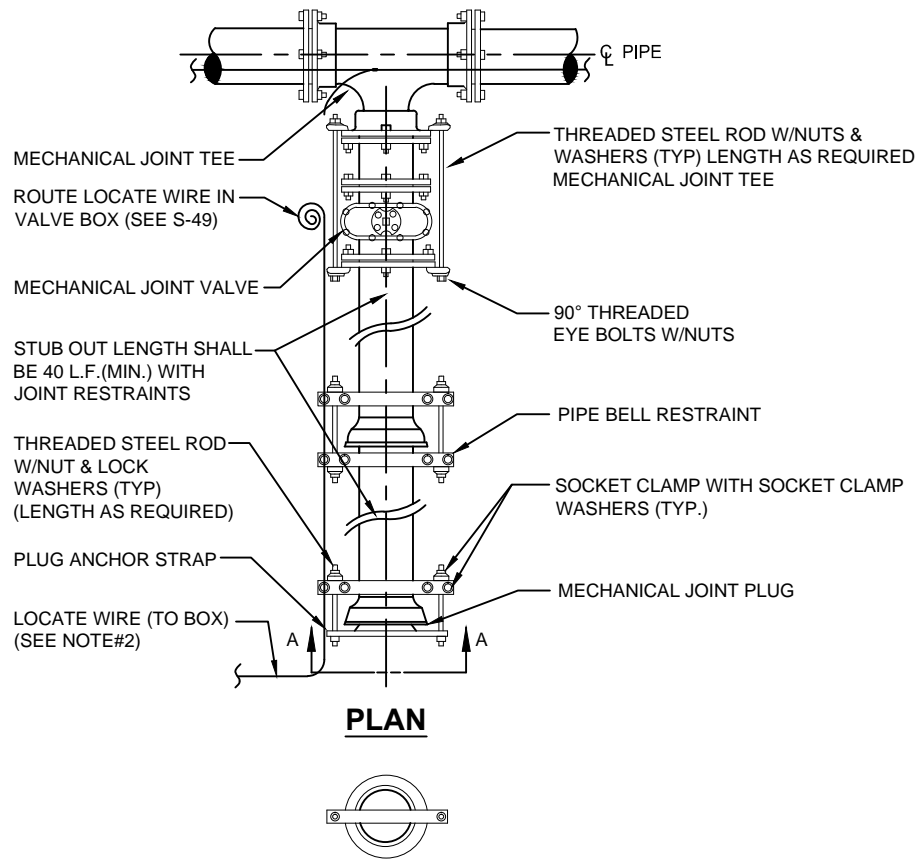


NOTES:

1. IN LIEU OF BELL/ROD RESTRAINTS, MECHANICAL JOINT RESTRAINTS MAY BE USED.
2. LOCATING WIRE REQUIRED, UTILIZING A LOCATE WIRE BOX INSTALLED AT PLUG LOCATION.
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
10" - 12"	DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

PLUGGED DEAD END USING TIRE RODS

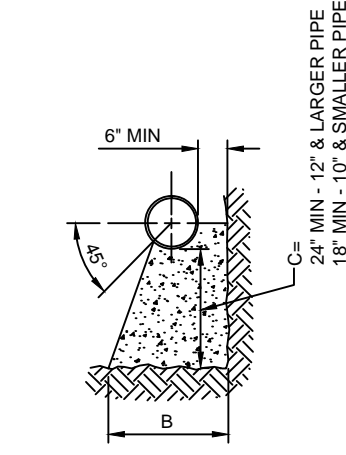
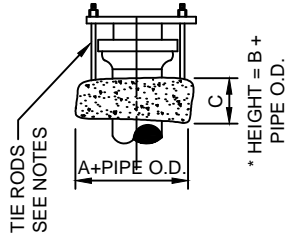
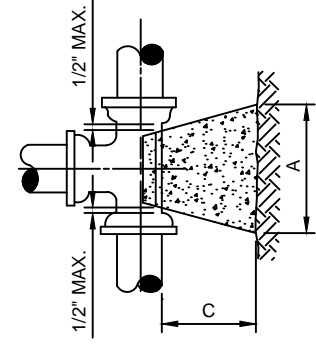


NOTES:

1. IN LIEU OF BELL/ROD RESTRAINTS, MECHANICAL JOINT RESTRAINTS MAY BE USED.
2. LOCATING WIRE REQUIRED, UTILIZING A LOCATE WIRE BOX INSTALLED AT PLUG LOCATION.
3. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:

3" - 8"	DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
10" - 12"	DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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54"	DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
4. THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

PLUGGED DEAD END USING MECHANICAL RESTRAINTS



NOTES:

1. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED SOIL.
2. THESE TABLES SHOW MINIMUM SIZES FOR THRUST BLOCKS IN GOOD SOIL (A-1 THRU A-3, CLEAN SANDS AND GRAVELS) WITH MINIMUM BEARING CAPACITY OF 2000 psi.
3. POOR SOILS A-4 THRU A-8, SILTY SOILS, CLAYS, MUCK AND PEAT WILL REQUIRE LARGER THRUST BLOCKING.
4. BOTH CONCRETE THRUST BLOCKS AND TIE RODS MUST BE USED WHEN, IN THE JUDGEMENT OF THE ENGINEER, THE NATURE AND CRITICALITY OF AN INSTALLATION IS SUCH AS TO REQUIRE POSITIVE ASSURANCE OF STABILITY.
5. 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.
6. CONCRETE COLLARS WITH TIE RODS MAY BE USED ON DEAD END LINES AT THE CONTRACTOR'S DISCRETION. NUMBER OF TIE RODS REQUIRED IS AS FOLLOWS:
 3" - 8" DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT (3/4" ROD)
 10" - 12" DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT (3/4" ROD)
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 54" DIAMETER MAIN - 18 TIE RODS REQUIRED PER JOINT (1 1/4" ROD)
7. MAXIMUM TEST PRESSURE TO BE 150 PSI.

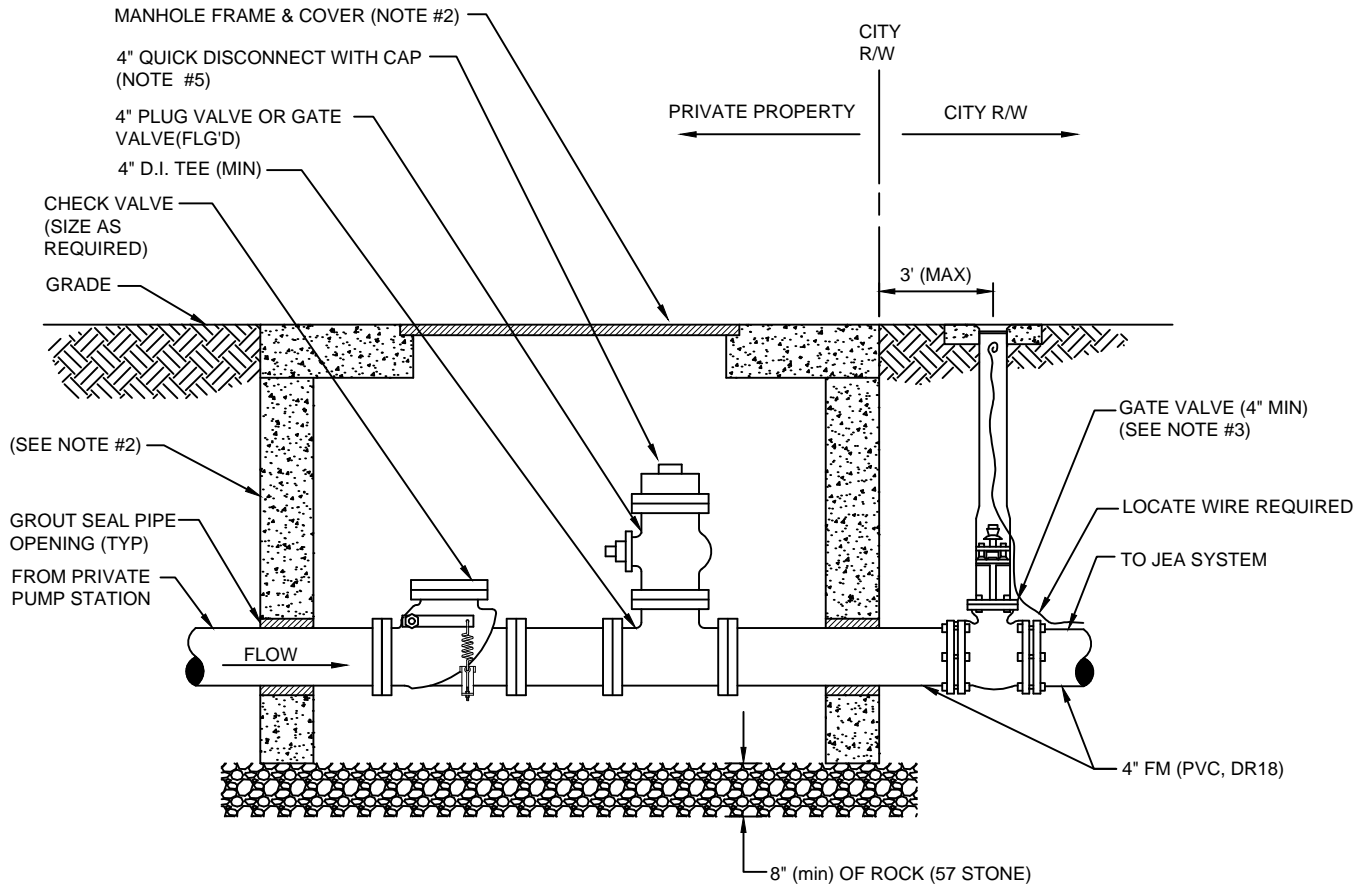
THRUST BLOCK FOR TEES & PLUGS

SIZE	90° BEND			S.F. BEARING SURFACE
	A	B	C	
4"	16"	16"	18"	1.78
6"	20"	24"	18"	3.33
8"	26"	32"	18"	5.78
10"	32"	40"	18"	8.89
12"	36"	48"	24"	12.00
14"	40"	56"	24"	15.56
16"	48"	60"	24"	20.00
18"	56"	64"	24"	24.89
20"	60"	76"	24"	31.67
24"	72"	90"	24"	45.00
30"	86"	102"	24"	60.67
36"	116"	108"	24"	86.11

THRUST BLOCK FOR BENDS

SIZE	90° BEND			S.F. BEARING SURFACE	45° BEND			S.F. BEARING SURFACE	22-1/2° BEND			S.F. BEARING SURFACE	11-1/4° BEND			S.F. BEARING SURFACE
	A	B	C		A	B	C		A	B	C					
4"	16"	16"	18"	1.78	14"	16"	18"	1.56	14"	16"	18"	1.56	14"	16"	18"	1.56
6"	22"	32"	18"	4.89	16"	18"	18"	2.00	14"	16"	18"	1.56	14"	16"	18"	1.56
8"	32"	36"	18"	8.00	24"	28"	18"	4.67	16"	18"	18"	2.00	14"	16"	18"	1.56
10"	36"	46"	18"	11.50	26"	36"	18"	6.50	20"	24"	18"	3.33	14"	18"	18"	1.75
12"	44"	56"	24"	17.11	32"	40"	24"	8.89	24"	30"	24"	5.00	16"	20"	24"	2.22
14"	52"	62"	24"	22.39	36"	48"	24"	12.00	26"	36"	24"	6.50	20"	24"	24"	3.33
16"	58"	72"	24"	29.00	40"	54"	24"	15.00	32"	38"	24"	8.44	22"	26"	24"	3.97
18"	64"	80"	24"	35.56	46"	60"	24"	19.17	36"	42"	24"	10.50	24"	32"	24"	5.33
20"	72"	88"	24"	44.00	52"	66"	24"	23.83	38"	48"	24"	12.67	26"	36"	24"	6.50
24"	96"	96"	24"	36.89	64"	78"	24"	34.67	46"	56"	24"	17.89	32"	40"	24"	8.89
30"	122"	102"	24"	86.11	72"	94"	24"	47.00	56"	62"	24"	24.11	36"	48"	24"	12.00
36"	166"	104"	24"	123.33	88"	108"	24"	66.00	64"	78"	24"	34.67	44"	54"	24"	16.50

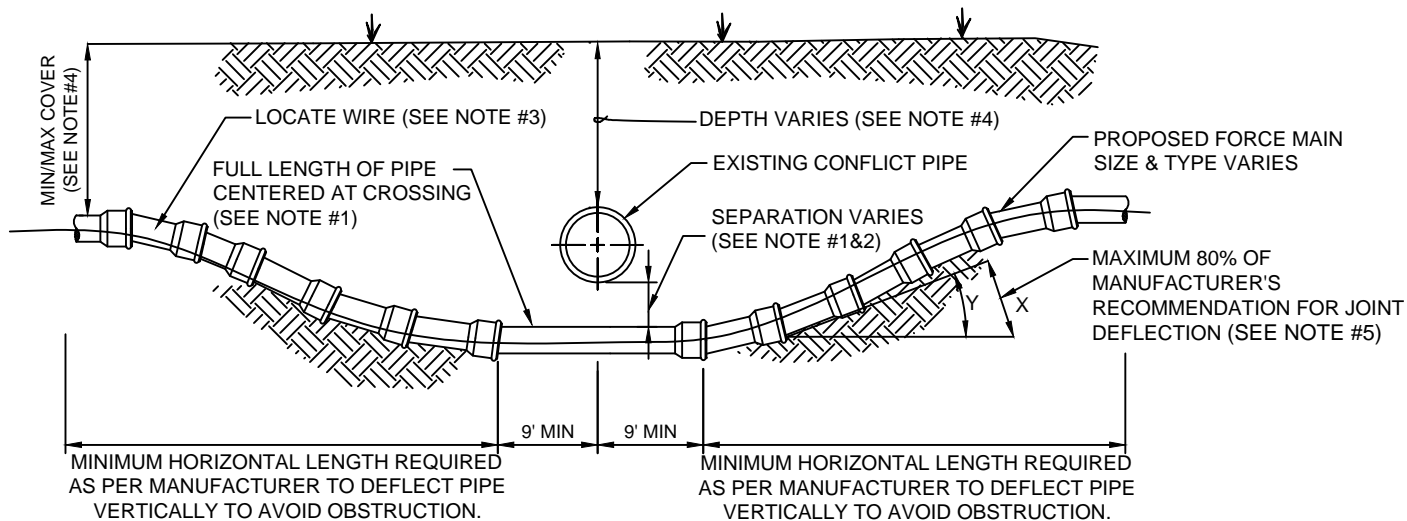
THRUST BLOCK SIZE CHART



NOTES:

1. SEWER PUMP-OUT BOX SHALL BE CONSTRUCTED ON PRIVATE PROPERTY AND LOCATED AT THE R/W LINE. THE PREFERRED CONSTRUCTION LAYOUT IS SHOWN ABOVE.
2. ASSEMBLY TO BE ENCLOSED WITHIN A 48"x48" (MIN) PRECAST CONCRETE BOX WITH OPEN BOTTOM W/H-20 TRAFFIC LOADING COVER OR TYPE "C" MANHOLE OPEN BOTTOM WITH FRAME AND COVER (NON-JEA LOGO TYPE COVER).
3. A JEA APPROVED GATE VALVE (4" MIN) SHALL BE PROVIDED AT THE R/W LINE FOR ALL FORCE MAIN PIPING WHICH EXCEEDS 15' LINEAR FEET WITHIN THE CITY R/W AREA. THE GATE VALVE AT THE R/W LINE IS NOT REQUIRED WHERE THE CONNECTION (CONNECTION AT JEA MAIN) IS LOCATED ON THE SAME SIDE OF THE STREET AS THE PUMP-OUT BOX (SHORT-SIDE SERVICE) AND CONSIST OF 15 LINEAR FEET OR LESS WITHIN THE CITY R/W AREA.
4. NO CONNECTIONS PERMITTED INTO JEA FORCE MAINS WHICH ARE GREATER THAN 12" WITHOUT PRIOR JEA APPROVAL.
5. QUICK DISCONNECT WITH CAP SHALL BE ALUMINUM AND BE POSITIONED DIRECTLY UNDER MANHOLE LID FOR ACCESS.

PRIVATE PUMP OUT ASSEMBLY



CASE "B" CROSSING

NOTES:

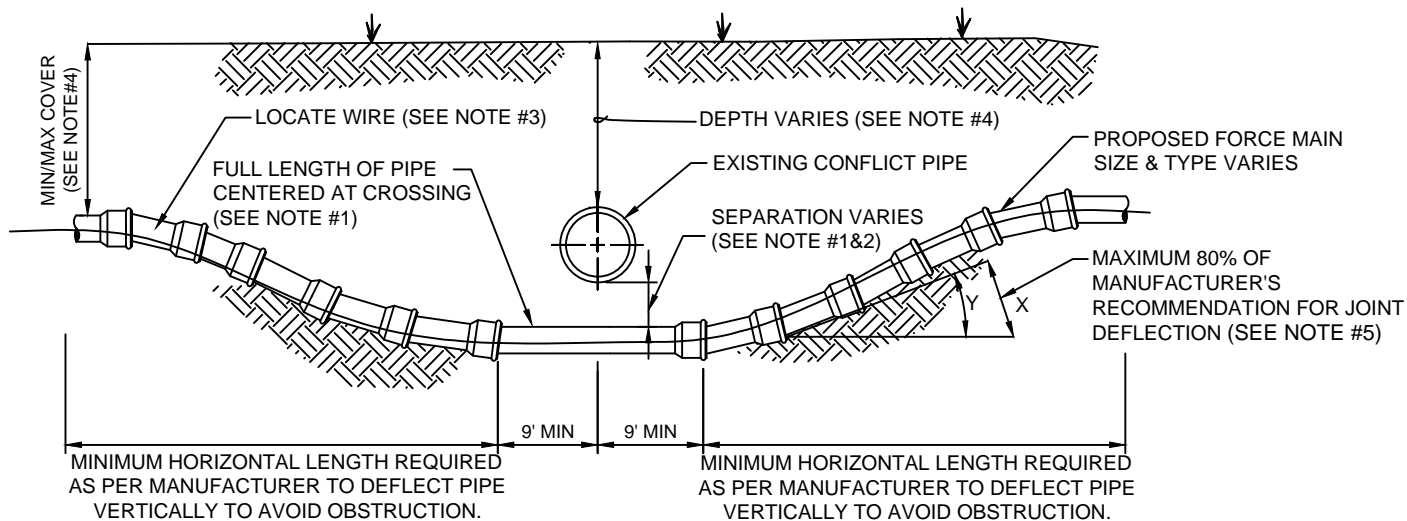
1. IF EXISTING CONFLICT PIPE IS A WATER MAIN OR RECLAIM WATER MAIN, 12-INCHES OF SEPARATION IS REQUIRED. A FULL LENGTH OF PIPE SHALL BE CENTERED OVER EXISTING UTILITY MAIN TO PROVIDE MAXIMUM JOINT SPACING FOR ALL CROSSING.
2. FOR OTHER LOCATION LIMITATIONS SEE DETAIL (S-26 & S-27).
3. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
4. THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 30" IN UNPAVED AREAS AND 36" IN PAVED AREAS WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY JEA. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" (PAVED AND UNPAVED) AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY JEA. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.
5. JEA ONLY ALLOWS 80% OF THE PIPE MANUFACTURER'S RECOMMENDATION FOR JOINT DEFLECTION. BENDING THE PIPE BARREL IS NOT ALLOWED. UNLESS OTHERWISE APPROVED BY JEA, THE MAXIMUM ARE LISTED IN TABLE BELOW. ONLY MANUAL FORCE CAN BE UTILIZED TO OBTAIN THESE JOINT DEFLECTION. ALL OFFSETS ARE BASED ON MINIMUM 20LF PIPE LENGTH.

MAXIMUM ALLOWED OFFSET FOR PIPE BY JOINT DEFLECTION

PVC PIPE

PIPE SIZE (IN.)	(X) MAX. OFFSET (IN.)	(Y) ANGLE AT ONE BELL	RESULTING RADIUS OF CURVE WITH 20FT. LENGTHS
2	30	7°	158 FT
4	10	2.4°	480 FT
6	10	2.4°	480 FT
8	10	2.4°	480 FT
10	10	2.4°	480 FT
12	8.5	2°	564 FT
14 - 24	5	1.2°	960 FT
30 - 48	3.25	0.8°	1477 FT

ADJUSTMENT UNDER EXISTING UTILITIES PIPE JOINT DEFLECTION



CASE "B" CROSSING

NOTES:

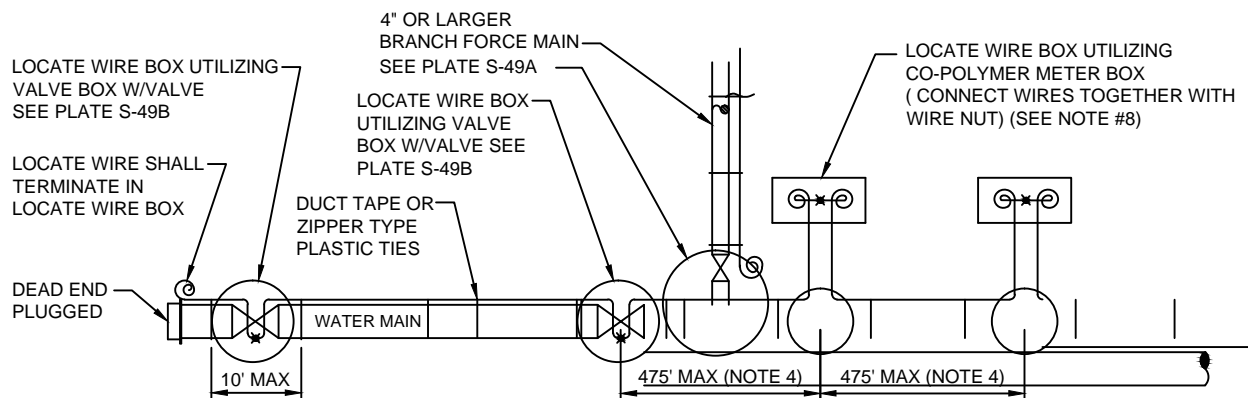
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3. LOCATING WIRE REQUIRED: SEE DETAIL S-49.
4. THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 30" IN UNPAVED AREAS AND 36" IN PAVED AREAS WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY JEA. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" (PAVED AND UNPAVED) AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY JEA. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST ASTM D 1557.
5. JEA ONLY ALLOWS 80% OF THE PIPE MANUFACTURER'S RECOMMENDATION FOR JOINT DEFLECTION. BENDING THE PIPE BARREL IS NOT ALLOWED. UNLESS OTHERWISE APPROVED BY JEA, THE MAXIMUM ARE LISTED IN TABLE BELOW. ONLY MANUAL FORCE CAN BE UTILIZED TO OBTAIN THESE JOINT DEFLECTION. ALL OFFSETS ARE BASED ON MINIMUM 20LF PIPE LENGTH.

MAXIMUM ALLOWED OFFSET FOR PIPE BY JOINT DEFLECTION

PVC PIPE

PIPE SIZE (IN.)	(X) MAX. OFFSET (IN.)	(Y) ANGLE AT ONE BELL	RESULTING RADIUS OF CURVE WITH 20FT. LENGTHS
2	30	7°	158 FT
4	10	2.4°	480 FT
6	10	2.4°	480 FT
8	10	2.4°	480 FT
10	10	2.4°	480 FT
12	8.5	2°	564 FT
14 - 24	5	1.2°	960 FT
30 - 48	3.25	0.8°	1477 FT

ADJUSTMENT UNDER EXISTING UTILITIES PIPE JOINT DEFLECTION

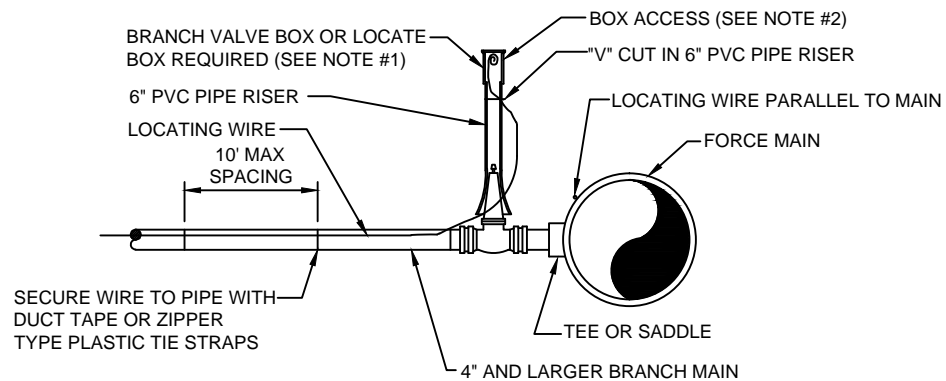


LOCATE WIRE SYSTEM

NOTES:

1. LOCATING WIRE TO BE INSTALLED IN EITHER THE ONE OR ELEVEN O'CLOCK POSITION ON ALL DUCTILE IRON OR PVC (PRESSURE MAINS). LOCATE WIRE SHALL ALSO BE INSTALLED ON ALL (HDPE) POLY MAIN PIPING (1:00 OR 11:00 POSITION, IF POSSIBLE).
2. SECURE LOCATING WIRE TO PVC FORCE MAIN BY USE OF DUCT TAPE OR ZIPPER TYPE PLASTIC TIE STRAPS SPACED AT A MAXIMUM DISTANCE OF TEN (10') AND AT EACH SIDE OF BELL JOINT OR FITTING.
3. THE ENTIRE LOCATING SYSTEM SHALL BE SUBJECTED TO TESTING TO DETERMINE ITS RELIABILITY. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO THE PLACEMENT OF PAVEMENT, UNLESS APPROVED OTHERWISE BY JEA.
4. LOCATING WIRE SHALL TERMINATE WITHIN AN ACTIVE VALVE BOX (WITH A VALVE) OR A METER BOX (IF NO VALVE) AT 475' INTERVALS. SEE DETAIL PLATE S-49B. WIRE CONNECTIONS BELOW GROUND (OUTSIDE OF A BOX) SHALL BE AVOIDED.
5. LOCATING WIRE SHALL BE 12 GAUGE COPPER WIRE WITH .03 INCHES (MINIMUM) HDPE INSULATION THICKNESS, 0.141 INCHES (MINIMUM) O.D. RATED BREAK LOAD 250LBS., UF RATED (DIRECT BURIAL), GREEN COLOR. FOR HDD INSTALLATIONS, THE LOCATE WIRE SHALL BE COPPER CODED STEEL AS SPECIFIED IN SPEC. SECTION 750.
6. "X" INDICATES THAT THE WIRES ARE CONNECTED TOGETHER.
7. "⊗" INDICATES A WIRE PIG-TAIL (12" LONG)
8. AN "LW" CUT SHALL BE CARVED IN THE CONCRETE CURB AND PAINTED AT ALL LOCATE WIRE BOXES.
9. FOUR LANES OF TRAFFIC (HAVING TWO LANES OF TRAFFIC IN EACH DIRECTION) OR GREATER THE LOCATE WIRE SHALL AND VALVE BOX BE OFF-SET TO THE RIGHT-OF-WAY.

LOCATE WIRE CONSTRUCTION FOR FORCE MAINS

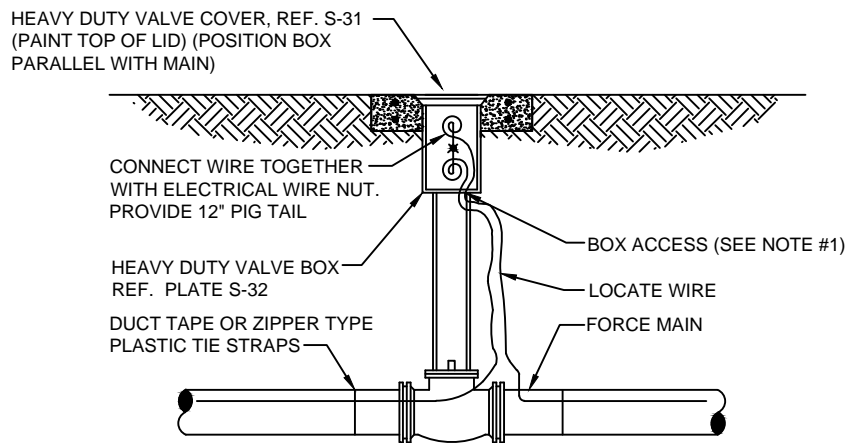


BRANCH FORCE MAIN
(4" AND LARGER SEWER MAIN)

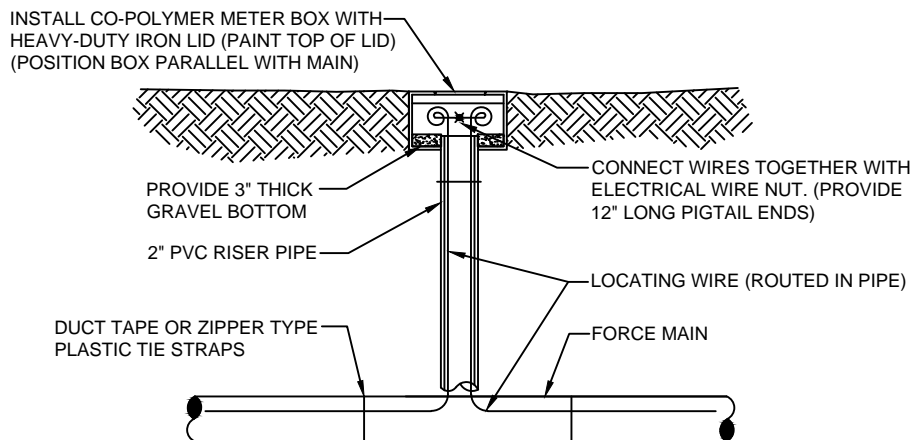
NOTE:

1. NOTE THAT THE BRANCH WIRE IS NOT CONNECTED TO THE MAIN WIRE.
2. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A "V" CUT IN THE 6" PVC RISER PIPE SECTION (SEE S-30).

LOCATE WIRE FOR BRANCH MAIN



LOCATE WIRE BOX UTILIZING VALVE BOX

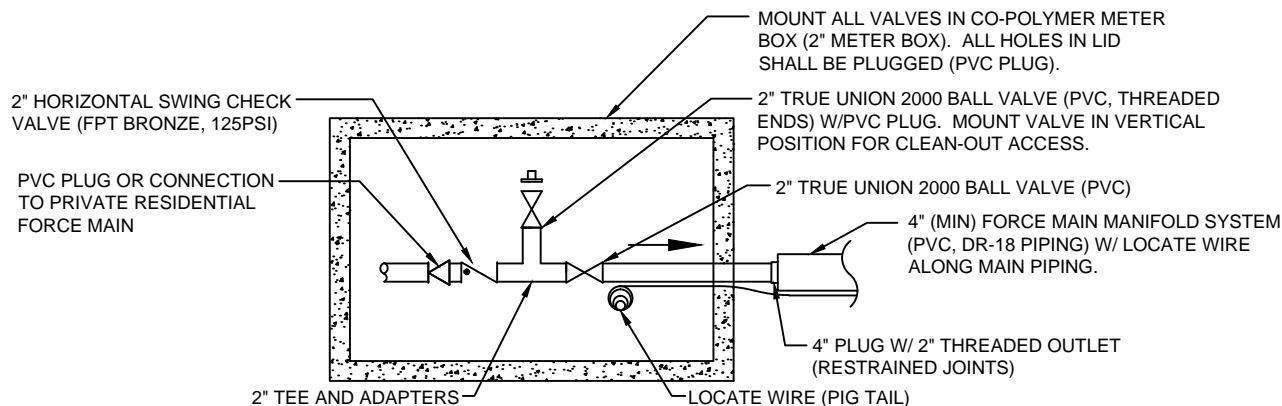


LOCATE WIRE BOX UTILIZING METER BOX

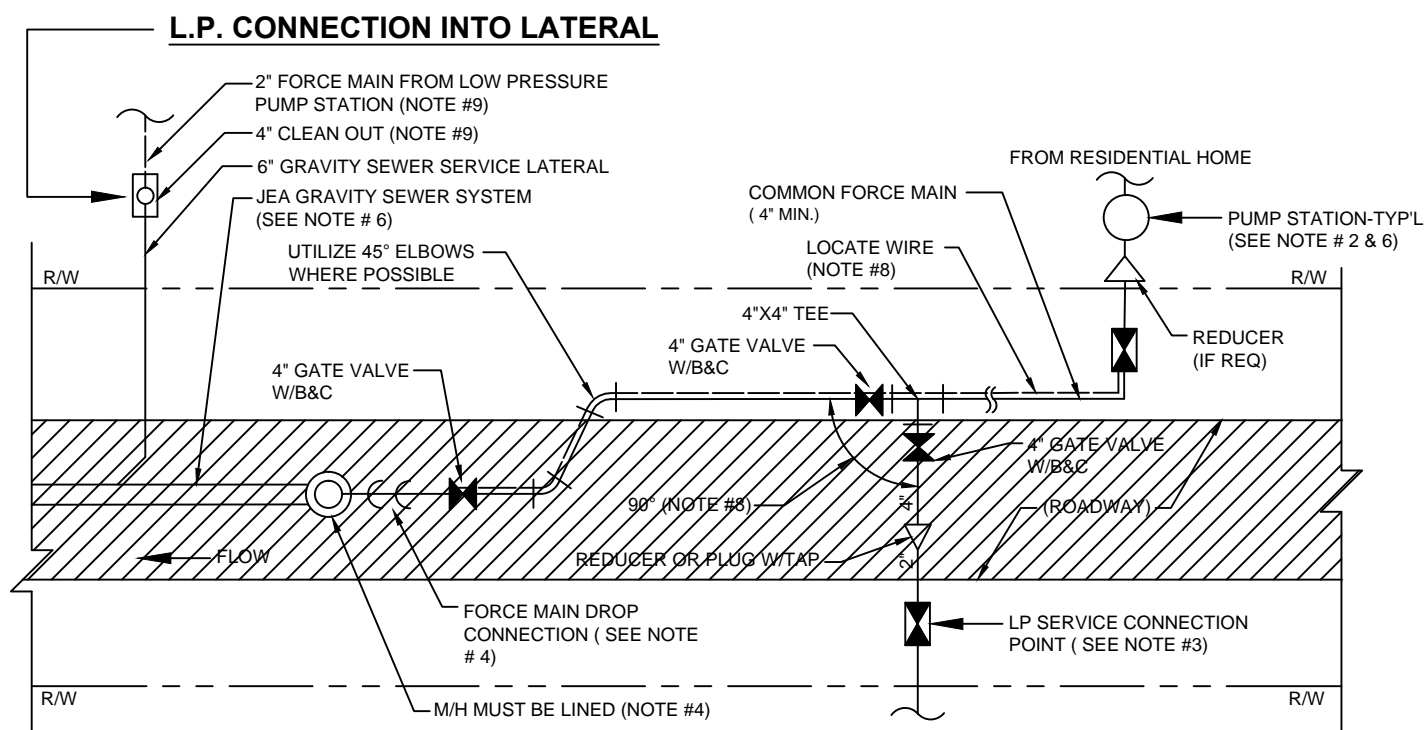
NOTES:

1. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A "V" CUT IN THE 6" PVC RISER PIPE (SEE S-30).

LOCATE WIRE BOX



LOW PRESSURE SERVICE CONNECTION POINT



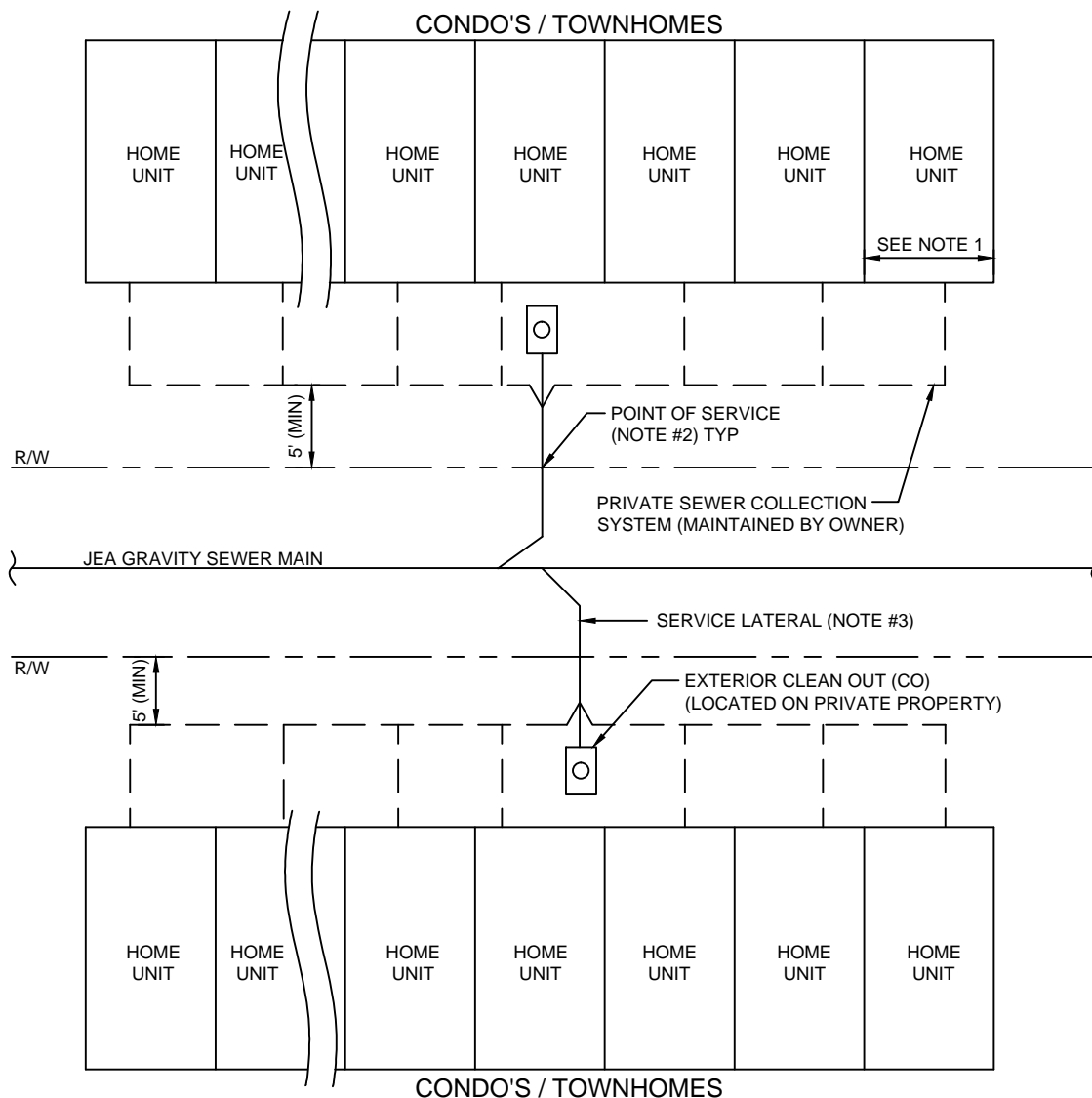
PLAN VIEW

LOW PRESSURE MANIFOLD SYSTEM

NOTES:

1. THIS LOW PRESSURE (LP) SEWER SERVICE ARRANGEMENT IS FOR " SPECIAL CASES ONLY " AND MUST FIRST BE APPROVED BY JEA MANAGEMENT PRIOR TO DESIGN OR CONSTRUCTION. THIS LOW PRESSURE SEWER MANIFOLD ARRANGEMENT MAY BE UTILIZED TO SERVE UP TO 9 EQUIVALENT RESIDENTIAL UNITS (ERU) AND SHALL BE PERMITTED SIMILAR TO A GRAVITY SEWER MAIN. THIS STANDARD SHALL APPLY TO RESIDENTIAL CUSTOMERS ONLY.
2. RESIDENTIAL PUMP STATION (PS) SHALL BE MAINTAINED BY THE CUSTOMER AND SHALL MEET EPB RULE No.3 (DUVAL COUNTY). THE CUSTOMER IS RESPONSIBLE FOR FINAL PUMP DESIGN AND SELECTION. A CHECK VALVE AND BALL VALVE SHALL BE PROVIDED AT THE PS AND MAINTAINED BY THE CUSTOMER.
3. EACH CUSTOMER SHALL HAVE A SEPARATE "LOW PRESSURE SERVICE CONNECTION POINT" (SEE ABOVE DETAIL). THE CHECK VALVE LOCATED IN THE BOX SHALL DEFINE THE "POINT OF SERVICE". THIS BOX (2" METER BOX WITH PVC PLUG IN TOP) SHALL BE APPROXIMATELY 7 FEET INSIDE THE R/W AND A MINIMUM OF 6 FEET FROM THE WATER METER BOX (IN FRONT OF CUSTOMER HOME).
4. LOW PRESSURE FORCE MAIN DROP CONNECTION AT M/H SHALL INCLUDE A 4" GATE VALVE AND BE IN ACCORDANCE WITH JEA STANDARD PLATE No. S-18. PROVIDE PROTECTIVE LINER TO RECEIVING MANHOLE (SEE SPEC# 446). FOR OTHER LOCATION LIMITATIONS SEE DETAIL (W-10 & W-11).
5. ALL PUMP STATIONS, PIPES (W/LOCATE WIRE), VALVES AND FITTINGS WHICH ARE MAINTAINED BY JEA SHALL BE OF JEA APPROVED MATERIALS AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH JEA W&S STANDARD
6. PER DEP RULES AND EPB RULE No.3, A LOW PRESSURE PUMP STATION CONNECTION INTO A JEA FORCE MAIN IS NOT ALLOWED. (NO EXCEPTIONS).
7. AS BUILT FOR ALL UTILITIES WITHIN THE R/W SHALL BE PROVIDED TO JEA IN ACCORDANCE WITH JEA STANDARDS.
8. LOCATE WIRE IS REQUIRED ALONG THE MAIN PIPING TO THE LAST CUSTOMER CONNECTION BOX.
9. FOR RESIDENTIAL CUSTOMERS LOCATED IN AREAS OF LOW ELEVATION, THE CUSTOMER MAY BE REQUIRED TO OPERATE AND MAINTAIN A LOW PRESSURE PUMP STATION (SEE NOTE #2) WHICH MAY DISCHARGE INTO A 6 INCH GRAVITY SEWER SERVICE LATERAL. IN THESE CASES, THE CUSTOMER SHALL PROVIDE AND MAINTAIN A 4 INCH CLEAN-OUT LOCATED AT THE CONNECTION POINT (AT R/W LINE).

LOW PRESSURE RESIDENTIAL SEWER FORCE MAIN CONNECTIONS

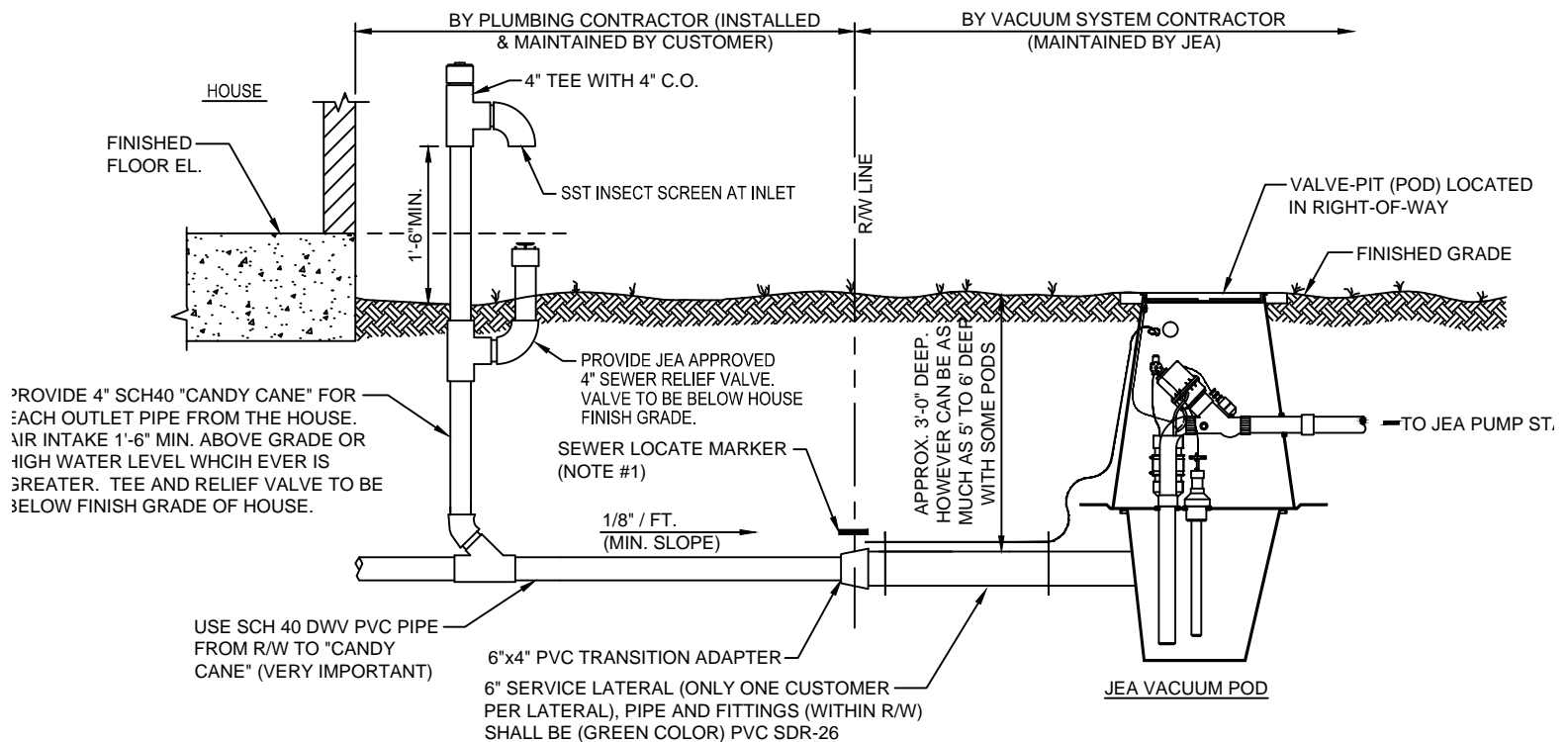


GANG SEWER SERVICES

NOTES:

1. THIS STANDARD MAY APPLY TO CONDO'S AND/OR TOWNHOMES WITH PRIVATE LOT LINES LESS THAN 40 FEET WIDE.
2. THE " POINT OF SERVICE " (POS) SHALL BE DEFINED AT THE R/W LINE FOR ALL LATERALS. JEA WILL ONLY BE RESPONSIBLE FOR O&M (EXCLUDING STOPPAGES) BEGINNING AT THE P.O.S. TO THE MAIN (60 FEET MAX). THEREFORE, O&M RESPONSIBILITY BETWEEN THE P.O.S. AND THE CUSTOMER IS BY OTHER (HOME OWNER ASSOCIATION OR OTHER). CUSTOMER WILL CONTINUE TO BE RESPONSIBLE FOR FREE FLOW OF SEWAGE BETWEEN CUSTOMER TO MAIN.
3. SERVICE LATERALS BETWEEN MAIN AND R/W SHALL BE 6" SDR-26 (PVC) AT 1/4" SLOPE, AT A MINIMUM, AND SERVE A MAXIMUM OF 6 HOME UNITS. ENGRAVE AN "S" IN CURB TO SHOW LOCATION OF LATERAL. MANHOLE SHALL BE REQUIRED AT THE MAIN IF THE LATERAL IS LARGER THAN 6 INCH SIZE. LARGER LATERALS SHALL BE SIZED BY DESIGN ENGINEER. ALL PIPING ON PRIVATE PROPERTY SHALL MEET LOCAL PLUMBING CODE REQUIREMENTS AND BE MAINTAINED BY OWNER. ALL CLEANOUTS LOCATED IN PAVED AREAS SHALL BE CAST IRON FRAME AND TOP.

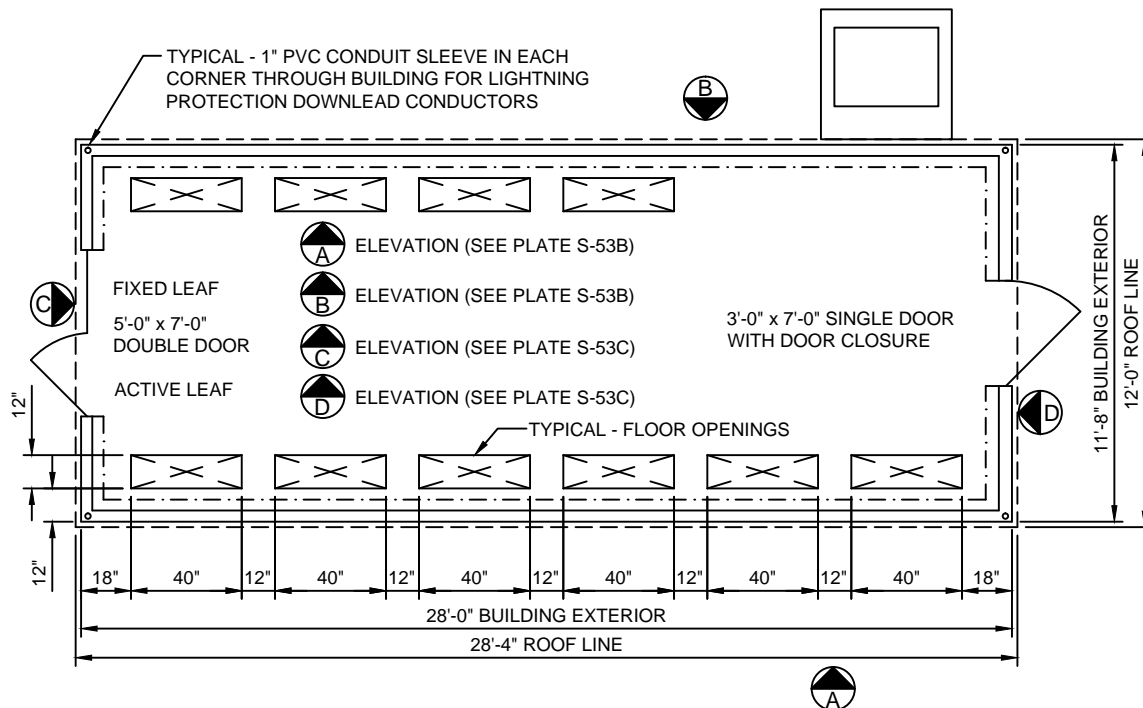
GANG SEWER SERVICES FOR CONDO'S AND TOWNHOMES



NOTES:

1. AN "S" SHALL BE SCRIBED IN THE CURB (PAINTED GREEN) TO INDICATE LOCATION OF LATERAL AT THE R/W. FOR SEPTIC TANK PHASE-OUT PROJECTS AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT" IN USE. FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED TO MARK THE LOCATION OF THE 6" PLUG.
2. THE MINIMUM SIZE OF ALL HOUSE LATERALS SHALL BE 6 INCHES AND SHALL BE 6 FEET LONG, AT A MINIMUM. THE MAXIMUM LENGTH OF A HOUSE LATERAL SHALL BE 60 FEET (LENGTH BETWEEN VALVE PIT OR MANHOLE TO CUSTOMERS PROPERTY LINE).
3. LOCATE WIRE SHALL BE INSTALLED ALONG THE 6" GRAVITY SEWER LATERALS BEGINNING INSIDE THE POD (PROVIDE A 2" DIA. x 1/8" THICK BRASS TAG INDICATING THE HOME SERVICE ADDRESS OR APPROVED PROPERTY I.D. (EMBOSSSED) AND ATTACH TO THE END OF THE WIRE) TO THE R/W. WIRE END SHALL BE TAPED WATER TIGHT AND SECURED TO THE PIPE, BELOW GROUND. THE END OF THE LOCATE WIRE AT THE R/W DOES NOT HAVE TO BE EXPOSED. LOCATE WIRE SHALL BE 10 GAGE, SINGLE STRAND, UF RATED (DIRECT BURIAL), COPPER WIRE WITH 30 MIL (MIN.) INSULATION WITH EITHER WHITE OR YELLOW COLOR. THE CONTRACTOR SHALL PROVIDE FIELD LOCATE WIRE TESTING AS PART OF THE FINAL PROJECT INSPECTION.
4. REMOVE THE VALVE OUT OF PODS WHICH SERVE NOT IN USE PODS (NO ACTIVE LATERALS) AFTER DRY FIT HAS BEEN CONFIRMED AND PROVIDE 3" PVC SPOOL PIECE AS SHOWN ABOVE. FOR THESE CASES, DELIVER THE NEW UNUSED VALVE TO JEA OEM DEPARTMENT FOR FUTURE INSTALLATION.
5. VACUUM SEWER MAINS (PIPE AND FITTINGS) SHALL BE GREEN PVC DR-25 MEETING ASTM D-3139. THE USE OF WYE FITTINGS (PVC OR D.I.P. WITH EPOXY COATINGS) SHALL BE UTILIZED (NO TEE FITTING).
6. VACUUM SEWER (POD) SHALL NOT BE PLACED IN DRIVEWAY, REFERENCE RULES AND REGULATIONS FOR WATER, SEWER AND RECLAIM SERVICES.

SEWER LATERAL VACUUM SYSTEM



PRE-CAST CONCRETE BUILDING FLOOR PLAN

NOTES:

1. THE ELECTRICAL BUILDING SHALL BE A PRECAST CONCRETE BUILDING AS MANUFACTURED BY OLD CASTLE PRECAST, INC. THE BUILDING DIMENSIONS SHALL BE AS REQUIRED TO ACCOMMODATE THE EQUIPMENT FURNISHED BUT NO LESS THAN MINIMUMS INDICATED ABOVE.
2. SEE STRUCTURAL DRAWING FOR FOUNDATION DETAILS.
3. INTERIOR AND EXTERIOR COLORS OF ELECTRICAL BUILDING TO BE SPECIFIED BY JEA PROJECT MANAGER
4. BUILDING SHALL BE EQUIPPED WITH 7'-0" HIGH ALUMINUM DOORS AND DOOR FRAMES, 316 STAINLESS STEEL HARDWARE, AND JEA STANDARD DOOR LOCKSETS AND KEYS.
5. BUILDING INTERIOR SHALL BE SEALED AND PAINT FINISHED. BUILDING FLOOR SHALL BE SLIP RESISTANT GRAY AND WALLS & CEILINGS SHALL BE PAINTED WHITE.
6. BUILDING EXTERIOR SHALL HAVE TWO APPLICATIONS OF THOROSEAL FINISHED WITH ONE EXPOSED OF THOROCOAT. PAINT.

PRECAST CONCRETE ELECTRICAL BUILDING GENERAL DESCRIPTION AND RATINGS:

STRUCTURAL:

OUTSIDE DIMENSION: 28'-0" LONG x 11'-8" WIDE x 10'-5"

HIGH FLOOR LOAD RATING: 250 PSF ROOF LOAD RATING: 65 PSF

WIND LOAD RATING: 150 MPH, EXP "C"

BULLET RESISTANCE: UL752 LEVEL 4

SEISMIC ZONE: ZONE 4

TIE DOWN KIT: BRACKETS AND BOLTS. PROVIDED BY MANUFACTURER AS REQUIRED BY WIND LOAD

FINISHES:

EXTERIOR WALLS: EXPOSED AGGREGATE

INTERIOR WALLS: 1/8" FRP MOUNTED ON 1/2" PLYWOOD. WHITE PAINT

INSULATION: MIN R-15 ON WALLS AND R-22 ON CEILING FLOOR: PREPARED, PRIMED AND FINISHED. SLIP RESISTANT GRAY

COLOR ROOFING: WHITE ELASTOMERIC COATING. SLOPED SO CENTER RIDGE LINE IS AT LEAST ONE INCH ABOVE SIDES

DOORS AND OPENINGS:

DOORS: SEE FLOOR PLAN. 1 3/4" THICK ALUMINUM

LOCKS: JEA STANDARD LOCKSETS, INTERIOR PANIC BARS

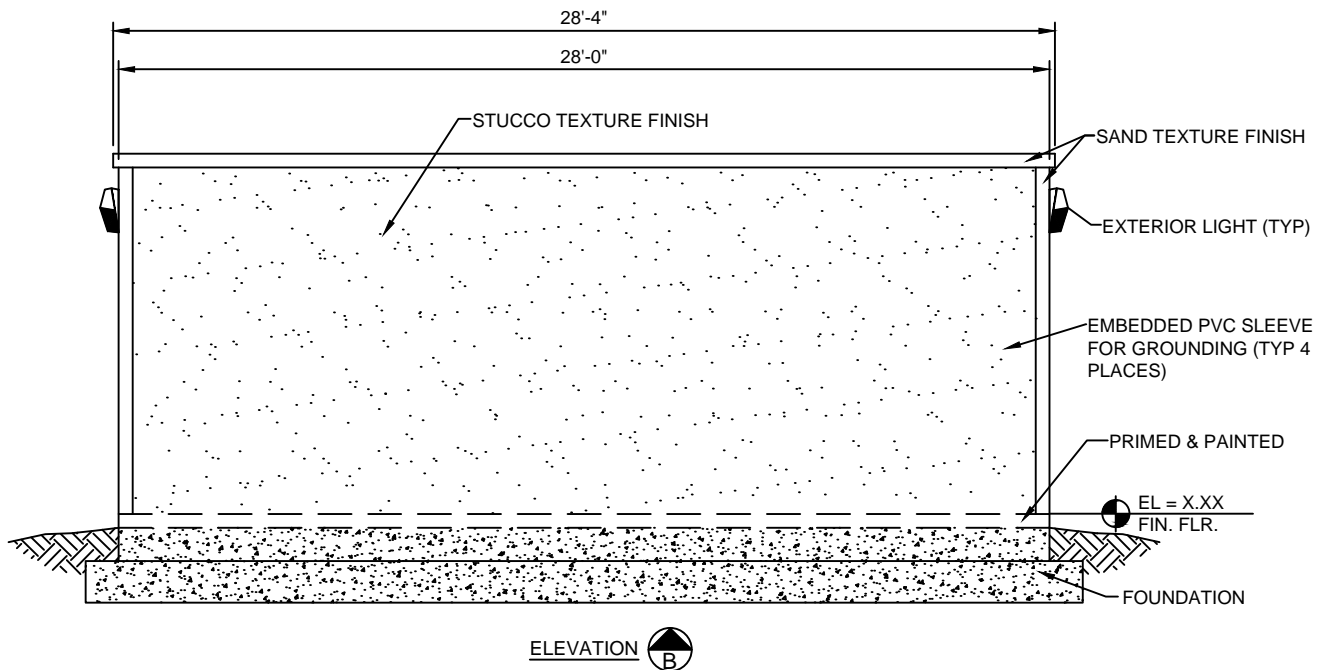
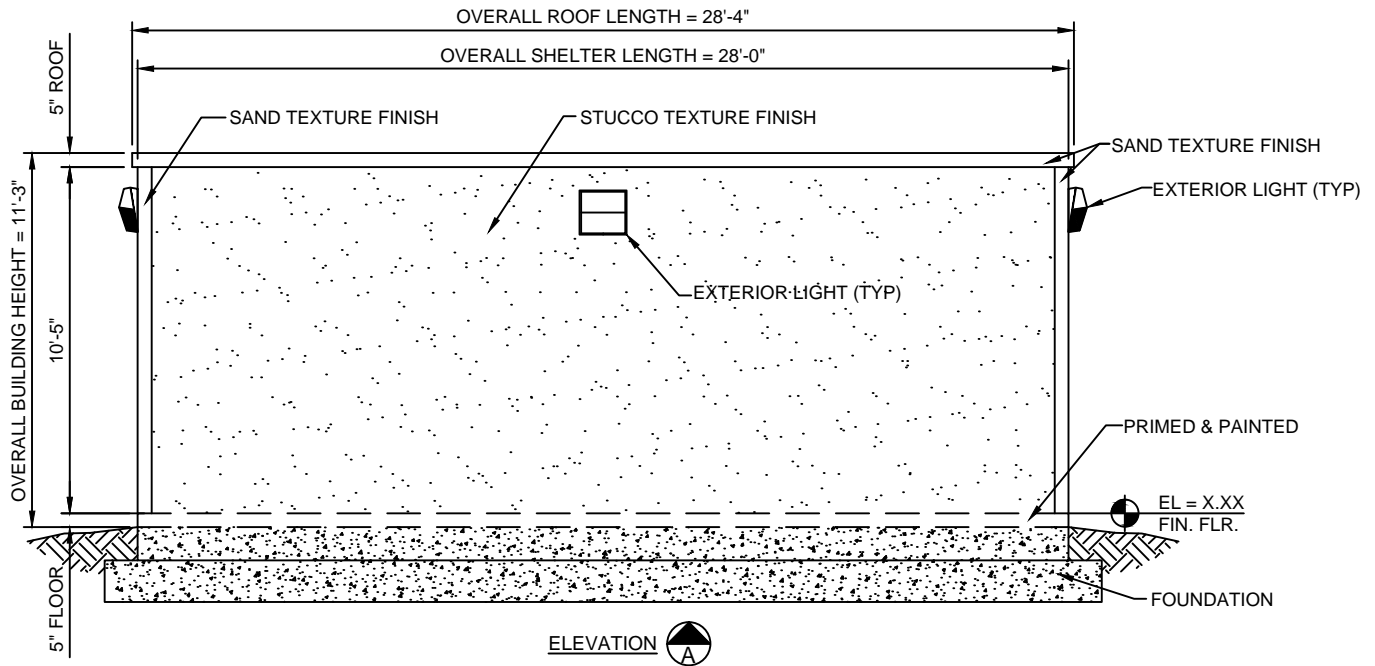
HARDWARE: ALL HARDWARE AND WEATHER STRIP SHALL BE 316 STAINLESS STEEL

DOOR HOOD: DOOR DRIP CAPS - 2.5" WIDE

FLOOR: PREPARED, PRIMED AND FINISHED SLIP RESISTANT GRAY COLOR

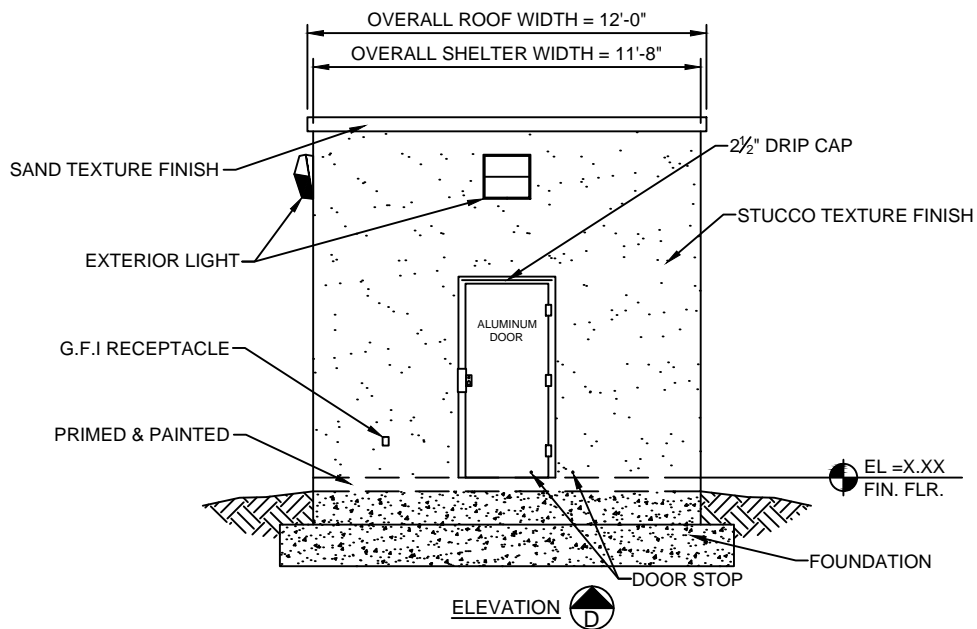
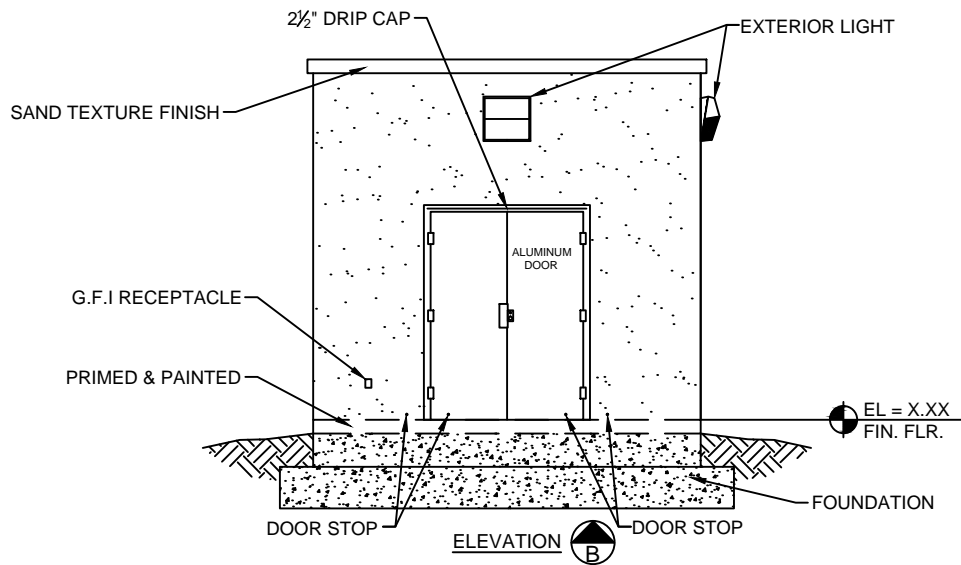
OPENINGS: FLOOR AND WALL BLOCK-OUTS PER FLOOR PLAN

PREFABRICATED CONCRETE ENCLOSURE



SEE PLATE 53A FOR PLAN AND NOTES

PREFABRICATED CONCRETE ENCLOSURE



SEE PLATE 53A FOR PLAN AND NOTES

PREFABRICATED CONCRETE ENCLOSURE

WATER & RECLAIM APPROVED MATERIALS**APPROVED
ITEM NUMBER****DESCRIPTION:****PAGE:****AW-100****PIPE**

AW – 101	Ductile Iron Pipe	X - 2
AW – 102	PVC Pipe (DR14 & DR18)	X - 3
AW – 103	PVC Pipe (SDR-21)	X - 4
AW – 104	PVC Pipe (SCH 40 & SCH 80)	X - 5
AW – 105	Polyethylene Tubing	X - 6
AW – 106	Galvanized Pipe	X - 7

AW-200**FITTINGS**

AW – 201	Ductile Iron Fitting	X - 8
AW – 202	Iron Tapping Sleeve	X - 9
AW – 203	Stainless Steel Tapping Sleeve	X - 10
AW – 204	PVC Solvent Weld Fitting	X - 11
AW – 205	SDR21 Push on Joint Fitting	X - 12
AW – 206	PVC Pressure Fitting	X - 13

AW-300**VALVES, HYDRANTS**

AW – 301	Valve Box and Cover	X - 14
AW – 302	Gate Valve	X - 15
AW – 303	NOT USED	X - 16
AW – 304	Tapping Valve	X - 17
AW – 305	Corporation Stop	X - 18
AW – 306	NOT USED	X - 19
AW – 307	Curb Stop	X - 20
AW – 308	Fire Hydrant	X - 21

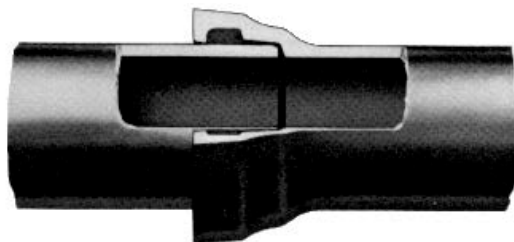
AW-400**COUPLINGS, RESTRAINERS**

AW – 401	Cast Coupling	X - 22
AW – 402	Boltless Coupling	X - 23
AW – 403	Full Circle Repair Clamp	X - 24
AW – 404	Accessory Pack	X - 25
AW – 405	NOT USED	X - 26
AW – 406	Restraints for PVC & D.I. Pipe	X - 27
AW – 407	PVC/D.I. Bell Restraining Device	X - 28
AW – 408	Mechanical Joint Fasteners	X - 29
AW – 409	Flange Adapter	X - 30
AW – 410	Brass Adapter & Coupler	X - 31
AW – 411	Service Saddle, Double Strap	X - 32
AW – 412	Service Saddle, Single Strap	X - 33
AW – 413	Casing Spacer	X - 34
AW – 414	Meter Box	X - 35

TOC - 1 of 1

AW-101

DUCTILE IRON PIPE



Note: Push on joint shown as example only (For additional joints, see specifications)

DESCRIPTION: Ductile Iron Pipe (D.I.P), cement lined. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	American Cast Iron Pipe Company	N/A
3-inch & larger	Clow/McWane Pipe Company	N/A
3-inch & larger	Griffin Pipe/ U.S. Pipe	N/A

AW-102**PVC PIPE (DR14 & DR18)**

DESCRIPTION: DR14 & DR18 Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch - 12	Diamond Plastics	N/A
4-inch - 12	JM Eagle	N/A
4-inch - 12	National Pipe & Plastics/National PVC)	N/A
4-inch - 12	North American Pipe Co. (NAPCO)	N/A
4-inch - 12	Ipex	N/A
4-inch - 12	Sanderson Pipe Corporation	N/A

DESCRIPTION: DR16 Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
16-inch	Diamond Plastics	N/A
16-inch	JM Eagle	N/A
16-inch	National Pipe & Plastics/National PVC)	N/A
16-inch	North American Pipe Co. (NAPCO)	N/A
16-inch	Ipex	N/A

AW-103

PVC PIPE (SDR-21)

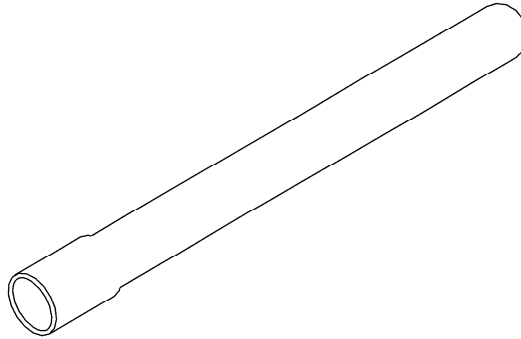


DESCRIPTION: PVC 1120, SDR 21 Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2-inch only	Diamond Plastics	N/A
2-inch only	JM Eagle	N/A
4-inch only	National Pipe & Plastics	N/A
2-inch only	North American Pipe Co. (NAPCO)	N/A

AW-104

PVC PIPE (SCH 40 & SCH 80)



DESCRIPTION: PVC SCH 40 & SCH 80 Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2-inch only	JM Eagle Manufacturing	N/A
2-inch only	National Pipe and Plastics	N/A
2-inch only	North American Pipe Co. (NAPCO)	N/A
2-inch only	Universal 100 / Accord	N/A
2-inch only	Charlotte Pipe & Fittings	N/A

AW-105

POLYETHYLENE TUBING

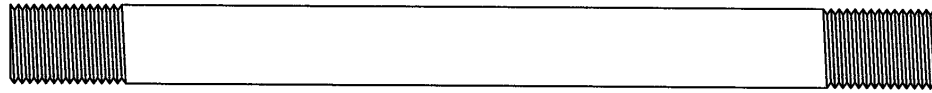


DESCRIPTION: PE 4710, SDR-9, Copper Tube Size, Polyethylene Tubing. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2-inch & smaller	Endot-Yardley	EndoPure
2-inch & smaller	Phillips Driscopipe/Performance Pipe	N/A
2-inch & smaller	Charter Plastics	Blue Ice
2-inch & smaller	Silver-Line Plastics	N/A
2-inch & smaller	Advance Drainage System	ADS PolyFlex

AW-106

GALVANIZED PIPE



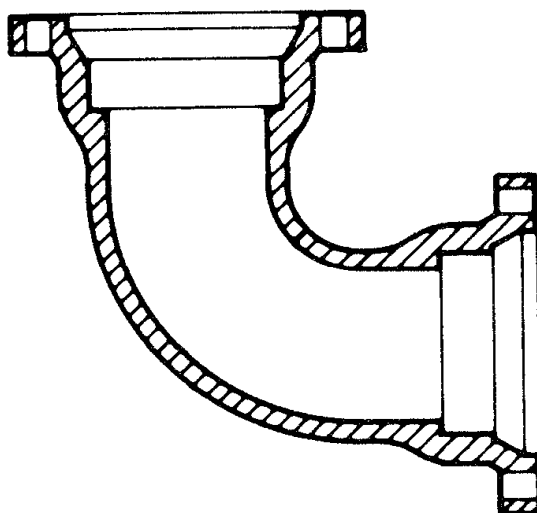
Note: For use in Contaminated Soil Sites only.

DESCRIPTION: Galvanized Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & smaller	Grinnell Corporation	N/A
4-inch & smaller	Seminole Tubing	N/A

AW-201

DUCTILE IRON FITTING



Note: Mechanical Joint, 90-degree bend, **shown** as example only (for additional joints & fittings, see specifications).

DESCRIPTION: Ductile Iron Fitting, cement-lined or JEA approved equal. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	Tyler Union	N/A
4-inch & larger	Star Pipe Products	N/A
3-inch & larger	Sigma Corp. (Russell Pipe)	N/A
3-inch & larger	SIP Industries	N/A

AW-202

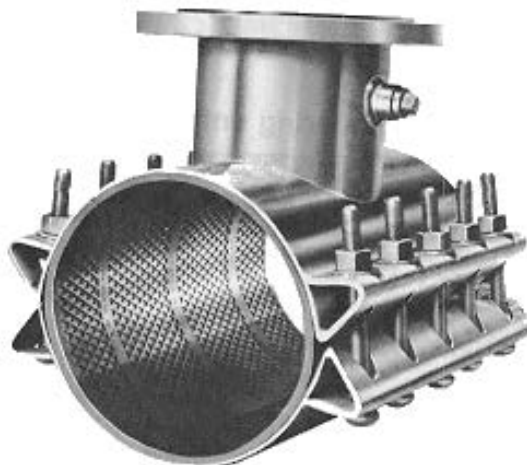
IRON TAPPING SLEEVE



Note: Mechanical Joint Shown as example only (for additional joints, see specifications).

DESCRIPTION: Iron Tapping Sleeve. See Chapter III. 2. - Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter VI. 2. - Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements. This sleeve shall not be utilized on PVC pipe larger than 12-inch.

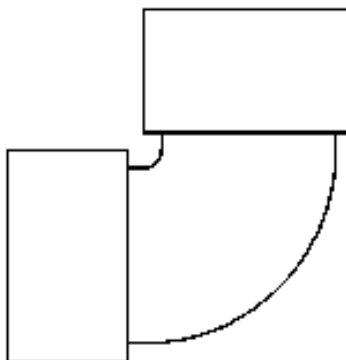
SIZE	MANUFACTURER	MODEL #
4-inch & larger	American Cast Iron Pipe Company	1004
4-inch & larger	Clow Valve	F-5205
4-inch & larger	M & H Valve Company	1574
4-inch & larger	Mueller Company	H-615, H-616, H-619
4-inch & larger	Tyler Union	5-149-CI
4-inch & larger	US Pipe	N/A
30-inch & larger	Smith-Blair (Carbon Steel)	623

AW-203**STAINLESS STEEL TAPPING SLEEVE**

Note: Must be all stainless steel, no dissimilar metals allowed.

DESCRIPTION: Stainless Steel Tapping Sleeve. See Section 351 of the current JEA Standards for specifications and requirements. See section 702 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch & larger	Cascade	CST-EX
4-inch & larger	Dresser Inc.	630
4-inch & larger	Ford Meter Box Company	FAST Series, FTSS
4-inch & larger	JCM Industries, Inc.	432, 439, 452 (14-inch and larger)
4-inch & larger	Power Seal	3490, 3490 MJ (8-inch and smaller)
4-inch & larger	Romac Industries, Inc.	SST
4-inch & larger	Smith-Blair	663 & 665
4-inch & larger	Mueller	H304

AW-204**PVC SOLVENT WELD FITTING**

DESCRIPTION: Schedule 40 & 80 Solvent Weld Fittings. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2-inch only	Chemtrol/NIBCO	N/A
2-inch only	Ipex	N/A
2-inch only	Lasco Fittings, Inc.	N/A
2-inch only	Georg Fisher Sloane Manufacturing	N/A
2-inch only	Spears Manufacturing	N/A
2-inch only	Charlotte Pipe and Foundry Co	N/A

AW-205**SDR 21 PUSH ON JOINT FITTING**

DESCRIPTION: PVC 1120, SDR 21 Push On Joint Fittings. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2-inch	Ipex	N/A

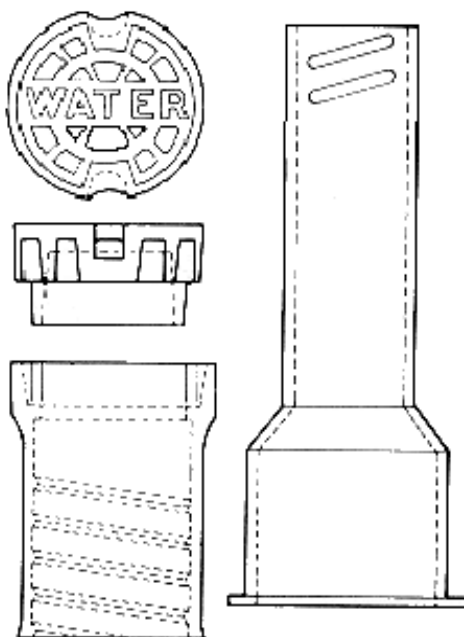
AW-206**PVC PRESSURE FITTING**

DESCRIPTION: PVC C900, DR18 Injection Molded, Push on Joint (pressure) Fittings. See Chapter III. 1.
- Section 350 of the current JEA Standards for specifications and requirements. See
Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch-12	Harco	N/A
4-inch-12	Ipex	N/A
4-inch-12	Multi-Fittings	N/A

AW-301

VALVE BOX AND COVER



DESCRIPTION: Valve Box and Cover. See Section 351 of the current JEA Standards for specifications and requirements. See Section 702 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
N/A	Tyler Pipe	461-S, Heavy Duty
N/A	Sigma Corp. (Russell Pipe)	VB-26, Heavy Duty
N/A	U.S. Foundry	7500, Heavy Duty
N/A	East Jordan Iron Works	461S, Heavy Duty
N/A	Star Pipe Products	VB 461 SHD, Heavy Duty

AW-302

GATE VALVE



Note: All valves shall open by turning to the left. Mechanical joint shown as example only. See specifications for additional joints.

DESCRIPTION: Resilient Seat Gate Valve. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

GATE VALVE (SIZE)	MANUFACTURER	M.JT. MODEL #
3-inch & larger	American Flow Control	2500 Series
3-inch & larger	AVK (S/S Stem Only)	Series 45
3-inch & larger	Clow Valve	F-6100
3-inch & larger	Kennedy Valve Company	8571
3-inch & larger	Mueller	A2360, A2361
3-inch & larger	M & H Valve Company	4067
3-inch & larger	U.S. Pipe	250
3-inch to 12-inch	United Water Product	2010
3-inch & larger	Mueller Co	A-2361 Series
3-inch & larger	American – RD	D100
Pressure Control Valves (Requires specification from design engineer)		
4-inch & larger	Bermad	730
4-inch & larger	Singer Valve	106RPS
4-inch & larger	Flowmatic	COOO/CAOO

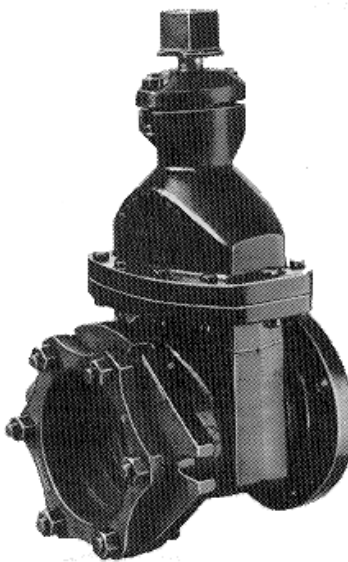


AW-303

NOT USED

AW-304

TAPPING VALVE

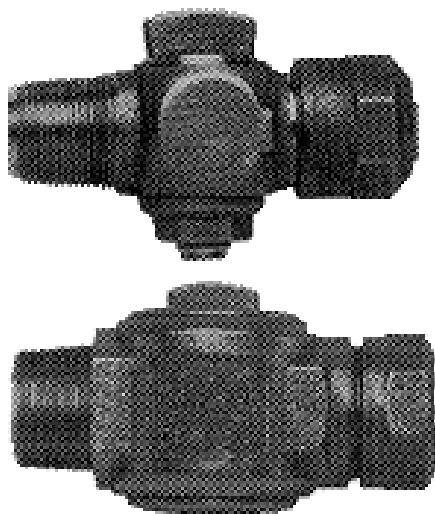


DESCRIPTION: Tapping Valve. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	American Flow Control	N/A
3-inch & larger	AVK (S/S Stem Only)	25/30081
3-inch & larger	Clow Valve	F-6114, 2638
3-inch & larger	Kennedy Valve Company	950-X
3-inch & larger	M & H Valve	4751
3-inch & larger	Mueller	T-2360, T-2361
3-inch & larger	U.S. Pipe	5860
3-inch & larger	Mueller-Aqua Grip	A-2361-76
3-inch & larger	American – RD	N/A

DESCRIPTION: Insert-A-Valve: See Chapter IV. 4. - Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch thru 8-inch	ROMAC	310 Sleeve w/ 361 valve
10" thru 12"	ROMAC	311 Sleeve w/ 358 valve
14-inch & larger	Submittal and JEA Approval	Special Case

AW-305**CORPORATION STOP**

Note: Only full port valves are allowed.

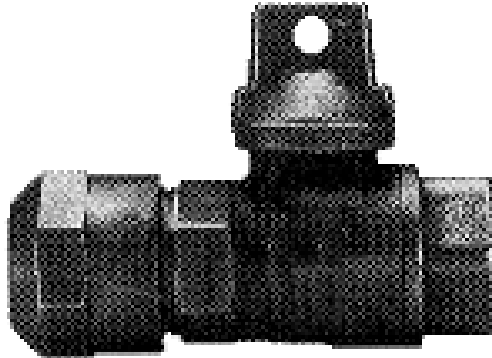
DESCRIPTION: Corporation Stop Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

SIZE BRASS	MANUFACTURER	MODEL #
2-inch & smaller	Ford Meter Box Company	1000 Series
2-inch & smaller	A.Y. McDonald Mfg.	4700 Series
2-inch & smaller	Mueller	H Series
2-inch & smaller	Mueller	B Series
2-inch & smaller	James Jones Company	N/A
2-inch & smaller	Cambridge Brass	N/A

AW-306

NOT USED

AW-307 CURB STOP



Note: Only full port valves are allowed.

DESCRIPTION: Curb Stop, Ball Valve. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

SIZE BRASS	MANUFACTURER	MODEL #
2-inch & smaller	Ford Meter Box Company	B11 Series (w/lockwing, FIPxFIP)
2-inch & smaller	Ford Meter Box Company	B41 Series (w/lockwing)
2-inch & smaller	McDonald A.Y. McDonald Mfg	6100 Series (w/lockwing)
2-inch & smaller	Mueller	B20200 (w/lockwing, FIPxFIP)
2-inch & smaller	Mueller	B25170 (w/lockwing)
2-inch & smaller	James Jones	N/A
2-inch & smaller	Cambridge Brass	N/A

AW-308

FIRE HYDRANT



Note: All fire hydrants for JEA dedication shall be painted Yellow.

DESCRIPTION: 5¼" Fire Hydrant. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements.

MANUFACTURER	MODEL #
American Flow Control	B-84-B
M & H Valve Company	129
Mueller Co	A-423
US Pipe/Muller	Met M94
AVK	2780

Note: It is intended that this JEA approved material will be considered acceptable for the next 10 year period (till year 2015), unless new technology exists or if it is in the best interest of JEA to revise the approved material list.

AW-401

CAST COUPLING



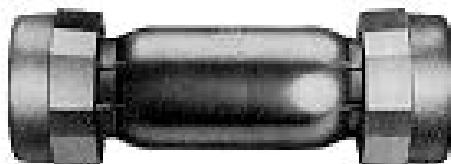
Note: O.D. Ranges may vary. Refer to manufacturer's specifications.

DESCRIPTION: Cast Coupling. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
4-inch & larger	Cascade	CDC, CRC, CRFA
4-inch & larger	Dresser Inc.	153, 262
4-inch & larger	Ford Meter Box	FC2A, FC2W
4-inch & larger	JCM Industries	210
4-inch & larger	PowerSeal	3501, 3501B, 3521
4-inch & larger	Romac	501
4-inch & larger	Smith-Blair	441
4-inch & larger	TPS, Hymax	2000
2-inch & larger	Mueller	MAXIFIT
4-inch & larger	Mueller Aqua Grip	

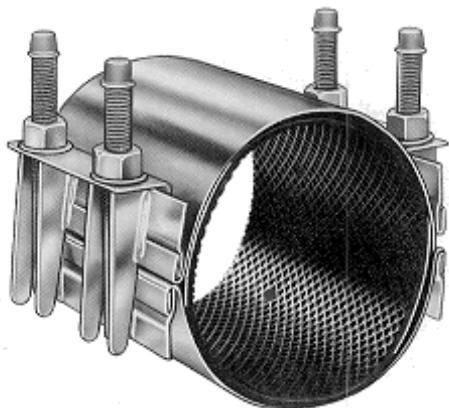
AW-402

BOLTLESS COUPLING



DESCRIPTION: Boltless Coupling (Long or Short type). See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
2-inch & smaller	Dresser Inc.	Style 65
2-inch & smaller	Smith-Blair	525
2-inch & smaller	TPS	Series 6000

AW-403**FULL CIRCLE REPAIR CLAMP**

DESCRIPTION: Full Circle Repair Clamp (stainless steel). See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
All Sizes	Cascade	CDR1, CDR2, CDR3
All Sizes	Dresser Inc.	360
All Sizes	The Ford Meter Box Co, Inc	"F", "FS" Series
All Sizes	JCM Industries	101, 131
All Sizes	JCM Industries	102, 132
All Sizes	Powerseal	3121, 3122
All Sizes	Romac	"SS", "CL" Series
All Sizes	Smith Blair	Series 226, 256
All Sizes	Smith Blair	Series 228, 263
All Sizes	TPS, EZ-MAX	Model 4000
All Sizes	Mueller	500, 510, 540, 550

AW-404

ACCESSORY PACK



DESCRIPTION: Accessory Pack, See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
3-inch & larger	American Cast Iron Pipe Company	N/A
3-inch & larger	Clow Valve	N/A
3-inch & larger	Tyler Union	N/A
3-inch & larger	Sigma	N/A
3-inch & larger	U.S. Pipe	N/A
3-inch & larger	Star Pipe Products	N/A



AW-405

NOT USED

AW-406

RESTRAINTS FOR PVC & D.I. PIPE

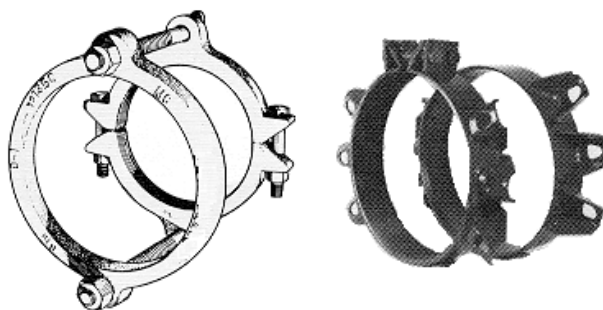


DESCRIPTION: Restraints for PVC or D.I. Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
All Sizes	EBAA Iron	1100 (Ductile Pipe Only)
All Sizes	EBAA Iron	2000 PV, 2000 SV (PVC Pipe Only)
All Sizes	The Ford Meter Box Co, Inc (Uniflange)	1400 (Ductile Pipe Only)
All Sizes	The Ford Meter Box Co, Inc (Uniflange)	1500 (PVC Pipe Only)
All Sizes	Sigma (Russell Pipe)	One-Lok SLCE (PVC Pipe Only)
All Sizes	Sigma (Russell Pipe)	One-Lok SLDE (Ductile Pipe Only)
All Sizes	Star Pipe Products	Stargrip 3000 (Ductile Pipe Only)
All Sizes	Star Pipe Products	AllGrip (Ductile/PVC Pipe)
All Sizes	Star Pipe Products	Stargrip 4000 (PVC Pipe)
All Sizes	Tyler Union	TUFGrip (Ductile-TLD/PVC-TLP Pipe)

AW-407

PVC & D.I. BELL RESTRAINING DEVICE

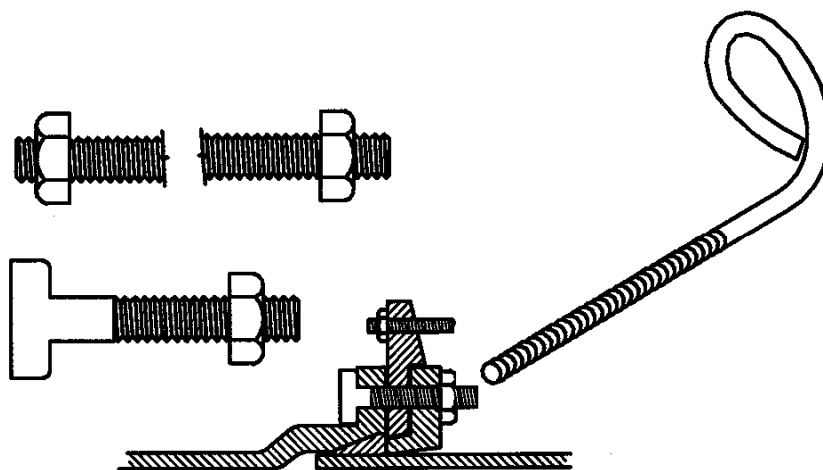


DESCRIPTION: Bell Restraining Devices. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
All Sizes	EBAA Iron	1500, 1600 Series (PVC/Ductile)
All Sizes	EBAA Iron	2500 Series (PVC Only)
All Sizes	EBAA Iron	2800 Series (PVC Only)
All Sizes	The Ford Meter Box Co, Inc (Uniflange)	1300 Series (PVC/Ductile)
All Sizes	The Ford Meter Box Co, Inc (Uniflange)	1350, 1360 Series (PVC Only)
All Sizes	The Ford Meter Box Co, Inc (Uniflange)	1390 Series (PVC/Ductile)
All Sizes	JCM	610 Series (PVC/Ductile)
All Sizes	JCM	621 Series (PVC/Ductile)
All Sizes	Romac	Grip Ring (PVC/Ductile)
All Sizes	Star Pipe Products, Inc.	1000, 1100 (PVC/Ductile), 1200 (PVC Only) Series
All Sizes	Star Pipe Products, Inc.	ALLGRIP 3600 (PVC/Ductile),
All Sizes	Star Pipe Products, Inc.	Stargrip 3100(Ductile only), 4100 (PVC Only)
All Sizes	Sigma (Russell Pipe)	PWP(PVC/Ductile)
All Sizes	Tyler Union	3000 (PVC Only)

AW-408

MECHANICAL JOINT FASTENERS

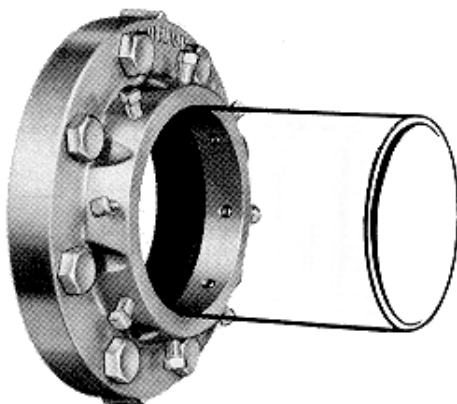


DESCRIPTION: Mechanical Joint Fasteners. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model #
	Tie Lugs:	
	See Specifications	
	All Thread Rods:	
	See Specifications	
	Eye Bolts:	
	See Specifications	
	Nuts & Washers:	
	See Specifications	

AW-409

FLANGE ADAPTER



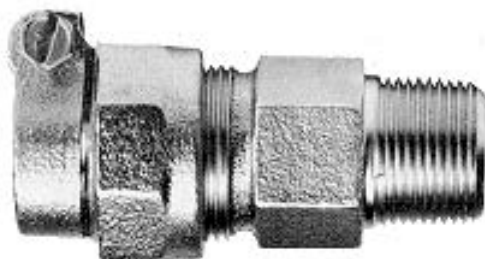
DESCRIPTION: Flange Adapters. See Section 350 of the current JEA Standards for specifications and requirements. See Section 701 for Reclaimed Water specifications and requirements.

The use of flange adapters shall be limited to areas specifically approved by JEA on a project-by-project basis.

Size	Manufacturer	Model #
3-inch & larger	EBAA	Series 1000 DIP
3-inch & larger	EBAA	Series 2100 DIP
3-inch & larger	The Ford Meter Box Co, Inc (Uni-flange)	200 C & S
3-inch & larger	The Ford Meter Box Co, Inc (Uni-flange)	400 C & S
3-inch & larger	The Ford Meter Box Co, Inc (Uni-flange)	900 C & S
3-inch & larger	The Ford Meter Box Co, Inc (Uni-flange)	UFA-200 DIP
3-inch & larger	The Ford Meter Box Co, Inc (Uni-flange)	UFA-900 PVC
3-inch & larger	Star Pipe	Series 200G
3-inch & larger	Star Pipe	Series 400G

AW-410

BRASS ADAPTER & COUPLER



DESCRIPTION: Brass Adapters & Couplers. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

Size	Manufacturer	Model # See Specifications for Configuration and Sizing.
2-inch & smaller	The Ford Meter Box Co, Inc	
2-inch & smaller	McDonald A.Y. McDonald Mfg	
2-inch & smaller	Mueller	
2-inch & smaller	James Jones	
2-inch & smaller	Cambridge Brass	

AW-411

SERVICE SADDLE, DOUBLE STRAP



Note: Select desired saddle O.D. range which specifically matches outside diameter of pipe. Saddles for C-900 shall be sized to the exact O.D. size for proper fit. A double strap saddle will be required for all wet taps and are acceptable for installation on dry water supply mains (all sizes).

DESCRIPTION: Service Saddle shall be epoxy or poly coated with double stainless steel straps. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

Outlet Size	Manufacturer	Model #
2-inch & smaller	Cascade	CDS2/CDS-LD
2-inch & smaller	Dresser Inc.	291DS
2-inch & smaller	The Ford Meter Box Co.	FC – 202, 202BS
2-inch & smaller	JCM Industries	406
2-inch & smaller	Smith Blair	317
2-inch & smaller	Mueller	DR 25
2-inch & smaller	Power Seal	3417, 3409

AW-412

SERVICE SADDLE, SINGLE STRAP



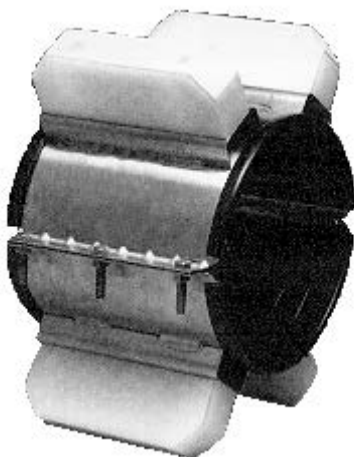
Note: Select desired saddle O.D. range which specifically matches outside diameter of pipe. Saddles for C-900 shall be sized to the exact O.D. size for proper fit. Single Strap Saddle is approved for new 1-inch water services only which are installed on dry water main, sized 4-inch through 10 inch.

DESCRIPTION: Service Saddle shall be epoxy or poly coated with single stainless steel straps. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter VI. 2. - Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

Outlet Size	Manufacturer	Model #
1-inch & smaller	Cascade	CDS2
1-inch & smaller	Dresser Inc.	291-SS
1-inch & smaller	Ford Meter Box Company	FC-101
1-inch & smaller	JCM Industries	405
1-inch & smaller	Smith Blair	315
1-inch & smaller	Mueller	DR1S
1-inch & smaller	Power Seal	3417, 3409

AW-413

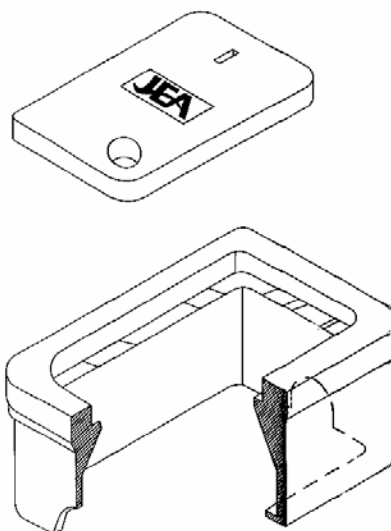
CASING SPACER



DESCRIPTION: Casing Spacers. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
Varies	Cascade	CCS
Varies	PSI Pipeline Seal & Insulator Co	S/S Type
Varies	PSI Pipeline Seal & Insulator Co	PVC Coated Steel
Varies	RACI	High Density Polyethylene
Varies	Advanced Products & Systems, Inc.	SSI, SI, CI
Varies	BWM Company	
Varies	CCI Pipeline Systems	CSC, CSS

AW-414 METER BOX



DESCRIPTION: Meter Box. See Chapter III. 2. - Section 351 of the current JEA Standards for specifications and requirements. See Chapter V. 2. - Section 702 for Reclaimed Water specifications and requirements.

Size	Box	Model #
N/A	Glasmasters	N/A
N/A	Southern Meter Box	N/A
N/A	Pentek	N/A

Size	Top	Model #
N/A	Glasmasters	N/A
N/A	Southern Meter Box	N/A
N/A	Pentek	N/A

WASTEWATER APPROVED MATERIALS**APPROVED
ITEM NUMBER****DESCRIPTION:****PAGE:****AS-100****PIPE**

AS - 101	NOT USED	XI. - 2
AS - 102	PVC Pressure (DR18) Pipe	XI. - 3
AS - 103	PVC Gravity Pipe (SDR26)	XI. - 4
AS - 104	PVC Pipe (SCH 40 & SCH 80)	XI. - 5

AS-200**FITTINGS**

AS - 201	Ductile Iron Fittings	XI. - 6
AS - 202	NOT USED	XI. - 7
AS - 203	Stainless Steel Tapping Sleeve	XI. - 8
AS - 204	PVC Solvent Weld Fitting	XI. - 9
AS - 205	PVC Gravity Fitting (SDR26)	XI. - 10
AS - 206	PVC Pressure Fitting	XI. - 11

AS-300**VALVES**

AS - 301	Valve Box and Cover	XI. - 12
AS - 302	Gate Valve	XI. - 13
AS - 303	Tapping Valve	XI. - 14
AS - 304	Plug Valve	XI. - 15
AS - 305	Check Valve	XI. - 16
AS - 306	Air Valve	XI. - 17

AS-400**COUPLINGS, CLAMPS, RESTRAINERS**

AS - 401	Full Circle 2" Tapping Saddle for ARV	XI. - 18
AS - 402	Restraints for PVC or D.I. Pipe	XI. - 19
AS - 403	PVC/D.I. Bell Restraining Device	XI. - 20
AS - 404	Accessory Pack	XI. - 21
AS - 405	Mechanical Joint Fastener	XI. - 22
AS - 406	Flange Adapter	XI. - 23
AS - 407	Casing Spacer	XI. - 24
AS - 408	Cast Coupling	XI. - 25
AS - 409	Full Circle Repair Clamp	XI. - 26

AS-500**MANHOLES**

AS - 501	Manhole and Accessories	XI. - 27
AS - 502	Protective Coating	XI. - 28
AS - 503	Manhole Adjustment Ring	XI. - 29
AS - 504	Manhole Frame and Cover	XI. - 30

AS-600**PUMP STATIONS**

AS - 601	Aluminum Hatch (Frame and Cover)	XI. - 31
AS - 602	Concrete Liner	XI. - 32
AS - 603	Wastewater Pump	XI. - 33
AS - 604	Electrical and Control Panel & VFD	XI. - 34

TOC - 1 of 1

AS-101

NOT USED

AS-102

PVC PRESSURE (DR18) PIPE



DESCRIPTION: DR18 PVC Pipe. See Chapter IV. 2. - Section 428 & Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch – 48	Diamond Plastics	N/A
4-inch – 48	JM Eagle	N/A
4-inch – 30	National Pipe & Plastics	N/A
4-inch – 36	North American Pipe Co. (NAPCO)	N/A
4-inch – 48	Ipex	N/A
4-inch – 48	National Pipe & Plastics	N/A
4-inch – 12	Sanderson Pipe Corporation	N/A

DESCRIPTION: DR16 Pipe. See Chapter III. 1. - Section 350 of the current JEA Standards for specifications and requirements. See Chapter VI. 1. - Section 701 for Reclaimed Water specifications and requirements.

SIZE	MANUFACTURER	MODEL #
16-inch	Diamond Plastics	N/A
16-inch	JM Eagle	N/A
16-inch	National Pipe & Plastics/National PVC)	N/A
16-inch	North American Pipe Co. (NAPCO)	N/A
16-inch	Ipex	N/A

AS-103

PVC GRAVITY PIPE

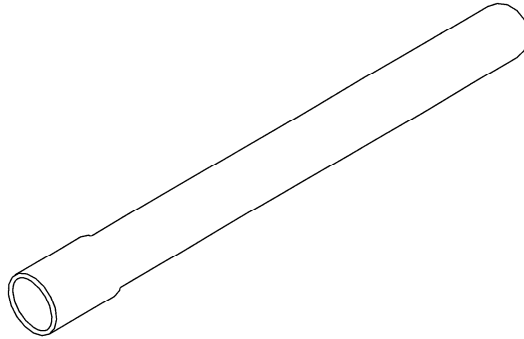


DESCRIPTION: PVC SDR 26: See Chapter IV. 2. - Section 428 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
6-inch & larger	Charlotte Pipe	N/A
6-inch & larger	Diamond Plastics Corp	N/A
6-inch & larger	JM Eagle	N/A
6-inch & larger	National Pipe & Plastics	N/A
6-inch & larger	North American Pipe Co. (NAPCO)	N/A
6-inch & larger	Sanderson Pipe Co.	N/A
6-inch & larger	HAWK Plastics Corporation	SDR-26

AS-104

PVC PIPE (SCH 40 & SCH 80)

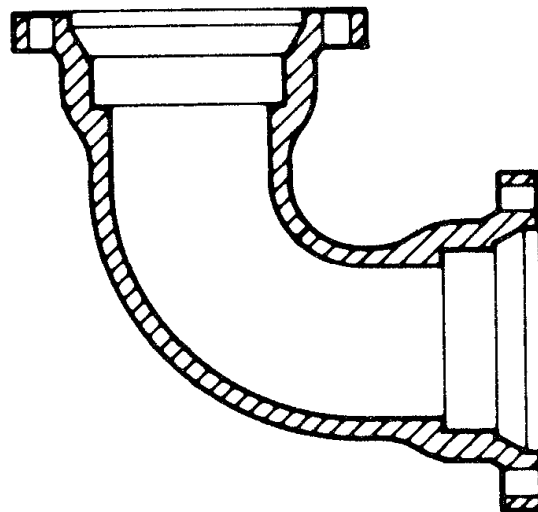


DESCRIPTION: PVC SCH 40 or 80 Pipe. See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & smaller	JM Eagle	
3-inch & smaller	National Pipe & Plastics	
3-inch & smaller	North American Pipe Co. (NAPCO)	
3-inch & smaller	Sanderson Pipe Company	
3-inch & smaller	Accord Industries	
3-inch & smaller	Charlotte Pipe & Foundry	

AS-201

DUCTILE IRON FITTINGS



Note: Mechanical joint, 90-degree bend & fittings, shown as example only (for additional joints, see specifications).

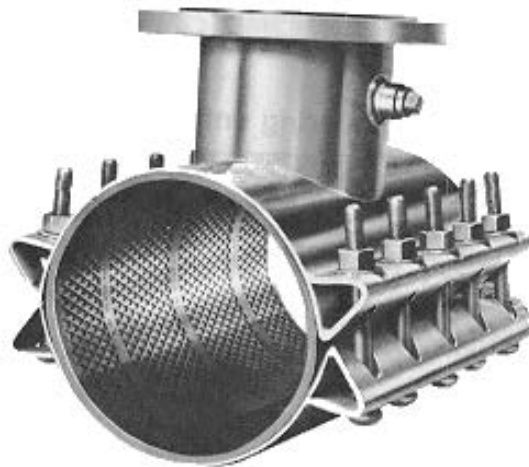
DESCRIPTION: Ductile Iron Fitting, epoxy-lined. See Sections 428 & Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	Tyler Union	N/A
3-inch & larger	Star Pipe Products	N/A
3-inch & larger	Sigma Corporation (Russell Pipe)	N/A
3-inch & larger	SIP Industries	N/A

AS-202
NOT USED

AS-203

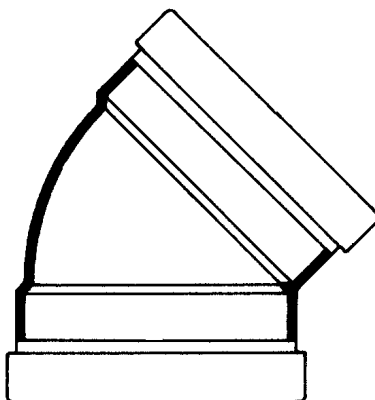
STAINLESS STEEL TAPPING SLEEVE



Note: Must be all stainless steel, no dissimilar metals allowed.

DESCRIPTION: Stainless Steel Tapping Sleeve. See Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch & larger	Cascade	CST-EX
4-inch & larger	Dresser Inc.	630
4-inch & larger	Ford Meter Box Company	FAST Series, FTSS
4-inch & larger	JCM Industries, Inc.	432, 439, 452, (taps 14-inch and larger)
4-inch & larger	Power Seal	3490, 3490MJ (8-inch and smaller)
4-inch & larger	Romac Industries, Inc.	SST
4-inch & larger	Smith-Blair	N/A
4-inch & larger	Mueller	H304

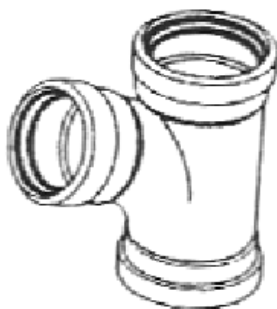
AS-204**PVC SOLVENT WELD FITTING**

DESCRIPTION: Schedule 40 and 80 Solvent Weld Fittings. See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & smaller	Ipex	
3-inch & smaller	Lascoe Fittings, Inc	
3-inch & smaller	Nibco	
3-inch & smaller	Georg Fischer Sloane	
3-inch & smaller	Spears	
3-inch & smaller	Charlotte Pipe & Foundry	

AS-205

PVC GRAVITY FITTING (SDR26)



DESCRIPTION: PVC Gravity Fitting (SDR26). See Chapter IV. 2. - Section 428 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
6-inch & larger	GPK Products, Inc	
6-inch & larger	Harco Inc.	
6-inch & larger	Multi Fittings	
6-inch & larger	Tigre-ADS USA	
6-inch & larger	Plastic Trends	

AS-206

PVC PRESSURE FITTING

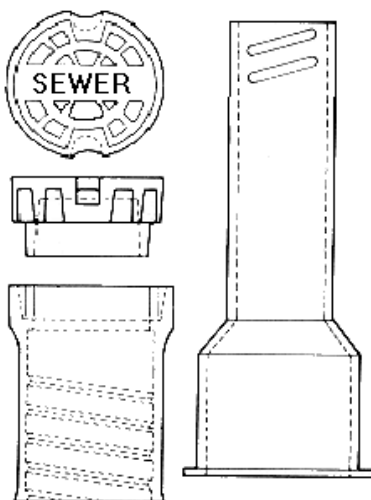


DESCRIPTION: For 12 inch and smaller (Pressure Fittings) - PVC C900, DR18 Injection Molded, Push On Joint Fittings. See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements. For 14 inch and larger (pressure Fittings) - PVC C905 Fabricated Fittings (no Tee Fitting). See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch – 12-inch	Harco Inc.	N/A
4-inch – 12-inch	Multi-Fittings	N/A
4-inch & larger	IPEX	N/A
14-inch & larger	Galaxy Plastics	N/A
14-inch & larger	Plastic Trends	N/A

AS-301

VALVE BOX AND COVER



DESCRIPTION: Valve Box and Cover. See Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
N/A	Tyler Union	461-S, Heavy Duty
N/A	Sigma (Russell Pipe)	VB-26, Heavy Duty
N/A	U.S. Foundry	7500, Heavy Duty
N/A	East Jordon Iron Works	461S, Heavy Duty
N/A	Star Pipe Products	VB 461 SHD, Heavy Duty

AS-302

GATE VALVE



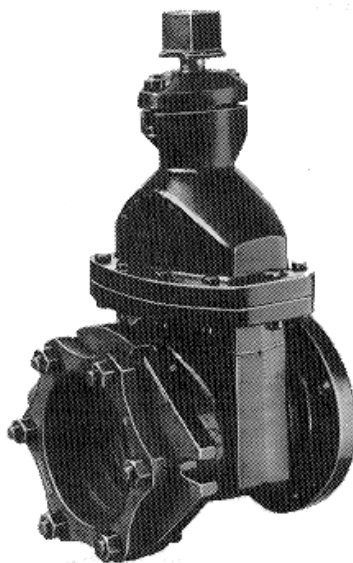
Note: All valves shall open by turning to the left.
Mechanical joint shown as example only. See specifications for additional joints.

DESCRIPTION: Resilient Seat Gate Valve. See Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	M.Jt. MODEL #
3-inch & larger	AVK (S/S Stem Only)	Series 45
3-inch & larger	American Flow Control	2500 Series
3-inch & larger	Clow Valve	F-6100
3-inch & larger	Kennedy Valve Company	8571
3-inch & larger	M & H Valve Company	4067
3-inch & larger	Mueller	A2360, 2361
3-inch & larger	U.S. Pipe	250
3-inch & larger	American – RD	D 100
3-inch to 12-inch	United Water Products	2010

AS-303

TAPPING VALVE



Note: All valves shall open by turning to the left.

DESCRIPTION: Tapping Valve. See Section 430 of the current JEA Standards for specifications and requirements.

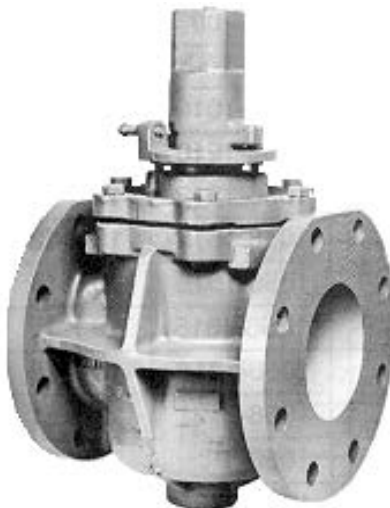
SIZE	MANUFACTURER	MODEL #
3-inch & larger	American Flow Control	N/A
3-inch & larger	AVK (S/S Stem Only)	25/30081
3-inch & larger	Clow Valve	F-6114
3-inch & larger	Kennedy Valve Company	8950
3-inch & larger	M & H Valve	4751
3-inch & larger	Mueller	T-2360, 2361
3-inch & larger	U.S. Pipe	5860
3-inch & larger	Mueller – Aqua Grip	A-2361-76
3-inch & larger	American – RD	N/A

DESCRIPTION: Insert-A-Valve: See Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
4-inch thru 8-inch	ROMAC	310 Sleeve w/361 valve
10" thru 12"	ROMAC	311 Sleeve w/358 valve
14-inch & larger	Submittal and JEA Approval	Special Case

AS-304

PLUG VALVE



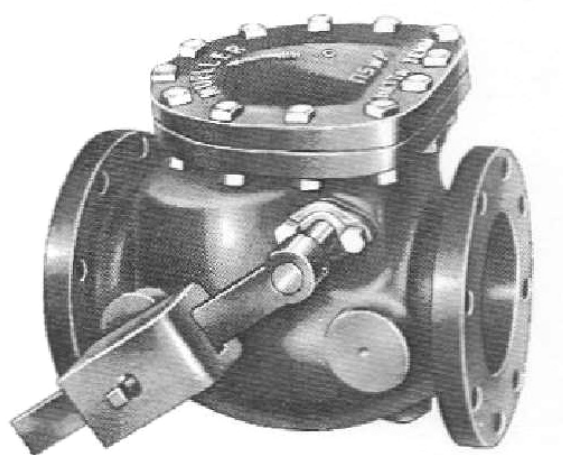
Note: Flange joint shown as example only. (For additional joints, see specifications.)

DESCRIPTION: Plug Valve. See Section 430 of the current JEA Standards for specifications and requirements. Actuator may be required to achieve 150 P.S.I. drip tight shut-off in both directions. Contact valve manufacturer for requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	Clow Valve	5412
3-inch & larger	Clow Valve	5413
3-inch & larger	Dezurik	5412
3-inch & larger	Dezurik	5413
3-inch & larger	TYCO/Keystone	Eccentric Valve
3-inch & larger	Milliken Valve or Mueller Water Products	600 N (MJ)
3-inch & larger	Milliken Valve/Mueller Water Products	601 N (FLG)
3-inch & larger	Henry Pratt Co	N/A
3-inch & larger	Val-Matic	N/A

AS-305

CHECK VALVE



DESCRIPTION: Check Valve. See Section 430 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	American Flow Control	50SC-LW
3-inch & larger	Clow Valve/Kennedy	106LW
3-inch & larger	M & H Valve	159-02
3-inch & larger	Mueller/CNNE(Charles Finch)/Milliken	8001
3-inch & larger	NIBCO	F938-31-BL&W
3-inch & larger	Matco-Norca	

AS-306

AIR VALVE



DESCRIPTION: Air Valve. See Section 430 of the current JEA Standards for specifications and requirements. It should be noted that, per the specification, valves may require back wash feature, stainless steel body or nylon plastic body and other requirements.

SIZE	MANUFACTURER	MODEL #
	AIR RELEASE VALVE	
Varies	A.R.I. USA	D-025-P (**)
	AIR COMBINATION VALVE (RELEASE & VACUUM)	
Varies	Vent-O-Mat	Series RGX (*)
Varies	A.R.I. USA	D-020, D-025 (***)
Varies	H-TEC USA	316TI (***)

Notes: (*) Denotes Stainless Steel Body.
(***) Stainless Steel or Nylon Body.

AS-401

FULL CIRCLE 2" TAPPING SADDLE FOR ARVS



DESCRIPTION: Full Circle 2" Tapping Saddle Stainless Steel (Banded) for ARVs. See Chapter V. 3. - Section 430 and Chapter III-Section 351 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
2" to 3"	Ford Meter Box, Co	FS313 Series
4" to 36"	Ford Meter Box, Co	FS323-FS343 Series
2" to 16"	Smith Blair	372 Series
2" to 24"	Romac	305/306 Series

AS-402

RESTRAINTS FOR PVC OR D.I. PIPE

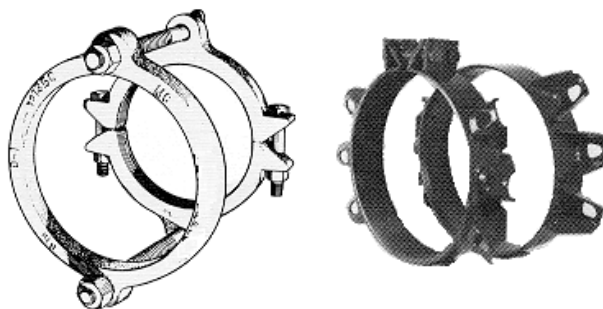


DESCRIPTION: Restraints for PVC or D.I. Pipe. See Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	EBAA Iron	1100 (Ductile Pipe Only)
3-inch & larger	EBAA Iron	2000 PV, 2000 SV (PVC Pipe Only)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1400 (Ductile Pipe Only)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1500 (PVC Pipe Only)
3-inch to 10-inch	Sigma (Russell Pipe)	One-Lok SLCE – (PVC pipe only)
12-inch & larger	Sigma (Russell Pipe)	One-Lok SLCE – (PVC pipe only)
3-inch & larger	Sigma (Russell Pipe)	One-Lok SLDE – (Ductile Pipe Only)
3-inch & larger	Star Pipe	Stargrip 3000 (Ductile Pipe Only)
3-inch & larger	Star Pipe	AllGrip (Ductile/PVC Pipe)
3-inch & larger	Star Pipe	Stargrip 4000 (PVC Pipe)
3-inch & larger	Tyler Union	TUFGrip (Ductile-TLD/PVC-TLP Pipe)

AS-403

PVC OR D.I. BELL RESTRAINING DEVICE



DESCRIPTION: Bell Restraining Devices. See Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	EBAA Iron	1500 Series (PVC/Ductile)
3-inch & larger	EBAA Iron	1600 Series (PVC/Ductile)
3-inch & larger	EBAA Iron	2500 Series (PVC Only)
3-inch & larger	EBAA Iron	2800 Series (PVC Only)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1300 Series (PVC/Ductile)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1350 Series (PVC Only)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1360 Series (PVC Only)
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	1390 Series (PVC/Ductile)
3-inch & larger	JCM Industries	610 Series (PVC/Ductile)
3-inch & larger	JCM Industries	621 Series (PVC/Ductile)
3-inch & larger	Romac	Grip Ring (PVC/Ductile)
3-inch & larger	Star Pipe Products, Inc.	ALLGRIP 3600 (PVC/Ductile)
3-inch & larger	Star Pipe Products, Inc.	1000, 1100 (PVC/Ductile), 1200 (PVC Only) Series
3-inch & larger	Star Pipe Products, Inc.	Stargrip 3100 (Ductile Only), 4100 (PVC Only)
3-inch & larger	Tyler Union	3000 (PVC Only)
3-inch & larger	Sigma (Russell Pipe)	PWP(PVC/Ductile)

AS-404

ACCESSORY PACK

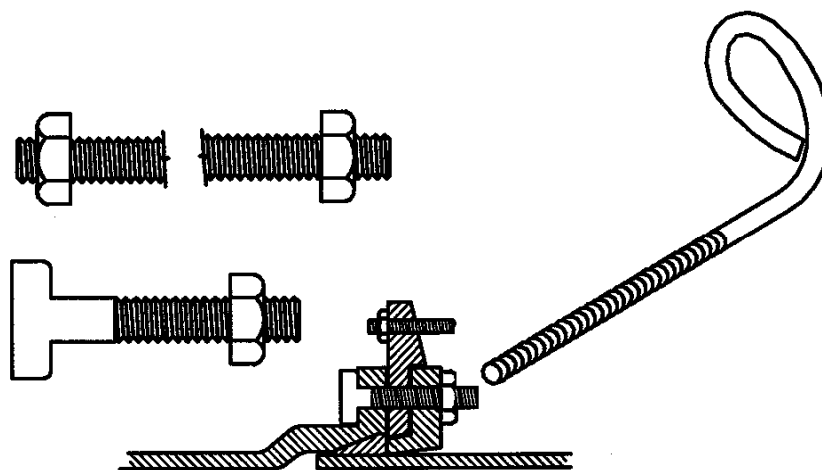


DESCRIPTION: Accessory Pack. See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	American Cast Iron Pipe Company	N/A
3-inch & larger	Clow Valve	N/A
3-inch & larger	Tyler Union	N/A
3-inch & larger	U.S. Pipe and Foundry	N/A
3-inch & larger	Sigma	N/A
3-inch & larger	Star Pipe Products	N/A

AS-405

MECHANICAL JOINT FASTENER

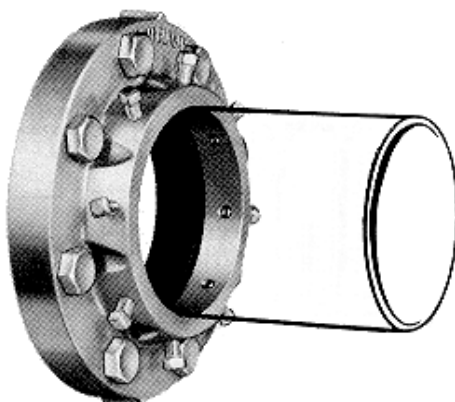


DESCRIPTION: Mechanical Joint Fasteners. See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
	Tie Lugs	
	See Specifications	
	All Thread Rods	
	See Specifications	
	Eye Bolts	
	See Specifications	
	Nuts & Washers	
	See Specifications	

AS-406

FLANGE ADAPTER

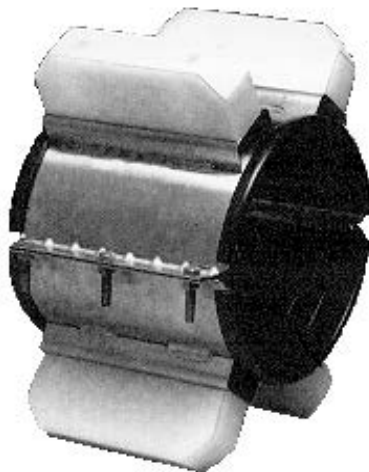


DESCRIPTION: Flange Adapters. See Section 429 of the current JEA Standards for specifications and requirements. The use of flange adapters shall be limited to areas specifically approved by JEA on a project-by-project basis.

SIZE	MANUFACTURER	MODEL #
3-inch & larger	EBAA	Series 1000 DIP only
3-inch & larger	EBAA Iron	Series 2100 PVC or DI
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	200 C & S 400 C & S 900 C & S
3-inch & larger	The Ford Meter Box Co, Inc (Uniflange)	UFA-200 DIP UFA-900 PVC
3-inch & larger	Star Pipe	Series 200G Series 400G

AS-407

CASING SPACER



DESCRIPTION: Casing Spacers. See Sections 428 & Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
Varies	Cascade	CCS
Varies	Pipeline Seal & Insulator, Co	S/S Type
Varies	Pipeline Seal & Insulator, Co	PVC Coated Steel
Varies	Pipeline Seal & Insulator, Co	Ranger II
Varies	Raci Spacers	High Density Polyethylene
Varies	BWM Company	N/A
Varies	Advanced Products & Systems	SSI, SI, CI
Varies	CCI Pipeline Systems	CSC, CSS

AS-408

PIPE COUPLING



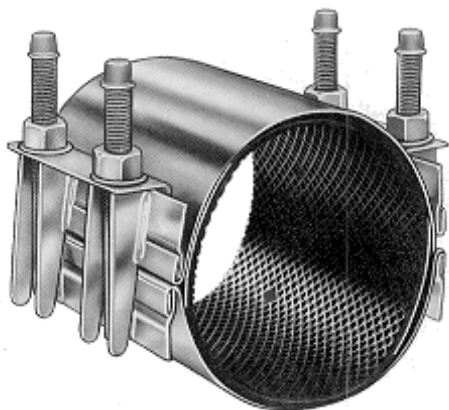
Note: O.D. Ranges may vary. Refer to manufacturer's specifications.

DESCRIPTION: Cast Coupling. See Chapter IV. 2. - Section 428 of the current JEA Standards for specifications and requirements, including coating requirements.

SIZE	MANUFACTURER	MODEL #
4-inch & larger	Cascade	CDC, CRC, CRFA
4-inch & larger	Dressler Inc.	153
4-inch & larger	Ford Meter Box	FC2A, FC2N
4-inch & larger	JCM	210
4-inch & larger	PowerSeal	3501, 3501B, 3506, 3521
4-inch & larger	Romac	501
4-inch & larger	Smith-Blair	441
4-inch & larger	TPS, Hymax	2000
4-inch & larger	Mueller	MAXIFIT
4-inch & larger	Mueller Co	N/A
4-inch & larger	FERNCO	5000

AS-409

FULL CIRCLE REPAIR CLAMP

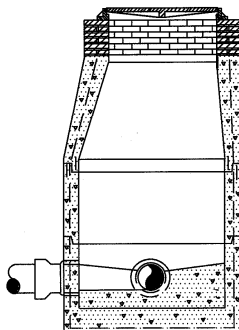


DESCRIPTION: Full Circle Repair Clamp (stainless steel). See Chapter IV. 3. - Section 429 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
All Sizes	Ford Meter Box, Co	"F" or "FS" Series
All Sizes	Dresser Inc.	360
All Sizes	JCM Industries	101 or 131
All Sizes	JCM Industries	102 or 132
All Sizes	Powerseal	3121 or 3122
All Sizes	Romac	"SS" or "CL" Series
All Sizes	Smith Blair	Series 226 or 256
All Sizes	Smith Blair	Series 228 or 263
All Sizes	TPS, EZ-MAX	Model 4000
All Sizes	Mueller Co.	500, 510, 540, 550

AS-501

MANHOLE AND ACCESSORIES

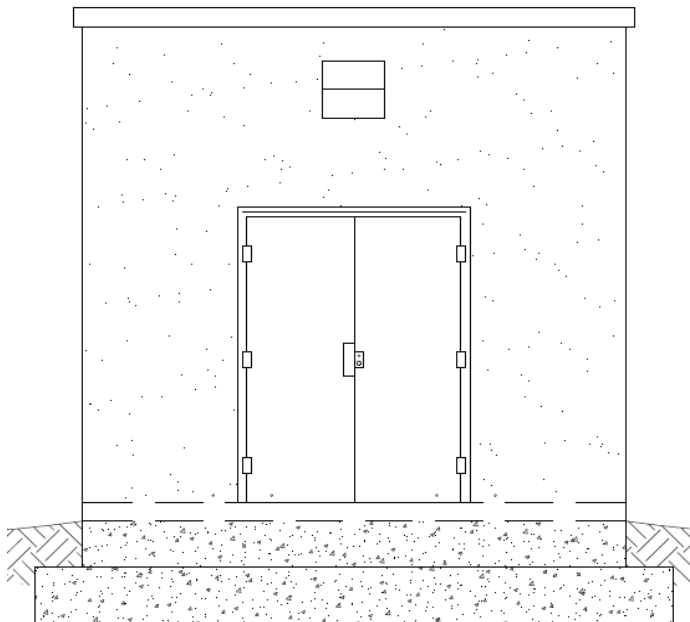


DESCRIPTION: Manhole and Accessories. See Section 427 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
Manhole and Accessories		
Varies	Standard Precast	N/A
Varies	Forterra (Hanson Pipe)	N/A
Varies	Del Zotto Precast	N/A
Manhole Joint Sealant		
1-inch	Con-Seal	CS102, 202
1-1/2 inch	Ram-Nek/Henry Company	Ram-Nek
	NPC Bidco /Trelleborg	C-56
1-inch	Evergrip	990
Exterior Joint Sealant Tape		
0.1 inch X 8 inch W (minimum)	Con Seal	CS-300, CS-212
9 inch W (minimum)	Rub-R-Nek/ Henry Company	N/A
6 inch W (minimum)	Wrapid Seal	N/A
Manhole General Coating		
12 mils thick	Con-Seal	CS-55
12 mils thick	PRO-Tect Coatings, Inc.	EW1-Aquapoxy

AS-502

PROTECTIVE COATING

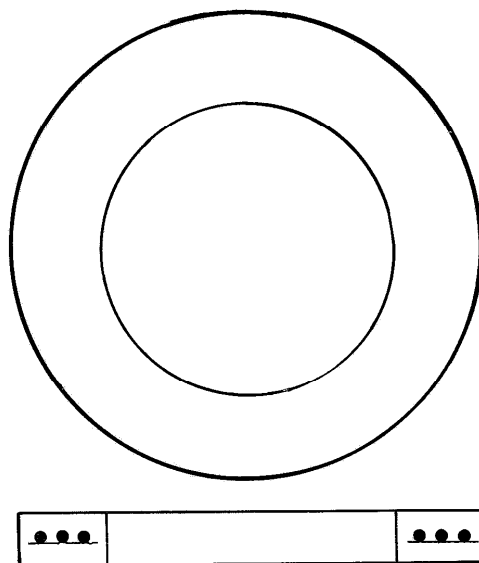


DESCRIPTION: Water Wastewater Protective Coating. See Section 447 of the current JEA Standards for specifications and requirements.

COMPANY NAME	CONTACTS	PHONE	EMAIL
The Sherwin-Williams Company	Josh Hinson	904-591-3137	swrep4538@sherwin.com
Corrocoat Usa, Inc.	Josh Tankersley	904-472-0768	Josht@corrocoat.com
PPG Protective & Marine Coatings	Jim Hartley	904-626-6382	jim.hartley@ppg.com
Carboline	Eric Foreman	904-576-0800	eforeman@carboline.com

AS-503

MANHOLE ADJUSTMENT RING

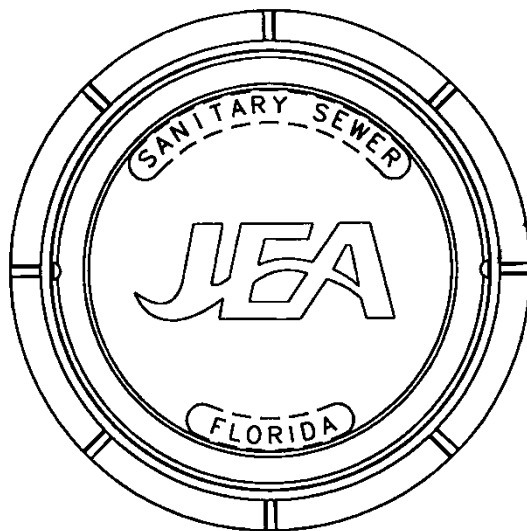


DESCRIPTION: Manhole (adjustment rings) Collars. See Section 427 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
Varies	Standard Precast	
Varies	Forterra (Hanson Pipe)	
Varies	Lad Tech, HDPE Rings	
Varies	EJ, Steel Adjustment Ring	
Varies	EJ, infra-riser	

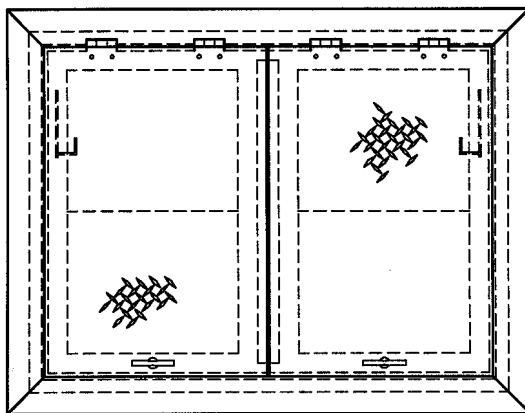
AS-504

MANHOLE FRAME AND COVER



DESCRIPTION: Manhole Frame and Cover (with rubber "T" Gaskets). See Section 427 of the current JEA Standards for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
32-inch	U.S. Foundry	USF-655
32-inch	East Jordan Iron Works	N/A

AS-601**ALUMINUM HATCH (FRAME AND COVER)**

DESCRIPTION: Aluminum Hatch Frame and Cover. See Section 433 of the current JEA Standard for specifications and requirements.

SIZE	MANUFACTURER	MODEL #
Varies	U.S. Foundry	
Varies	Halliday Products, Inc.	

AS-602

CONCRETE LINER



DESCRIPTION: Concrete Liner. See Section 446 of the current JEA Standards for specifications and requirements.

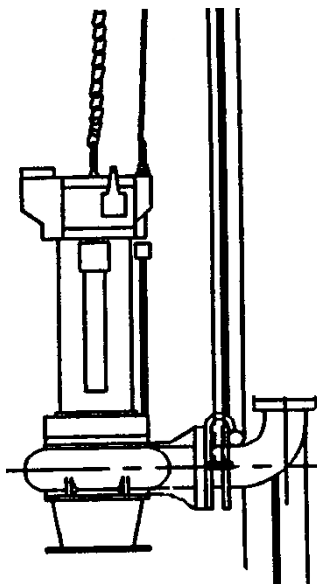
MANUFACTURER	MODEL #
Associated Fiberglass Enterprises	Hard Shell Liner (***)
Concrete Conservation, Inc.	Spectra-Shield (*)
L. F. Manufacturing, Inc.	Hard Shell Liner (***)
LarFarge/ Kerneos Inc. Calcium Aluminates	SEWPERCOAT (**)
GML Coatings, LLC.	Green Monster (*)

NOTES:

- (*) Denotes Polyurethane, HDPE or Fiberglass Liner Material
- (**) Denotes Cementitious Liner Material
- (***) Denotes Hard Shell Liner Material

AS-603

WASTEWATER PUMP

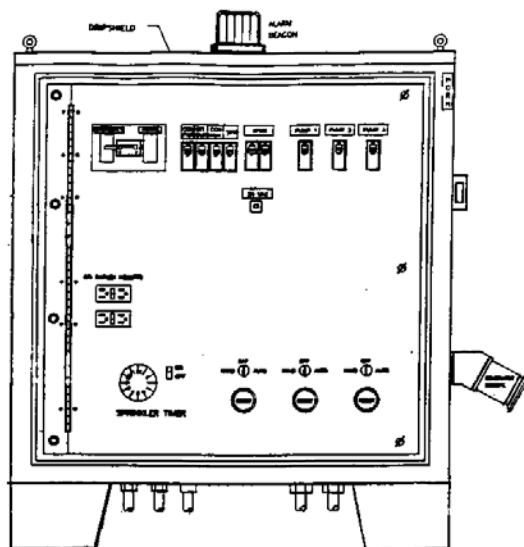


DESCRIPTION: Wastewater Pump. See Section 433 of the current JEA Standards for specifications and requirements. It is intended that JEA approved material list shall be considered acceptable, unless new technology exist or if it is in the best interest of JEA to revise the approved material list.

SUBMERSIBLE WASTEWATER PUMPS	
Manufacturer/Representative	Telephone Number
Flygt, currently rep by ITT	(407) 880-2900
EMU, currently rep by KAMAN Industrial Tech.	(904) 626-5189
KSB, currently rep by Custom Pump	(904) 858-9605
Hydromatic, currently rep by Barneys Pump (40hp and less)	(904) 260-0669
DRY-PIT WASTEWATER PUMPS	
EMU, currently rep by KAMAN Industrial Tech.	(904) 626-5189
Flow Serve (MSX), currently rep by Carter & Ver Planck	(904) 282-2836
KSB, currently rep by Custom Pump	(904) 858-9605
SUBMERSIBLE WASTEWATER PUMPS (GRINDERS)	
Barns, currently rep by South Eastern Pump	(904) 425-6931
Flygt, currently rep by ITT	(904) 282-2836
Hydromatic, currently rep by Barneys Pump	(904) 260-0669
KSB, currently rep by Custom Pump	(904) 858-9605
Myers, currently rep by Custom Pump	(904) 858-9605

AS-604

ELECTRICAL, CONTROL PANEL, VFD & SCADA



DESCRIPTION: Pump Station Electrical and Control Panel including (RTU). See Section 433 of the current JEA Standards for specifications and requirements.

COMPANY NAME	CONTACTS	PHONE	FAX	EMAIL
ECS	Ralph Sinn	(904)367-5000	(904)367-5100	ralph@ecscontrolpanels.com
EG Controls, Inc.	Brian Dail	(904)292-0110	(904)233-1525	bdail@egcontrols.com
Suncoast	Mark Owens	(904)693-3318	(904)693-3203	mowens@suncoastcontrols.biz
Sun State System, Inc.	Barney Messer	(904)269-2544	(904)269-2613	bmesser@sunstatesystems.com
Infamation Technologies Group, (ITG)	Dale R. Young	(904)425-4760	(904)425-4759	dyoung@infamation.com

DESCRIPTION: Variable Frequency Drives (VFD). See section 433 of the current JEA standard for specifications and requirements. It is intended that this JEA approved material will be considered acceptable, unless new technology exist or if it is in the best interest of JEA to revise the approved material list.

VFD	SCADA
Cutler Hammer/Eaton	SIEMENS
Yaskawa P7	